

Appendix

Appendix A Summary of Proceedings of the Study Seminar

Seminar for the Joint DBSA-JICA Study: Data Collection Survey for Economic and Industrial Development along Economic Corridors in Southern Africa

Johannesburg, South Africa, 21 February 2013

I. Introduction

1. The Seminar for the Data Collection Survey for Economic and Industrial Development along Economic Corridors in Southern Africa (hereinafter “the Seminar”) was held in Johannesburg, South Africa, on 21 February 2013. Senior officials representing Botswana, Malawi, Mozambique, Namibia, South Africa, and Zambia, as well as officials of regional economic communities (RECs), corridor organizations, international development partners, and the private sector attended the Seminar. The seminar program is provided as **Attachment 1** and the list of participants as **Attachment 2**.

2. The aim of the Seminar was to present the findings of the Data Collection Survey for Economic and Industrial Development along Economic Corridors in Southern Africa (hereinafter “the Study”) jointly undertaken by the Japan International Cooperation Agency (JICA) and the Development Bank of Southern Africa (DBSA). Specific aspects presented and discussed included: (i) growth scenarios for Southern Africa, and (ii) development initiatives for Southern Africa.

3. The chairperson for the Seminar was Dr. Michele Ruiters, Program Manager, Regional Integration, DBSA. The Seminar was directed by JICA staff members, including Mr. Yoshiro Kurashina, Director, Africa Division 3, Africa Department, JICA. Five study team members from PADECO Co., Ltd., Nippon Koei Co., Ltd., and Mitsubishi UFJ Research and Consulting Co., Ltd. presented the study findings.

II. Session 1: Welcome Remarks

4. Mr. Michael Hillary, Group Executive, Financing Operations, DBSA, opened the Seminar by warmly welcoming all the participants. He stated that this project sets the foundation for a critical need in the SADC region. One cannot understate the importance of this report, which establishes the foundation for real action for implementing actions going forward. He looks forward to building on this platform and moving forward. Finally, he expressed thanks and gratitude to JICA for sponsoring this study.

5. Mr. Ken Okaniwa, Minister, Embassy of Japan in South Africa, put the Seminar in context. The Government of Japan, in cooperation with the World Bank, the United Nations, and the African Union, will hold the Tokyo International Conference on African Development (TICAD) V during 1-3 June 2013 in Yokohama, marking the 20th year of the TICAD process. The main theme of TICAD V will be transformation for quality growth; they are aiming at growth that will promote industrialization as well as poverty reduction. Mr. Okaniwa observed that the Study is ambitious in scope, since the development envisaged goes beyond infrastructure to encompass broader economic and social development. Finally, he welcomed all delegates and expressed his hope that the discussion will be productive and help finalize the Study, which will facilitate development not only of physical infrastructure but also of industries in the region.

6. Mr. Yoshiro Kurashina, Director, Africa Division 3, JICA Africa Department, then presented on JICA's cooperation for the Southern African Region and the Study. He provided an overall introduction to JICA, and of its assistance to Sub-Saharan Africa, which totaled about USD 1.73 billion in 2010. As an example, he discussed JICA's assistance for one-stop border posts (OSBPs), including the legal framework, infrastructure, and staff training. As another example, he described JICA's assistance for development of the Nacala Corridor, including road, port, OSBP, agriculture, and education projects. Other topics addressed by Mr. Kurashina included the previous "growth belt" study and the upcoming TICAD V also mentioned by Mr. Okaniwa.

III. Session 2: Growth Scenarios for Southern Africa

A. Summary of Previous Study and Objectives of this Study

7. Mr. Yuichiro Motomura, JICA Study Team Leader, first provided a summary of the previous (2010) JICA corridors study and outlined the objectives of the current study. He explained that focusing on the eight priority corridors identified in the previous study, the current study (i) surveyed and examined potential assistance for the development of infrastructure along major economic corridors in Southern Africa, and (ii) proposed financial and technical assistance that JICA could provide for this purpose.

B. Proposed Overall Development Scenarios

8. Mr. Kensuke Shimura, JICA Study Team Member, presented overall development scenarios. He started by setting out an innovative approach for formulating an overall development vision involving "backcasting" from a vision of the future (as opposed to forecasting from the present). He then discussed the envisioned future in the region for the secondary sector, the agriculture and agro-industry sectors, and information and communication technology (ICT) and other services. The assumptions made in formulating the development scenarios were explicitly stated (e.g., adequate institutional mechanisms are in place, required physical infrastructure to be developed without delay, particular attention paid to job creation). Finally, Mr. Shimura observed that the high rate of population growth projected in Southern Africa makes the region more attractive as a destination for investment for foreign enterprises including from Japan.

C. Progress in Regional Integration

9. Mr. Bruce Winston, JICA Study Team Member, then reviewed progress in regional integration. He first offered a number of general observations concerning regional integration, e.g., it is multifaceted, including economic, cultural, and eventually political integration; the focus of the current work has been on economic integration since it relates most directly to corridor development. After discussing integration activities of existing regional economic communities (RECs)/regional economic blocs, he discussed specific integration initiatives related to corridor development. These included: (i) border and customs procedures, including one-stop border posts, coordinated (integrated) border management, and regional customs bond guarantee scheme(s); (ii) transport procedures, including road transport market liberalization, harmonization and enforcement of axle load limits, third-party motor liability insurance, harmonization of road user charges, and self-regulation of transporters; and (iii) regional corridor management.

D. Infrastructure Development Issues

10. Mr. Motomura, JICA Study Team Leader, and Mr. Michio Hasegawa, JICA Study Team Leader, then discussed infrastructure development issues. Addressing transport, Mr. Motomura considered major development issues for priority corridors, including road, railway, and port issues for the Beira, Dar es Salaam, Lobito, Maputo, Nacala, North-South, Trans-Caprivi, and Trans-Kalahari Corridors. Addressing power, Mr. Hasegawa assessed power accessibility in the respective corridors. He also noted that a number of issues remain to develop large-scale power generation, i.e., a lack of credible off-takers/power purchase agreements to underpin projects, a lack of competitive industry/market structures at the national level (single buyer model), and a tariff gap (non-cost reflective tariffs). Regarding water supply, irrigation, and water resources, Mr. Hasegawa discussed common development issues and development scenarios for priority corridors.

E. Discussion

11. Dr. Ruiters, DBSA, stressed the importance of moving forward from the report with concrete, implementable programs. She also noted that the North-South Corridor is a project championed by President Jacob Zuma of South Africa.

12. The delegate from the Trans-Kalahari Corridor Secretariat urged consideration of the role of supporting infrastructure (e.g., truck stops integrated with wellness centers including HIV/AIDS prevention, logistical hubs); along these lines, DBSA has been assisting a project developing truck stops along the Trans-Caprivi and Trans-Kalahari Corridors. He also stressed the importance of harmonization of axle load limits, customs systems interconnectivity, and risk management across borders. Regarding slide 10, looking 20 years forward, he suggested that the impression given is skewed in favor of South Africa rather than in favor of regional integration; the impression is given that in 20 years other states will only be producers of primary products. Mr. Motomura stated that the final report will incorporate these aspects. Mr. Shimura clarified that it may be difficult to develop certain industries in 15-20 years (e.g., automobile or high-tech industries), but other industries such as petrochemicals can flourish within that time horizon.

13. A delegate from Malawi stated that he was satisfied with the analysis of transport issues, but he expressed concern that the Sena Line was not sufficiently highlighted. Mr. Motomura assured that the final report will highlight it sufficiently.

14. A delegate from the Southern African Development Community (SADC) observed that corridor prioritization in the Study was undertaken based on considerations that are different from those used by SADC. He urged consideration of the Programme for Infrastructure Development in Africa (PIDA), the SADC Regional Infrastructure Development Master Plan, and national development plans. He agreed with JICA's approach regarding spatial development initiatives and the need to differentiate between transport and economic corridors. Regarding corridors, he highlighted the problem of unilateral implementation of nontariff barriers by certain countries. SADC has taken an approach focusing on instruments, institutions, and infrastructure. For revitalizing railways, he stressed the need for governments to select certain policy options. In terms of power, he observed that shortfalls in the region are decreasing and that by 2014 supply can surpass demand and provide a reserve margin; the approach they are following does not relate directly to power supply along corridors, but rather focuses on regional and national energy security. Regarding water supply, major issues relate to food and energy security, as well as to water supply and sanitation. He noted that the SADC master plan will cost USD 500-600 billion over 15 years, and the short-term term action plan (for the first five years) will cost USD 310 billion.

15. Mr. Motomura clarified that the Study was prepared from the viewpoint of possible JICA assistance. Rather than compiling all national plans into one, the Study focused on how JICA can assist the whole region. Therefore, inevitably, the recommendations will not be completely in line with existing plans. Mr. Hasegawa clarified that almost all hydropower will be in the Zambezi River basin; he noted that strengthening transmission lines (e.g., the Mozambique backbone) is important and will be mentioned in the final report.

16. In response to a concern raised by Mozambique, the JICA Study Team mentioned that agricultural and agro-processing development programs along the Nacala and Beira corridors would be discussed in the next session.

17. Mr. Peter Copley, Transportation Specialist, Office of CEO, DBSA, noted the importance of considering wastewater in addition to considering water supply and irrigation. A delegate from Zimbabwe observed that wastewater systems were not functioning in many cities in the region. Mr. Hasegawa indicated that these comments will be forwarded to the JICA Study Team's Water Specialist for incorporation in the final report.

18. A representative from DFID Southern Africa stated that coverage of infrastructure development issues may be considered "simplistic". It would be better to focus on analysis of transport capacity along corridors; this is crucial for development partner assistance. Also, he urged that the final report indicate who is doing what along the corridors in terms of infrastructure development. It is important for JICA and other development partners to focus on gaps; DFID would be happy to share relevant information. Regarding the depth of analysis, Mr. Motomura clarified that the Study was not a planning exercise, but was more of a strategic nature; the intention was not to provide specific plans for any sector, but the general direction of the development strategy. Accordingly, study resources were limited. The focus was on providing a strategy rather than specific regional or even national plans; the hope was to provide an alternative viewpoint to that derived from the approach of using masses of data; that was the intention from the beginning.

19. The representative from the Common Market for Eastern and Southern Africa (COMESA) Secretariat thanked JICA for the second-phase study. Regarding slide 9, he noted the distinction between the conventional mindset and the innovative approach involving "backcasting" that was proposed. He asked whether stakeholders were engaged to determine the ideal future 20 years hence. Mr. Motomura concurred that to implement any plan, there is a need for thorough stakeholder engagement, but again he noted the strategic nature of the Study.

20. A delegate from Zimbabwe noted that JICA will consider energy and water infrastructure in Zimbabwe. She was also happy to hear that rehabilitation of railways will be considered since that is a key issue in the country's medium-term development plan. In addition, she suggested that gender issues particularly with respect to females involved in cross-border trade be taken into account. Also, she urged closer examination of Zimbabwe's medium-term plan, including its emphasis on industrial development, mining, and tourism. Mr. Shimura confirmed that the JICA Study Team reviewed the various national development plans and will check the Zimbabwe medium-term plan again to assure that it is fully reflected in the development scenarios. Mr. Motomura stated that team's basic approach was "optimistic and seamless"; having a vision for the future rather than merely assuming an extension of the present was an important feature of the approach taken by the JICA Study Team.

21. The CEO of the NEPAD Business Foundation in South Africa stressed the important role played by the private sector and the need for public-private partnerships (PPPs), e.g., in the establishment of industrial zones. She was happy to see that the JICA Study Team identified agriculture as a key growth area. She urged consideration of feeder roads to farms to assure that

the benefits of corridor development are more widely dispersed; she also urged consideration of agricultural facilities and grain terminals at ports rather than just facilities for the bulk handling of minerals. Further, she urged more support for female farmers.

22. Regarding slide 33, the delegate from the Southern African Railways Association pointed out that the first bullet point should be corrected since the missing link mentioned in Zimbabwe has already been completed.

23. A representative from TradeMark Southern Africa concurred with the innovative approach adopted by the JICA Study Team (i.e., finding a vision for a desirable future and underpinning it with an economic rationale based on development paths taken elsewhere). He asked for information on possible roles for the state in articulating the desired future, especially in trying to realize industrial development opportunities in lead sectors.

24. Regarding slide 5, a representative from the African Development Bank observed that the concept of corridor development is to support a development process, by materializing the hard infrastructure and unifying the regulations.

25. Mr. Motomura observed that in envisioning the future, as stated in slide 21, there are a number of conditions necessary for realizing the vision. He noted that while the Study did not specify what could be done by the public sector and what could be done by the private sector, but generally the strategy is for private sector action wherever possible. He agreed on the importance of feeder roads and stated that the subject will be mentioned in the final report. He also concurred on the importance of providing agricultural storage facilities at ports as well as the gender issue in cross-border trade. He further stated that the information on the missing railway link in Zimbabwe will be corrected.

IV. Session III: Development Programs for Southern Africa

A. Potential JICA Focus Economic Corridors

26. Mr. Motomura introduced the measures used for assessing the priority corridors, including measures of development potential (corridor analysis in the 2010 JICA study, priority of corridors in the 2012 SADC Regional Infrastructure Development Master Plan, and the potential for realizing the overall development scenarios) and of the relationship with Japan (synergistic investment by Japanese firms and recent/ongoing JICA assistance). He then set out the assessment of the priority corridors based on these evaluation measures. Group 1 corridors (Nacala and the North-South) offer relatively higher potential for realizing overall development scenarios and are relatively more closely related to the activities of Japanese firms and JICA. Group 2 corridors (Beira and Dar es Salaam) offer relatively higher potential for realizing overall development scenarios but are relatively less closely related to the activities of Japanese firms and JICA. Other corridors were classified in a Group 3 (Maputo) and a Group 4 (Lobito, Trans-Capriivi, and Trans-Kalahari). Development programming was undertaken for corridors in Groups 1 and 2; however, assistance for the corridors in Groups 3 and 4 has not been ruled out.

B. Proposed Development Initiatives

27. Mr. Shimura then set out the development programming for the Group 1 and 2 corridors, i.e., the Nacala, North-South, Beira, and Dar es Salaam Corridors, including a discussion of development strategies and critical public sector actions. Finally, he discussed the long list of technical assistance projects and infrastructure development initiatives. The long list was presented by type of activity (i.e., agriculture and agro-industry; mining, downstream

industries, and other manufacturing; regional integration; infrastructure development) and indicated corridor(s), country/countries, sector/subsector, and proposed development projects/initiatives. The JICA Study Team clarified that these projects/initiatives were relatively broadly defined, based on discussions with JICA.

C. Discussion

28. Dr. Ruiters observed that the JICA Study Team has proposed a high-level identification of areas of development that could be considered for cooperation with JICA. She observed that now is the time to discuss concrete issues bearing in mind national plans, regional plans, and continental priorities.

29. A delegate from Zimbabwe observed that the exercise is helpful for taking the process forward. In this context, he asked how much consultation was done in the Study to link the plans with national and regional-level plans. For example, according to the Zimbabwe industrial development policy any development of the mining sector must be linked not only to value addition but also to enhanced value addition.

30. A delegate from Botswana noted that they will be developing a major project irrigating 70,000 ha of land with water from the Zambezi River.

31. The delegate from the Zambezi Watercourse Commission (ZAMCOM) stressed that water cannot be considered an infinite resource. He asked whether a strengths, weaknesses, opportunities, threats (SWOT) analysis had been undertaken to better assess the existing situation. Regarding the selection of projects, he observed that process was as important as the end product. Engagement of stakeholders is important, and a good SWOT analysis can facilitate the process.

32. Mr. Shimura observed that the situation of Zimbabwe is perhaps unique. In the next 20 years if the region is to be developed as a whole, South Africa should be developed to higher industrial levels (e.g., high tech and information technology service industries). Zimbabwe has established industries but looking at industrial and trade statistics, Zimbabwe is not utilizing the capacity of its established industries. It is important to focus on the modernization of industries, and then later go into more value-added technological development.

33. Mr. Hasegawa confirmed that regarding the water sector, the specialist interviewed officials in all countries and referred to all relevant documents. The final report will provide the details, including the present status and bottlenecks.

34. Dr. Ruiters asked about linkages between clusters. Mr. Shimura clarified that some of the strategies include the cluster function for agricultural development, with linkages to small and medium enterprises and microenterprise clusters. Agricultural development near cities may include perishable fruit production; the commercial functions in large cities will be utilized for marketing of these products.

35. Mr. Copley, DBSA, noted that the city of Bulawayo in Zimbabwe was not mentioned. Since it is the center of gravity of the Southern African rail system, it lends itself to rail-related industries. He also noted the importance of the Northern Corridors in East Africa. Mr. Motomura pointed out that JICA has been assisting a major goods transport study in Tanzania in which a comparison with the Northern Corridor was presented.

36. It was observed that on slide 58 on the Nacala Corridor the interventions included port and road components rather than components for railway development. A question was raised

whether this is because rail is being developed through other resources. A delegate from Malawi clarified that Vale is carrying out rehabilitation of the rail line through Moatize in Mozambique.

37. A representative from Malawi asked whether the central part of Malawi could be included in the strategy. He also asked whether the construction of dams was included on slide 39 in terms of the supply of water for existing irrigation schemes; JICA previously supported such a scheme in the country.

38. Mr. Hasegawa clarified that the proposed projects in long list were not defined in detail. Rather, it is a conceptual list at this stage. Dr. Ruiters clarified that what remains is bilateral discussions between the countries and JICA and other development partners, with the countries looking at their gaps and development partners considering how to fill in the gaps. That is the next step.

39. Dr. Ruiters stated that it may be necessary to look at new rail lines to connect mining and industrial lines to commercial and passenger lines. Infrastructure is not only commercial, but one must look at the social impact of infrastructure on people's lives.

V. Panel Discussion and Questions and Answers

40. The findings of the study were discussed by a panel consisting of: (i) Mr. Peter Copley, Transportation Specialist, Office of CEO, DBSA; (ii) Mr. Yuichiro Motomura, JICA Study Team Leader and President & CEO, PADECO; and (iii) Mr. Freddie O. Motlhatlhedhi, Energy Specialist, SADC.

41. Mr. Motomura, the JICA Study Team Leader, stated that the study was not a planning exercise but rather an attempt to assess possible actions to be taken by the governments. Rather than projecting the future, the JICA Study Team identified a desirable future state, and identified what was necessary to reach that future. In the past emphasis was based more on how export commodities could be shipped out of a port, but with growing populations along corridors, people should now be given the priority. Corridors are not (merely) conduits of goods, but belts dotted with cities and towns and surrounding villages. In rapidly expanding East Asian countries, governments provided corridors with both hard and soft infrastructure. Facilities such as industrial estates, distribution centers, vocational schools, and agricultural processing centers were built. Development financing institutions played a large role in the process. Thinking first about the people in the corridor means that the issue of tackling unemployment is a top priority. Labor costs in East Asia are growing over 7% per year, while these costs are increasing by only a little more than 2% per year in Africa, so that in seven years labor costs on average will be more attractive in Africa than in East Asia. Japanese manufacturing companies are establishing bases in Southern Africa anticipating such a change. Government and the public sector is always very important, but it is not everything, and it is not suited for picking winners in industry. The JICA Study Team's vision is for government to provide infrastructure, both hard and soft, rather than pick winners. The Study was done mainly for JICA to formulate its assistance strategy for the region, but because the approach taken was not traditional, it may provide some "food for thought" for policymakers in the region.

42. Mr. Motlhatlhedhi, SADC, thanked JICA for its assistance with the Study. SADC's role as a regional organization is not to implement programs as such, but to facilitate implementation of these programs. Corridors need to be implemented regionally. Last year the SADC Heads of State approved a Regional Infrastructure Development Master Plan. The Study took cognizance of these findings, which makes it easier for SADC to take the Study's findings on board. Their master plan addressed the various sectors to 2027, and divided projects into five-year periods for ease of implementation. The Study represents a refinement; the real challenge is how we

move forward. While he mentioned the role of SADC, the role of member states is most important; they need to create an environment conducive for investment. There is a need to “zero in” at some stage on specific projects with a comparative advantage that need to be implemented. In the end, the programs need to be “in synch with” the national development plans, but this process must proceed independently, so that clear decisions can be made without being “clouded” by the national development plans. That said, there should be no conflicts with the national development plans. Ministers of planning need to be involved. Resources will need to be raised from Japan, the SADC governments, or elsewhere. He noted that an infrastructure summit will be held in Maputo and information on the Study will be shared with the Heads of State.

43. Mr. Copley, DBSA, stated that the Study was “a fantastic effort”. JICA was the first to recognize the need for OSBPs starting 15 years ago at Chirundu, which remains a work in progress “but we will get there”. Southern African railways operate at only about 12.5% efficiency. South Africa has arguably the best truck logistics system in the world, but outside of South Africa, trucking costs are 5-8 times higher than in the rest of the world, and this is largely because of border posts, which are critical (trucks must be able to pass in 30-60 minutes). Since Japan shares the same rail gauge on its freight system as most of Southern Africa, it is easy to obtain rolling stock from Japan. He then spoke about the BRICS (Brazil, Russian, India, China, South Africa) cooperation grouping; he observed that South Africa cannot necessarily compare itself with these “mighty countries”, but South Africa can become more meaningful if it speaks for the region. Against the background of several previous studies, the present Study is “commendable”; it fills a gap because it is a hybrid between corridor and industrial studies. He observed that the Kazungula Bridge is a “hugely significant” project, for which it required 25 years to obtain the funding (which came mainly from JICA, the senior financing partner for the project). On the subject of hydropower he asked why South Africa has not brought in more from the north. He argued that manufacturing is best done in South Africa in view of the country’s natural competitive advantages; “it is better not to force things”. Finally, he observed that the role of the SADC Secretariat is “massive” from the point of view of being an “honest broker”, being credible, and being able to confirm what is in the best interests of the region.

44. It was observed that the New Partnership for Africa’s Development (NEPAD) is “12 years young”; coordinating all of the countries on the continent is not easy.

45. The delegate from the Zambezi River Authority expressed appreciation for the view that instead of being passages corridors should be “a means by themselves”. They will contact JICA to see how the Zambezi River can be tapped for the maximum benefit of the corridors.

46. A Zimbabwe delegate asked whether the theory of comparative advantage works practically, or whether is necessary “to refocus the paradigm”. Mr. Motomura noted that comparative advantage is determined by the market, which is fragmented.

47. There was some discussion of the relative effectiveness of different RECs in the region and elsewhere in Africa.

48. Mr. Testuya Fukunaga, TICAD Advisor, JICA (attached to DBSA), noted practical issues in project preparation, particularly in determining which projects are suitable for PPPs, which are suitable for pure public participation, and which are suitable for pure private participation.

49. Dr. Ruiters observed that the region does not yet have an industrialization plan, even though this is one of the pillars of Tripartite cooperation. The Study has started the discussion, but it has not been a regional discussion based on the comparative advantages of each of the

SADC member states. This is a discussion that SADC could arrange and in which DBSA could possibly engage.

50. Mr. Motomura requested the delegates to send any additional comments by email.

VI. Closing Remarks

51. Mr. Toshiyuki Nakamura, Chief Representative, JICA South Africa, made the closing remarks. On behalf of JICA and DBSA he expressed his sincere thanks to all participants in the Study and Seminar. He explained that the starting point for the Study was transferring the experience of East Africa to the African continent in terms of corridor development. Based on this initial premise, the Study was carried out through communication with all stakeholders in the Southern African region. A number of points were raised by the stakeholders, of which he highlighted the importance of capacity building. For example, skills are required to maintain infrastructure. As Mr. Kurashina explained in Session 1, JICA not only provides funds, but taking a holistic approach to development it also provides technical assistance.

Attachment 1: Seminar Program



Seminar for Joint DBSA-JICA Study: Data Collection Survey for Economic and Industrial Development along Economic Corridors in Southern Africa

1. Purpose of the meeting:

The seminar aims to present the draft study outputs which range from the development scenarios in regional economic corridors and the key bottlenecks to be tackled with high priority for achieving the desirable economic growth in Southern Africa, to JICA's proposed assistance. Participants are kindly requested to provide us with valuable inputs for enhancing the final outputs of the study through the intensive discussion with regional stakeholders at the seminar.

2. Schedule and Venue:

Date: February 21, 2013

Time: 9:00 – 16:15

Venue: DBSA Vulindlela Academy, 1258 Lever Road, Headway Hill, Midrand, Gauteng, South Africa

3. **Agenda:** MC: Dr. Michele Ruiters, Program Manager, Regional Integration, DBSA

8:30 –9:00 Registration

9:00 –9:45 Session 1: Welcome Remarks

9:00 –9:10 Welcome Remarks from Mr. Michael Hillary, Group Executive, Financing Operations, DBSA

9:10 –9:20 Welcome Remarks from Mr. Ken Okaniwa, Minister, Embassy of Japan in South Africa

9:20 –9:45 Introduction from Mr. Yoshiro Kurashina, Director, Africa Division 3, JICA Africa Department

9:45 –10:15 Coffee Break

10:15 –12:15 Session 2: Growth Scenarios of Southern Africa (JICA Study Team)

Presentation: Summary of Previous Study and Objectives of this Study

Presentation: Proposed Overall Development Scenarios

Presentation: Progress in Regional Integration

Presentation: Infrastructure Development Issues

Discussion

12:15 – 13:30 Lunch Break

13:30 –14:30 Session 3: Development Programs for Southern Africa (JICA Study Team)

Presentation: Potential JICA Focus Economic Corridors and Development Programs

Presentation: Proposed Development Initiatives

Discussion

14:30-14:45 Coffee Break

14:45 –16:15 Session 4: Panel Discussion: The way forward and challenge

Panelists:

- (1) DBSA: Mr. Peter Copley, Transportation Specialist, Office of CEO
- (2) JICA Study Team: Mr. Yuichiro Motomura, President & CEO, PADECO
- (3) SADC Secretariat: Mr. Remigious Makumbe, Director, Infrastructure and Services

16:15 –16:30 Session 5: Closing Remarks

16:15–16:30 Closing Remarks from Mr. Toshiyuki Nakamura, Chief Representative, JICA South Africa Office

16:30– Networking Session

Attachment 2: List of Seminar Participants

No.	Name	Position	Organization	Country
1	Mmadima Nyathi	Director; Agricultural Hub	Ministry of Agriculture	Botswana
2	Freddie O. Motthatlhedhi	Senior Program Officer - Energy	SADC Secretariat	Regional
3	Gift Manase	Program Manager Regional Strategic Water Infrastructure Development	SADC Secretariat	Regional
4	Remigious Makumbe	Director, Infrastructure and Services	SADC Secretariat	Regional
5	Michael Mutale	Executive Secretray, Interim Secretariat	Zambezi Watercourse Commission (ZAMCOM)	Regional
6	Tomics Kaunda	Director of Transport Planning	Ministry of Transport and Public Infrastructure	Malawi
7	Khumbolawo Mulumbeni Lungu	Assistant Director of Energy, Department of Energy Affairs	Ministry of Energy and Mines	Malawi
8	Bisa Namarika	SENIOR MANAGER PROJECTS AND RESEARCH	Malawi Investment and Trade Center	Malawi
9	Pepani W.R.Kaluwa	Deputy Director of Water Resources	Ministry of Water Development and Irrigation	Malawi
10	Chawanangwa Kajiso Jana	Deputy Director of Irrigation Services	Ministry of Irrigation and Water Development, Department of Irrigation	Malawi
11	António Lomiasse Goliate Chicachama	Head of Analysis and Policies Department	Ministry of Energy, National Directorate of Electrical Energy	Mozambique
12	Marcelo Chaquisse	Deputy Director of Agrarian Services	Ministry of Agriculture, National Directorate of Agrarian Services	Mozambique
13	Jose Antunes	Director of Studies and Cooperation Services	GAZEDA (Special Economic Zone Office)	Mozambique
14	Lufunda Muzeya	Energy Economist, Department of Energy	Ministry of Mines, Energy and Water Development	Zambia
15	Alick Daka	Deputy Director Crops Branch, Department of Agriculture	Ministry of Agriculture & Livestock, Department Agriculture	Zambia
16	M.C. Munodawafa	Chief Executive	Zambezi River Authority (ZAR)	Regional
17	Gilbert M. Maeti	Senior Transport Economist	COMESA	Regional
18	Caesar Gift Kurewa	Senior Administrative Officer, Policy, Planning and Coordination	Ministry of Transport, Communications and Infrastructural Development	Zimbabwe
19	Samson Bhuza	Chief Planning Manager, STRATEGIC PLANNING	National Railways of Zimbabwe (NRZ)	Zimbabwe
20	Benson Munyaradzi	Director, Policy and Planning	Ministry of Energy and Power Development	Zimbabwe
21	Ndomupeyi Chikonye	Director of Power Developmen	Ministry of Energy and Power Development	Zimbabwe
22	Stanslaus Daison Mangoma	Director Enterprise Development	Ministry of Industry and Commerce	Zimbabwe
23	Evelyn Ndlovu	Permanent Secretary	Ministry of Small and Medium Enterprises and Cooperative Development	Zimbabwe
24	Conrade Zawe	Director of Irrigation Department	Ministry of Agriculture Mechanisation and Irrigation Development	Zimbabwe
25	Vavarirai Humwe Choga	Acting Principal Director, Water Resources Management	Ministry of Water Resources Development and Management	Zimbabwe
26	Alison Chikova	Chief Engineer	Southern African Power Pool (SAPP)	Regional
27	Bernard Dzawanda	Executive Director	Southern African Railways Association (SARA)	Regional
28	Gondi Diaz	Chief Economist, Projects and Incentives, Namibia	Ministry of Trade and Industry	Namibia
29	Kelvin Kaluba	Corporate Secretary/Finance Director	Zambezi River Authority (ZAR)	Regional
30	Mary-Jean Gabriel	Director of Water Use and irrigation Development	Department of Agriculture, Forestry & Fishery	South Africa

No.	Name	Position	Organization	Country
31	Michele Ruiters	Sector Strategies Unit Sector Specialist : Regional Programmes	Development Bank of Southern Africa (DBSA)	
32	Peter Copley	Transportation Specialist, Office of CEO	Development Bank of Southern Africa (DBSA)	
33	Libby Dreyer	Advisory Unit Manager	Development Bank of Southern Africa (DBSA)	
34	Zakhele Mayisa	Manager Infrastructure	Development Bank of Southern Africa (DBSA)	
35	Albert Mafusire		AfDB	
36	Paolo Craviolatti	Economic Adviser	DFID Southern Africa	
37	Leon Gouws	MRGP Programme Lead	DFID Southern Africa	
38	Marc Leistner	Deputy Head of Regional Representation for	European Investment Bank (EIB)	
39	Graham Norman Smith	Corridors Manager, DFID	Trade Mark Southern Africa (TMSA)	
40	Lynette Chen	CEO	NEPAD Business Foundation	
41	Sandra Pires	Head: Stakeholder Relations	NEPAD Business Foundation	
42	Patrick Ooro	Manager, Johannesburg Office	Hitachi Europe Ltd	
43	Shigeo Yanai	General Manager	Mitsui Co. & African Railway Solutions	
44	Akira Matsuo		Mitsubishi Corporation	
45	Isao Deki	Director, Johannesburg office	Mitsubishi Heavy Industries	
46	Julian Gopaul	Manager, Johannesburg office	Mitsubishi Heavy Industries	
47	Motoko Wakatabe	Manager Africa Regional Office	Nippon Koei	
48	Mitsunori Okimura	General Manager	Sojitz	
49	Shizuko Naruse	Coordinator, SubSahala Office	Sumitomo Corporation	
50	Tetsuhiko Yamano	General Manager, Johannesburg Representative Office	Toshiba Corporation	
51	Ken Okaniwa	Minister	Embassy of Japan	
52	Tomohide Yamada		Embassy of Japan	
53	Hitoshi Hatta		Embassy of Japan	
54	Katsuro IGARI	Deputy Executive Director	JETRO Johannesburg	
55	Keiji SAWA	Trainee	JETRO Johannesburg	
56	Lizelle Rykaart	Africa Business Development Officer	AFGRI Operations Limited	
57	Yolanda Fourie	Associate, Transport Economics	Aurecon	
58	Wynand Bezuidenhout	Associate, Project Manager	Aurecon	
59	Retief Steyn	Country Manager, Central Africa and Indian Ocean Islands	Aurecon	
60	Aldina de Pinho	Administrator Assistant, Emerging Regions – East Africa Aurecon	Aurecon Centre	

No.	Name	Position	Organization	Country
61	Lynn M. Harmon	Managing Director	Corridor Development Consultants (Pty) Ltd	
62	David Robbette	Director	Executive Research Associates	
63	Michelle Da Costa	Marketing Manager	Executive Research Associates	
64	Nalika Kodikara	Second Secretary (Commercial)	High Commission of Sri Lanka	
65	Mary Wamaitha	Senior Business Development Manager, Africa Unit	Industrial Development Corporation	
66	Pierre Regnier	CEO	Isilo Trust	
67	Janine Erasmus	Editor	MediaClubSouthAfrica.com	
68	Peter Draper	Senior Research Fellow	South African Institute of International Affairs	
69	Sven Schroeder		South African Institute of International Affairs	
70	Oscar Muyatwa	Secretariat	Trans Kalahari Corridor	Namibia
71	Gilbert Boois	Project Manager: Spatial Development Initiatives	Walvis Bay Corridor Group	Namibia
72	Hanief Ebrahim		The Presidency	
73	Mervin Chetty	GM Africa Strategy	Transnet SOC LTD	
74	Tetsuya Fukunaga	TICAD Advisor	JICA	
75	Hiroyuki Kutsuna	JICA Advisor to SADC Secretariat	JICA	
76	Yoshiro Kurashina	Director, Africa Division 3, Africa Department	JICA	
77	Toshiyuki Nakamura	Chief Representative	JICA South Africa Office	
78	Masao Shino		JICA South Africa Office	
79	Yuko Kanto	Project Formulation Advisor(PPP)	JICA South Africa Office	
80	Tomoko Miyata	Project Formulation Advisor	JICA Botswana Office	
81	Yukiko Ohno	Project Formulation Adviser	JICA Mozambique Office	
82	Takeshi Tomitani	Assistant Resident Representative	JICA Malawi Office	
83	Yuichiro Motomura		PADECO Co., Ltd. (JICA Study Team)	
84	Bruce Winston		PADECO Co., Ltd. (JICA Study Team)	
85	Kensuke Shimura		Mitsubishi UFJ Research and Consulting (JICA Study Team)	
86	Michio Hasegawa		Nippon Koei Co., Ltd. (JICA Study Team)	
87	Risa Yokoyama		PADECO Co., Ltd. (JICA Study Team)	

Appendix B Power Point Presentation Made at the Study Seminar



**Joint DBSA-JICA Study:
Data Collection Survey for
Economic and Industrial
Development along Economic
Corridors in Southern Africa**

Draft Final Report Presentation

February 2013

Japan International Cooperation Agency



PADECO Co., Ltd.
Nippon Koei Co., Ltd.

1

Table of Contents

1. Background and Objectives
2. Overall Development Scenarios
3. Progress in Regional Integration
4. Infrastructure Development Issues
5. Potential JICA Focus Economic Corridors
6. Development Programming for Group 1 and 2 Corridors
7. Long List of Potential Technical Assistance Projects and Infrastructure Development Initiatives

2

Background and Objectives

3

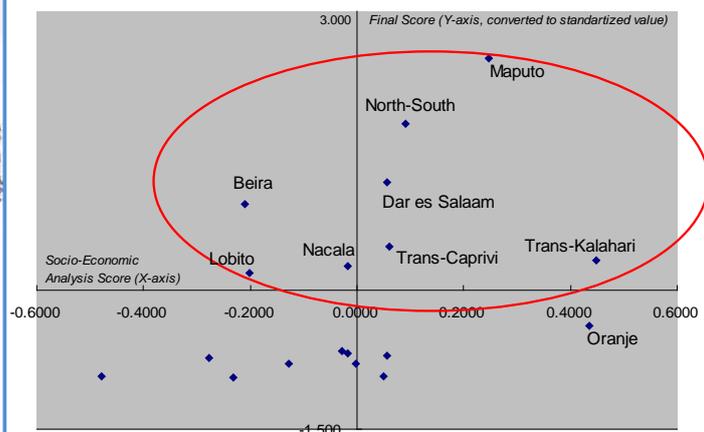
Previous JICA Study in 2010 (1/3)

(Preparatory Survey for Southern Africa Integrated Regional Transport Program, 2010)

Corridor analysis undertaken in 2010 JICA Study



18 corridors assessed



Eight priority corridors selected

4

Previous JICA Study in 2010 (2/3)

(Preparatory Survey for Southern Africa Integrated Regional Transport Program, 2010)

Growth Scenarios Proposed

Scenario A)	<p>Growth led by mineral resources development</p> <ul style="list-style-type: none"> • Revitalize mineral resources development • Develop basic infrastructure and induce investment in manufacturing • Promote public and private investment in power/energy development
Scenario B)	<p>Growth through intra-regional trade</p> <ul style="list-style-type: none"> • Utilize regional trade potential of South Africa • Expand intra-regional trade that does not go through South Africa
Scenario C)	<p>Diversification and advancement of the industrial structure through global trade</p>

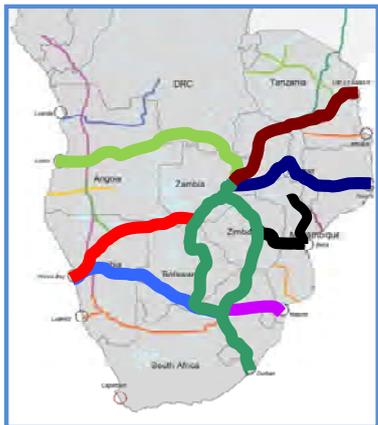
These growth scenarios are sensible, while broad-based.

5

Previous JICA Study in 2010 (3/3)

(Preparatory Survey for Southern Africa Integrated Regional Transport Program, 2010)

➤ Eight priority corridors selected

<ul style="list-style-type: none"> ■ Beira Corridor (including the Sena and Tete Corridors) ■ Dar es Salaam Corridor ■ Lobito Corridor ■ Maputo Corridor ■ Nacala Corridor ■ North-South Corridor ■ Trans-Caprivi Corridor ■ Trans-Kalahari Corridor 	
--	--

➤ Broad-based growth scenarios

➤ Transport-oriented study

This Study proposes:

- ✓ more specific development scenarios focusing on the eight priority corridors
- ✓ development of regional economic corridors (industrial as well as infrastructure development including transport, power, and water)

6

Study Objectives

1. To survey and examine potential assistance for the development of infrastructure along major economic corridors in Southern Africa
2. To propose financial and technical assistance to be provided by JICA for the above purpose



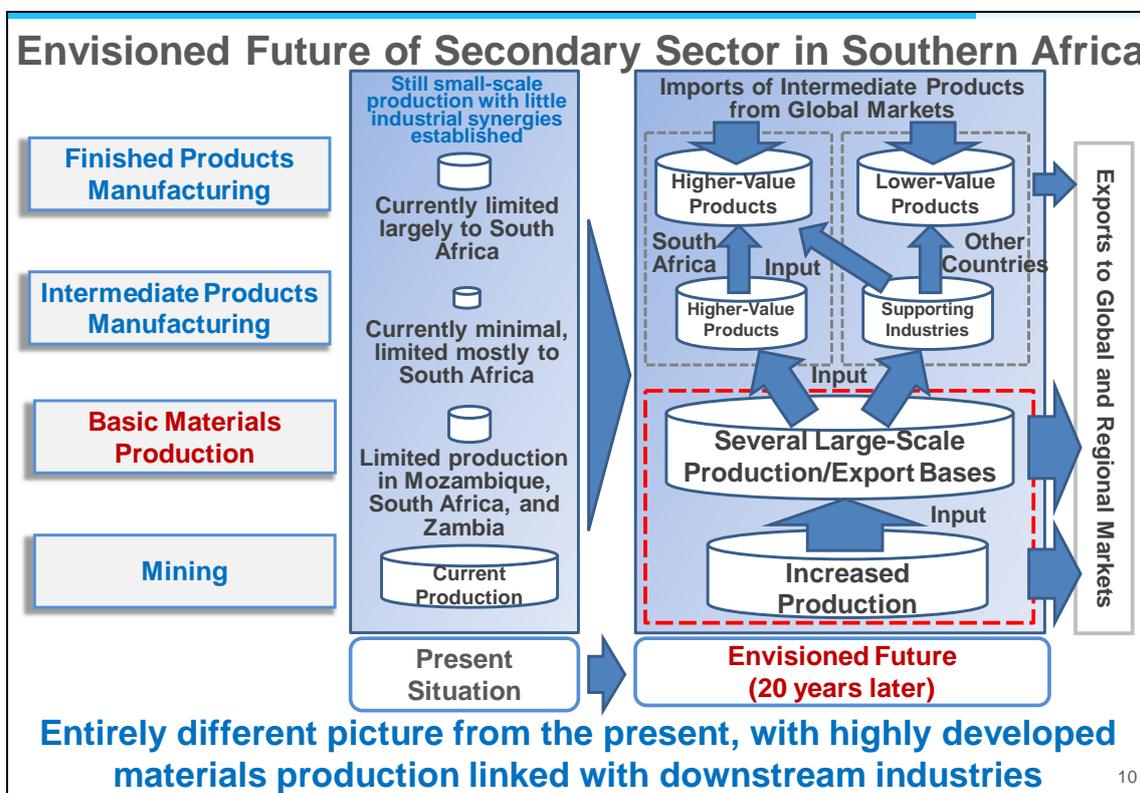
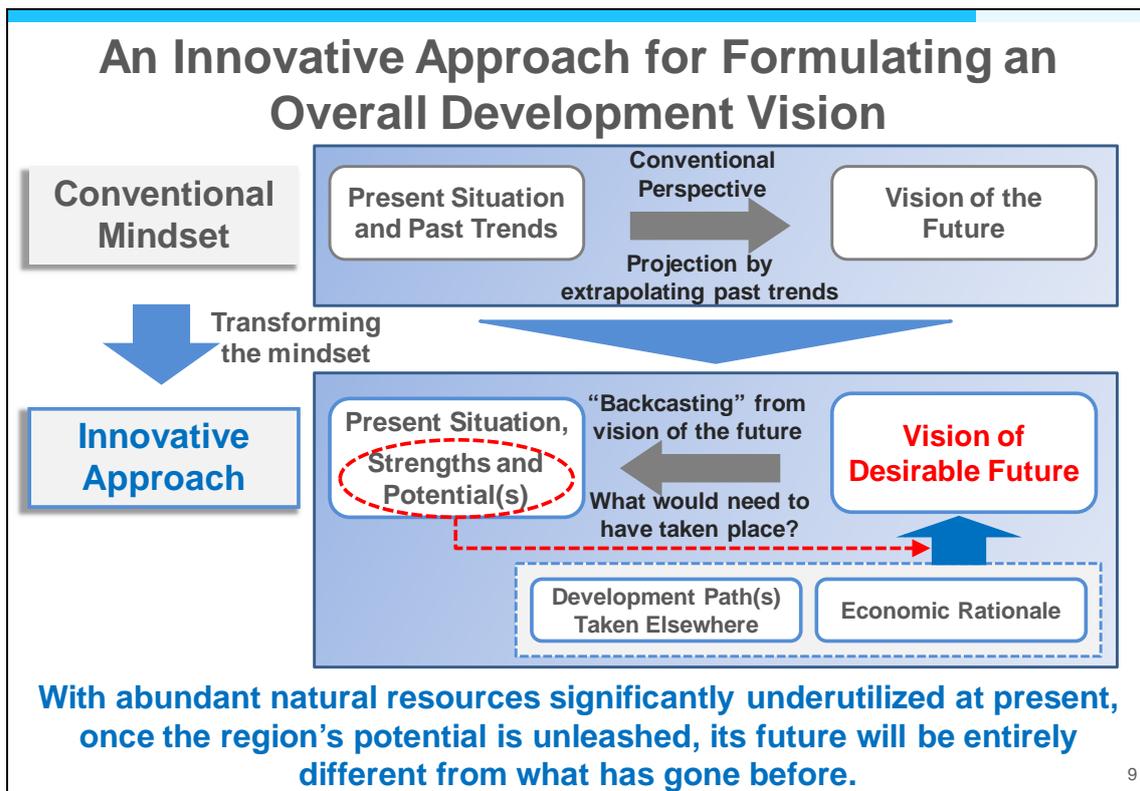
- ✓ Focusing on the eight priority corridors identified in the previous JICA study (as shown in the previous slides)
- ✓ Based on more specific development scenarios

Study Area: Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe

7

Overall Development Scenarios

8



Examples of Envisioned Large-Scale Basic Materials Industries in Southern Africa

Country	Basic Materials Industry	Corridor
Mozambique	Aluminum production at the Mozal Aluminum Smelter with synergistic effects on related industries	Maputo Corridor
Mozambique	Heavy chemical industries to be developed, transforming the Nacala Special Economic Zone into a large-scale petrochemical industry base	Nacala Corridor
Tanzania	Heavy chemical industries to be developed at a newly created port in Bagamoyo, about 60 km north of Dar es Salaam, where a large-scale industrial park is to be developed	Dar es Salaam Corridor
Zambia	Copper fabrication and iron/steel industries to be developed at multi-facility economic zone (MFEZ) and through construction of individual plants in and around Lusaka and Copperbelt	Nacala and North-South Corridors

11

An Image of Industrial and Urban Development along the Coast in Southern Africa



Bagamoyo 2012

Natural Tourist Sites



Bagamoyo 2040

Central Business District

International Gateway Harbor

Mixed Use Urban Development

Industrial Port

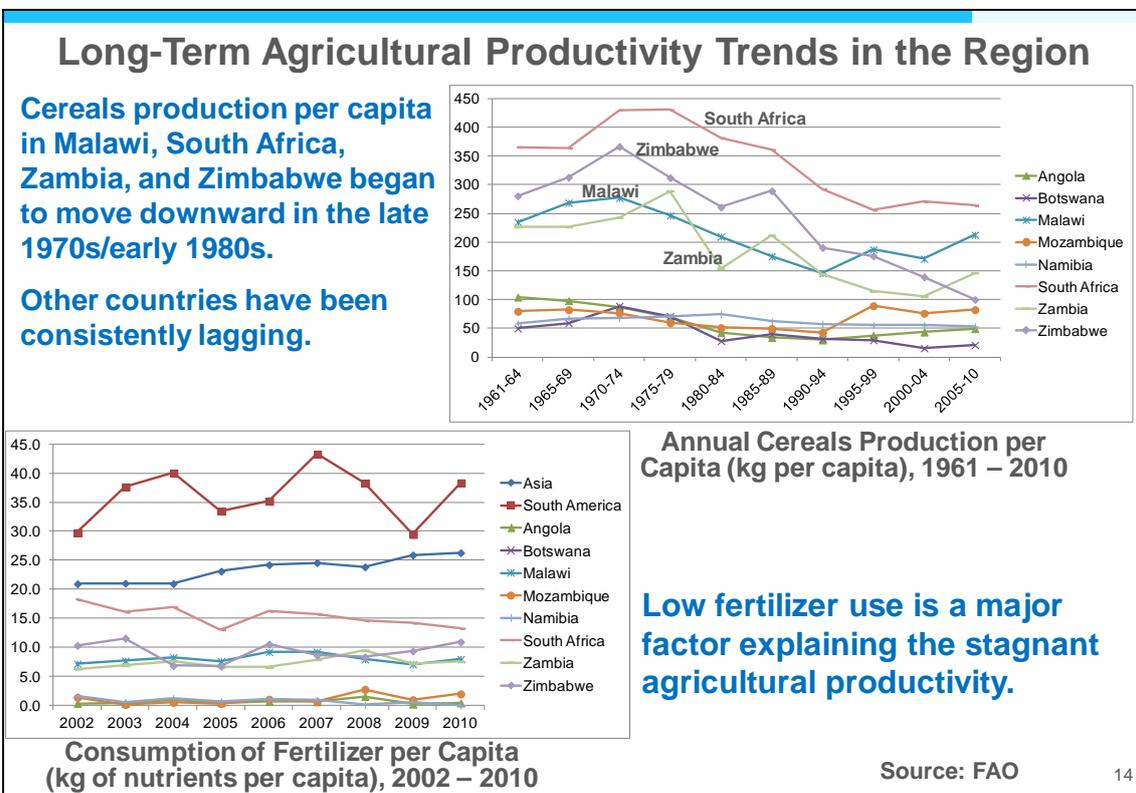
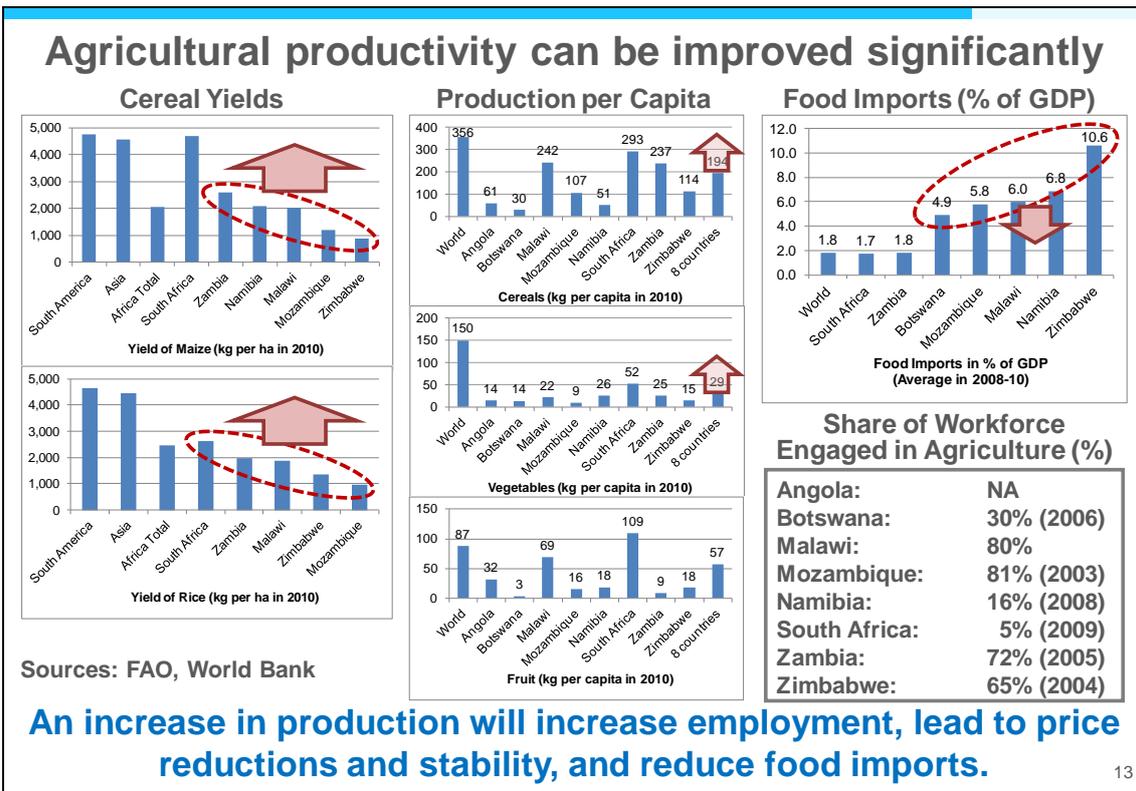
Industrial Development

Recreational and Tourism Development

This type of development can also be undertaken at other locations in Southern Africa (e.g., in Nacala)

Source: Concept prepared by JICA Study Team

12



Envisioned Development of Agriculture and Agro-Industry Sectors in Southern Africa

Productivity growth in cereals production

- Resulting from (i) a sharp increase in fertilizer production, (ii) infrastructure development, (iii) R&D breeders, and (iv) absorption of the informal sector labor force especially in rural areas
- Achieved through development of large-scale production

Diversification toward higher-value products

- Significant increase in production of a variety of commercial crops, resulting in a high rate of export growth
- Significant growth in perishable crops production (especially around metropolitan areas) for domestic and regional consumption

Agro-industry production (expansion downstream)

- Expanding agriculture-based activities to a variety of agro-processing industries including large-scale ones (e.g., near raw materials production sites and around metropolitan areas)
- Resulting in import substitution of food products as well as growth in exports to other regions and global markets

Geographical diversification of production

- Rural areas for cereals production
- Various areas for commercial crops farming and food processing industries, including rural areas
- Around metropolitan areas for perishable crops production and for agro-processing

Agriculture in the region achieves global standards in production and productivity with emergence of Regional Agripowers.

15

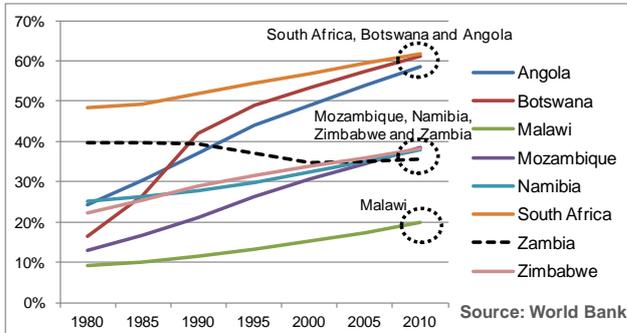
Examples of the Envisioned Development of Agriculture and Agro-Industry in Southern Africa

Country	Agriculture and Agro-Industry	Corridor
Mozambique	Clusters of commercial farms and agribusiness enterprises to be developed along the Beira and Nacala Corridors through outgrower schemes (contract farming operations). Large storage facilities/packing houses and processing facilities/mills will be established at/near the major cities along the corridors.	Beira and Nacala Corridors
Tanzania and Zambia	Agribusiness special economic zones (SEZs) are to be deployed at key cities along the corridor, linked with SME/MME clusters.	Dar es Salaam Corridor
Zambia and Zimbabwe	Clusters of commercial farms and agribusiness, including soybean value chains, to be situated along the corridor near Zambia/Zimbabwe border.	North-South Corridor

16

Urbanized Population and Unemployment as an Opportunity for Creating New Industries around Metropolitan Areas

Rapidly urbanized population over the past decades



High unemployment rate

Angola:	26%
Botswana:	17.5%
Malawi:	NA
(Note: Unemployment is prevalent.)	
Mozambique:	27%
Namibia:	NA
(Note: Official unemployment rate in 2008 was 51.2%.)	
South Africa:	23.9%
Zambia: Urban 20-24 age:	48%
Rural 20-24 age:	7%
Zimbabwe:	NA

Source: African Economic Outlook 2012

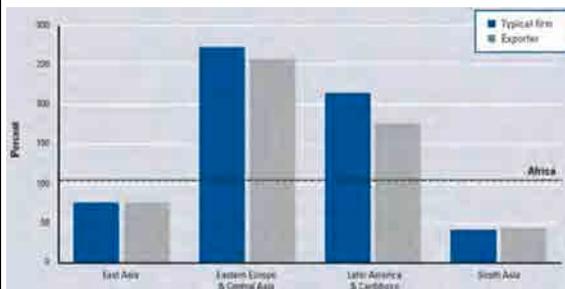
Proportion of Urban Population in the Focus Countries, 1980-2010

Labor-intensive, light industries in and around metropolitan areas

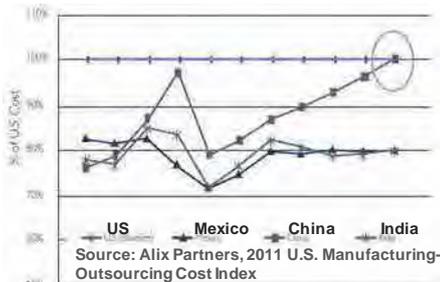
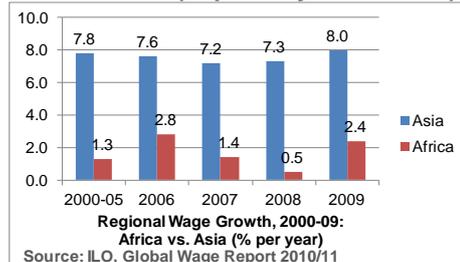
Value-added agriculture and agro-processing industries around metropolitan areas

Will the labor cost disadvantage of Africa continue?

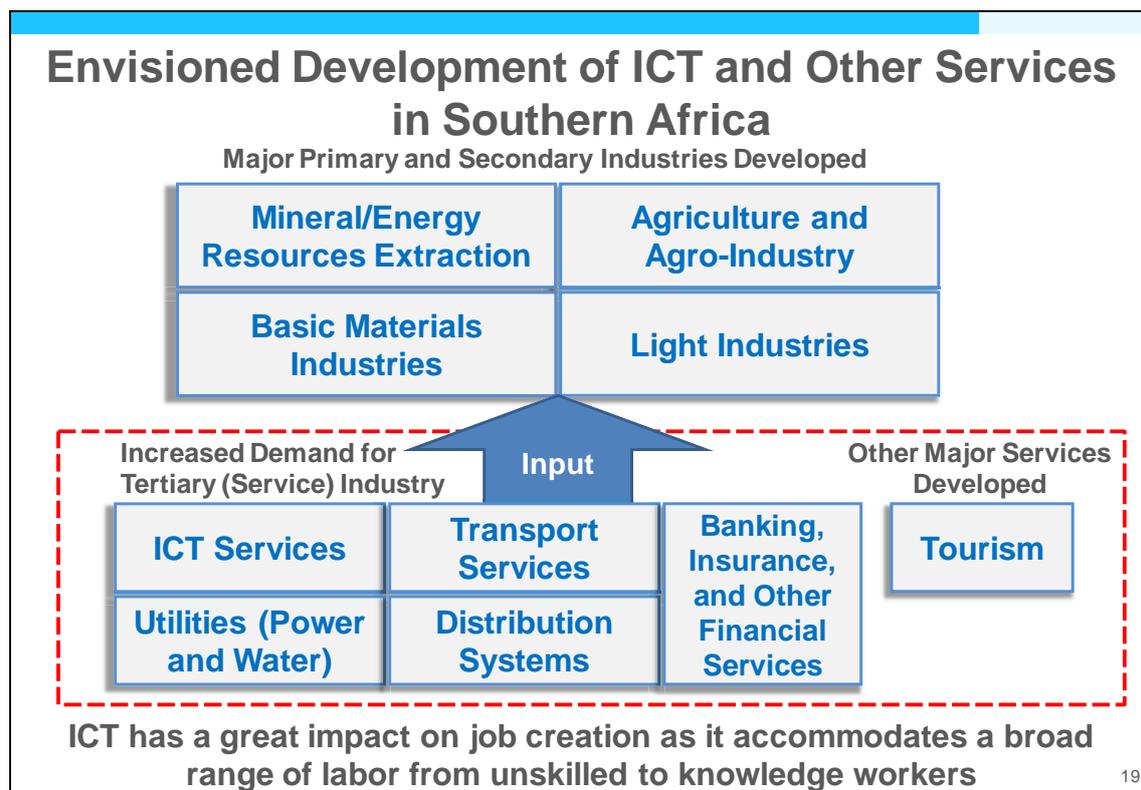
Labor Cost Disadvantage of Africa



Selected Data on Increasing Labor Costs in Asia (especially in the PRC)

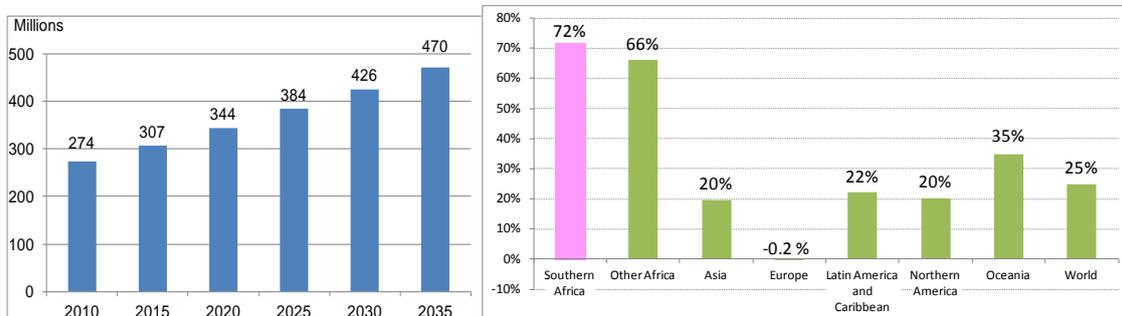


Scenario of US Manufacturing-Outsourcing Cost Index (US=100%)



- ## Assumptions Made in Formulating the Overall Development Scenarios
1. Political will for the envisioned development is in place
 2. Adequate institutional mechanisms/capacity are in place
 3. Required physical infrastructure is developed without delay
 4. Development leads to “win-win” outcomes within the region
 5. The private sector plays a vital role in transforming the region’s industrial structure, with an environment encouraging private sector initiatives to be provided
 6. Particular attention is paid to job creation with the envisioned development
- These assumptions (except for entirely domestic issues, e.g., political will) are addressed in this study
- 20

High Rate of Population Growth Projected in Southern Africa



Projections of Population in Southern Africa (millions): Medium-Fertility Variant

Projections of Population Growth Rate by Region from 2010 to 2035: Medium-Fertility Variant

- **Make the region more attractive as a destination of investment for foreign enterprises including from Japan**
- **Need to accelerate the pace of job creation**
- **Need to increase agricultural productivity and improve food security**

21

Progress in Regional Integration

22

General Comments (1/2)

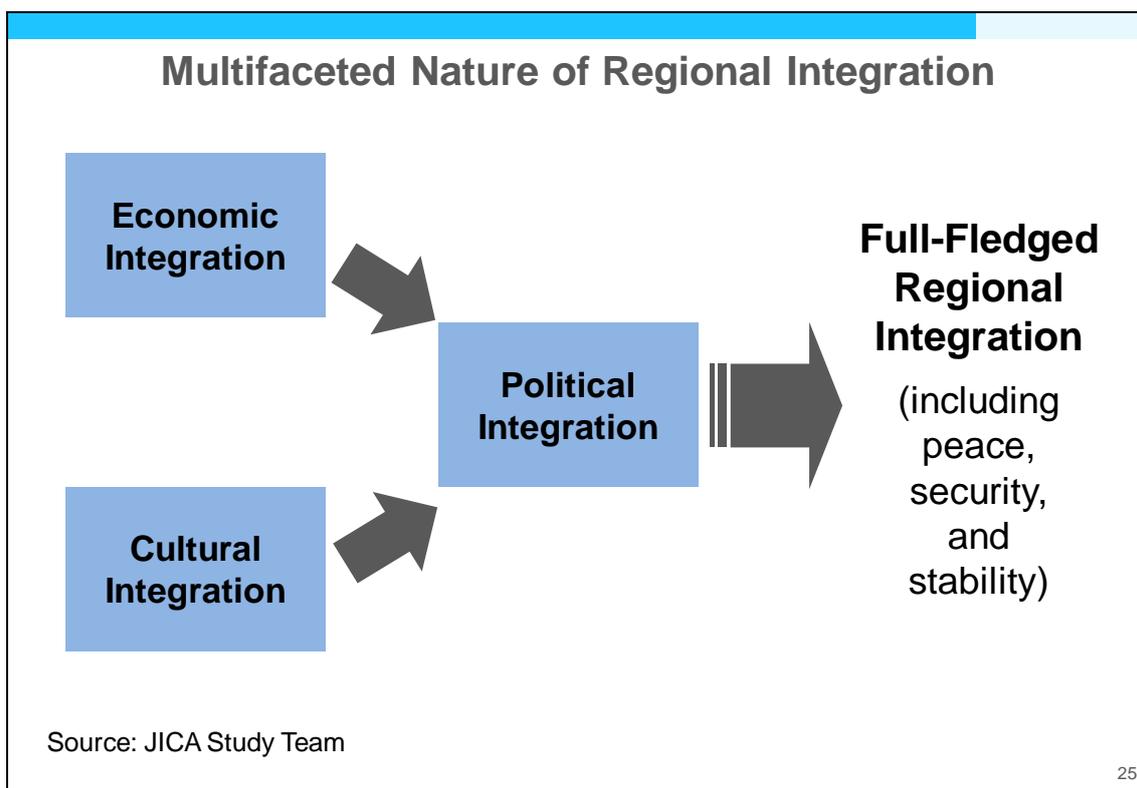
- **Regional integration is multifaceted (see the following figure), including economic and cultural integration, and eventually political integration, leading to the ultimate objective of full-fledged regional integration and peace building**
- **Considering that economic integration has received most emphasis to date in the region, and since it relates most directly to corridor development (the focus of this study), it was the main focus**
- **This part of the work assessed the overall regional integration framework and specific integration initiatives related to corridor development**

23

General Comments (2/2)

- **We note with appreciation the various initiatives for transport/trade facilitation in the region assisted by other development partners (e.g., the World Bank, AfDB, TMSA, DfID, USAID SATH).**
- **While a number of different initiatives are ongoing, these are only steps toward the final goal, since over time the countries expect to achieve a full customs union, common market, and a single currency**

24



Integration Activities of Existing RECs/Regional Integration Blocs

In Southern Africa, a number of integration activities are being pursued by SADC, COMESA, and SACU

For example, SADC (established in 1992) has a Common Agenda and a long list of policies and strategies, as well as specific milestones

On a larger scale, the COMESA-EAC-SADC Tripartite, established in 2006, has three main pillars of integration:

- market integration, including trade/transport facilitation
- infrastructure development
- industrial development

26

Specific Integration Initiatives Related to Corridor Development (1/2)

Border and Customs Procedures

- One-stop border posts
- Coordinated (integrated) border management
- Regional customs bond guarantee scheme(s)

Transport Procedures

- Road transport market liberalization
- Harmonization of vehicle dimensions standards and regulations
- Harmonization and enforcement of axle load limits
- Third-party motor liability insurance

27

Specific Integration Initiatives Related to Corridor Development (2/2)

Transport Procedures (continued)

- Harmonization of road user charges for foreign vehicles
- Self-regulation of transporters

Regional Corridor Management (efficiency of corridor clustering versus consideration of uniqueness of specific corridors)

Sources: See, e.g.: (i) Mark Pearson and Charles Chaitezvi, Trade Facilitation in the COMESA-EAC-SADC Region, Regional Integration Research Network, Discussion Paper RIRN/DP/12/02, September 2012; and (ii) Mark Pearson, Trade Facilitation in COMESA-EAC-SADC Tripartite Free Trade Area, Trade Law Centre for Southern Africa (Tralac) Working Paper No. SIIWP/II, September 2011

28

Infrastructure Development Issues

29

Transport: Major Development Issues for Priority Corridors (1/3)

Beira Corridor

- **Railway:** rehabilitation of Beira-Machipanda-Harare; upgrading/capacity expansion of Sena line
- **Road:** rehabilitation of Beira-Chimoio-Tete; dry ports
- **Port:** capacity expansion of the Port of Beira

Dar es Salaam Corridor

- **Railway:** rehabilitation of the TAZARA line to be assisted by the PRC; two TAZARA extensions proposed by the PRC (Chipata-Mpike or Petauke, and Mpulungu-Nselika)
- **Road:** rehabilitation/upgrading of sections in poor condition (e.g., upgrading of Chalinze-Dar es Salaam)
- **Port:** construction of a new port at Bagamoyo (Tanzania); upgrading of the Port of Mpulungu (Zambia)

Lobito Corridor

- **Railway:** development of a new line to connect to the Benguela Railway, i.e., Luau (Angola)-Jimbe (Zambia)-Lumwana-Solwezi-Chingola (the North-Western Railway) (Note that Lobito-Luau has been under rehabilitation with PRC assistance.)
- **Road:** rehabilitation of Lobito (Angola)-Dilolo (DRC)-northern Zambia; Kitwe-Jimbe rehabilitation (Zambia)
- **Port:** Master planning for expansion of the Port of Lobito

30

Transport: Major Development Issues for Priority Corridors (2/3)

Maputo Corridor

- **Railway:** upgrading of Mozambique section, a new line linking Botswana-Zimbabwe-Techobanine (Mozambique); upgrading of Limpopo railway
- **Road:** congestion countermeasures; development of a dry port at the Lebombo-Ressano Garcia border crossing
- **Port:** expansion of Port of Maputo; development of a new port at Techobanine

Nacala Corridor

- **Railway:** extension and rehabilitation undertaken by Vale (a new Moatize-Nkaya line and rehabilitation of the existing Nkaya-Nacala line plus a connection of the existing line to a new coal terminal at Nacala); review/revision of concession conditions between the Government of Malawi and CEAR
- **Road:** rehabilitation of poor sections along the corridor; Lilongwe-Mchinji; dry port development (e.g., at Chipata in Zambia)
- **Port and waterway:** expansion of the existing port; construction of a new port for coal and other fuel, at the western part of the bay; SEZ development; waterborne transport on Lake Malawi

31

Transport: Major Development Issues for Priority Corridors (3/3)

North-South Corridor

- **Railway:** resolving railway concessioning issues in Zambia; rehabilitation of all facilities in Zimbabwe and Zambia; construction of the Lion's Den-Kafue missing link (Zimbabwe-Zambia); construction of the West Nicholson-Beitbridge missing link (Zimbabwe)
- **Road:** Beitbridge-Chirundu rehabilitation (Zimbabwe); rehabilitation of Chirundu-25 km toward Kafue (Zambia); Kazungula Bridge and related roads (e.g., Kazungula-Nata); rehabilitation of Lusaka-Kafue and Zimba-Livingstone (Zambia); Beitbridge-Bulawayo-Victoria Falls (Zimbabwe)
- **Port:** expansion of the Port of Durban

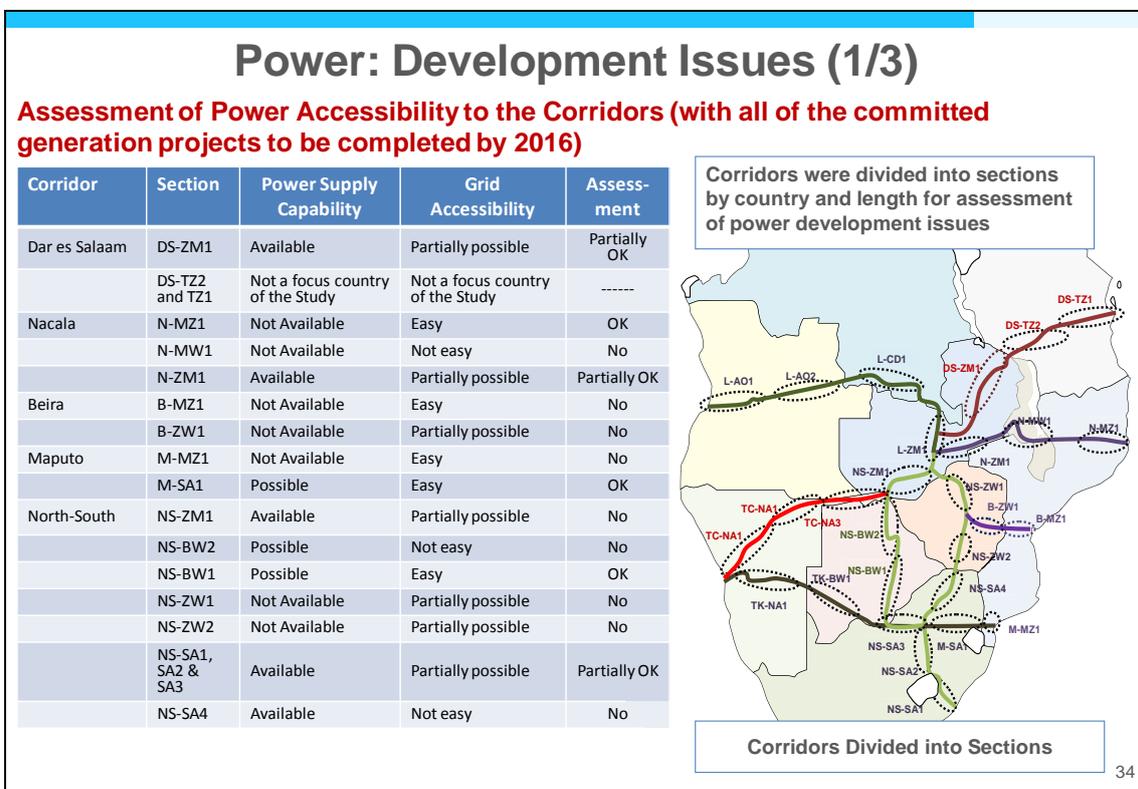
Trans-Caprivi Corridor

- **Railway:** construction of a new line including Tsumeb-Katima Mulilo (in Namibia) and Katima Mulilo-Livingstone (in Zambia)
- **Road:** Western Corridor roads in Zambia (Kasempa-Kaoma-Mongu-Senanga-Nangweshi-Sesheke, including a bridge over the Zambezi River)
- **Port:** expansion of the Port of Walvis Bay

Trans-Kalahari Corridor

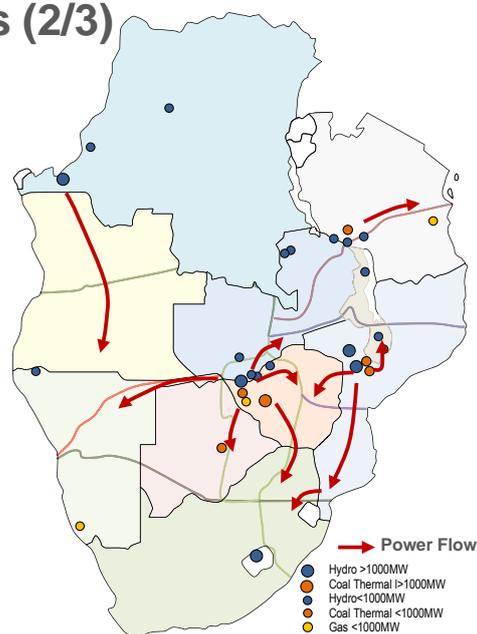
- **Railway:** construction of a new line linking Gaborone (Botswana)-Gobabis (Namibia)
- **Road:** rehabilitation and widening of Namibia section (ongoing in several phases)
- **Port:** expansion of the Port of Walvis Bay

32



Power: Development Issues (2/3)

- The figure shows the SADC Priority Generation Projects (except those in South Africa) that were not committed as of August 2012.
- Large hydropower projects are located mainly along the Zambezi River and its tributaries, i.e., in Mozambique, Zambia, and Zimbabwe.
- Small to medium hydropower projects are located in western Tanzania, Malawi, and eastern Zambia.
- Gas turbine or coal thermal power projects are located in Botswana, Mozambique, Namibia, and Zimbabwe.



Location of SADC Priority Generation Projects (except those in South Africa) That Were Not Committed as of August 2012

35

Power: Development Issues (3/3)

To develop large-scale power generation, the following issues remain:

- **Lack of Credible Off-takers/Power Purchase Agreements to Underpin Projects**
The region has been largely relying on Eskom to purchase power since most projects are too big for the demand of a single country except for South Africa. Eskom also has its Integrated Resource Plan (IRP) to implement and has thus far not been able to sign power purchase agreements (PPAs) for most projects floated in the region.
- **Lack of Competitive Industry/Market Structures at the National Level (single buyer model)**
There is no regulatory framework that encourages competition especially for off-takers. Although Electricity Acts have been revised to allow independent power producers (IPPs), the single buyer model whereby the utility is the buyer is still prevalent. If the utility is not able to absorb the generated power, often the project has no market to sell the power and hence no financing.
- **Tariff Gap (non-cost reflective tariffs)**
Currently, tariffs for most utilities do not reflect the costs of supply. SADC Member States have agreed on a 5-year plan to introduce cost-reflective tariffs in the region, but this has not been achieved.

36

Water Supply: Common Development Issues and Development Scenarios for Priority Corridors

<div style="border: 1px solid blue; padding: 5px; text-align: center; background-color: #e6f2ff;"> Major Development Issues </div>	<ul style="list-style-type: none"> • High nonrevenue water and water losses in municipal water supply • A shortage of water supply (less than 24 hours) • Low water supply service ratio in major cities • Poor functioning of water supply systems
<div style="border: 1px solid blue; padding: 5px; text-align: center; background-color: #e6f2ff;"> Development Scenarios </div>	<ul style="list-style-type: none"> • Reduction in nonrevenue water and water losses in capital city water supply (a capacity building project) • Construction of dams to provide raw water supply for major cities and surrounding areas along the corridors • Construction of water treatment facilities and pipelines

37

Irrigation and Water Resources: Common Development Issues and Development Scenarios for Priority Corridors

<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <h3 style="color: blue;">Irrigation</h3> </div> <div style="text-align: center;"> <h3 style="color: blue;">Water Resources</h3> </div> </div>	
<div style="border: 1px solid blue; padding: 5px; text-align: center; background-color: #e6f2ff;"> Major Development Issues </div>	<ul style="list-style-type: none"> • Underutilized irrigated area due to inadequate availability of water resources • Deteriorated irrigation facilities • Limited irrigated area compared with irrigation potential area
<div style="border: 1px solid blue; padding: 5px; text-align: center; background-color: #e6f2ff;"> Development Scenarios </div>	<ul style="list-style-type: none"> • Construction of dams to provide irrigation water in development area • Rehabilitation of irrigation facilities • Extension of irrigated area
<ul style="list-style-type: none"> • Insufficient water resources development to meet water demand in development areas along the economic corridors, even though such resources are relatively available 	
<ul style="list-style-type: none"> • Construction of multi-purpose dams to provide raw water in development areas 	

38

Potential JICA Focus Economic Corridors

39

Measures Used for Assessing the Priority Corridors

Broad Measures	Measures Used for Assessment
(a) Development Potential	a-1: Corridor analysis in 2010 JICA Study a-2: Priority of corridors in SADC RIDMP (2012) a-3: Potential for realizing the overall development scenarios formulated in this study, especially for the following key drivers of regional development: (i) agriculture and agro-industry (ii) mining and downstream industries
(b) Relationship with Japan	b-1: Investment (existing and potential) by Japanese companies, which is more likely to increase with JICA assistance than is investment in other corridors, potentially maximizing benefits in the beneficiary countries b-2: Recent/ongoing JICA assistance closely related to corridor development in the region, creating momentum to provide assistance with a longer-term perspective, which is desirable for the development of economic corridors in the region

40

Assessment of the Priority Corridors (1/4)

Potential for Realizing Overall Development Scenarios

Agriculture and Agro-Industry

Higher:

- Beira
- Dar es Salaam
- Nacala
- North-South

Mining and Downstream Industries

Higher:

- Beira
- Nacala
- North-South

Annual Cereals Production per Capita (kg per capita), 1961 – 2010

Potential for Agricultural Production

(Source: SADC RIDMP)

Potential for Mining Production

(Source: SADC RIDMP)

Assessment of the Priority Corridors (2/4)

Relationship with Japan

Synergistic Investment by Japanese Firms

Number of Japanese Establishments in the Focus Countries as of October 2011

Activities of leading Japanese firms for major investment in mining (i.e., coal in Tete, natural gas in northern and central Mozambique) →

- Beira
- Nacala

Recent/Ongoing JICA Assistance

Active Support for the Nacala Corridor

- Project for Nacala Corridor Economic Development Strategies, ongoing
- Support for Agricultural Development Master Plan for Nacala Corridor, ongoing (Pro-Savana Development Initiative), as well as other related projects
- Financial assistance for several road/bridge projects along the corridor
- Project for Improvement of Nacala Port, ongoing

Support for the North-South Corridor

- Assistance for regional integration including financial assistance for Kazungula Bridge Construction Project (Zambia-Botswana), and assistance for introduction of One-Stop Border Post at Chirundu Bridge (Zambia-Zimbabwe)

42

B-21

Assessment of the Priority Corridors (3/4)

(a) Development Potential

Corridor	Rank in 2010 JICA Study (a-1)	Priority in SADC RIDMP (a-2)	Potential for Realizing Overall Development Scenarios (a-3)	
			Agriculture and Agro-Industry (a-3-i)	Mining and Downstream Industries (a-3-ii)
Beira	Medium		Higher	Higher
Dar es Salaam	Medium	High	Higher	Medium
Lobito			Medium	Medium
Maputo	Higher	High	Lower	Medium
Nacala			Higher	Higher
North-South	Higher	High	Higher	Higher
Trans-Caprivi			Lower	Medium
Trans-Kalahari			Lower	Medium

(b) Relationship with Japan

Corridor	Synergistic Investment by Japanese Firms (b-1)	Recent/Ongoing JICA Assistance (b-2)
Beira	Medium	
Dar es Salaam		
Lobito		
Maputo	Higher	
Nacala	Higher	Higher
North-South	Higher	Medium
Trans-Caprivi		
Trans-Kalahari		

Group 1:
Nacala and North-South

Group 2:
Beira and Dar es Salaam

Group 3:
Maputo

Group 4:
Lobito, Trans-Caprivi, and Trans-Kalahari

43

Assessment of the Priority Corridors (4/4)

Item	Group 1	Group 2	Group 3	Group 4
Corridors	Nacala and North-South	Beira and Dar es Salaam	Maputo	Lobito, Trans-Caprivi, and Trans-Kalahari
Definition	<ul style="list-style-type: none"> ✓ Relatively higher potential for realizing the overall development scenarios ✓ Relatively more closely related to the activities of Japanese firms and JICA 	<ul style="list-style-type: none"> ✓ Relatively higher potential for realizing the overall development scenarios ✓ Less closely related to the activities of Japanese firms and JICA than the Group 1 corridors 	<ul style="list-style-type: none"> ✓ Among the corridors other than the Group 1 and 2 corridors, ranked highest in past relevant studies 	<ul style="list-style-type: none"> ✓ These are the corridors other than those in Groups 1-3

For Groups 1 and 2:

- ✓ Development programming was undertaken in this study.
- ✓ A long list of potential technical assistance projects and infrastructure development initiatives was proposed in this study.

For Groups 3 and 4:

- ✓ It is important to note that assistance for Group 3 and 4 corridors will NOT be ruled out.

Note also that this categorization of the priority corridors will be reviewed by JICA when necessary.

44

Development Programming for Group 1 and 2 Corridors

45

Nacala Corridor (Group 1) – Major Development Areas



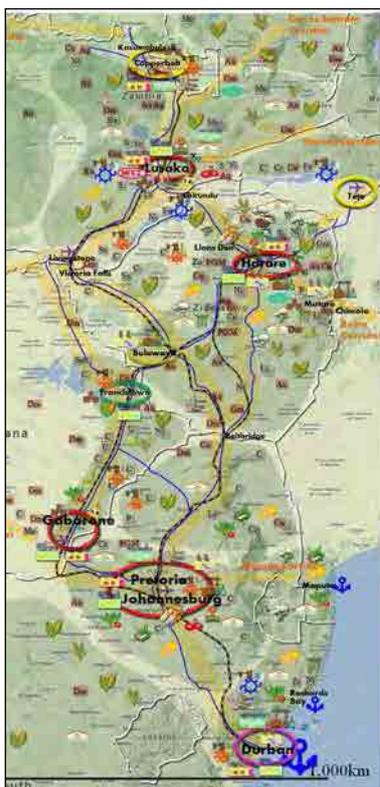
Agriculture and Agro-Industry

- **Mozambique:** agricultural areas along Nacala-Nampula-Cuamba (including Pro-Savana Project area); Nacala, Nampula, and Cuamba as a major agro-industrial base
- **Malawi:** central and southern region; Blantyre and Zomba as an agro-industrial base
- **Zambia:** agricultural areas along Chipata-Lusaka

Mining and Downstream Industries

- **Mozambique:** Nacala SEZ for various industries including heavy chemicals industries using natural gas extracted offshore in northern Mozambique; Tete for use of coal
- **Malawi:** various areas with mining potential (e.g., heavy mineral sands, rare metals, uranium, coal)
- **Zambia:** areas along Lusaka-Copperbelt, e.g., for copper, iron ore, coal; MFEZ with “engineering products” manufacturing

46



North-South Corridor (Group 1) – Major Development Areas

Agriculture and Agro-Industry

- **Zambia:** agricultural areas along Copperbelt-Lusaka-Livingstone; MFEZs with agro-industry
- **Zimbabwe:** central, eastern, and southern Zimbabwe; Harare as a major agro-industrial base
- **Botswana:** eastern Botswana; Francistown and Gaborone as a major agro-industrial base
- **South Africa:** eastern South Africa

Mining and Downstream Industries

- **Zambia:** Copperbelt areas for mining; MFEZ with “engineering products” manufacturing
- **Zimbabwe:** central Zimbabwe for redevelopment/modernization of mining; Harare, Bulawayo (rail-centered base), and Manicaland Province (eastern Zimbabwe) for related downstream industries
- **Botswana:** eastern Botswana
- **South Africa:** northeastern South Africa for mining; Durban and eastern South Africa for various downstream industries

Supporting Industry/Light Manufacturing Industries

- In and around the capital cities including Lusaka (Zambia), Harare (Zimbabwe), and Gaborone (Botswana)
- In and around the metropolitan area in eastern South Africa and the Durban area

47

Development Programming for Group 1 and 2 Corridors – Common Elements (1/3)

Development Strategies	Critical Public Sector Actions
Agricultural productivity enhancement and agro-processing capacity expansion	<p>Promoting industrial development: formulation and implementation of modernization program (e.g., investment and regional value-chain promotion; financial and other support for access to inputs; promotion for development of logistics functions; planning and promotion for development of “farm blocks”; reduction of tariffs and nontariff barriers)</p> <p>Infrastructure development: irrigation; road improvement; development of intermodal facilities; revitalization of railways; port expansion/development</p> <p>Capacity development: extension services and technical assistance for small farmers; technical/management assistance for leading local farmers; capacity development in the railway sector</p>
(Re)development and modernization of mining and downstream industries	<p>Promoting industrial development: formulation and implementation of (re)development/modernization program including investment promotion and negotiation with potential investors and developers</p> <p>Infrastructure development: revitalization of railways; road improvement; port expansion/development; enhancement of water supply, power generation and transmission, and pipeline transport</p> <p>Capacity development: technical assistance for highly productive and environmentally conscious mining/processing; technical assistance for reduction in nonrevenue water and water losses in large cities; capacity development in the railway sector</p>

48

Development Programming for Group 1 and 2 Corridors – Common Elements (2/3)

Development Strategies	Critical Public Sector Actions
Development of industrial zone(s)	<p>Promoting industrial development: formulation of action plans for industrial zone and related development, taking into account the development of mining in relevant areas</p> <p>Infrastructure development: zone development including provision of necessary infrastructure; revitalization of railways; road improvement; port expansion/development; enhancement of water supply, power generation and transmission, and pipeline transport</p> <p>Capacity development: technical and vocational education and training; technical assistance for reduction in nonrevenue water and water losses in large cities; capacity development in the railway sector</p>
Development and promotion of SME/MME clusters	<p>Promoting industrial development: formulation of action plans for development of industrial clusters in relevant fields; improvement of access to credit for SMEs and MMEs; strengthening of business development service providers; investment and value-chain promotion</p> <p>Infrastructure development: same as those for development of industrial zone(s) above</p> <p>Capacity development: technical and vocational education and training; management skills development education; technical assistance for reduction in nonrevenue water and water losses in large cities; capacity development in the railway sector</p>

49

Development Programming for Group 1 and 2 Corridors – Common Elements (3/3)

Development Strategies	Critical Public Sector Actions
Implementation of regional integration strategies and related trade/transport facilitation measures	<ul style="list-style-type: none"> • Border crossing facilitation • Trade facilitation at the ports along the corridors • Railway transport facilitation (e.g., through an international railway joint operating agreement along the corridors) • Establishment of a corridor authority to address trade/transport facilitation issues, or technical support for existing corridor management institution
Mitigation of environmental and social impacts	<ul style="list-style-type: none"> • Negative environmental and social impacts should be avoided, minimized, and/or mitigated for each development initiative. • Mitigation measures should be planned prior to implementation based on environmental and social studies to meet applicable legislation and guidelines.

50

Beira Corridor (Group 2) – Major Development Areas

Agriculture and Agro-Industry

- **Mozambique:** Beira Agricultural Growth Corridor (Manica, Sofala, and Tete Provinces); Chimoio, Tete, Chemba, and Beira as a major agro-industrial base
- **Zimbabwe:** agricultural areas along the corridor in eastern Zimbabwe; Harare and Mutare as a major agro-industrial base

Mining and Downstream Industries

- **Mozambique:** Tete Province for coal; Tete for use of coal resources; Beira for various industries including fertilizer and heavy chemicals industries using natural gas extracted offshore in the south of Beira (Pande/Temane)
- **Zimbabwe:** central Zimbabwe for redevelopment/modernization of mining; Harare and Manicaland Province (eastern Zimbabwe) for related downstream industries

Supporting Industry/Light Manufacturing Industries

- In and around the capital cities including Dar es Salaam (Tanzania) and Lusaka (Zambia)
- Provincial capital cities and major regional cities along the corridor in Tanzania and Zambia

Legend:

- Agricultural Land
- Business/Industrial Center
- Agro-Business Center
- Mining-Business Center
- Logistics/Industrial Center
- National Boundary
- Major road
- Railway
- Pipeline to be upgraded

Other icons indicate products and industries with potential as well as infrastructure to be developed/improved.

51

Dar es Salaam Corridor (Group 2) – Major Development Areas

Agriculture and Agro-Industry

- **Tanzania:** Southern Africa Growth Corridor of Tanzania (SAGCOT) along the corridor; provincial capital cities along the corridor as a major agro-industrial base (e.g., Mbeya, Iringa, Morogoro)
- **Zambia:** agricultural areas between Tanzania border and Lusaka; regional cities along the corridor as a major agro-industrial base (e.g., Kasama, Mpika, Kabwe)

Mining and Downstream Industries

- **Tanzania:** Ludewa District in Iringa Province for mining (e.g., coal, iron ore) and for downstream industries; Bagamoyo SEZ for various industries including fertilizer and heavy chemicals industries using natural gas extracted in southern coastal area of Tanzania
- **Zambia:** Copperbelt areas for mining, MFEZ with “engineering products” manufacturing

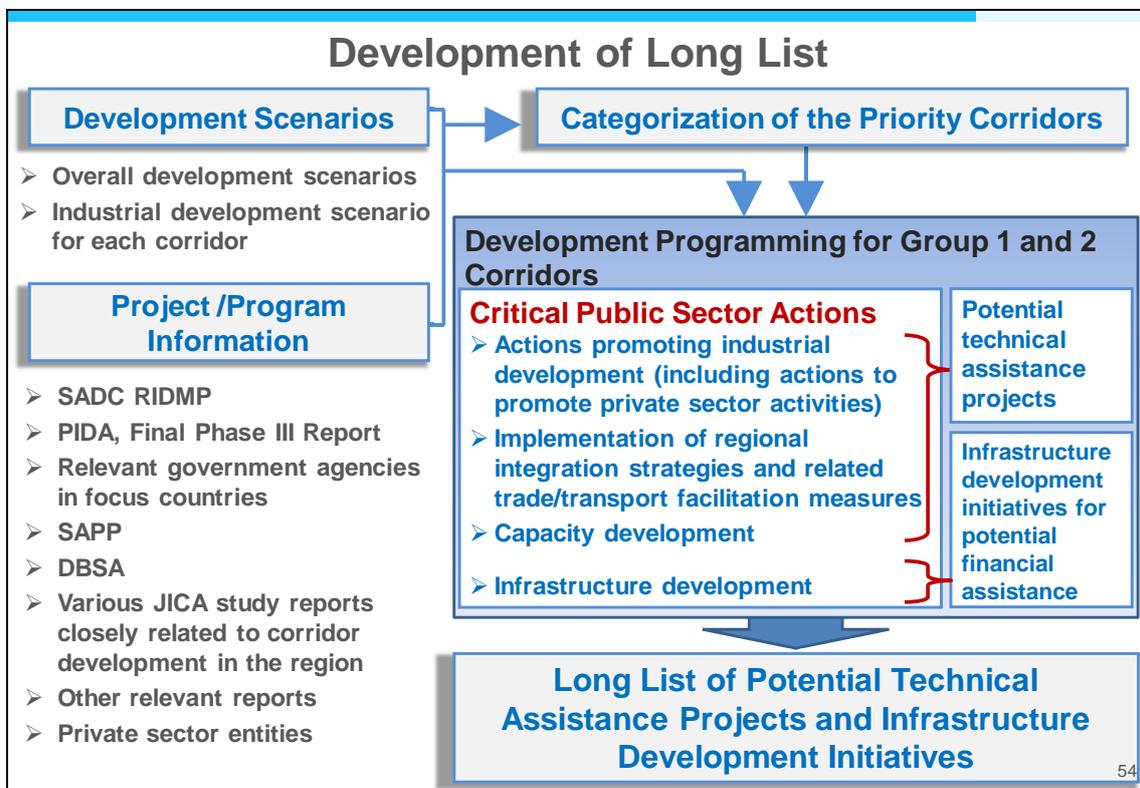
Supporting Industry/Light Manufacturing Industries

- In and around the capital cities including Dar es Salaam (Tanzania) and Lusaka (Zambia)
- Provincial capital cities and major regional cities along the corridor in Tanzania and Zambia

52

Long List of Potential Technical Assistance Projects and Infrastructure Development Initiatives

53



Long List of Potential Technical Assistance Projects (1/2)

No.	Corridor(s)	Country/Countries	Sector/Sub-sector	Proposed Technical Assistance
Agriculture and Agro-Industry				
1	Group 1 and 2 corridors	Each country along the corridors	Agriculture and agro-industry	Formulation and implementation of modernization program
2	Group 1 and 2 corridors	Each country along the corridors	Agriculture	Extension services and technical assistance for small farmers
3	Group 1 and 2 corridors	Each country along the corridors	Agriculture	Technical/management assistance for leading local farmers
Mining, Downstream Industries, and Other Manufacturing				
4	Beira, Nacala, and North-South	Malawi, Zimbabwe	Mining and processing	Technical assistance for highly productive and environmentally conscious mining/processing
5	Group 1 and 2 corridors	Each country along the corridors	Chemical and other relevant industries	Technical and vocational education and training
6	Group 1 and 2 corridors	Each country along the corridors	Light manufacturing (including agro-industry and SMEs/ MMEs)	Management skills development education
7	Group 1 and 2 corridors	Each country along the corridors	Regional/industrial zone development	Planning for regional development and/or industrial zone/clusters development

- ✓ **These proposed projects are relatively broadly defined, based on discussions with JICA.**
- ✓ **Some of these projects may also be suited for the development of other corridors including those in Groups 3 and 4.**

55

Long List of Potential Technical Assistance Projects (2/2)

No.	Corridor(s)	Country/Countries	Sector/Sub-sector	Proposed Technical Assistance
Regional Integration				
8	Group 1 and 2 corridors/ Region-wide	Each country along the corridors/other countries in the region	Transport/trade facilitation (regional integration)	Assistance for implementation of improved corridor transit, coordinated border management, OSBPs, and port/railway transport facilitation including related policy/regulatory framework interventions
9	Group 1 and 2 corridors/ Region-wide	Each country along the corridors/other countries in the region	Transport/trade facilitation (regional integration)	Assistance for corridor management bodies, and ultimately for establishment of a regional corridor management system
10	Region-wide	Regional	Trade (regional integration)	Assistance for implementation of deep integration, including a full-fledged customs union, common market, monetary union, and single currency
Infrastructure Development				
11	Group 1 and 2 corridors	Malawi, Mozambique, South Africa, Zimbabwe	Railway	Capacity development in the railway sector
12	Group 1 and 2 corridors	Each country along the corridors	Water supply	Reduction in nonrevenue water and water losses in capital cities in the region
13	Region-wide	Regional	Power (power trade)	Capacity development of the Southern African Power Pool

- ✓ **These proposed projects are relatively broadly defined, based on discussions with JICA.**
- ✓ **Some of these projects may also be suited for the development of other corridors including those in Groups 3 and 4.**

56

Long List of Infrastructure Development Initiatives for Potential Financial Assistance (1/2)

No.	Corridor(s)	Country/Countries	Sector/Sub-sector	Proposed Infrastructure Development Initiative
Transport				
1	Beira, Dar es Salaam, Nacala, North-South	Malawi, Mozambique, Tanzania, Zambia, Zimbabwe	Transport (road)	Upgrading of selected road sections along the corridors
2	Nacala, Dar es Salaam	Malawi	Transport (waterway)	Development of a dry port and waterborne transportation
3	Nacala	Mozambique	Transport (port)	Expansion of the Port of Nacala
4	Beira, North-South	Zimbabwe	Transport (railway)	Revitalization of National Railways of Zimbabwe
Power/Energy				
5	Nacala	Malawi	Power (hydropower)	Development of hydropower generation
6	Beira, Nacala, North-South	Mozambique	Power (transmission)	Development of new transmission line(s) in central and southern Mozambique
7	Beira, Nacala, North-South	Mozambique	Power (hydropower)	Development of new hydropower generation on the Zambezi River

These proposed initiatives are relatively broadly defined, based on discussions with JICA, leaving broader options for potential future JICA assistance.

57

Long List of Infrastructure Development Initiatives for Potential Financial Assistance (2/2)

No.	Corridor(s)	Country/Countries	Sector/Sub-sector	Proposed Infrastructure Development Initiative
Power/Energy (continued)				
8	Dar es Salaam	Tanzania, Zambia	Power (transmission)	Development of new interconnection transmission
9	Beira, North-South	Zimbabwe	Energy (liquid fuel transmission)	Enhancement of liquid fuel pipeline
Water				
10	Nacala	Malawi	Water (irrigation)	Extension of the irrigation area in the southern part of Malawi
11	Nacala, North-South	Zambia	Water (environment/irrigation)	Climate change adaptation for drought in farmlands of Agro Ecological Region I
12	North-South	Zimbabwe	Water (irrigation)	Rehabilitation and development of irrigation systems along the corridor

These proposed initiatives are relatively broadly defined, based on discussions with JICA, leaving broader options for potential future JICA assistance.

58

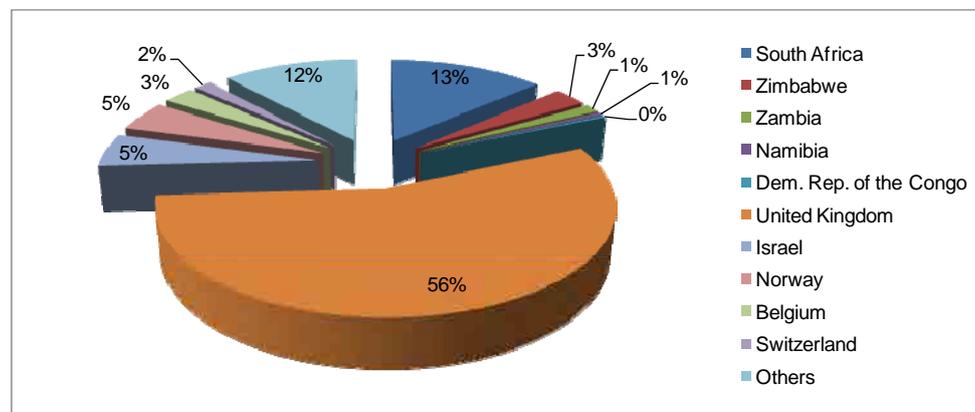
Appendix C Trade Statistics of the Focus Countries¹

C.1 Botswana

Table C.1: Top 10 Exported Products of Botswana at HS Two-Digit Level, 2011

HS code	Description	2011 Trade Value (USD million)	Share (%)
Total		5,881.9	100.0
71	Natural or cultured pearls, precious or semi-precious stones (Note: Diamonds (HS 7102) account for 98% of the value in this category.)	4,529.9	77.0
75	Nickel and articles thereof	354.6	6.0
62	Articles of apparel and clothing accessories, not knitted or crocheted	163.8	2.8
87	Vehicles other than railway or tramway rolling stock	110.1	1.9
61	Articles of apparel and clothing accessories, knitted or crocheted	79.3	1.3
84	Machinery and mechanical appliances, parts thereof	75.6	1.3
26	Ores, slag and ash (Note: Copper ores and concentrates (HS 2603) account for nearly 100% of the value in this category.)	74.6	1.3
85	Electrical machinery, equipment and parts thereof	70.2	1.2
02	Meat and edible meat offal	48.4	0.8
28	Inorganic chemicals	40.9	0.7
	Others	334.7	5.7

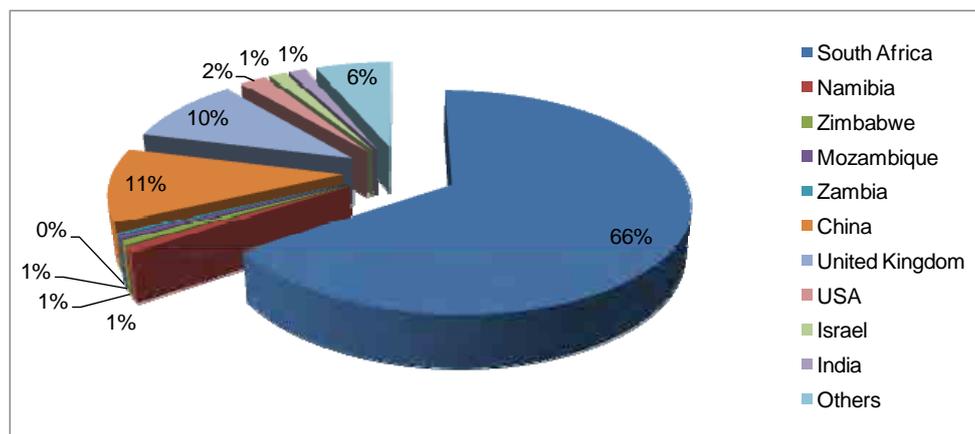
Abbreviation: HS = Harmonized Commodity Description and Coding System
Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and the top five export destination countries outside of Africa.
Source: UN Comtrade

Figure C.1: Exports of Botswana by Destination Country in 2011 (Percent of Total Exports)

¹ Data for Angola in recent years are not available in the United Nations Commodity Trade Statistics Database (UN Comtrade, <http://comtrade.un.org/>).



Note: The countries specified in the figure include the top five import source countries in the SADC region and the top five import source countries outside of Africa.

Source: UN Comtrade

**Figure C.2: Imports of Botswana by Source Country in 2011
(Percent of Total Imports)**

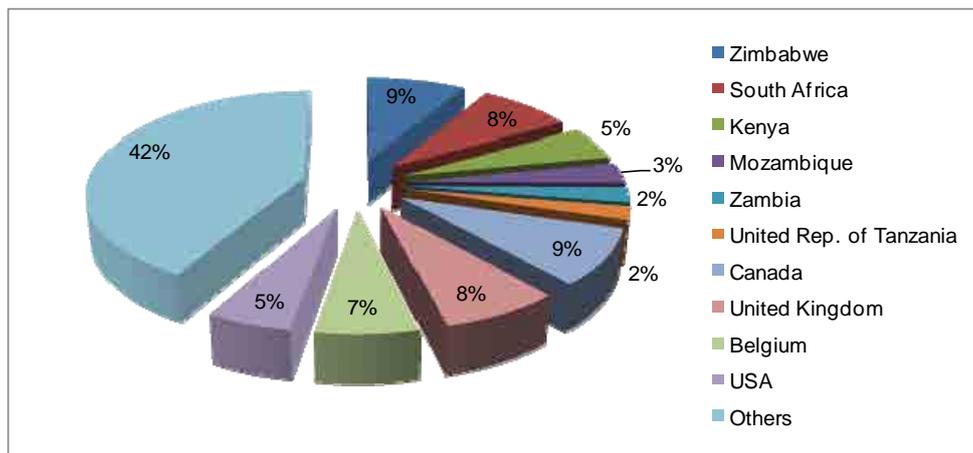
C.2 Malawi

Table C.2: Top 15 Exported Products of Malawi at HS Two-Digit Level, 2011

HS code	Description	2011 Trade Value (USD million)	Share (%)
Total		1,425.3	100.0
24	Tobacco and manufactured tobacco substitutes	571.0	40.1
17	Sugars and sugar confectionery	213.9	15.0
26	Ores, slag and ash (Note: Uranium ores and concentrates (HS 261210) account for 97% of the value in this category.)	124.5	8.7
10	Cereals	95.5	6.7
09	Coffee, tea, mate and spices (Note: Tea (HS 0902) accounts for 91% of the value in this category.)	94.7	6.6
52	Cotton	48.6	3.4
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	34.5	2.4
07	Edible vegetables and certain roots and tubers	27.5	1.9
39	Plastics and articles thereof	27.2	1.9
87	Vehicles other than railway or tramway rolling stock	25.3	1.8
93	Arms and ammunition	18.5	1.3
62	Articles of apparel and clothing accessories, not knitted or crocheted	15.8	1.1
40	Rubber and articles thereof	14.9	1.0
08	Edible fruit and nuts, peel of citrus fruit or melons	11.9	0.8
44	Wood and articles of wood; wood charcoal	11.2	0.8
	Others	90.2	6.3

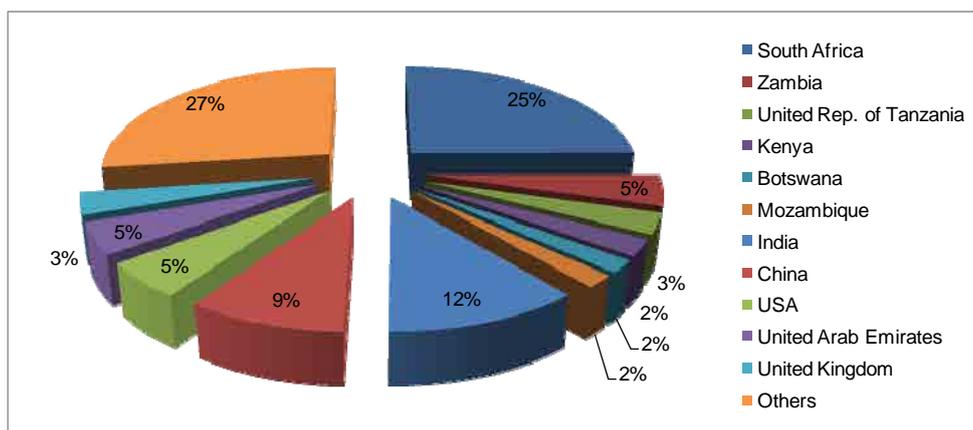
Abbreviations: HS = Harmonized Commodity Description and Coding System

Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and Kenya, and the top four export destination countries outside of Africa.
Source: UN Comtrade

**Figure C.3: Exports of Malawi by Destination Country in 2011
(Percent of Total Exports)**



Note: The countries specified in the figure include the top six import source countries in the SADC region and Kenya, and the top five import source countries outside of Africa.
Source: UN Comtrade

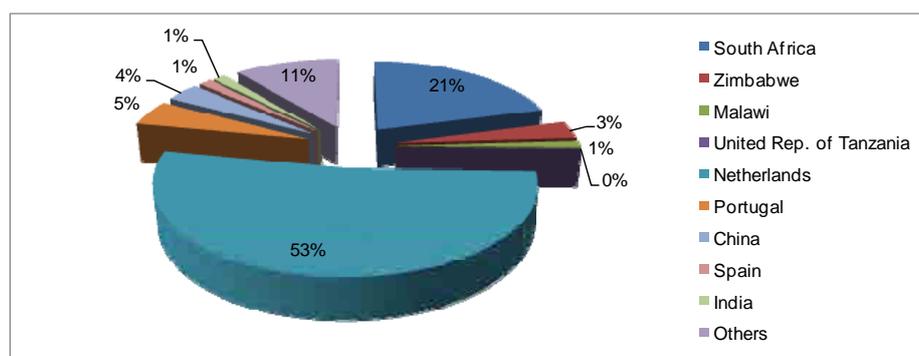
**Figure C.4: Imports of Malawi by Source Country in 2011
(Percent of Total Imports)**

C.3 Mozambique

Table C.3: Top 10 Exported Products of Mozambique at HS Two-Digit Level, 2010

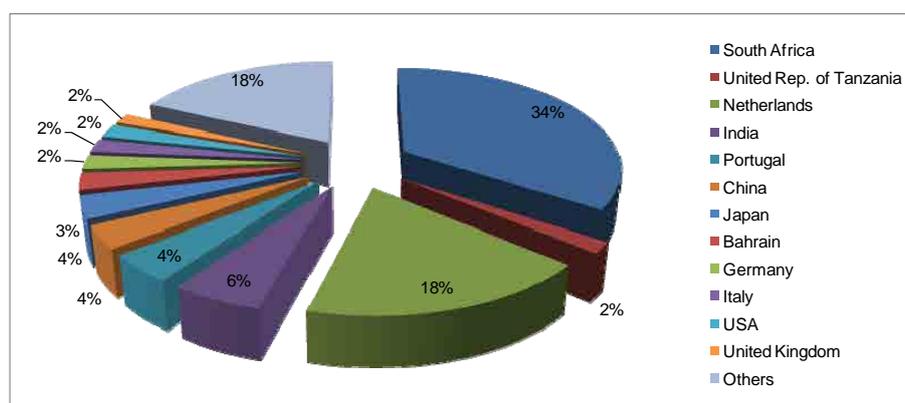
HS code	Description	2010 Trade Value (USD million)	Share (%)
Total		2,243.1	100.0
76	Aluminum and articles thereof	1,160.0	51.7
27	Mineral fuels, mineral oils and products of their distillation	447.4	19.9
24	Tobacco and manufactured tobacco substitutes	144.5	6.4
99	Commodities not specified according to kind	83.7	3.7
03	Fish and crustaceans, mollusks and other aquatic invertebrates	56.6	2.5
44	Wood and articles of wood, wood charcoal	55.9	2.5
08	Edible fruit and nuts, peel of citrus fruit or melons	43.4	1.9
12	Oil seeds and oleaginous fruits	30.4	1.4
50	Silk	29.1	1.3
07	Edible vegetables and certain roots and tubers	28.7	1.3
	Others	163.2	7.3

Abbreviations: HS = Harmonized Commodity Description and Coding System
Source: UN Comtrade



Note: The countries specified in the figure include the top four export destination countries in the SADC region and the top five export destination countries outside of Africa.
Source: UN Comtrade

Figure C.5: Exports of Mozambique by Destination Country in 2010 (Percent of Total Exports)



Note: The countries specified in the figure include the top two import source countries in the SADC region and the top ten import source countries outside of Africa.
Source: UN Comtrade

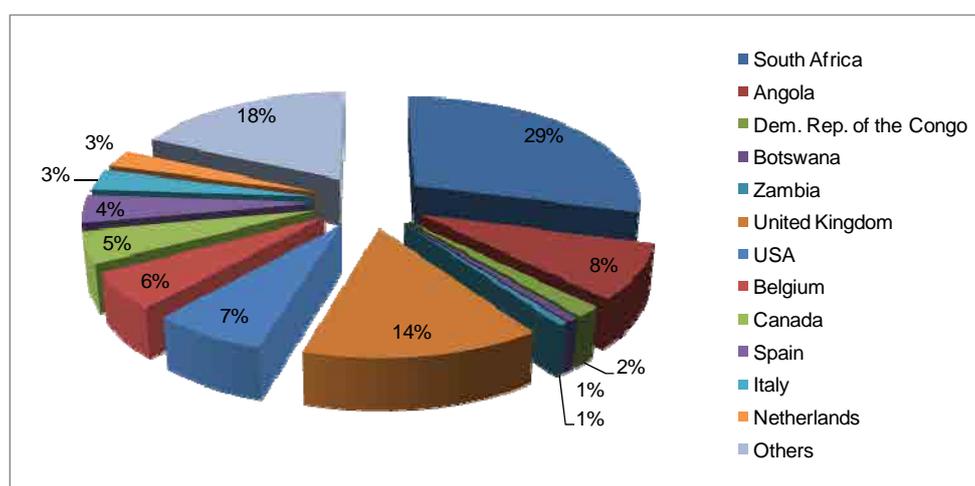
Figure C.6: Imports of Mozambique by Source Country in 2010 (Percent of Total Imports)

C.4 Namibia

Table C.4: Top 15 Exported Products of Namibia at HS Two-Digit Level, 2011

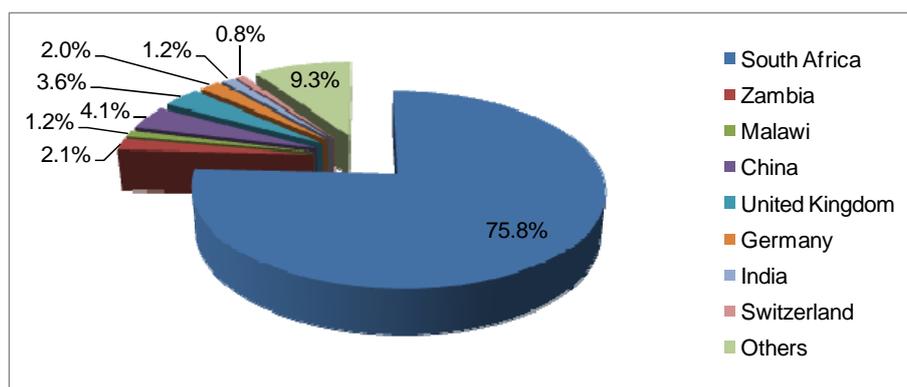
HS code	Description	2011 Trade Value (USD million)	Share (%)
	Total	5,900.9	100.0
71	Natural or cultured pearls, precious or semi-precious stones (Note: Diamonds account for most of the value in this category.)	1,406.3	23.8
26	Ores, slag and ash (Note: Uranium and concentrates account for most of the value in this category.)	739.7	12.5
03	Fish and crustaceans, molluscs and other aquatic invertebrates	701.1	11.9
49	Printed books, newspapers, pictures and other products of the printing industry	571.6	9.7
74	Coppers and articles thereof	413.2	7.0
79	Zinc and articles thereof	330.2	5.6
22	Beverages, spirits and vinegar	216.2	3.7
87	Vehicles other than railway or tramway rolling stock	188.2	3.2
02	Meat and edible meat offal	188.1	3.2
01	Live animals; animal products	149.1	2.5
89	Ships, boats and floating structures	123.2	2.1
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	120.6	2.0
25	Salt; sulphur; earth and stone; plastering materials, lime and cement	102.8	1.7
27	Mineral fuels, mineral oils and products of their distillation	76.3	1.3
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	59.7	1.0
	Others	514.8	8.7

Abbreviations: HS = Harmonized Commodity Description and Coding System
Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and Kenya, and the top seven export destination countries outside of Africa.
Source: UN Comtrade

Figure C.7: Exports of Namibia by Destination Country in 2011 (Percent of Total Exports)



Note: The countries specified in the figure include the top three import source countries in the SADC region and the top five import source countries outside of Africa.
Source: UN Comtrade

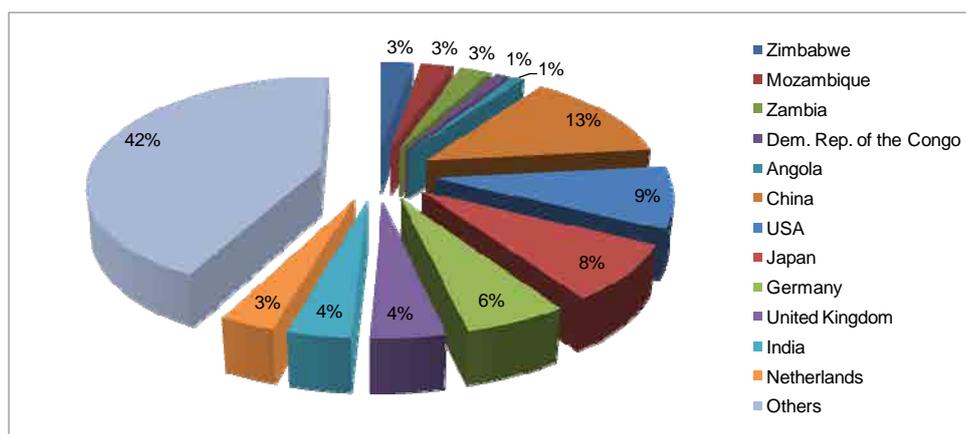
**Figure C.8: Imports of Namibia by Source Country in 2011
(Percent of Total Imports)**

C.5 South Africa

Table C.5: Top 20 Exported Products of South Africa at HS Two-Digit Level, 2011

HS code	Description	2011 Trade Value (USD million)	Share (%)
Total		92,975.6	100.0
71	Natural or cultured pearls, precious or semi-precious stones (Note: Platinum (HS 7110) accounts for 53% and gold (HS 7108) for 33% of the value in this category.)	20,751.0	22.3
26	Ores, slag and ash	14,288.2	15.4
27	Mineral fuels, mineral oils and products of their distillation	9,734.6	10.5
72	Iron and steel	7,983.5	8.6
87	Vehicles other than railway or tramway rolling stock	7,205.4	7.7
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	6,249.0	6.7
76	Aluminum and articles thereof	2,252.4	2.4
08	Edible fruit and nuts, peel of citrus fruit or melons	2,240.2	2.4
85	Electrical machinery, equipment and parts thereof	1,658.8	1.8
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	1,552.4	1.7
29	Organic chemicals	1,382.2	1.5
73	Articles of iron or steel	1,164.4	1.3
22	Beverages, spirits and vinegar	1,112.3	1.2
39	Plastics and articles thereof	1,097.2	1.2
47	Pulp of wood or of other fibrous cellulosic material	973.0	1.0
10	Cereals	843.1	0.9
74	Copper and articles thereof	808.6	0.9
38	Miscellaneous chemical products	758.2	0.8
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	636.6	0.7
94	Furniture, etc.	558.1	0.6
	Others	9,726.4	10.5

Abbreviations: HS = Harmonized Commodity Description and Coding System
Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and the top seven export destination countries outside of Africa.

Source: UN Comtrade

**Figure C.9: Exports of South Africa by Destination Country in 2011
(Percent of Total Exports)**

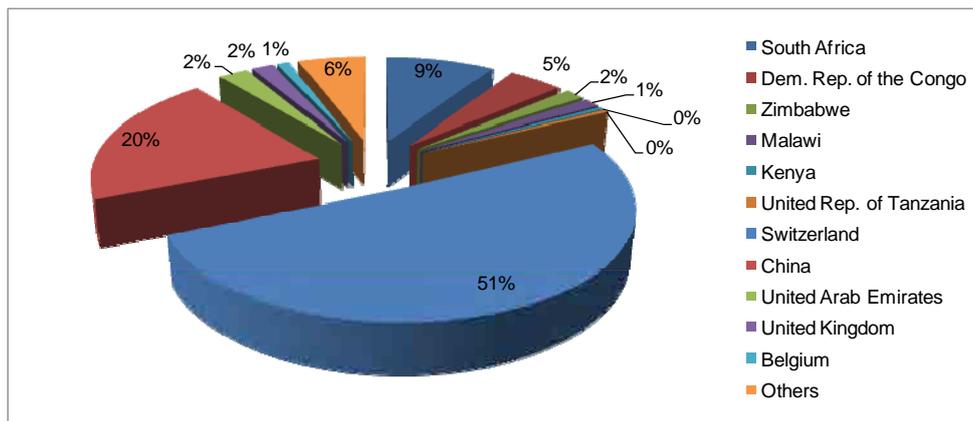
C.6 Zambia

Table C.6: Top 10 Exported Products of Zambia at HS Two-Digit Level, 2010

HS code	Description	2010 Trade Value (USD million)	Share (%)
Total		7,200.3	100.0
74	Copper and articles thereof	5,417.5	75.2
26	Ores, slag and ash (Note: The products exported include copper ores and concentrates (HS 2603), cobalt ores and concentrates (HS 2605), and slag, ash and residues (HS 2620).)	523.6	7.3
81	Other base metals; cermets; articles thereof	194.5	2.7
17	Sugars and sugar confectionery	149.7	2.1
24	Tobacco and manufactured tobacco substitutes	117.8	1.6
25	Salt; sulphur; earth and stone; plastering materials, lime and cement	88.1	1.2
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	69.8	1.0
71	Natural or cultured pearls, precious or semi-precious stones (Note: Gold (HS 7108) accounts for about 70% of the value in this category.)	67.1	0.9
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	62.1	0.9
52	Cotton	47.2	0.7
	Others	463.0	6.4

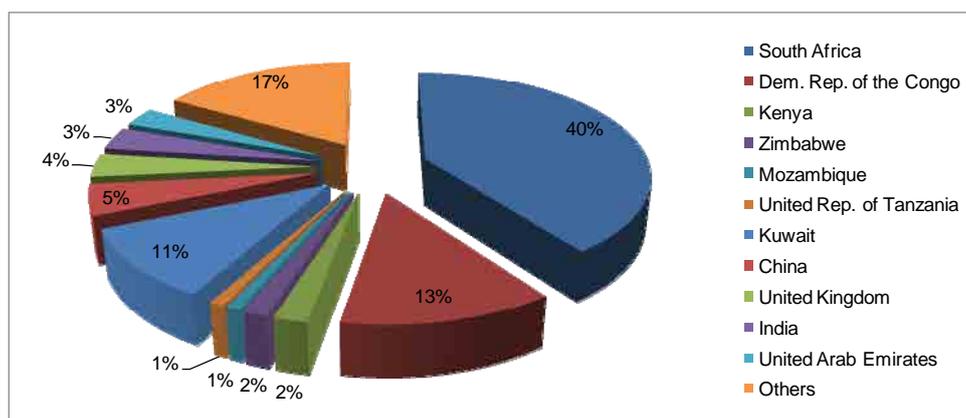
Abbreviations: HS = Harmonized Commodity Description and Coding System

Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and Kenya, and the top five export destination countries outside of Africa.
 Source: UN Comtrade

**Figure C.10: Exports of Zambia by Destination Country in 2010
 (Percent of Total Exports)**



Note: The countries specified in the figure include the top five import source countries in the SADC region and Kenya, and the top five import source countries outside of Africa.
 Source: UN Comtrade

**Figure C.11: Imports of Zambia by Source Country in 2010
 (Percent of Total Imports)**

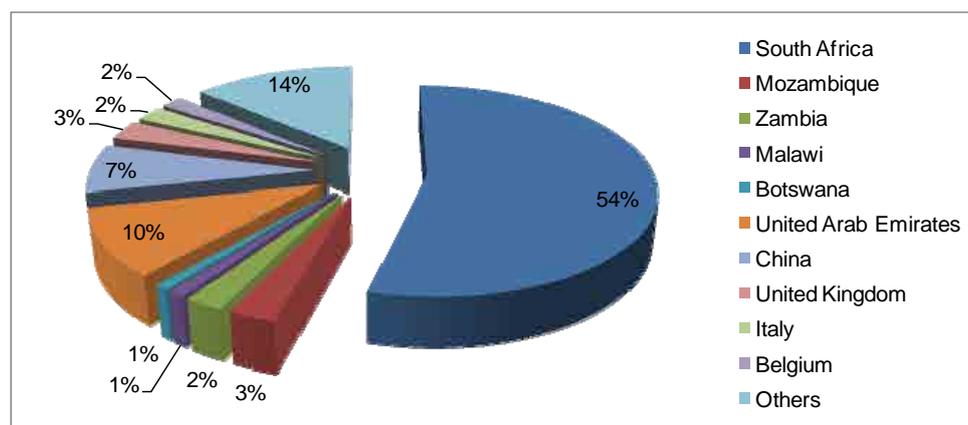
C.7 Zimbabwe

Table C.7: Top 10 Exported Products of Zimbabwe at HS Two-Digit Level, 2010

HS code	Description	2010 Trade Value (USD million)	Share (%)
Total		3,199.2	100.0
71	Natural or cultured pearls, precious or semi-precious stones (Note: Diamonds (HS 7102) account for 52% and gold (HS 7108) for 46% of the value in this category.)	623.4	19.5
49	Printed books, newspapers, pictures or other products of the printing industry	559.3	17.5
24	Tobacco and manufactured tobacco substitutes	478.1	14.9
75	Nickel and articles thereof	454.5	14.2
26	Ores, slag and ash (Note: Nickel ores and concentrates (HS 2604) account for 87% of the value in this category.)	310.1	9.7
72	Iron and steel	204.6	6.4
52	Cotton	162.5	5.1
17	Sugars and sugar confectionery	52.5	1.6
27	Mineral fuels, mineral oils and products of their distillation	46.7	1.5
25	Salt; sulphur; earth and stone; plastering materials, lime and cement	37.6	1.2
	Others	270.0	8.4

Abbreviations: HS = Harmonized Commodity Description and Coding System

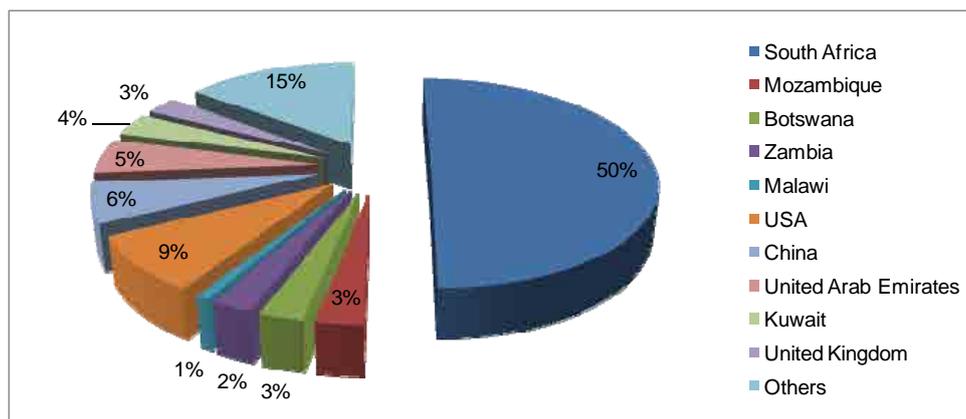
Source: UN Comtrade



Note: The countries specified in the figure include the top five export destination countries in the SADC region and the top five export destination countries outside of Africa.

Source: UN Comtrade

Figure C.12: Exports of Zimbabwe by Destination Country in 2010 (Percent of Total Exports)



Note: The countries specified in the figure include the top five import source countries in the SADC region and the top five import source countries outside of Africa.

Source: UN Comtrade

**Figure C.13: Imports of Zimbabwe by Source Country in 2010
(Percent of Total Imports)**

Appendix D Socio-Economic Statistics for ASEAN Countries and the Focus Countries in Southern Africa

Table D.1: Population and GDP Per Capita of the Focus Countries, 2011

Country	Angola	Botswana	Malawi	Mozambique
Population (million)				
2011	19.6	2.0	15.4	23.9
GDP per capita (current USD)				
2011	5,148	8,680	371	535
Country	Namibia	South Africa	Zambia	Zimbabwe
Population (million)				
2011	2.3	50.6	13.5	12.8
GDP per capita (current USD)				
2011	5,293	8,070	1,425	776

Source: World Bank, *World DataBank*

Table D.2: Population and GDP Per Capita of ASEAN Countries, 1980 and 2011

Country	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia
Population (million)					
1980	0.2	6.5	150.8	3.2	13.8
2011	0.4	14.3	242.3	6.3	28.9
GDP per capita (current USD)					
1980	26,037	NA	517	NA	1,803
2011	31,008 ^a	900	3,495	1,320	9,656
Country	Myanmar	Philippines	Singapore	Thailand	Vietnam
Population (million)					
1980	32.9	47.1	2.4	47.5	53.7
2011	48.3	94.9	5.2	69.5	87.8
GDP per capita (current USD)					
1980	NA	689	4,913	681	NA
2011	NA	2,370	46,241	4,972	1,411

Note: ^a Based on 2010 data since Brunei's GDP per capita in 2011 was missing on the World DataBank as of August 2012.

Source: World Bank, *World DataBank*

**Table D.3: Annual Average Growth Rates of GDP and GDP Per Capita
of Selected ASEAN Countries in 1980–2011**

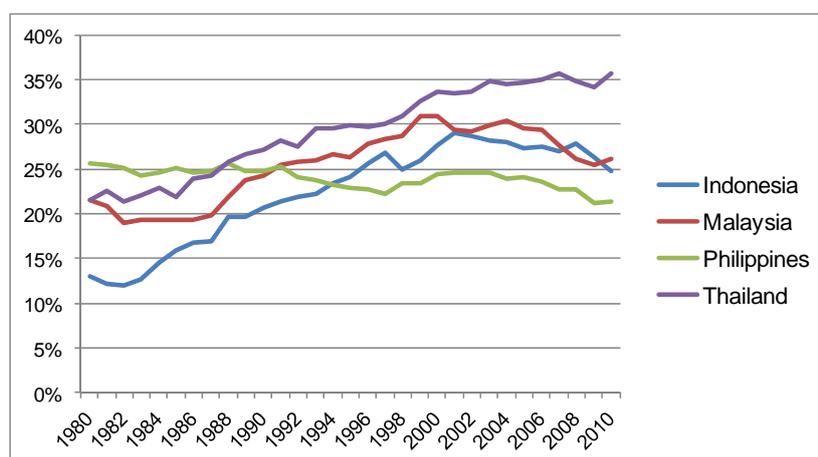
	Indonesia	Malaysia	Philippines	Thailand
Real GDP				
1980–2011	5.3%	5.9%	3.1%	5.4%
1980–1997	6.8%	7.3%	2.3%	7.4%
1997–1998	-13.1%	-7.4%	-0.6%	-10.5%
1998–2011	5.0%	5.1%	4.5%	4.0%
Real GDP per capita				
1980–2011	3.7%	3.4%	0.8%	4.1%
1980–1997	4.9%	4.5%	-0.3%	5.8%
1997–1998	-14.3%	-9.6%	-2.7%	-11.6%
1998–2011	3.7%	3.0%	2.6%	3.1%

Source: World Bank, *World DataBank*

Table D.4: Manufacturing in Percentage of GDP for Selected ASEAN Countries, 1980 and 1997

	Indonesia	Malaysia	Philippines	Thailand
1980	13.0%	21.6%	25.7%	21.5%
1997	26.8%	28.4%	22.3%	30.2%
% change	+13.8	+6.8	-3.4	+8.7

Source: World Bank, *World DataBank*



Source: World Bank, *World DataBank*

Figure D.1: Manufacturing in Percentage of GDP for Selected ASEAN Countries, 1980–2010

Table D.5: Gross Fixed Capital Formation in Percentage of GDP: Comparison between the Focus Countries and Selected ASEAN Countries, 1980–2010

	Indonesia	Malaysia	Philippines	Thailand
1980–1989	24%	29%	22%	29%
1990–1997	28%	39%	23%	40%
1998–2010	24%	22%	21%	25%
	Angola	Botswana	Malawi	Mozambique
1980–1989	14%	29%	16%	12%
1990–1997	21%	28%	16%	21%
1998–2010	16%	25%	18%	21%
	Namibia	South Africa	Zambia	Zimbabwe
1980–1989	19%	23%	12%	16%
1990–1997	21%	16%	12%	21%
1998–2010	22%	18%	20%	7%

Note: These figures are the averages for each period.

Source: World Bank, *World DataBank*

Table D.6: Gross Domestic Savings in Percentage of GDP for Selected ASEAN Countries, 1980–2010

	Indonesia	Malaysia	Philippines	Thailand
1980–1989	32%	30%	21%	26%
1990–1997	32%	39%	16%	35%
1998–2010	30%	43%	16%	32%

Note: These figures are the averages for each period.

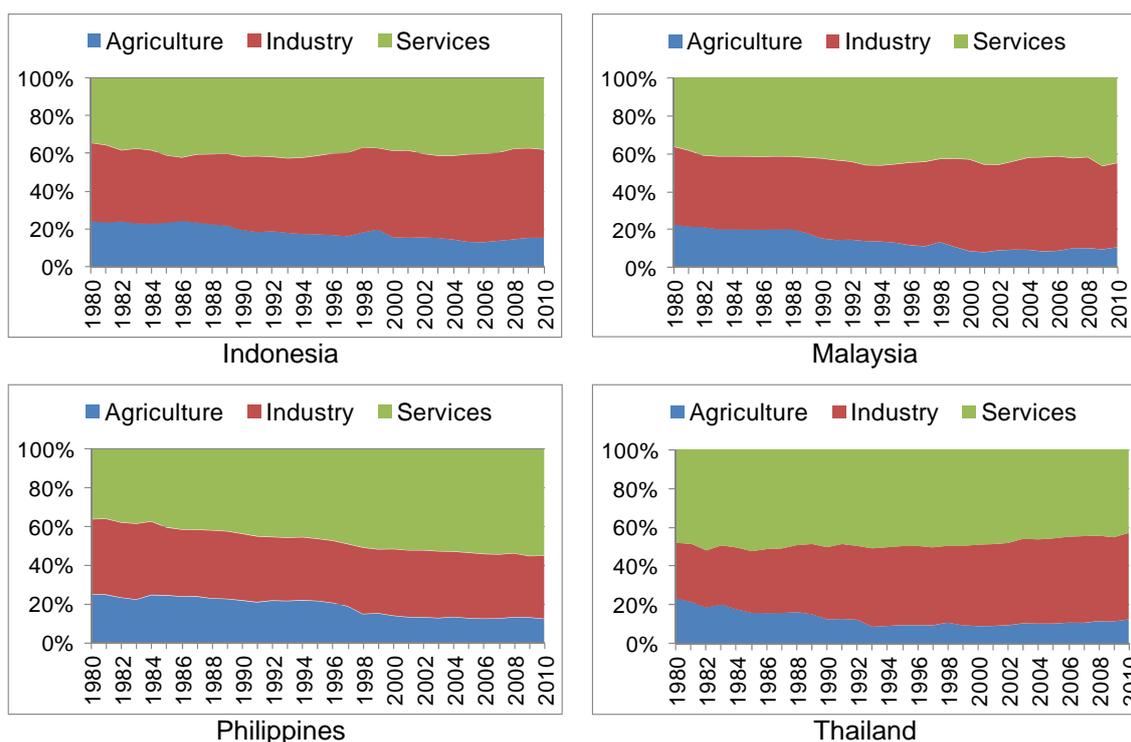
Source: World Bank, *World DataBank*

Table D.7: Gross Domestic Savings in Percentage of GDP for the Focus Countries, 2008–2010

	Angola	Botswana	Malawi	Mozambique
Average in 2008–10	29%	25%	7%	3%
	Namibia	South Africa	Zambia	Zimbabwe
Average in 2008–10	21%	19%	27%	-25%

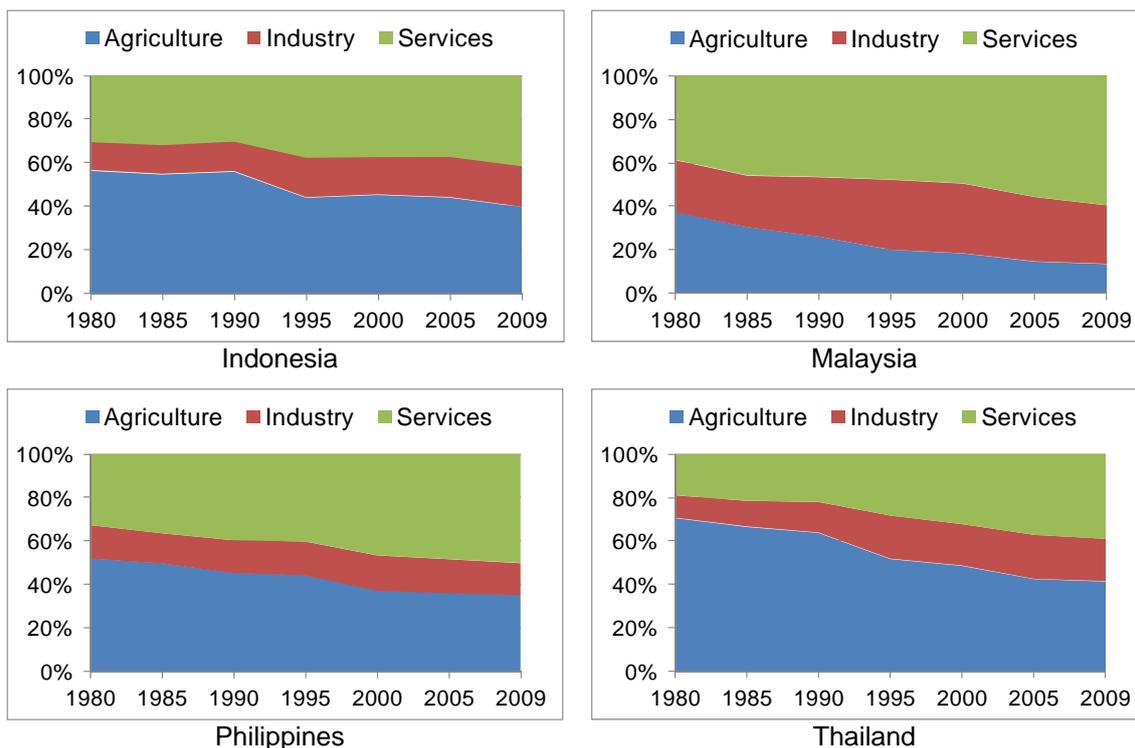
Note: These figures are the averages for each period.

Source: World Bank, *World DataBank*



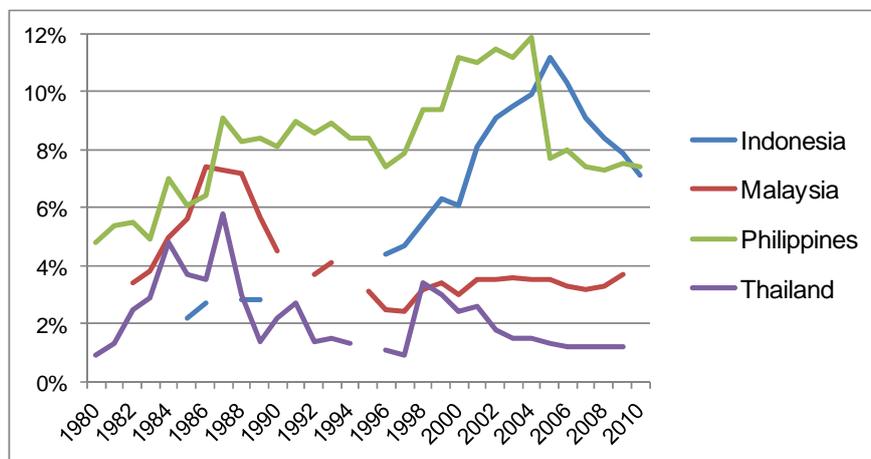
Source: World Bank, *World DataBank*

Figure D.2: GDP by Sector in Selected ASEAN Countries, 1980–2010



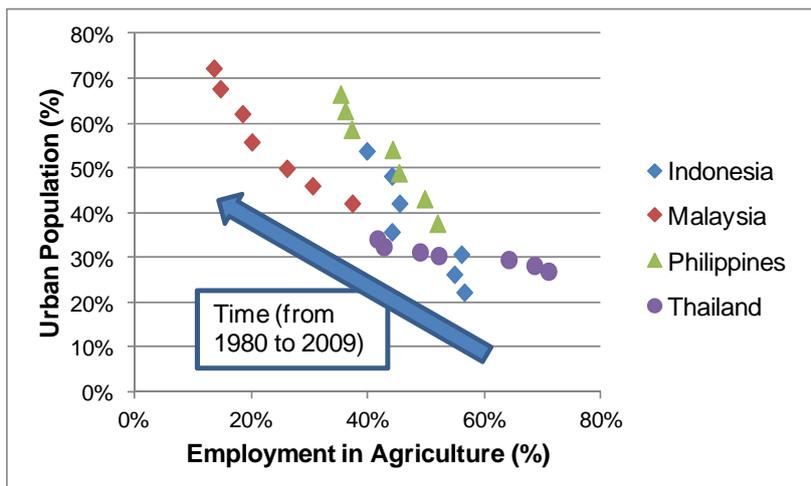
Source: World Bank, *World DataBank*

Figure D.3: Employment by Sector in Selected ASEAN Countries, 1980–2009



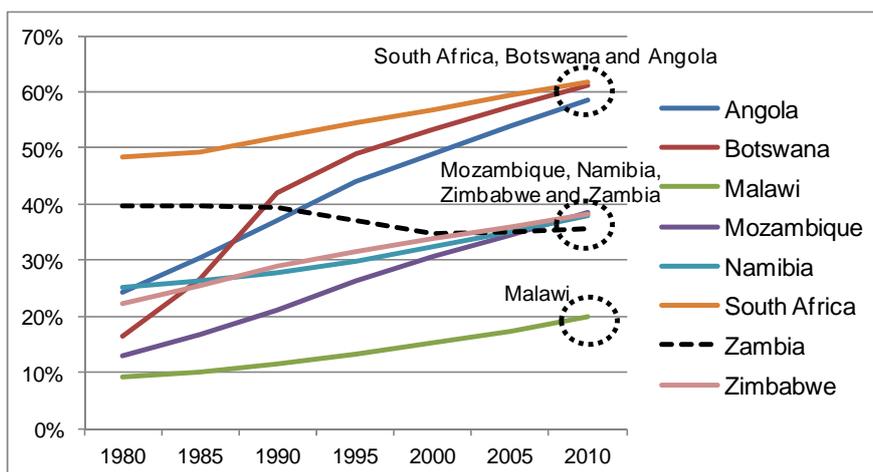
Source: World Bank, *World DataBank*

Figure D.4: Unemployment Rate in Selected ASEAN Countries, 1980–2010



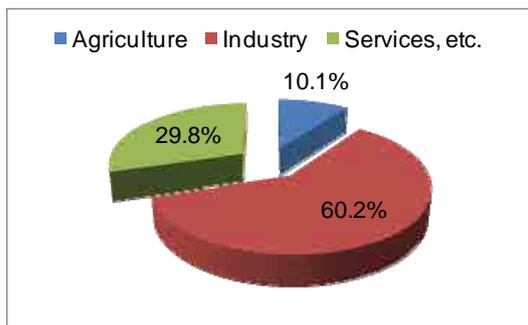
Source: World Bank, *World DataBank*

Figure D.5: Urban Population vs. Employment in Agriculture for Selected ASEAN Countries, 1980–2009

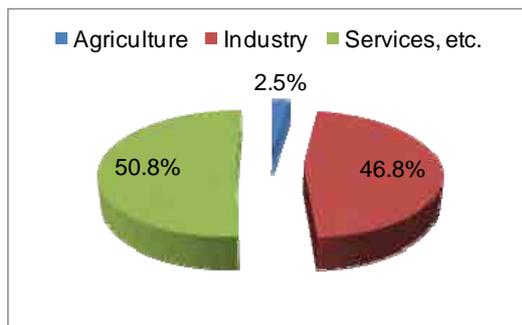


Source: World Bank, *World DataBank*

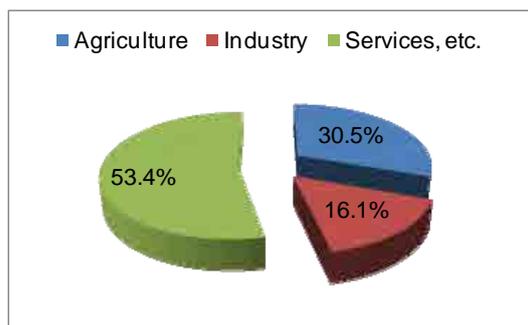
Figure D.6: Proportion of Urban Population in the Focus Countries, 1980–2010



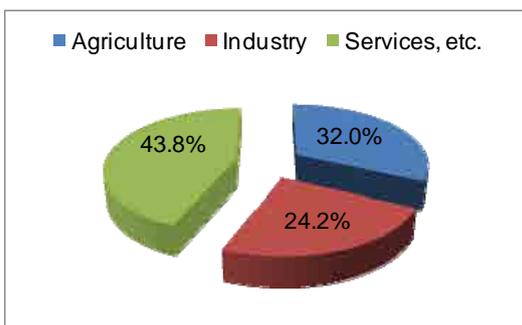
Angola (2011)



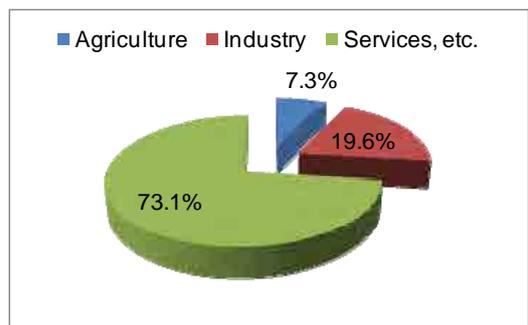
Botswana (2011)



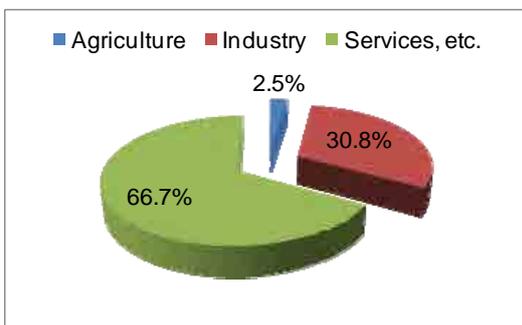
Malawi (2009)



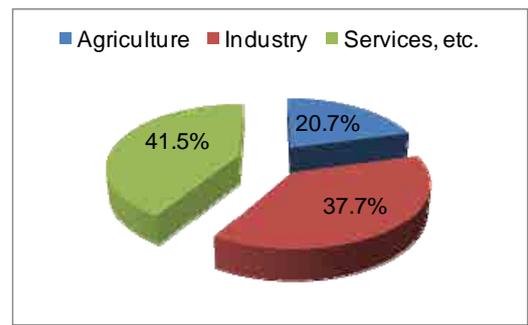
Mozambique (2011)



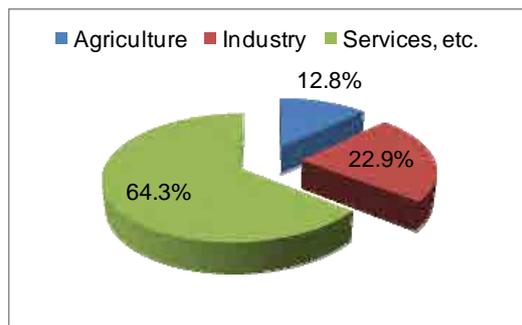
Namibia (2011)



South Africa (2010)



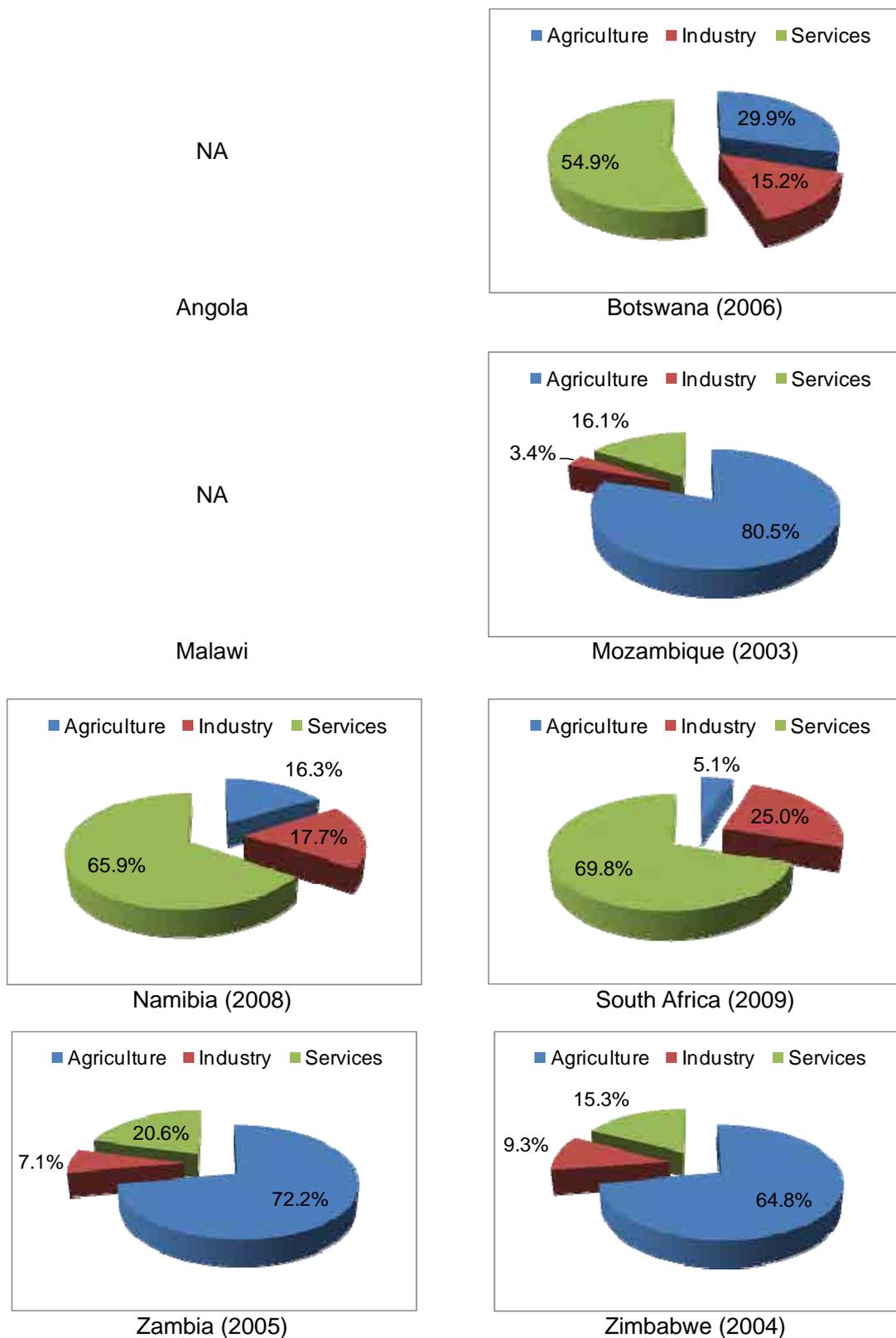
Zambia (2011)



Zimbabwe (2011)

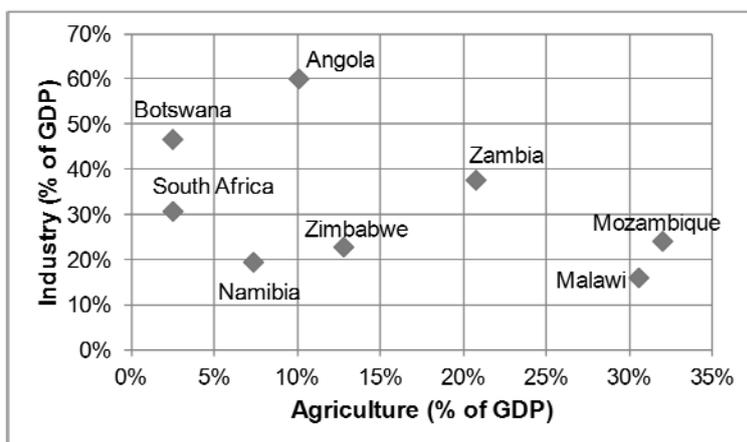
Source: World Bank, *World DataBank*

Figure D.7: GDP by Sector of the Focus Countries



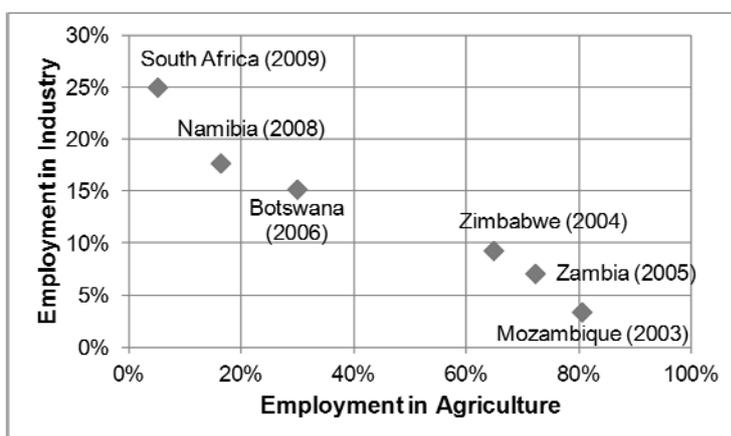
Source: World Bank, World DataBank

Figure D.8: Employment by Sector in the Focus Countries



Source: World Bank, *World DataBank*

Figure D.9: Percentage of Agriculture and Industry in GDP of the Focus Countries



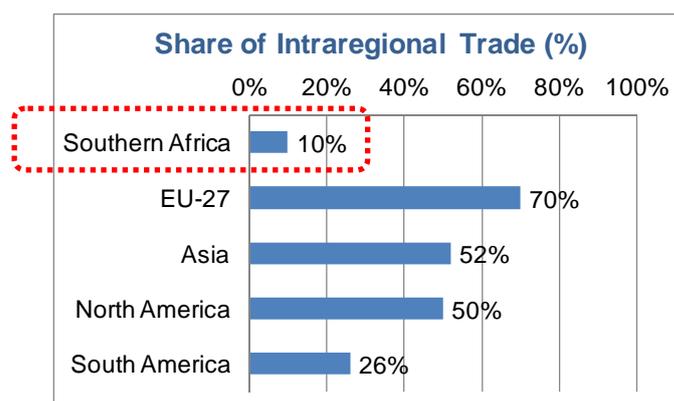
Source: World Bank, *World DataBank*

Figure D.10: Employment in Agriculture and Industry (% of Total Employment) in the Focus Countries

Appendix E Background on Market Integration in Southern Africa

Background on market integration in the region includes the following:

- (i) Intra-regional trade is low in Southern Africa – about 10% of total trade¹ – compared to 70% among the EU-27, 52% among Asian countries, 50% in North America countries, and 26% for South American countries (see Figure E.1).



Note: The EU-27 refers to the (current) 27 member countries of the European Union

Source: Speech of H.E. Valentine Rugwabiza, Deputy Director General, World Trade Organization, at the University of Witwatersrand, Johannesburg, 12 April 2012, downloaded from http://www.wto.org/english/news_e/news12_e/ddg_12apr12_e.htm [for the EU-27, Asian countries, North American countries] and World Bank, *Harnessing Regional Integration for Trade and Growth in Southern Africa*, March 2011, p. 11 [for Southern African countries]

Figure E.1: Share of Intra-regional Trade

- (ii) While intra-regional trade is low in proportional terms, it remains important for many Southern African countries (see Table E.1). Botswana and Namibia – members of the Southern African Customs Union (SACU) receive more than 80% of their imports from South Africa, while Malawi, Mozambique, Zambia, and Zimbabwe export 10–34% of their total exports to South Africa.² However, the intra-regional exports of most Southern African countries tend to be concentrated in just a few products (e.g., in 2007, three-quarters of Zimbabwe’s exports to South Africa were nickel, and three-quarters of Zambia’s exports to South Africa and Namibia were copper concentrate).³

¹ However, there is a significant amount of unrecorded cross-border trade in the region, and therefore official statistics may underestimate the volume of intra-regional trade. World Bank, *Harnessing Regional Integration for Trade and Growth in Southern Africa*, March 2011, pp. 5–6.

² World Bank, *Harnessing Regional Integration for Trade and Growth in Southern Africa*, March 2011, Appendix 1, pp. 21, 131.

³ See source in previous footnote, p. 22.

Table E.1: Regional Trade among Southern African Countries

Country	Main Regional Export Destinations (% of World Exports)	Main Regional Import Sources (% of World Imports)	Exports to Southern Africa (% of World Exports)	Imports from Southern Africa (% of World Imports)
Angola	SACU (1%)	SACU (7%)	1.5%	7.2%
Botswana	South Africa (6%) Zimbabwe (6%)	South Africa (86%) Zimbabwe (2%)	12.4%	88.8%
Malawi	SACU (12%) Egypt (9%) Mozambique (4%) Zimbabwe (4%)	SACU (36%) Mozambique (6%) Tanzania (5%) Zambia (8%) Zimbabwe (4%)	33.1%	61.3%
Mozambique	SACU (15%) Malawi (2%) Zimbabwe (3%)	SACU (42%)	20.4%	44.8%
Namibia	South Africa (24%) Angola (6%)	South Africa (82%)	32.2%	83.7%
South Africa	Zambia (2%) Zimbabwe (2%) Mozambique (2%)	Zimbabwe (1%) Angola (1%) Libya (1%)	11.5%	4.1%
Zambia	SACU (21%) Tanzania (6%) DRC (5%)	SACU (51%) Tanzania (3%) Zimbabwe (3%)	39.0%	61.9%
Zimbabwe	SACU (33%) DRC (5%) Zambia (4%)	SACU (58%) Mozambique (3%) Zambia (4%)	47.4%	68.7%

Abbreviation: SACU = Southern African Customs Union

Source: World Bank, *Harnessing Regional Integration for Trade and Growth in Southern Africa*, March 2011, Appendix 1, p. 131 [drawing from International Monetary Fund Direction of Trade Statistics and UNCOMTRADE for Botswana and Namibia]

- (iii) The continent's share of world trade – less than 3% in 2011 – is also small. This is not surprising since the most integrated regions in the world are the most competitive.⁴
- (iv) The Southern Africa region is fragmented with numerous, “thick”⁵ border crossings. There are a number of bottlenecks to movements along corridors, including customs documentation and procedures, transit procedures, and roadblocks. Except for South Africa, the countries of the region rank relatively low in terms of the logistics performance index, a global multidimensional global assessment prepared by the World Bank every two years (Table E.2).

⁴ Speech of H.E. Valentine Rugwabiza, Deputy Director General, World Trade Organization, at the University of Witwatersrand, Johannesburg, 12 April 2012, downloaded from http://www.wto.org/english/news_e/news12_e/ddg_12_apr12_e.htm.

⁵ The term “thick borders” has come into common use recently. See, e.g., World Bank, *Harnessing Regional Integration for Trade and Growth in Southern Africa*, March 2011, pp. 7–8 [“Cross-border Trade in Africa is Limited by Thick Borders”; “The wider the border, the more the country limits trade, travel and the flow of the factors of production.”]

Table E.2: Logistics Performance Index (LPI) Rankings of Focus Countries in Southern Africa

Country	LPI		International Shipments	Logistics Quality and Competence	Tracking and Tracing		Timeliness
	Ranking	Customs			Infra-structure	Tracing	
South Africa	23	26	19	20	24	16	20
Botswana	68	48	60	111	75	81	58
Malawi	73	77	64	48	60	102	88
Namibia	89	54	69	114	88	67	144
Zimbabwe	103	105	127	93	127	106	71
Mozambique	136	145	124	87	130	135	150
Zambia	138	111	140	128	149	130	131
Angola	138	101	92	139	149	147	141

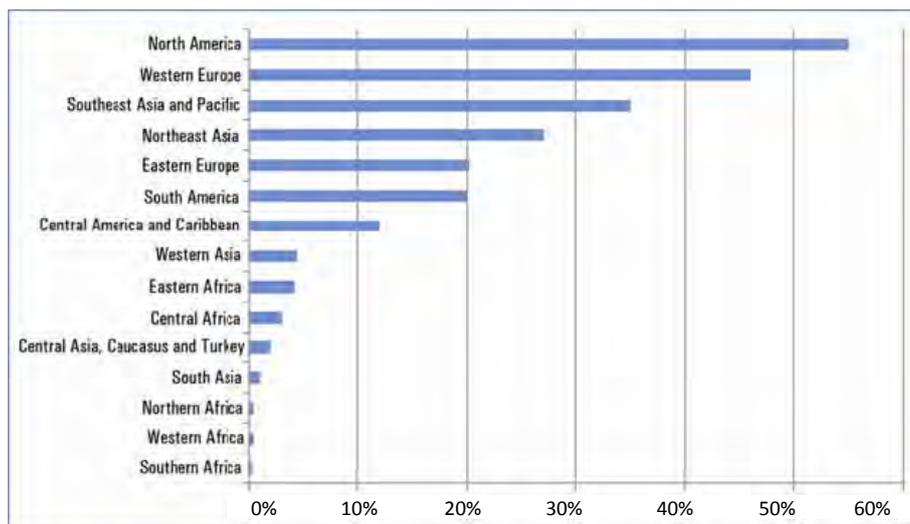
Notes: (1) The LPI ranking is a composite ranking based on a simple average of the country scores on the seven key dimensions shown in the table. (2) Countries are shown in order of their LPI ranking. (3) Singapore ranked first, Japan ranked eighth, DR Congo ranked 143rd, and Burundi ranked last (155th). (4) The 2010 rankings were used for Mozambique and Zambia (the latest available); the 2012 rankings were used for the other focus countries.

Source: Jean-François Arvis (World Bank), Monica Alina Mustra (World Bank), Lauri Ojala (Turku School of Economics), Ben Shepherd (World Bank), and Daniel Saslavsky (Turku School of Economics), *Connecting to Compete: Trade Logistics in the Global Economy, The Logistics Performance Index and Its Indicators*, 2012 (pp. 26–33) and 2010 (p. 31)

- (v) Consequences of the low level of intraregional trade include the following:
- (a) low investment and competitiveness: foreign investors have bypassed Africa even though several studies have suggested that returns on investment are higher in Africa than in Asia and Latin America;
 - (b) a high vulnerability to external shocks: with a high dependence on trade with the rest of the world, the region is vulnerable to external shocks (e.g., recession in Japan, Europe, and North America);
 - (c) missed growth and development opportunities: an increase in the continent’s share of global trade by only 1% would result in close to USD 200 billion in additional trade on an annual basis,⁶ about five times what Africa receives in annual official development assistance; and
 - (d) limited participation in global value chains: the high degree of fragmentation of markets in Africa and high transaction costs make it difficult for African firms to integrate into regional and global value chains, where currently trade in intermediate products accounts of 60% of nonfuel merchandise trade.⁷
- (vi) Unlike Asia – where advanced production networks have deepened regionally and led export growth – “Factory Southern Africa” has not yet emerged (Figure E.2).

⁶ In 2011, the USD value of world merchandise trade was to \$18.2 trillion. World Trade Organization, World Trade 2011, Prospects for 2012: Trade Growth to Slow in 2012 after Strong Deceleration in 2012, http://www.wto.org/english/news_e/pres12_e/pr658_e.htm.

⁷ Speech of H.E. Valentine Rugwabiza, Deputy Director General, World Trade Organization, at the University of Witwatersrand, Johannesburg, 12 April 2012, downloaded from http://www.wto.org/english/news_e/news12_e/ddg_12_apr12_e.htm.



Source: International Trade Centre, *ITC Business Briefing, Trade Policy*, Private Sector Reviews of the Implementation of the SADC FTA, Part II, downloaded from http://www.saiia.org.za/images/stories/research/dtpp/20120305_trade_newsletter/edip_itc_business_briefing_vol13_part2_16_jan2012.pdf and <http://www.intracen.org/BB-2012-01-16-Private-sector-views-of-the-implementation-of-the-SADC-FTA-Part-II/>, 16 January 2012

Figure E.2: Intra-Industry Trade by Region

Appendix F Transport Infrastructure Bottlenecks and Development Issues

F.1 Beira Corridor (including the Sena and Tete Corridors)

F.1.1 Outline of the Corridor

Figure F.1 presents a map of the Beira corridor, which is generally south of the Nacala Corridor, although the two corridors intersect in Malawi. As defined here, the Beira Corridor includes the following sections: (i) Beira – Border (Machipanda/Mutare) – Harare; (ii) Beira – Vanduzi – Tete (Tete Corridor) towards Malawi; and (iii) Beira – Mutarara (Sena Corridor) – Blantyre.

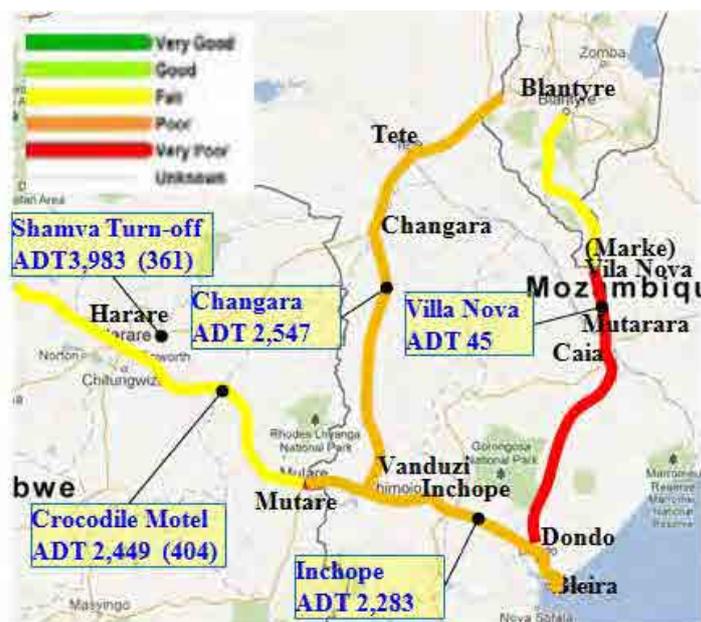


Legend: blue = roads, purple = railways;
Source: <http://www.tmsagis.co.za/>

Figure F.1: The Beira Corridor

F.1.2 Current Conditions

Current road and railway conditions along the Beira Corridor are presented in the text below as well as in Figure F.2 and Table F.1 (roads) and Figures F.3–F.4 and Table F.2 (railways). Also, current port conditions are set out, in the following text and in Table F.3 and Figures F.6–F.7.



Notes: (i) ADT = average daily traffic; (ii) the numbers in parentheses are for ADT for heavy freight vehicles
Sources: (i) SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012 [plus information collected by the JICA Study Team]; (ii) Zimbabwe National Road Administration (ZINARA) AADT data, 2011; (iii) Mozambique Regional Gateway Programme, *Situation Analysis and Roadmap*, May 2012; and (iv) Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

Figure F.2: Beira Corridor Road Conditions

(1) Roads

Key aspects of corridor roads include the following:

- **Beira–Mutare:** Fair, and almost all of this section will be improved, according to the North-South Corridor map prepared by Trademark Southern Africa (TMSA) presented at <http://www.tmsagis.co.za/>.
- **Mutare–Harare:** Fair. The Plumtree – Bulawayo – Harare – Mutare section is under rehabilitation, with financing by the Development Bank of Southern Africa (DBSA).
- **Vanduzi–Changara-Tete:** Fair
- **Dondo–Caia:** Very poor
- **Caia–Vila Nova:** Very poor (and no bridges)
- **Vila Nova (Marke)–Blantyre:** Fair
 - Chikwawa–Nchalo (30 km), rehabilitated, financed by the 9th European Development Fund (EDF), road width = 9.7 m, paved width = 7.2 m
 - Nchola–Bangula (50 km), rehabilitated, by the Ministry of Transport (MoT) of Mozambique, road width = 9.7 m, paved width = 7.2 m
 - Bangula–Nsanje (50 km), upgrading, by MoT, road width=9.7 m, paved width = 7.2 m
 - Nsanje–Marke (27 km): unpaved, road width=5–6 m¹

¹ JICA, *The Study on Development of the Sena Corridor in the Republic of Malawi, Final Report*, February 2012.

Table F.1: Beira Corridor Road Distances and Conditions

Route	Mozambique				Zimbabwe			
	Beira		Inchope	Machipanda	Forbes		Harare	
Distance	Ch. + 0	135 km	Ch. + 135	151	Ch. + 286	Ch. + 0	266 km	Ch. + 747
Road Condition	Poor / Potholed Paved – Single carriage Standard width				Fair, needs resealing Paved – Single carriage Standard width			
Category	Non-Toll, RUC				Non-Toll, RUC			
Drive side	Left				Left			
Cost	USD 2.31/km (48 tons)				USD 2.17/km (48 tons)			

Abbreviation: RUC = road user charges

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

(2) Railways

Beira Corridor Railway Lines in Mozambique

Basic facts concerning the **Beira-Machipanda Line** follow:

- Name: CFM²-Centro Lines
- CFM-Centro Lines include the first four lines shown in Table F.2.
- Authority: CFM (100% owned by the Government of Mozambique, GoM)
- Operator: Companhia dos Caminhos de Ferro da Beira (CCFB, the Beira Railway Company (Concessionaire)(see Figure F.3)
- Beira Corridor railways are mapped in Figure F.4.

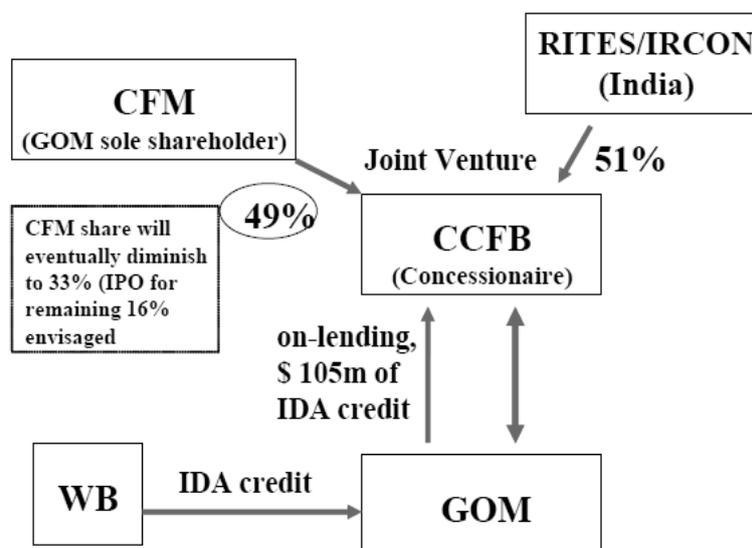


Figure F.3: Beira Corridor Railway Concession

² CFM = Portos e Caminhos de Ferro de Moçambique (in English, Mozambique Ports and Railways).



Source: <http://www.tmsagis.co.za/>

Figure F.4: Beira Corridor Railways

The Companhia de Chemin de Ferro de Beira (CCFB) was concessioned in 2004 for 20 years. However, CFM took back control of the railways because work had not commenced on the Machipanda Line and due to a lack of progress in rebuilding the Sena line.

CFM commenced work on the rehabilitation of the **Machipanda line** in January 2012. The COMESA Transport and Communications Strategy and Priority Investment Plan includes a project (187) to upgrade the Mutare–Machipanda rail link including demining.

CFM is now upgrading the **Sena Line** in connection with a coal development project. The current line capacity of 6 million tons per annum will be increased to 18 million tons per annum (Mtpa).

Table F.2: Overview of Beira Corridor Railways

	Category	Section		Length	Remarks
1	CFM-Centro	Beira	Machipanda (border with Zimbabwe)	298 km	Condition: Operational, but poor/fragile, with steep gradients and sharp curves near the Zimbabwe border
2	CFM-Centro (Sena)	Dondo	Moatize	575 km	Design axle: 20.5 tons Dona Ana Bridge completed in 2009 Refurbished in 2010 Capacity became 6 Mtpa * Coal from Moatize * Limestone from Muanza * Cement from Dondo
3	CFM-Centro	Inhamitanga	Marromeu	88 km	Rehabilitated in 2008 * Huge sugar product
4	CFM-Centro	Vila de Sena	Vila Nova (Malawi border)	43 km	Not in use Missing link at Chiromo
5	NRZ (Zimbabwe)	Machipanda (border with Zimbabwe)	Harare	270 km	Condition: Good * 45 kg/m continuously welded rail * Concrete sleepers * 20 tons axle load * Capacity: in excess of 15 Mtpa (current traffic: less than 10% of the capacity)

Abbreviations: CFM = Portos e Caminhos de Ferro de Moçambique (in English, Mozambique Ports and Railways); Mtpa = million tons per annum; and NRZ = National Railways of Zimbabwe
Source: JICA Study Team

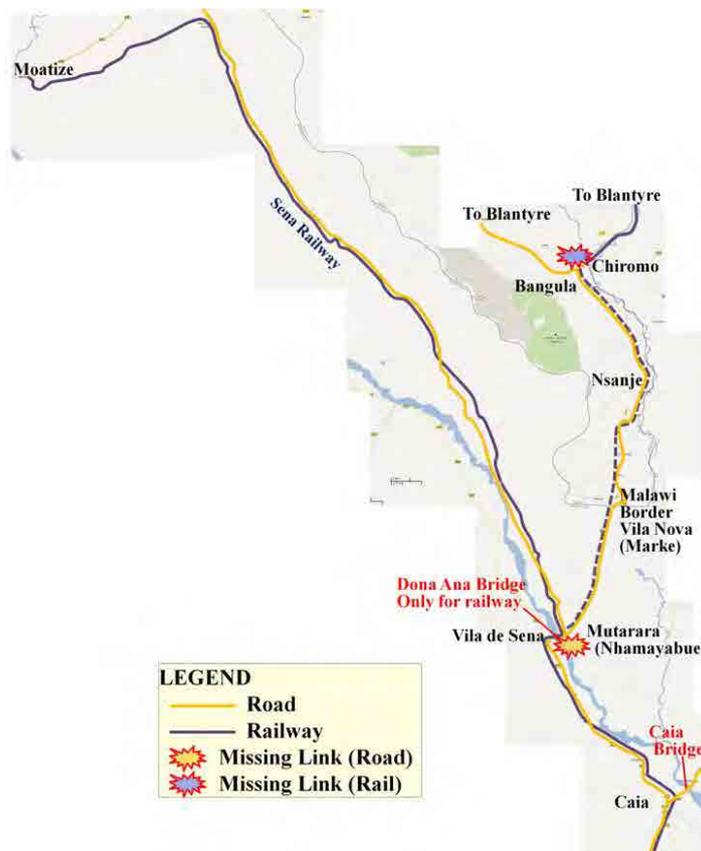
(3) Missing Links along the Sena Corridor

Road

The Dana Ana Bridge, which served as a road and rail bridge, was rehabilitated only for the Sena railway in 2009, with financing from the United States Agency for International Development (USAID). This section is a missing link in the road between Beira and Malawi.

Railway

The bridge near Chiromo in Malawi was washed away in 1997 (for the location see Figure F.5). The bridge length was about 1,800 m.



Source: JICA, *The Study on Development of the Sena Corridor in the Republic of Malawi*, Final Report, February 2012

Figure F.5: Chiromo Bridge Washaway

(4) Port of Beira

Background

Essential background concerning the port of Beira follows:

- On 15 October 1998, a joint venture was formed between Cornelder Holding (67%) based in Rotterdam and CFM (33%) for the management of the Beira Ports (Container and General Cargo Terminals) by Cornelder de Moçambique (CdM).
- The port has a total of 11 berths stretching over a total length of 1,994 m, excluding berth number 1, which has been reserved as a fishing harbor.
- Beira is 319 km from the Zimbabwe border at Machipanda.

- The port handles a variety of cargo from break bulk, neo bulk,³ and bulk, including petroleum products.
- The port is affected by silting and tides, and requires ongoing dredging. In 2011, the port and the 40 km access channel were again **dredged to its design depth** (8.5 m) to make it ready for Moatize coal.
- Coal exports **and coal-related imports** have been increasing. A new coal terminal (18 Mtpa) is being planned upriver of the current port, although the existing coal terminal (Quay No.8) was recently refurbished.
- In its bid to spearhead economic development in the region, CdM formed a joint venture with a Zimbabwean company located in Mutare (GMS Freight) where dry port facilities are being offered (inland container terminal).
- In January 2012 Vale (62%) and Riversdale (Rio Tinto, 38%) completed rehabilitation of the coal terminal at Quay No.8. It has a stockpiling capacity of 330,000 tons and can handle 6 Mtpa. Due to the shallow depth, Panamax (i.e., more than 50,000 dwt) class vessels cannot berth at the coal terminal, but must to transship coal to Panamax or Cape- size⁴ vessels offshore. Vale has deployed transshipment vessels at the port.
- CFM plans to repair the existing smaller maintenance dredgers, and to acquire an ocean dredger to ensure access for vessels up to 60,000 dwt.⁵

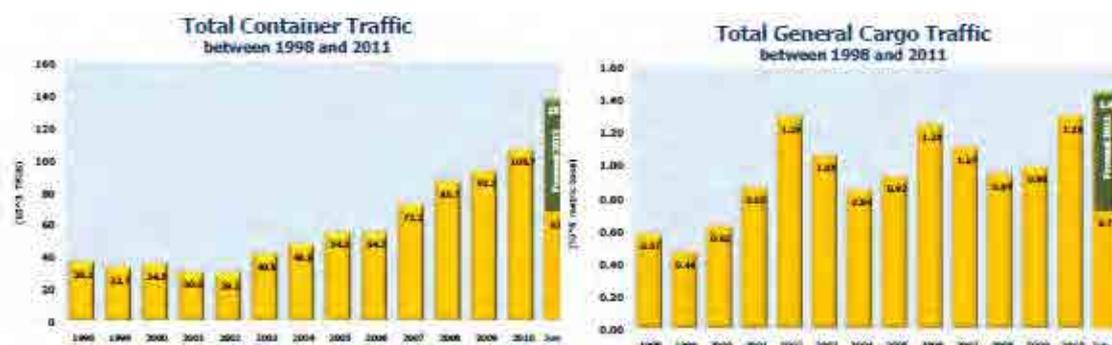
Port Facilities and Traffic

Basic data on Beira port facilities (Table F.3) and traffic (Figure F.6) follow. Figure F.7 presents an aerial view of the Port of Beira.

Table F.3: Beira Port Facilities

Terminal	Berths	Total Berth	Depth	Annual Capacity
Container	× 4	645 m	12 m	100,000 TEU
General Cargo	× 4	670 m	10 m	2.3 Mt
Coal	× 1		10 m	6 Mtpa
Liquid Bulk (Oil) – pipeline to Zim.	× 1		12 m	est 2 Mtpa
New planned coal terminal	× 2		12 m	18 Mtpa

Source: Mozambique Regional Gateway Programme, *Situation Analysis and Roadmap*, May 2012



Source: New Energy and Industrial Technology Development Organization, *Study on the Current Status of Development of Coal Mining in Mozambique and Possibility of Exporting the Coal to Japan*, February 2012

Figure F.6: Beira Port Traffic

³ Neo-bulk cargo consists of goods that are prepackaged, counted as they are loaded and unloaded (as opposed to bulk cargo, where individual items are not counted), not stored in containers, and transferred as units at port

⁴ Capesize ships are cargo ships originally too large to transit the Suez Canal (i.e., larger than both Panamax and Suezmax vessels). To travel between oceans, such vessels used to have to pass either the Cape of Good Hope or Cape Horn.

⁵ Drawn from www.ports.co.za/beira.php.



Source: JICA, *The Study on Development of the Sena Corridor in the Republic of Malawi*, Final Report, February 2012

Figure F.7: Aerial View of the Port of Beira

F.1.3 Bottlenecks and Major Development Issues

Table F.4 presents an overview of bottlenecks and development issues concerning the Beira Corridor.

Table F.4: Bottlenecks and Development Issues: Beira Corridor

Category	Bottlenecks	Development Issues
Roads	<ol style="list-style-type: none"> (1) Tete–Vanzuzi–Beira: The road condition is now fair, but it may be damaged with increased coal transport. (2) Dondo–Caia towards Malawi: The condition is very poor. Bridges over the Zambezi and Shire Rivers are needed. Mutarara is a missing link, with no bridge over the Zambezi River. 	<ol style="list-style-type: none"> (1) Beira–Machipanda (Zimbabwe border): Rehabilitation [Mutare (Machipanda)–Harare: rehabilitation is ongoing, financed by the African Development Bank and the Development Bank of Southern Africa] (2) Beira–Vanduzi–Tete (3) Dry ports (e.g., at Inchope, Mutarara)
Railways	<ol style="list-style-type: none"> (1) The Sena railway line has been rehabilitated. Its current capacity for coal is 6 Mtpa, which is insufficient for Tete coal. (2) There is a missing link at Chiromo, Malawi (where the bridge washed away) 	<ol style="list-style-type: none"> (1) Sena railway line upgrading to 18 Mtpa (2) Rehabilitation of the railway line linking Beira–Machipanda–Harare to serve increasing demand
Port, Waterway	<ol style="list-style-type: none"> (1) Capacity for coal handling (2) Shallow depth due to siltation 	<ol style="list-style-type: none"> (1) Expansion of the capacity for coal handling to 18 Mtpa (2) Development of the Zambezi River for waterborne export of Tete coal

Source: JICA Study Team

F.2 Dar es Salaam Corridor

F.2.1 Outline of the Corridor

Figure F.8 presents a map of the Dar es Salaam Corridor, which is defined here as Dar es Salaam – Border (Tunduma/Nakonde) – Kapiri Mposhi.



Legend: blue = roads, pink = railways;
Source: <http://www.tmsagis.co.za/>

Figure F.8: The Dar es Salaam Corridor

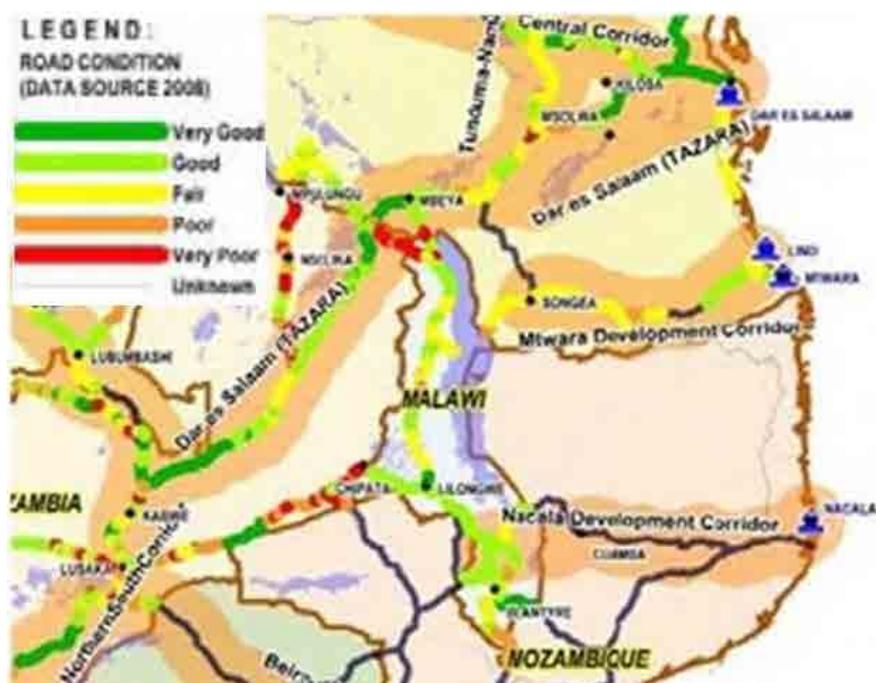
F.2.2 Current Conditions

Current road and railway conditions along the Dar es Salaam are presented in the text below as well as in Figures F.9–F.10 and Table F.5. Also, current port conditions are set out, in the following text.

(1) Roads

Key aspects of corridor roads include the following:

- The road condition is fair to good (see Figure F.9).
- Design Capacity: 100 heavy freight vehicles (HFVs) per day (each direction)
- Current volume: 70–100 HFVs per day (based on SADC RIDMP Transport Sector Plan volume 1).
- Capacity constraint: The main constraint is at the border post (there is no road congestion)
- The road section between Kapiri Mposhi and Nakonde has been rehabilitated.
- Tanzania plans to upgrade the road between Dar es Salaam and Calinze. A feasibility study was completed.
- The COMESA Transport and Communications Strategy and Priority Investment Plan includes several road projects along the corridor (e.g., upgrading of the Makambako–Mfinga road, rehabilitation of the Igawa–Makambako road).



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

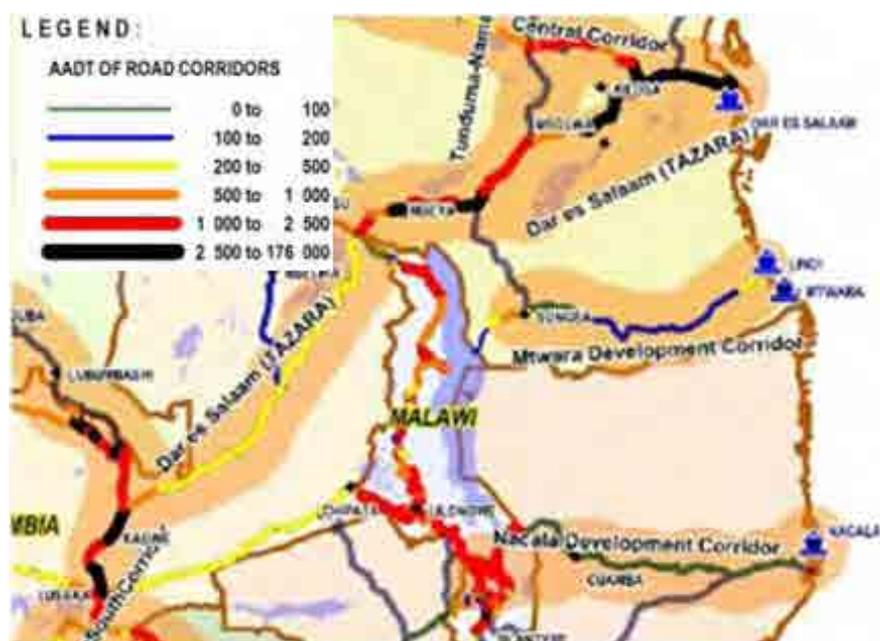
Figure F.9: Dar es Salaam Corridor Road Conditions

Table F.5: Dar es Salaam Corridor Road Distances and Conditions

Route	Tanzania				Zambia					
	Dar es Salaam		Uyole	Tanduma	Nakonde		Kapiri Mposhi		Lusaka	
Distance	Ch. + 0	778 km	Ch. + 778	108	Ch. + 886	Ch. + 0	800 km	Ch. + 385	206 km	Ch. + 1006
Road Condition	Good (Iringa-Uyole: Good/Fair) Paved – Single carriage Standard width			Good Asphalt Overlay		Fair – Poor/Potholed Paved – Single carriage Standard width			Good Paved – Single carriage Standard width	
Category	Non-Toll, RUC					Non-Toll, RUC				
Drive side	Right					Left				
Cost	USD 1.75/km (48 tons)					USD 2.26/km (48 tons)				

Abbreviation: RUC = road user charges

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.10: Road Traffic Capacity along the Dar es Salaam Corridor

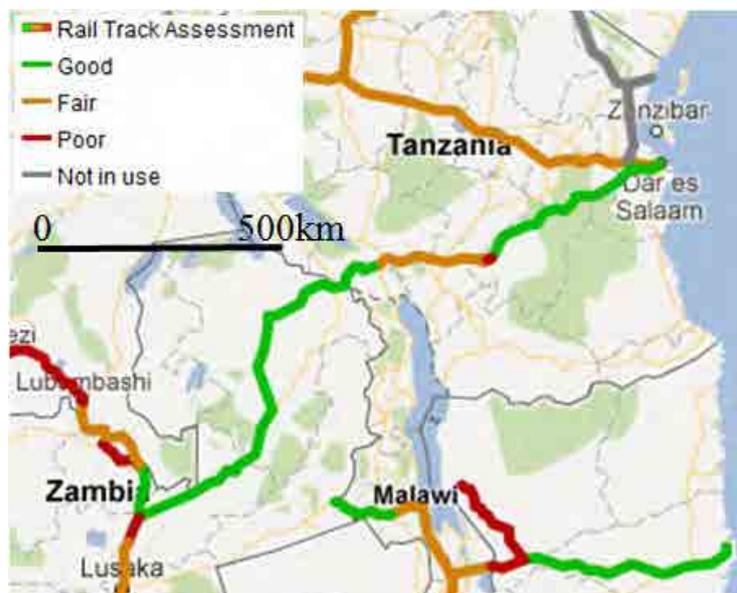
(2) Railways

Key aspects of the corridor railway are set out below:

- TAZARA is the Dar es Salaam corridor railway. The route is Dar es Salaam – Border (Tunduma/Nakonde) – Kapiri Mposhi.
- TAZARA was a turnkey project financed and executed by the People's Republic of China (PRC). Construction began in 1970 and was completed in 1975. Construction costs were about USD 500 million, making it the largest foreign assistance project undertaken by the PRC at the time.
- The Government of the PRC sponsored construction of the railway specifically to eliminate Zambia's economic dependence on Rhodesia (now Zimbabwe) and South Africa. Completion of the line provided landlocked Zambia with an alternative route for its copper exports.
- Although it remains in operation, TAZARA is now in a state of near collapse due to mismanagement, financial difficulties, and inadequate maintenance.
- Figure F.11 presents railway conditions along the corridor.
- Currently, about 80 PRC technical personnel are conducting a feasibility study of rehabilitation of the TAZARA line.
- The design capacity is 1.5 Mtpa, while current traffic is about 0.5 Mtpa.
- Equipment availability and the lack of working capital are constraints on capacity. Traffic of 1.2 Mtpa has been assessed as the financial breakeven point.

The SADC Regional Infrastructure Development Master Plan includes: (i) Rehabilitation of Zambian Railway Restructuring, (ii) TAZARA Upgrade (USD 250 million; prefeasibility study by (China Civil Engineering Construction Company); (iii) Nseluka (TAZARA)–Mpulunge (Extension) to connect TAZARA and Lake Tanganyika (Mpulungu) for transport cement, iron, foods, and other cargo (150 km); and (iv) Chipata – Mpike or Petauke (TAZARA extension;

may be not viable due to the difficult terrain). The COMESA Transport and Communications Strategy and Priority Investment Plan includes projects (26 and 27) for (i) installation of new telecommunications signaling systems on the TAZARA line, and (ii) landside rectification works between Mlimba and Makambako.



Source: North-South Corridor TMSA Map Viewer, Rail Track Assessment, <http://www.tmsagis.co.za/>

Figure F.11: Dar es Salaam Corridor Railway Conditions

(3) Port of Dar es Salaam

The Port of Dar es Salaam is the principal Tanzanian port with a capacity of 4.1 million dwt of dry cargo and 6.0 million dwt of bulk liquid cargo. The port has a total quay length of about 2,000 m with 11 deep-water berths. The port's design capacity is 8 Mtpa, with current throughput of 7.4 Mtpa.

The expansion of the port is ongoing including berth construction (13 and 14) and dredging. The COMESA Transport and Communications Strategy and Priority Investment Plan includes a project (137) for dredging and widening of the port entrance channel and upgrading of container handling equipment. However, since the port has no more space for expansion, the Government of Tanzania is preparing to develop a new port at Bagamoyo (75 km north of Dar es Salaam), with PRC assistance.

F.2.3 Bottlenecks and Major Development Issues

Table F.6 presents an overview of bottlenecks and development issues concerning the Dar es Salaam Corridor.

Table F.6: Bottlenecks and Development Issues: Dar es Salaam Corridor

Category	Bottlenecks	Development Issues
Roads	(1) The western section in Tanzania and the northern section in Zambia are in poor condition. (2) Border crossing time is another constraint.	(1) Rehabilitation and Upgrading of the sections in poor condition (2) Upgrading of Calinzez–Dar es Salaam
Railways	Although the line remains in operation, TAZARA is now in a state of near collapse due to mismanagement, financial difficulties, and inadequate maintenance.	(1) Currently, about 80 PRC technical personnel are conducting a feasibility study for rehabilitation of the TAZARA line. (2) The PRC has proposed two TAZARA extensions: (i) Chipata – Mpike or Petauke, and (ii) Mpulunge – Nselika.
Ports	Capacity and waiting time	(1) Construction of a new port at Bagamoyo (2) Upgrading of the Port of Mpulunge

Source: JICA Study Team

F.3 Lobito Corridor

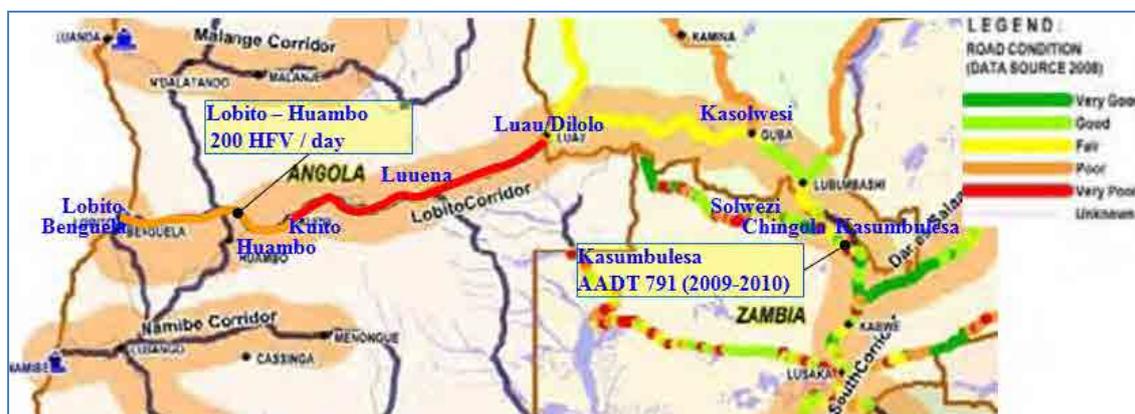
F.3.1 Outline of the Corridor

As defined here, the Lobito Corridor traverses Kasumbulesa–Kolwesi–Dilolo/Luau–Luena – Lobito.

F.3.2 Current Conditions

(1) Roads

Road conditions are as follows and as shown in Figure F.12 and Table F.7: Kasumbulesa – Kolwesi – poor to very poor, Kolwesi – Dilolo/Luau – poor, Dilolo/Luau – Luena – Kuito – very poor, and Kuito – Lobito – poor.



Abbreviations: HFV = heavy freight vehicle (48 t to 56 t)

Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.12: Lobito Corridor Road Conditions and Traffic Data

Table F.7: Lobito Corridor Road Distances and Conditions

Route	Zambia			DRC				
	Kitwe		Kasumbulesa	Kasumbulesa		Kolwezi		Dilolo
Distance	Ch. + 0	210 km	Ch. + 210	Ch. + 0	397 km	Ch. + 397	438 km	Ch. + 835
Road Condition	Badly Potholed Paved – Single carriage Standard width			Kasumbulesa–Lubumbashi (88 km) Poor / Potholed Lubumbashi–Likasi (124 km) Very Poor Paved – Single carriage Standard width Likasi–Kolwezi (185 km) Very poor / gravel road			Poor Paved – Single carriage	
Drive side	Left							

Angola				
Route	Luau		Luena	Lobito
Distance	Ch. + 0	334 km	Ch. + 334	831 km
Road Condition	Poor Paved – Single carriage			

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

(2) Railways

Figure F.13 presents a map of the Lobito Corridor Railway. More details by section are presented after this figure and in Figures F.14–F.15.



Legend: railway in purple

Source: <http://www.tmsagis.co.za/>

Figure F.13: Lobito Corridor Railway

Angola (Lobito–Luau)

- The corridor railway line (1,344 km), which is also referred to as the Benguela Railway, connects the Copperbelt with Lobito/Benguela.
- The line is of Cape gauge (1,067 mm).
- It was constructed for mining companies in the early 1900s.
- The railway was heavily damaged during Angola's civil war (1975–2002). Rehabilitation is necessary, especially in the eastern section in the DRC.
- The design capacity is 2.5 Mtpa and five trains per day (currently two trains per day are operated between Lobito and Benguela, one per week to Huambo, and three per week between Lobito and Cubal).
- In 2006, the China International Fund (a Chinese-owned private company based in Hong Kong) agreed to provide USD 300 million to begin rebuilding the railway. The reconstruction contract was awarded to China Railway 20 Bureau Group Corporation.

- By August 2011, service was restored eastward to Huambo from Lobito, a distance of 423 km.
- Reconstruction of the remaining 921 km of track – from Huambo to Luau (on the DRC border) – is expected to be completed by December 2012.
- Additional time will be required for ancillary construction, including signaling systems, maintenance yards, and the 64 stations along the route.
- When fully operational, the railway will be able to carry about 20 million tons of cargo and four million passengers annually.
- Caminhos de Ferro de Benguela (CFB, the Benguela Railway) employs (May 2012) 1,321 and transported 129,430 passengers and 5,640 tons in 2011.
- In August 2011 passenger services were inaugurated between Huambo and Lobito over the last (380 km) CFB section to be rehabilitated.⁶

DRC (Dilolo–Lubumbashi)

- The Société Nationale des Chemins de Fer du Congo (SNCC) is the national railway company operating the inland railways of the DRC.
- The DRC part of the railway line has not been operational for about 20 years.

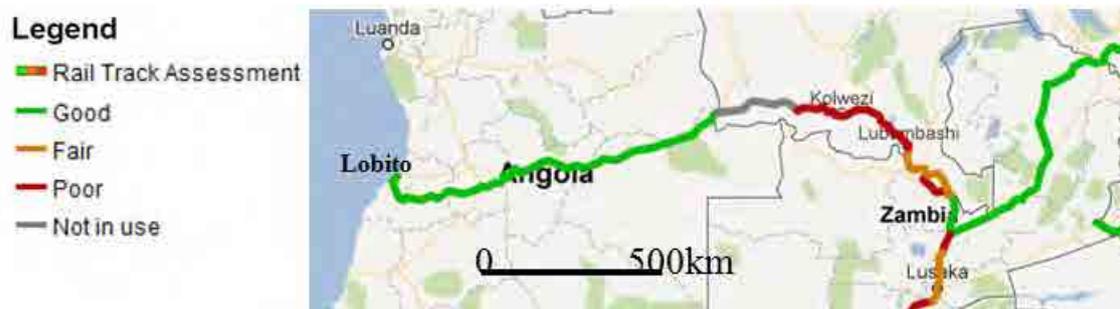
Zambia (Victoria Falls–Lusaka–Border (–Lubumbashi))

- The current condition of the Zambia sections is poor.
- A Dilolo (Angola) – Jimbe (Zambia) – Lumwana – Solwezi – Chingola line (the so-called North-Western Railway, shown in Figure F.14) serves the North Western Province (Zambia's new copper mining area). The Tagos Group, with financing (USD 500 million) from the United States and AfDB, is to construct a 254 km railway.



Figure F.14: Western Railway (dotted line in red)

⁶ Drawn from: (i) *Railway Gazette International*; and (ii) www.enr.com, 26 September 2011.



Source: North-South Corridor TMSA Map Viewer at <http://www.tmsagis.co.za/RailTrackAssessment>

Figure F.15: Lobito Corridor Railway Condition

(3) Port of Lobito

The Port of Lobito is a medium deepwater seaport, with a design capacity of 1.2 Mtpa and 40,000 TEUs. Currently, port throughput is at 100% of the design capacity.

Other observations about the Port of Lobito follow:

- There has been a steady increase in the number of vessels entering the port, with improved management and efficiency.
- There has also been a steady increase in hinterland demands.
- Exports from the Port of Lobito (volume and value) are minimal compared to imports (90%).
- Oil and petroleum are not exported through this port. The imports are generally materials required by the hinterland.
- There is a large amount of spare capacity for exports. With the upgrading and expansion of the port, this capacity will be able to serve the corridor road and commodities produced along it.
- The capacity of the Port of Lobito after completion of the master plan is to be 400,000 TEUs per year for berth operations and 550,000 TEUs per year in the storage areas.
- Capacity estimates of the container terminal indicate that the planned improvements of the port facility will result in a capacity well exceeding volume projections prepared without taking the Lobito - Beira road axis into account. This capacity surplus is easily extendable with further improvements in equipment. The addition of one more bridge crane will provide incremental capacity of 250,000–275,000 TEUs per year and will increase the terminal capacity of 750,000–800,000 TEUs per year.
- The general cargo terminal when fully completed will have a total rehabilitated quay length of 1,200 m. Particulars follow: (i) berthing capacity: 5 general cargo vessels; (ii) annual berth occupancy rate: 65%; (iii) terminal operation: 24 hours per day, 365 days per year; (iv) simultaneous operation: 2 gangs per ship; (v) average working hours per shift: 6.6; (vi) average gang productivity (t/hr): 15; (vii) terminal capacity (t/year): 1,056,949.⁷

Figure F.16 presents an artist's impression of the Lobito port master plan.

⁷ Drawn from UIR, *Beira Lobito Western Section, Updated Interim Report Presentation Transport Market Analysis, Volume 1*, EuropeAid/130157/D/SER/MULTI FS, Lusaka, 24 May 2012.



Source: UIR, *Beira Lobito Western Section, Updated Interim Report Presentation Transport Market Analysis, Volume 1*, EuropeAid/130157/D/SER/MULTI FS, Lusaka, 24 May 2012

Figure F.16: Lobito Port Master Plan (Artist's Impression)

F.3.3 Bottlenecks and Major Development Issues

Table F.8 presents an overview of bottlenecks and development issues concerning the Lobito Corridor.

Table F.8: Bottlenecks and Development Issues: Lobito Corridor

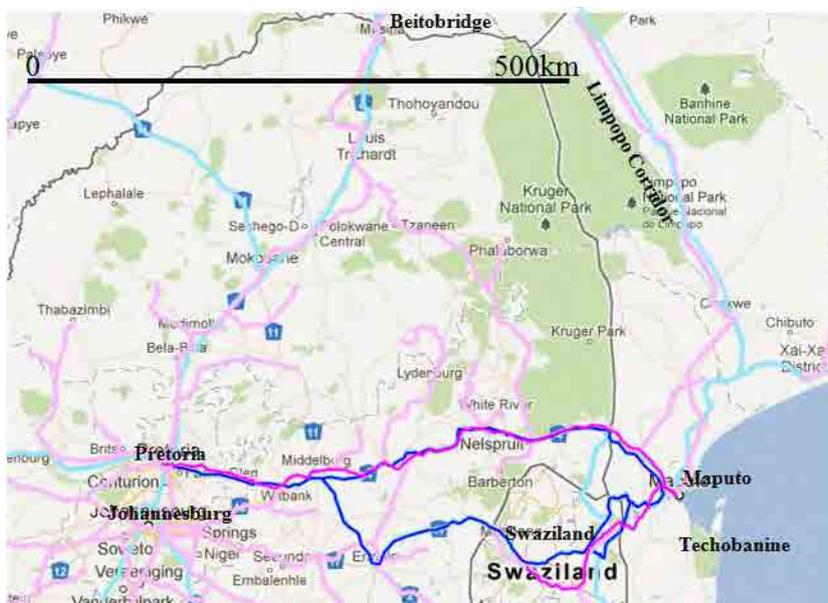
Category	Bottlenecks	Development Issues
Roads	<ol style="list-style-type: none"> (1) Kasumbulesa – Kolwesi: poor/potholed – very poor (2) Kolwesi - Dilolo/Luau: poor (3) Dilolo/Luau – Luena – Kuito : very poor (4) Kuito – Lobito: poor (5) Long crossing time at the border (Kasumabalesa) 	<ol style="list-style-type: none"> (1) Lobito – Dilolo (DRC) – Northern Zambia rehabilitation (2) Kitwe – Jimbe (Angola border) rehabilitation
Railways	<ol style="list-style-type: none"> (1) Lobito–Luau: Under rehabilitation with PRC assistance (2) Dilolo (Luau)–Zambia border in the DRC is not operational 	Development of a new railway line to connect to the Benguela Railway: Dilolo (Angola)–Jimbe (Zambia)–Lumwana–Solwezi–Chingola (the North-Western Railway) is ongoing
Port	<ol style="list-style-type: none"> (1) Exports are minimal; 90% of the traffic consists of imports (2) Missing road and railway links inland 	Port expansion master plan

Source: JICA Study Team

F.4 Maputo Corridor

F.4.1 Outline of the Corridor

Figures F.17 and F.18 present the Maputo Corridor railway and roads, respectively. As defined here, the corridor links (i) Pretoria/Johannesburg – Maputo, (ii) Swaziland – Maputo, and (iii) the Limpopo Corridor (Zimbabwe – Maputo).



Source: <http://www.tmsagis.co.za/>

Figure F.17: Maputo Corridor Railway



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.18: Maputo Corridor Road Condition

F.4.2 Current Conditions

Current road and railway conditions along the Maputo Corridor are presented in the text below as well as in Figure F.18 (above) and Table F.9 (road). Also, port conditions are set out, in the following text and Figures F.19–F.20.

(1) Roads

The road between Maputo and Johannesburg is in good condition (Figure F.18), although it is currently at capacity, with 600 trucks per day traveling from Maputo to Johannesburg. The modal share of road for freight traffic is 70%, with the remaining 30% is moved by rail. The sections between Johannesburg and Pretoria, and between Maputo and Matola, are congested during the morning and evening peaks (a JICA study of the latter section is ongoing). Table F.9 presents further data on Maputo Corridor roads.

Table F.9: Maputo Corridor Road Distances and Condition

Route	Mozambique			South Africa			
	Maputo		Ressano Garcia	Lubombo		Middleburg	Johannesburg
Distance	Ch. + 0	95 km	Ch. + 95	Ch. + 95	290 km	Ch. + 385	175 km Ch. + 560
Road Condition	Good Paved – Single carriage Standard width			Good Paved – Dual carriage Standard width		Good Paved – Single carriage Standard width	
Category	Toll road			Toll road			
Drive side	Left			Left			
Cost	USD 2.75/km (48 tons)						
Cost by Rail	USD 1.76/km (12 m container)						

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

(2) Railways

Mozambique

The Maputo Corridor railway section in Mozambique consists of the following sections: (i) Port Maputo – Ressano Garcia (border with South Africa, 95 km); (ii) Maputo – border with Swaziland (66 km); and (iii) the Limpopo Railway: Maputo – border with Zimbabwe (Chicualacuala district, in the southern province of Gaza), 522 km. The authority is Portos e Caminhos Ferro de Mozambique (CFM, Mozambique Ports and Railways) and the operator is New Limpopo Bridge Project Investments (NLPI) together with Transnet Freight Rail and Companhia do Pipeline Mozambique-Zimbabwe (CPM). The following sections are in poor condition: (i) the railway to Pretoria in Mozambique (dual tracks, but not yet electrified, operated with diesel locomotives, 88 km); (ii) the railway to Swaziland in Mozambique (single track, and not yet electrified, operated with diesel locomotives, 66 km); and (iii) the Limpopo Railway (rehabilitation ongoing, 522 km).

South Africa

The Maputo Corridor railway section in South Africa (Lebombo [border with Mozambique] – Johannesburg, 465 km) is operated by Transnet Freight Rail. The railway consists of electrified dual tracks and is in good condition.

Railway in Swaziland

Swazi Rail (SR), also known as Swaziland Rail, is the official railway corporation of Swaziland. SR only transports goods, not passengers. The railway consists of electrified dual tracks and is in good condition.

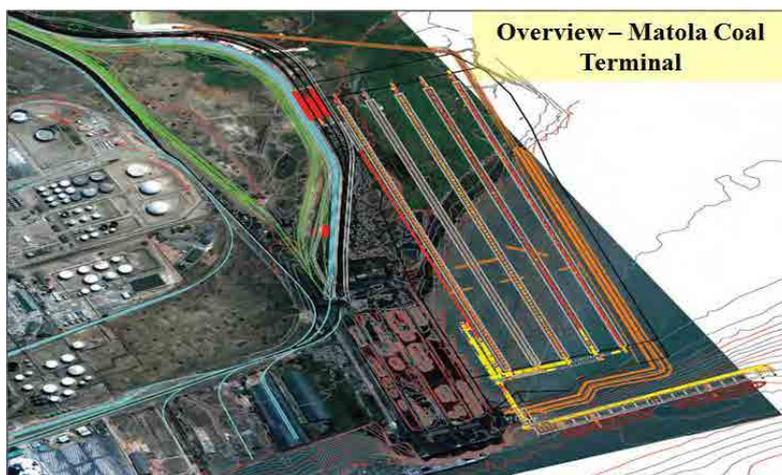
(3) Port

Key facts about the Port of Maputo follow:

- CFM is the Maputo port authority. The operator by concession has been the Maputo Port Development Company since 2003. Since 2008, ownership of the concession has been by Portus Indico (DPWorld, Grindrod, Mozambique Gestore; 51%) and CFM (49%). The concession, executed in 2003, is for 15 years, and will be extended for another 15 years in 2010.
- It is expected that a total of 14 million tons of cargo will be handled at the port in 2012 (11.9 million tons were handled in 2011, 40% for national import/export and 60% for transit, with 93% of the transit for South Africa). Current rail capacity is 10 Mtps. Since the Port Maputo forecasts tonnages upwards of 40 Mtpa by 2016, it has requested an increase in rail capacity.
- USD 291 million has been invested in the port since 2003, including USD 119 million for infrastructure, USD 129 million for equipment, and USD 43 million for the port authority.
- Regarding coal handling, the current capacity of the coal terminal is 6 Mtpa, mainly for coal from South Africa. The Port of Maputo envisages handling coal from the Limpopo Corridor. Recently, smaller producers (Exxaro and Coal Africa) have started to bring their shipments from the northern part of South Africa, since the Port of Richards Bay is short of capacity. The Port of Maputo also envisages receiving coal from Zimbabwe. Hwange Colliery in Zimbabwe envisages shipping 30,000-50,000 tons of coal per month of coal through Maputo in the near future. The planned capacity of the expansion for coal handling is 24 Mtpa. The new Motola coal terminal will have capacity of 20 Mtpa for the export of coal.
- The Port of Maputo has a master plan for expansion, which is ongoing, including Gate 9, a car terminal, warehouses, a ferro pad, a container terminal, and a coal terminal (Matola).
- The main competitor of the Port of Maputo is the Port of Richards Bay in South Africa.
- A significant potential competitor is Techobanine (a proposed new port for coal), to be served by a proposed new railway from Botswana through Zimbabwe. The coal terminal at Matola was planned in recognition of possible competition from the Techobanine port project.
- The Port of Maputo has sufficient space for expansion in Maputo, Matola, and Catembe.
- Conceptualized master plans for Maputo and Matola are presented in Figures F.19 and F.20.



Figure F.19: Port of Maputo Master Plan



Source: Porto Maputo, *Charting a Course for Successful Development*, 2012

Figure F.20: Matola Coal Terminal Plan

F.4.3 Bottlenecks and Major Development Issues

Table F.10 presents an overview of bottlenecks and development issues concerning the Maputo Corridor.

Table F.10: Bottlenecks and Development Issues: Maputo Corridor

Category	Bottlenecks	Development Issues
Roads	The sections between Johannesburg and Pretoria and between Maputo and Matola are congested during the morning and evening peaks (a JICA study of the latter section is ongoing.)	(1) Congestion countermeasures (2) Development of a dry port at the Lebombo–Ressano Garcia border crossing (a medium-term project in the SADC regional infrastructure master plan).
Railways	(1) Railway section in Mozambique: dual tracks, but not yet electrified (operated with diesel locomotives), 88 km (2) Railway to Swaziland in Mozambique: Single track, and not yet electrified (operated with diesel locomotives), 66 km	(1) Upgrading of the section in Mozambique (2) A new line linking Botswana–Zimbabwe–Tchobanine (3) Development of a Limpopo railway for Zimbabwe’s economic recovery and the agricultural/ mining products in the region
Port	Congestion of the access road to the port	(1) Port master plan for expansion to maintain competitiveness vis-à-vis the Port of Richards Bay and the proposed Port of Tchobanine (2) Development of a new port at Tchobanine

Source: JICA Study Team

F.5 Nacala Corridor

F.5.1 Outline of the Corridor

Figure F.21 shows the Nacala Corridor. The main route of the corridor links Nacala – Border (Chiponde/Mandimba) – Lilongwe – Border (Mchinji/Chipata) towards Lusaka and the Copperbelt. Including other routes, the Nacala Corridor is defined here as linking: (i) Nacala – Border (Chiponde/Mandimba) – Lilongwe – Border (Mchinji/Chipata) – Lusaka, (ii) Cuamba – Lichinga, and (iii) Nampula – Mocuba – Milange/Muloza – Blantyre – Mwanza – Tete.



Source: <http://www.tmsagis.co.za/>

Figure F.21: The Nacala Corridor

F.5.2 Current Conditions

Current road and railway conditions along the Nacala Corridor are presented in the text below as well as in Figures F.21–F.22 and Tables F.11 and F.12 (road) and Figures F.23–F.25 (railway). Also, current port facilities are described, in the following text and in Figures F.26–F.28 and Table F.13.

(1) Roads

Nacala Corridor road conditions and development status are presented in Figure F.22 and Tables F.11 and F.12 (with the latter table also presenting traffic data).



Notes: (i) ADT = average daily traffic; (ii) the numbers in parentheses are for ADT for heavy freight vehicles
Sources: (i) Zimbabwe National Road Administration (ZINARA) AADT data, 2011; and (ii) Mozambique Regional Gateway Programme, *Situation Analysis and Roadmap*, May 2012

Figure F.22: Map of Nacala Corridor Road Conditions

Table F.11: Basic Data on Nacala Corridor Roads

Route	Mozambique				Malawi			
	Nacala	Mocuba	Milange	Blantyre	Muloza	Blantyre	Blantyre	
Distance	Ch. + 0	541 km	Ch. + 541	179	Ch. + 720	Ch. + 0	109 km	Ch. + 109
Road Condition	Poor / Potholed for some sections Paved – Single carriage Standard width				Good Paved – Single carriage Standard width			
Category	Non-Toll, RUC				Non-Toll, RUC			
Drive side	Left				Left			
Cost	USD 2.12/km (48 tons)				USD 2.81/km (48 tons)			
Cost by Rail	USD 2.55/km (12 m container)							

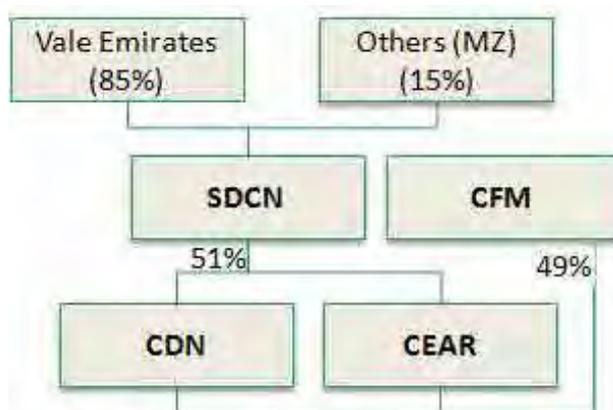
Abbreviation: RUC = road user charge

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

Malawi Rail System

The Malawi rail system was concessioned to CEAR in 1999. In 2005, the Port of Nacala and the northern rail network, Corredor de Desenvolvimento do Norte (CDN), was included in the concession. In 2011, Vale obtained 51% of the shares in CDN. Figure F.24 summarizes the shareholding structure of Nacala Railways.

The new line will run from Chikwawa in the far south of Malawi for 137 km to Nkaya Junction, where it will meet the existing line to Nacala. A Vale press release stated that in addition to the general benefits of regional economic integration, the line will provide jobs for Malawians in the construction phase, and will procure goods and services from local companies. The line will be used not only to haul coal from Vale's open cast mine in Moatize but also to carry Malawian exports and imports.



Source: CEAR Presentation to the JICA Study Team, 22 August 2012

Figure F.24: Shareholding Structure of Nacala Railways

To complete the railway will require rehabilitation of the existing line from Nkaya to Nayuci on the border with the Mozambican province of Niassa. This line is currently operated by CEAR. Vale owns 85% of the shares of Mozambique's Northern Corridor Development Company (SDCN), which in turn owns 51% of CEAR.

The southern line is essentially intact, but with a 300 m section washed away near Chiromo. Sections of the southern line include: (i) Cape Gauge (1,067 mm), 15–18 t axle: track in poor condition; (ii) Blantyre – Lilongwe, 380 km; (iii) Lilongwe – Mchinji, 100 km, (iv) Mchinji – Chipata, 30 km (recently linked); and (v) Blantyre – Bangula – Villa Nova (201 km + 45 km to Sena link). Also, a 300 km line linking Chipata – Serenje, or Mpika on TAZARA has been proposed by the PRC.⁹

CEAR

An overview of the CEAR system follows:

- Total Length: 797 km
 - Marka (Nsanje – Mchinji): 696 km
 - Nkaya – Nayuchi: 101 km
 - Network in operation: 716 km (Makhanga – Marka not operational)

⁹ This project may not be viable, because the minimum demand for viability is estimated to be about 10 Mtpa and the construction cost would be very high due to the difficult terrain. See <http://www.trademarksa.org/news/vale-signs-railway-agreement-malawi>.

- Locomotives
 - Mainline locomotives: 5 operational locomotives
Capacity 1500 hp, diesel electric
 - Shunting locomotives: 5 Operational locos
Capacity: 525 HP, Diesel Hydraulic
- Wagons: 253 (Commercial wagons)
- Fuel tank cars: 52
- Container carrying wagons: 55
- Covered bogie wagons: 88
- High-sided bogie wagons :43
- Ballast wagons: 15
- Coaches: 15 of all types
- Clinker traffic from Chilanga, Zambia, is to be transshipped and loaded at Mchinji Station en route to Blantyre Lafarge. Initially it was 50,000 tons per year and is expected to increase to 100,000 tons per year.
- Coal traffic from Moatize (Mozambique) is to be transshipped to rail at Liwonde Station for Nacala; CEAR expects to haul two million tons in first three years.
- Opportunities for CEAR
 - Immediate: Coal from Moatize to Nacala
Clinker traffic from Zambia
 - Near future: Prospects of mining of iron ore near Lirangwe
Prospects of mineral sands at Chipoka
Prospects of rare earth minerals at Balaka¹

Figure F.25 shows CEAR passenger and freight traffic from 2007 to 2011.

There have been issues with the CEAR concession agreement signed in 1999. The agreement was unclear concerning responsibility for track rehabilitation and maintenance of track. While the concessionaire (CEAR) is responsible for smaller rehabilitation and the owner (the Government of Malawi) is responsible for larger rehabilitation, the definitions of “smaller” and “larger” are unclear.

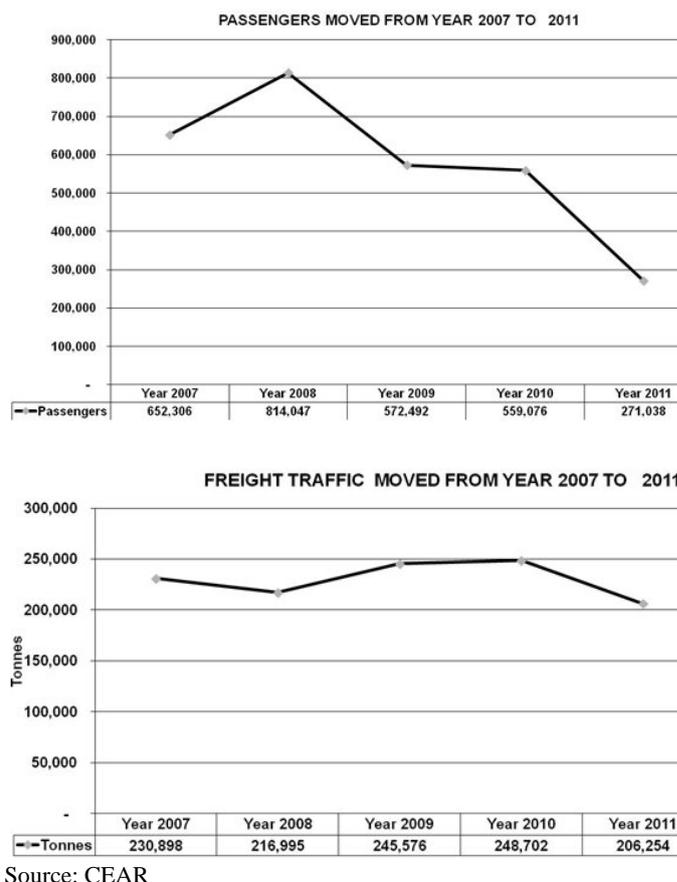


Figure F.25: CEAR Traffic Volumes, 2007–2011 (Passengers and Freight)

(3) Port of Nacala

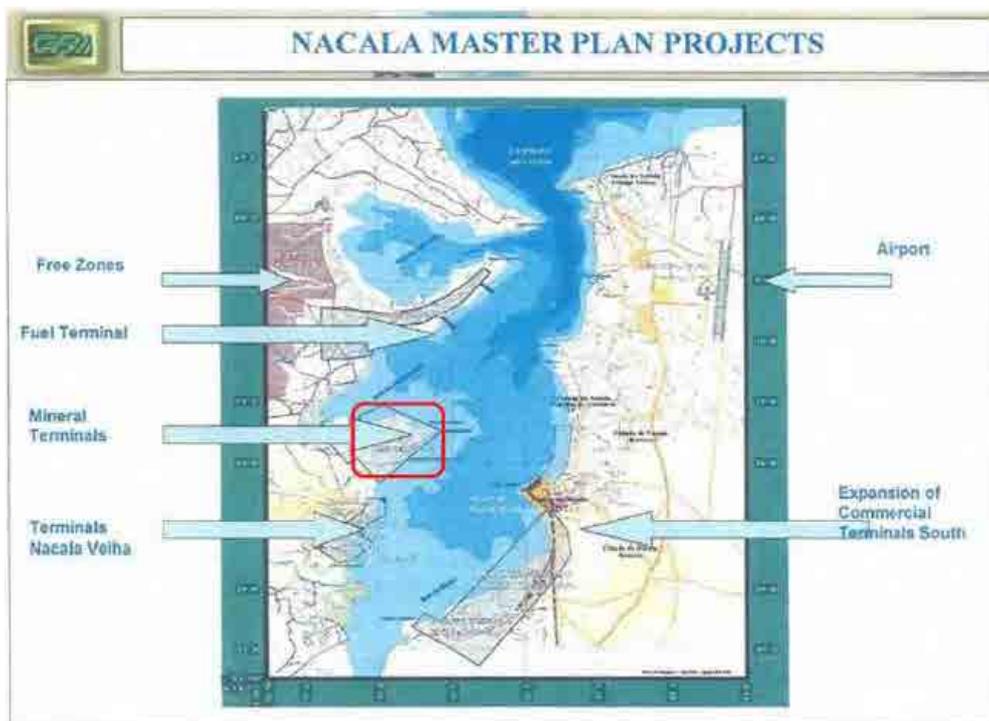
The Port of Nacala is located in a large and sheltered bay 60 m deep and 800 m wide at the entrance. Cargo handled includes containers, agricultural products, tobacco, timber, coal, cement, petrol, and grains. The port authority is the Ministry of Transport and Communication. Container and general cargo is handled by the concessionaire, Corredor de Desenvolvimento do Norte (CDN, Nacala Development Corridor). The concession shareholders are Vale Mozambique (51%) and CFM (49%).¹⁰ Table F.13 summarizes port berths and capacity. Figure F.26 presents a map of the port, Figure F.27 sets out the port master plan, and Figure F.28 presents the plan for a proposed new coal terminal.

Table F.13: Berths and Capacity and the Port of Nacala

Terminal	Berths	Total Berth	Depth	Annual Capacity
Container	× 2	372 m	14 m	100,000 TEU
General Cargo	× 4	610 m	7–10 m	2.4 Mtpa
Petroleum	× 1			

Source: Mozambique Regional Gateway Programme, *Situation Analysis and Roadmap*, May

¹⁰ See <http://ports.co.za/nacala.php>.



Source: JICA, *Study on Nacala Port Development*, Phase 1, 2009

Figure F.26: Nacala Port Master Plan



Source: JICA, *Study on Special Economic Zone Development*, Port of Nacala, 2008)

Figure F.27: Map of the Port of Nacala



Source: CFM, *Upgrading Mozambique's Railway System and Creating Access for New Projects*, Maputo, 4th July 2012

Figure F.28: Proposed New Coal Terminal

F.5.3 Bottlenecks and Major Development Issues

Table F.14 presents an overview of bottlenecks and development issues concerning the Nacala Corridor.

Table F.14: Bottlenecks and Development Issues: Nacala Corridor

Category	Bottlenecks	Development Issues
Roads	Some road sections are in poor condition: (i) Nampula – Lilongwe – Northern Zambia, including the bridges and drainage system (construction is ongoing, with financing by AfDB and others); (ii) sections in Malawi: Chiponde – Mangochi (51 km, under construction), Mangochi – Liwonde (70 km, under construction), Liwonde – Nsipe (64 km, under construction), Nsipe – Lilongwe (163 km, under construction, financed by the European Development Fund and the Government of Malawi), Lilongwe western bypass (13 km, under construction, AfDB Nacala Corridor Project, Phase 1), and Lilongwe – Mchinji (118 km, funds not yet identified); (iii) sections in Mozambique: Nampula – Cuamba (348 km, under construction, financed by AfDB (57%), JICA (23%), the Government of Mozambique (12%), and the Korean Export-Import Bank	<ol style="list-style-type: none"> (1) Rehabilitation of the poor sections, under construction (2) Lilongwe – Mchinji (3) Dry port development (e.g., at Chipata in Zambia)

Category	Bottlenecks	Development Issues
	(8%), for a total of USD 264 million), and Cuamba – Mandimba – Lichinga (350 km, under design), and (iv) sections in Zambia, including Lusaka - Malawi border, 360 km) and Luangwa Bridge – Malawi border (126 km, under construction)	
Railways	Cuamba – Nayuchi/Entre Lagos section is in very bad condition	<ol style="list-style-type: none"> (1) Extensions and rehabilitation undertaken by Vale: a new rail line between Moatize and Nkaya (201 km) and rehabilitation of the existing line between Nkaya and Nacala (682 km) plus a connection of the existing line to the new coal terminal (36 km)(the total capacity will be 18–30 Mtpa) (2) Review /revision of the concession conditions between the Government of Malawi and CEAR to assure proper maintenance
Ports, Waterways	Existing capacity of the port in relation to envisaged future demand	<ol style="list-style-type: none"> (1) Expansion of the existing port (2) Construction of a new port for coal and other fuel, at the western part of the bay. (3) SEZ development (4) Waterborne transport on Lake Malawi

Source: JICA Study Team

F.6 North-South Corridor

F.6.1 Outline of the Corridor

As shown in Figure F.29, the North-South Corridor (NSC) is no longer considered a single belt, but rather a regional network between South Africa and the countries north of it. It includes or overlaps with other corridors, including the Dar es Salaam, Lobito, and Nacala Corridors. Here, the NSC is defined as including the following: (i) Durban – Johannesburg – Gaborone – Kazungula – Lusaka – Kasumbalesa, (ii) Johannesburg – Martins Drift – Nata – Kazungula, (iii) Johannesburg – Beitbridge – Harare – Chirundu, (iv) Beitbridge – Bulawayo – Victoria Falls, and (v) Harare – Lilongwe.



Legend: blue = roads, purple = railways
 Source: <http://www.tmsagis.co.za/>

Figure F.29: North-South Corridor

F.6.2 Current Conditions

Current road and railway conditions along the NSC are presented in the text below as well as in Figure F.30 and Tables F.15–F.16 (road) and Figures F.31–F.34. Also, port conditions are set out, in the following text and in Table F.17 and Figure F.35.

(1) Roads

Figure F.30 presents road conditions along the NSC. The following road sections are in less than fair condition: (i) Botswana: Tlokweng border with South Africa – Kazungula (border with Zambia), (ii) Zambia: Kapiri Mposhi – Kasambulesa (border with the DRC), (iii) Zimbabwe (Beitbridge – Harare – Chirundu), (iv) Zimbabwe (Bulawayo – Victoria Falls (border with Zambia); (v) Mozambique (Cuchamano (border with Zimbabwe), and (vi) Tete – Calomue (border with Malawi). The section between Johannesburg and Pretoria is congested during the morning and evening peaks.



Source: <http://www.tmsagis.co.za/>

Figure F.30: North-South Corridor Road Conditions

Table F.15 summarizes additional details on road conditions and distances along the NSC. Table F.16 presents traffic data along the NSC.

Table F.15: Road Distances and Conditions along the North-South Corridor

a. Durban – Johannesburg – Gaborone – Kazungula – Lusaka – Kasumbalesa

Route	Zambia					
	Kazungula		Lusaka		Kapiri Mposhi	Kasambulesa
Distance	Ch. + 0	542 km	Ch. + 557	206 km	Ch. + 748	251 km Ch. + 999
Road Condition	Good Paved – Single carriage Standard width				Badly Potholed Paved – Single carriage Standard width	
Category	Non-Toll					
Drive side	Left					
Cost	USD 2.04/km (48 tons)					

Route	South Africa				Botswana			
	Durban		Johannesburg	Kopfontein	Tlokweng		Gaborone	Kazungula
Distance	Ch. + 0	557 km	Ch. + 557	341 km Ch. + 898	Ch. + 0	17 km	Ch. + 385	918 km Ch. + 935
Road Condition	Good Paved – Dual carriage Standard width		Good Paved – Single carriage Standard width		Reasonable Paved – Single carriage Standard width			
Category	Toll road				Non-Toll			
Drive side	Left				Left			
Cost	USD 1.48/km (48 tons)				USD 1.23/km (48 tons)			
Cost by Rail	USD 1.21/km (12 m container)							

b. Johannesburg – Martins Drift – Nata – Kazungula

Route	South Africa					Botswana				
	Durban		Johannes- burg		Groblers- burg	Martins Drift		Nata		Kazungula
Distance	Ch. + 0	557 km	Ch. + 557	460 km	Ch. + 1017	Ch. + 1017	447 km	Ch. + 1464	300 km	Ch. + 1764
Road Condition	Good Paved – Dual carriage Standard width		Good Paved – Dual carriage Standard width (Partially single)			Good (Sebina–Nata, 140 km: Fair) Paved – Single carriage Standard width				
Category	Toll road					Non-Toll				
Drive side	Left					Left				
Cost	USD 1.55/km (48 tons)					USD 1.29/km (48 tons)				

c. Johannesburg – Beitbridge – Harare – Chirundu

Route	South Africa					Zimbabwe				
	Durban		Johannes- burg		Beitbridge	Beitbridge		Harare		Chirundu
Distance	Ch. + 0	557 km	Ch. + 557	521 km	Ch. + 1078	Ch. + 1078	580 km	Ch. + 1658	332 km	Ch. + 1990
Road Condition	Good Paved – Dual carriage Standard width		Good Paved – Dual carriage Standard width (Partially single)			Fair/Potholed Paved – Single carriage Standard width		Fair/Stripping Paved – Single carriage Standard width		
Category	Toll road					Non-Toll, Bridge toll and RUC				
Drive side	Left					Left				
Cost	USD 1.55/km (48 tons)					USD 1.6/km (48 tons)				

d. Beitbridge – Bulawayo – Victoria Falls

Route	Zimbabwe				
	Beitbridge		Bulawayo		Victoria Falls
Distance	Ch. + 0	361 km	Ch. + 361	439 km	Ch. + 754
Road Condition	Good Paved – Single carriage Standard width		Fair Paved – Single carriage Standard width		
Category	Non-Toll, Bridge toll and RUC				
Drive side	Left				
Cost	USD 1.64/km (48 tons)				

e. Harare – Lilongwe

Route	Zimbabwe					Mozambique				
	Beitbridge		Harare		Nyamapanda	Cuchamano		Tete		Calomue
Distance	Ch. + 0	580 km	Ch. + 580	233 km	Ch. + 813	Ch. + 0	141 km	Ch. + 141	262 km	Ch. + 403
Road Condition	Fair/Potholed Paved – Single carriage Standard width		Good/Fair Paved – Single carriage Standard width			Cuchamano–Changara (50 km) Good/Fair/Potholed Changara–Tete (91 km) Coarse chip and spray Paved – Single carriage Standard width			Good/Poor/Potholed Paved – Single carriage Standard width	
Category	Non-Toll, Tete Bridge toll					Non-Toll, RUC				
Drive side	Left					Left				
Cost	USD 2.76/km (48 tons)					USD 2.46/km (48 tons)				

Route	Malawi		
	Dedza		Lilongwe
Distance	Ch. + 0	88 km	Ch. + 88
Road Condition	Good/Fair Paved – Single carriage Standard width		
Category	Non-Toll, Bridge toll and RUC		
Drive side	Left		
Cost	USD 3.94/km (48 tons)		

Abbreviation: RUC = road user charges

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011

Table F.16: Traffic Volumes along the North-South Corridor

Traffic Volume (AADT)	Road Sections
2,500–176,000	<ul style="list-style-type: none"> • Almost all sections in South Africa • Gaborone–Mahalapye in Botswana • Guweru–Harare–Marondera in Zimbabwe • Lusaka section, Kabwe–Kapiri MuMposhi, Ndola section, Kitwe section, Chungola section in Zambia
1,000–2,500	<ul style="list-style-type: none"> • Makhado–Beitbridge in South Africa • Mahalapye–Francistown–Plumtree in Botswana • Plumtree–Bulawayo–Guweru in Zimbabwe • Nata–Kasane–Ngoma Bridge in Botswana • Bubi–Harare–Chirundu in Zimbabwe • Marondera–Mutare in Zimbabwe • Harare–Nyamapanda in Zimbabwe • Kafue–Chingola (except Lusaka section, Kabwe–Kapiri MuMposhi, Ndola section, Kitwe section, Chungola section) in Zambia • Blantyre–Lilongwe–Chipata, Lilongwe–Kasungu, Chilumba–Tunduma, Bangla–Matka in Malawi • Marka–Mutarara in Mozambique
500–1,000	<ul style="list-style-type: none"> • Beitbridge–Bubi, Beitbridge–Bulawayo–Victoria Falls in Zimbabwe • Nata–Francistown in Botswana • Katima Mulilo–Kongola in Botswana • Monze–Kafue–Chirundu in Zambia • Kasungu–Chilumba in Malawi
Less than 500	The other sections

Abbreviation: AADT = annual average daily traffic

Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

(2) Railways

The railways along the NSC consist of Transnet Freight Rail (TFR), National Railways of Zimbabwe (NRZ), and Zambia Railways Limited (ZRL). Each is summarized below.

Transnet Freight Rail

The TFR line in the corridor links Johannesburg – Beitbridge. Track conditions are good and the line is electrified.

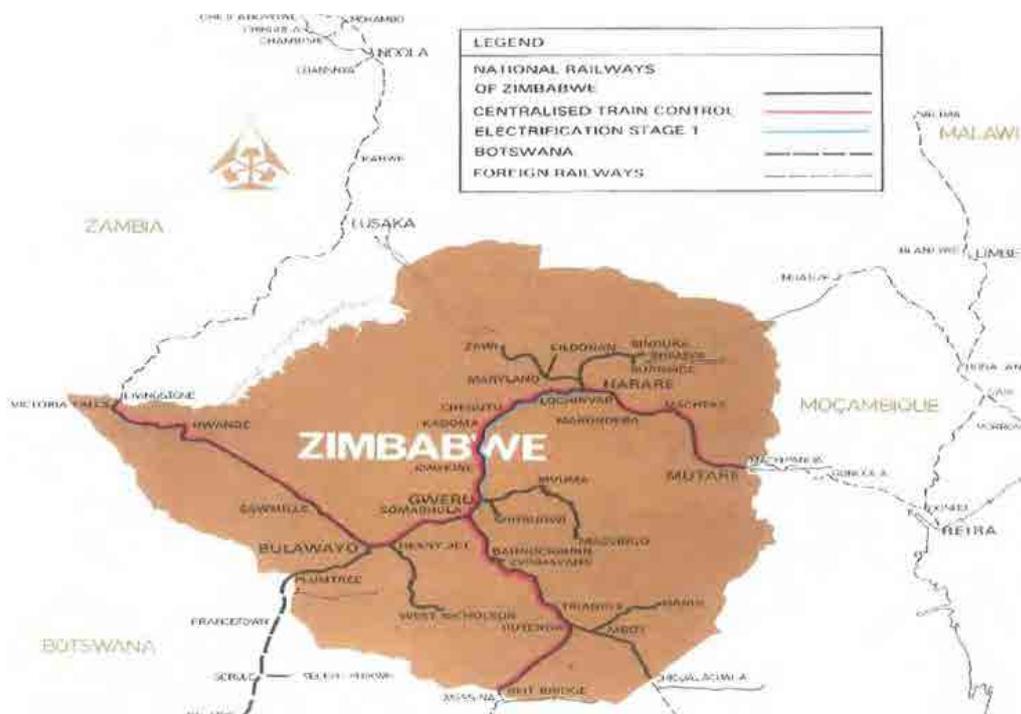
National Railways of Zimbabwe

NRZ is wholly owned by the Government of Zimbabwe. In accordance with the [Zimbabwe] Railways Act, NRZ is in responsible for operations and maintenance. The total length of NRZ's network is 2,760 km and the gauge is 1,067 mm. The design capacity of the network was 18 million, which was achieved in 1985. Now almost all of the network requires rehabilitation (see, e.g., Figure F.31). The section between Harare and Gweru was electrified, but the catenary and copper cables have been stolen. Figure F.32 presents a map of the NRZ network along with notes on network condition.



Source: JICA Study Team

Figure F.31: Railway in Harare (No Overhead Cable)



Notes: (i) The electrified section (in blue) is not currently electrified due to theft of overhead power cables. (ii) In almost all of the sections, wooden sleepers have become decayed, but they have not been replaced with concrete sleepers due to supply constraints (NRZ has only a small concrete sleeper factory). (iv) The centralized train control (CTC) and the signaling systems are not functional. (v) With poor track conditions, CTC, and signaling, trains cannot be operated faster than 20 km/hour. (vi) The section between Harare and Mutare is generally in good condition but maintenance (e.g., ballast cleaning and tamping) has been deferred. The Harare–Mutare line consists of 45 kg/m welded rail on concrete sleepers with a 20-ton axle load. The line capacity is in excess of 15 Mtpa, while current traffic is less than 10% of that. Overall, the NRZ system is carrying less than one-third of the traffic carried 15 years ago. (v) The Development Bank of Southern Africa is currently considering investing more than USD 200 million in NRZ, and a project appraisal study is being carried out by CPCS Transcom of Canada. (vi) In 2010, it was reported that the PRC’s Export-Import Bank would finance this link, but nothing has happened yet.

Source: NRZ and National Road Administration (ZINARA) AADT data, 2011; (iii) Mozambique Regional Gateway Programme, *Situation Analysis and Roadmap*, May 2012

Figure F.32: Current Conditions of NRZ

Other aspects of NRZ are presented below.

- Motive power and rolling stock
 - Locomotives: 105 of 168 are out of service.
 - Wagons: 5,083 of 8,682 are out of service.
 - Coaches: 139 of 309 coaches are out of service
 - Sleepers: The old wooden sleepers have decayed (there is a small concrete sleeper factory, but its production capacity is insufficient)
- Service frequency
 - Inter-city passenger service: 2–3 times a week
 - Inter-city commuter service: only 5 routes (3 in Harare, 2 in Bulawayo), twice a day (morning and evening) on weekdays
- NRZ has prepared a series of re-capitalization and revival plans.
- NRZ's investments include: (i) RMS (Pvt) Ltd.: 100% owned by NRZ, RMS provides a road feeder service to/from rail heads; (ii) Emerged Railway Properties (Pvt) Ltd. (ERP): 50% owned by NRZ, co-owned by Zambia Railways Ltd, ERP caters for the invisible assets of the former Rhodesia Railways, including the Victoria Falls Hotel and the Victoria Falls Bridge; (iii) Pan African Minerals Development Company (Pty) Ltd.: 33.3% owned by NRZ, a recently formed mining joint venture among South Africa, Zambia, and Zimbabwe; and (iv) Beitbridge Bulawayo Railway (Pvt) Ltd. (BBR): 15% owned by NRZ, BBR is a concession company that built the rail link between Beitbridge and West Nicholson and operates the rail link between Beitbridge and Bulawayo.

Also worth noting is the Lion's Den – Kafue Rail Development Project to construct a missing railway link (see Figure F.33), which is included in the COMESA Transport and Communications Strategy and Priority Investment Plan (among other projects along the corridor). This railway could provide large transport cost savings for Zambia and DRC trade by providing the shortest link to a seaport (Beira). The length of the route would be 300 km. A 1993 feasibility study of development of a multimodal rail – road – rail transport system found that the project may be viable. However, since the route traverses two escarpment areas, one north of Chirundu and the other a mountainous area in Zimbabwe, this missing railway link may not be viable. An updated feasibility study for this project has been proposed by DBSA, Zambia, and Zimbabwe, with possible financing from DBSA or SADC.



Source: JICA Study Team (using Google maps)

Figure F.33: Alignment of the Lion’s Den–Kafue Missing Railway Link

Railways in Zambia

The railways in Zambia consists of (i) Zambia Railways (ZRL) and (ii) TAZARA, the former of which is described below and the latter of which was described below under the Dar es Salaam Corridor subsection. Figure F.34 presents an overview of railway conditions in Zambia.



Source: North-South Corridor TMSA Map Viewer,
<http://www.tmsagis.co.za/>
Rail Track Assessment

Figure F.34: Railway Conditions in Zambia

The background of ZRL is as follows:

- ZRL is 100% owned by the Government of Zambia. Until 2003, ZRL was the owner and operator. However, in March 2000, the Government decided to grant a concession of the ZRL railway to the private sector. In December 2003, through international competitive bidding, Railway Systems of Zambia (RSZ) became the concessionaire.
- The concessionaire took over the operation of all of ZRL railways (1,266 km): (i) the 848 km Victoria Falls Bridge–Kitwe line, and (ii) other branches, extending 418 km (Choma–Masuku, Ndola–Luanshya, Kitwe–Chingola, Chambeshi–Mufulira, Ndola–Sakania, Luano–Chililabombwe).
- Since 2003, the operation of the railway has worsened as the concessionaire minimized the cost of maintenance and maximized profit. In 1985 the railway hauled tonnage of 4.9 million tons, in 2002 it carried 1.8 million tons, and in 2010 it carried only 0.8 million tons. The current speed of the railway is 20 kph due to poor track conditions (because of the lack of maintenance)
- ZRL operating costs exceed those of road transport.
- The Government of Zambia has decided to cancel the concession. However, the concession agreement does not include provisions for termination by the Government, which has complicated attempts at cancellation.

(3) Ports

Figure F.35 presents an aerial view of the Port of Durban. The port operates 24 hours a day, 365 days a year. The entrance channel has a depth of 12.8 m as determined from chart data. The channel width has been widened to 222 m at its narrowest point. The entrance channel is now 19 m deep in the outer entrance with 16.5 m draught in the inner channel. Table F.17 summarizes Port of Durban traffic in 2011–2012.

Table F.17: Port of Durban Traffic, 2011–2012

Item	Total	Imports	Exports	Transshipment
Cargo (Tons)	78,100,851	45,282,995 (58.0%)	25,613,589 (32.8%)	7,204,267 (9.2%)
Bulk Cargo (Tons)	34,677,840	25,815,759 (74.4%)	8,623,952 (24.9%)	238,129 (0.7%)
Breakbulk (Tons)	6,997,676	4,330,820 (61.9%)	2,446,560 (35.0%)	220,296 (3.1%)
Container	2.698 million TEUs 36,425,335 tons			

Note: Cargo includes oil and petroleum products and containers.

Source: <http://ports.co.za/durban-harbour.php>



Source: <http://www.google.co.jp/imgres?q=Port+Durban>

Figure F.35: Aerial View of Port Durban

F.6.3 Bottlenecks and Major Development Issues

Table F.18 presents an overview of bottlenecks and development issues concerning the North-South Corridor.

Table F.18: Bottlenecks and Development Issues: North-South Corridor

Category	Bottlenecks	Development Issues
Roads	<p>(1) The condition of the sections below are worse than fair:</p> <p>a. Botswana: Tlokweng Border with South Africa – Kazungula (border with Zambia)</p> <p>b. Zambia: Kapiri Mposhi – Kasambulesa (border with the DRC)</p> <p>c. Zimbabwe: Beitbridge – Harare – Chirundu and Bulawayo – Victoria Falls (border with Zambia)</p> <p>d. Mozambique: Cuchamano (border with Zimbabwe) – Tete – Calomue (border with Malawi)</p> <p>(2) The section between Johannesburg and Pretoria is congested during the morning and evening peaks.</p>	<p>(1) Beitbridge-Chirundu rehabilitation</p> <p>(2) Chirundu-25 km in Zambia towards Kafue, Rehabilitation, financed from the Tripartite Trust Account</p> <p>(3) Kazungula Bridge and related roads (e.g., Kazungula–Nata)</p> <p>(4) Rehabilitation of Lusaka–Kafue and Zimba–Livingstone</p> <p>(5) Beitbridge–Bulawayo–Victoria Falls</p>

Category	Bottlenecks	Development Issues
	(3) Long border crossing time (Kasambulesa, Kazungula, Chirundu, and Beitbridge)	
Railways	NRZ (Zimbabwe): operated by the public sector, except for the Beitbridge–Bulawayo railway ZRL (Zambia): operated by RSZ (concession) (1) NRZ and ZRL are almost not operational due to a lack of maintenance (2) Missing link between Lion’s Den and Kafue (3) Missing link between West Nicholson and Beitbridge	(1) The Government of Zambia seeks to cancel or at least revise the railway concession to ZRL. (2) Rehabilitation of all facilities in Zimbabwe and Zambia (3) Construction of the Lion’s Den–Kafue missing link (4) Construction of missing link between West Nicholson–Beitbridge
Port	Congestion at the Port of Durban	Expansion of the Port of Durban (included in the SADC Regional Infrastructure Master Plan)

Source: JICA Study Team

F.7 Trans-Caprivi Corridor

F.7.1 Outline of the Corridor

Figure F.36 presents a map of the Trans Caprivi Corridor, which is defined here as linking Livingstone–Kakima–Mulilo–Walvis Bay.



Legend: blue = roads, purple = railways;
Source: <http://www.tmsagis.co.za/>

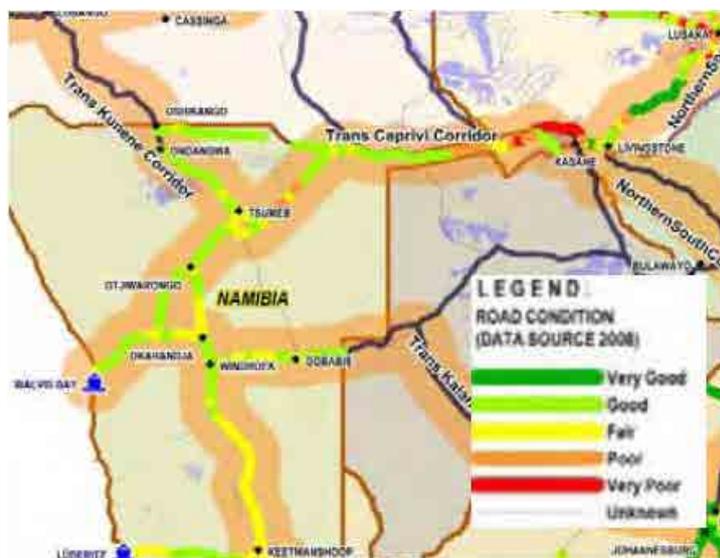
Figure F.36: Trans-Caprivi Corridor

F.7.2 Current Conditions

Current road and railway conditions along the Trans-Caprivi Corridor are presented in the text below as well as in Figures F.37–F.38 and Table F.19 (roads) and Figure F.39 (railways). Also, current port conditions are set out, in the following text and in Figure F.40.

(1) Roads

Almost all road sections along the corridor are relatively in good condition (see Figure F.37). Road traffic along the corridor is shown in Figure F.38. The main capacity constraint is congestion around Lusaka, where a bypass is needed, as well as constraints at the Livingstone and Kasumbalesa border crossing points, although crossing time at the Katima Mulilo (Zambia)–Wenela (Namibia) border crossing is relatively low.) Table F.19 presents data on road distances and conditions along the Trans-Caprivi Corridor.



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.37: Trans-Caprivi Road Conditions

Table F.19: Road Distances and Conditions

Route	Namibia					Zambia				
	Walvis Bay		Otavi		Wenela (Katima Mulilo)	Sesheke		Kapiri Mposhi		Kasumbalesa
Distance	Ch. + 0	522 km	Ch. + 522	865	Ch. + 1387	Ch. + 0	877 km	Ch. + 385	251 km	Ch. + 1128
Road Condition	Good Paved – Single carriage Standard width					Good Paved – Single carriage Standard width			Badly Potholed Paved – Single carriage Standard width	
Category	Non-Toll, RUC					Non-Toll, RUC				
Drive side	Left					Left				
Cost	USD 1.52/km (48 tons)					USD 1.94/km (48 tons)				

Abbreviation: RUC = road user charges

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.38: Trans-Caprivi Corridor, Road Traffic

(2) Railway

Figure F.39 presents a railway map of the Trans-Caprivi Corridor. Based on relevant information available in the SADC RIDMP, the railway condition is considered comparatively good. Design capacity is 2 Mtpa, with current traffic of 1.8 Mtp. The main capacity constraint is the need to upgrade the track between Kranzburg and Tsumeb.



Source: Wikipedia

Figure F.39: Trans-Caprivi Corridor Railway

An 89 km section of the new Northern Railway was opened in 2005. Construction of the project's second phase, a 59 km section from Ondangwa to Oshikango on the Namibia-Angola border at a cost of about NAD 329 million, has been assisted by the PRC and was opened in July 2012. A third phase, a 58 km branch from Ondangwa to Oshakati, at an estimated cost of NAD 220 million, is to connect Oshikango to a point near Cassinga, on Angola's southern railway network. The Tsumeb - border – Livingstone section is a missing link.

(3) Port

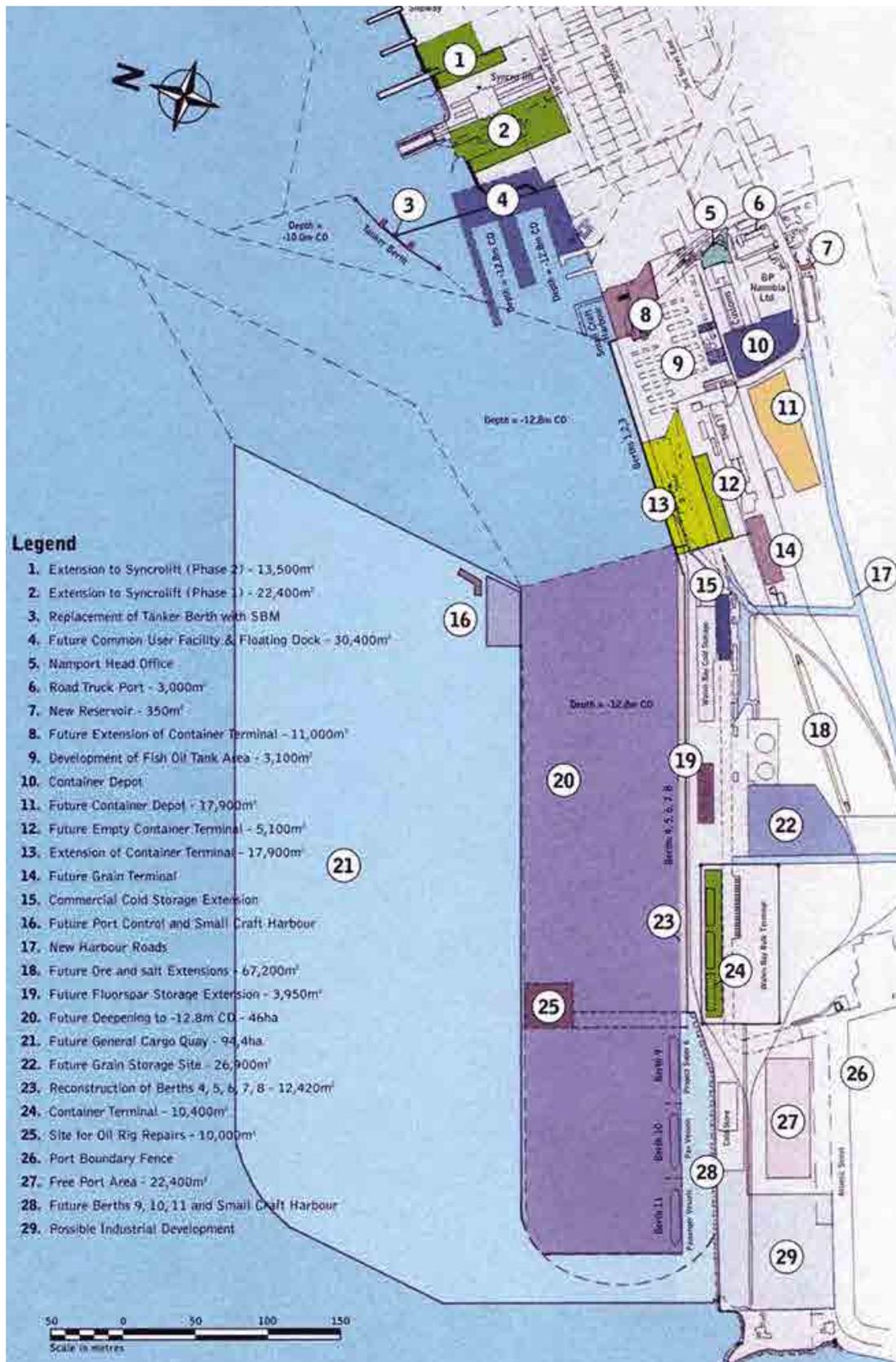
Namport, operating as the National Port Authority in Namibia since 1994 under the Namibian Ports Authority Act, 1994, manages both the Port of Walvis Bay and the Port of Lüderitz in Namibia. Walvis Bay is Namibia's largest commercial port, receiving about 3,000 vessel calls and handling about 5 million tons of cargo annually. It is a sheltered deepwater harbor benefiting from a temperate climate.

The container terminal at the Port of Walvis Bay can accommodate ground slots for 3,875 containers and also has provision for 482 reefer container plug points.

Since the container terminal can host about 250,000 containers per annum, various business development opportunities are being undertaken to facilitate imports and the export of containers at this port. A detailed map of the Port of Walvis Bay is presented in Figure F.40.

The Port of Walvis Bay has several expansion plans: (i) port extension, (ii) bulk and break-bulk handling, (iii) vessel traffic services/port control, (iv) a Botswana dry port at Walvis Bay, and a (v) a New Walvis Bay Container Terminal on reclaimed land. In September 2012 a tender was issued for (i) a new tanker berth, (ii) a ship and rig repair quay, and (iii) a Walvis Bay Marina Development.¹¹

¹¹ <http://www.namport.com.na/>.



Source: http://www.namport.com.na/images/maps/walvis_map.gif

Figure F.40: Walvis Bay Port Plan

F.7.3 Bottlenecks and Major Development Issues

Table F.20 presents an overview of bottlenecks and development issues concerning the Trans-Caprivi Corridor.

Table F.20: Bottlenecks and Development Issues: Trans-Caprivi Corridor

Category	Bottlenecks	Development Issues
Roads	Almost all sections are in good condition.	Western Corridor roads, Zambia (Kasempa–Kaoma–Mongu–Senanga–Nangweshi–Sesheke, including a bridge over the Zambezi River, with financing from the Development Bank for Southern Africa)
Railways	(1) The railway is relatively in good condition. (2) The Tsumeb – border (Katima Mulilo) – Livingstone section remains as a missing link.	(1) Construction of the 600 km Tsumeb – Katima Mulilo section in Zambia (2) Construction of the 200 km Katima Mulilo – Livingstone section in Zambia
Port	Capacity constraints	(1) The Port of Walvis Bay has several expansion plans: (i) port extension, (ii) bulk and break-bulk handling, (iii) vessel traffic services/port control, (iv) a Botswana dry port at Walvis Bay, and a (v) a New Walvis Bay Container Terminal on reclaimed land. (2) In September 2012 a tender was issued for (i) a new tanker berth, (ii) a ship and rig repair quay, and (iii) a Walvis Bay Marina Development.

Source: JICA Study Team

F.8 Trans-Kalahari Corridor

F.8.1 Outline of the Corridor

Figure F.41 presents a map of the Trans-Kalahari Corridor. The corridor is defined here as linking Gaborone–border (Trans-Kalahari–Mamuno)–Walvis Bay.



Legend: blue=roads, purple=railways; Source: <http://www.tmsagis.co.za/>

Figure F.41: Trans-Kalahari Corridor

F.8.2 Current Conditions

(1) Roads

Road conditions are good. There are no road constraints between Skilpadshek – Mamuno – Walvis Bay. Border crossing is relatively quick. Figure F.42 present data on traffic along the corridor, while Table F.21 summarizes road distances and conditions.

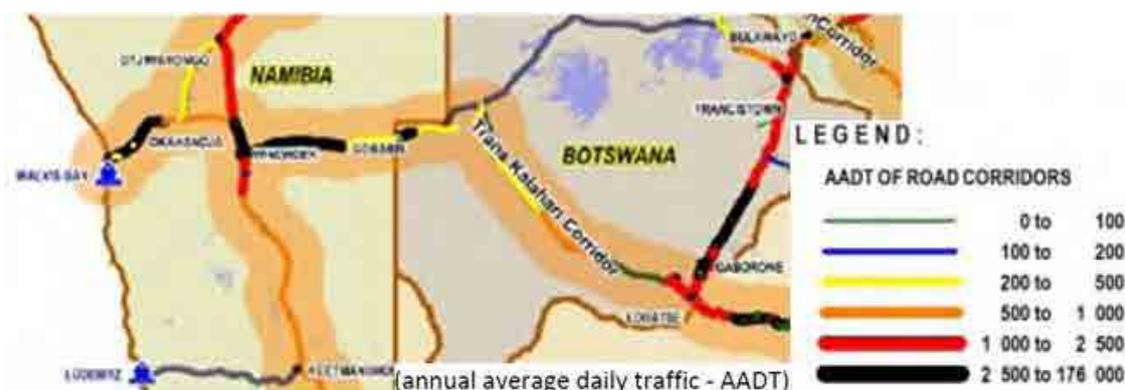
Table F.21: Trans-Kalahari Corridor Road Distances and Conditions

Route	Namibia					Botswana				
	Walvis Bay		Windhoek		Trans Kalahari	Mamuno		Kanye		Pioneer Gate
Distance	Ch. + 0	392 km	Ch. + 392	308	Ch. + 700	Ch. + 0	695 km	Ch. + 695	52 km	Ch. + 747
Road Condition	Good Paved – Single carriage Standard width					Good Paved – Single carriage Standard width				
Category	Non-Toll, RUC					Non-Toll				
Drive side	Left					Left				
Cost	USD 1.76/km (48 tons)					USD 1.28/km (48 tons)				

South Africa			
Route	Skilpadshek		Johannesburg
Distance	Ch. + 0	288 km	Ch. + 288
Road Condition	Good Paved – Single carriage		
Category	Toll road		
Drive side	Left		
Cost	USD 1.73/km (48 tons)		

Abbreviation: RUC = road user charges

Source: Federation of East and Southern African Road Transport Associations, *Corridor Information Handbook*, 2011



Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Figure F.42: Trans-Kalahari Corridor Road Traffic

(2) Railway

There is no railway along the Trans-Kalahari corridor. The SADC regional infrastructure master plan identified Gaborone – border (Mamuno/Trans-Kalahari) – Gobabis as a missing rail link (Figure F.43; Project MSP No. 37) intended to transport coal from Botswana to the west coast.



Source: <http://www.tmsagis.co.za/>

Figure F.43: Trans-Kalahari Corridor Railways

(3) Port

Please refer to the subsection on the Port of Walvis Bay in the discussion of the Trans-Caprivi Corridor.

F.8.3 Bottlenecks and Major Development Issues

Table F.22 presents an overview of bottlenecks and development issues concerning the Trans-Kalahari Corridor.

Table F.22: Bottlenecks and Development Issues: Trans-Kalahari Corridor

Category	Bottlenecks	Development Issues
Roads	None	Namibia section (716km): rehabilitation and widening ongoing in several phases
Railways	Missing link: Gaborone – border (Mamuno / Trans-Kalahari) – Gobabis	Construction of the Gaborone – border (Mamuno / Trans-Kalahari) – Gobabis missing link (SADC MSP No. 37)
Port	Capacity constraints	(1) The Port of Walvis Bay has several expansion plans: (i) port extension, (ii) bulk and break-bulk handling, (iii) vessel traffic services/port control, (iv) a Botswana dry port at Walvis Bay, and a (v) a New Walvis Bay Container Terminal on reclaimed land. (2) In September 2012 a tender was issued for (i) a new tanker berth, (ii) a ship and rig repair quay, and (iii) a Walvis Bay Marina Development.

Source: JICA Study Team

F.9 Summary of Conditions of Major Ports in Southern Africa

Table F.23 summarizes the capacity, current throughput, and development plans for the gateway ports along the priority corridors described in the SADC RIDMP.

Table F.23: Estimated Capacity of Gateway Ports and Development Plans

Corridor	Port	Design Capacity	Current Throughput	Development Plan (Project Number in SADC RIDMP)
Beira Corridor				
		Tons	5 mtpa	Expansion and upgrading, ongoing and planned (BGS 137, 153; CSTN 170; BGSP 15; CSTN vol. 4, no. 15)
	Beira	TEUs	100,000	
		Tons	2.8 mtpa	Expansion and upgrading, ongoing and planned (BGS 137, 153; CSTN 170; BGSP 15; CSTN vol. 4, no. 15)
	Beira	TEUs	45,000	
Dar es Salaam Corridor				
		Tons	8 mtpa	Expansion and dredging, ongoing and planned (CSTN 156-160; CSTN vol. 4, no. 1-5; MSP 34, 51) Note: Construction of a new port planned at Bagamoyo (MSP 56)
	Dar es Salaam	TEUs	250,000	
		Tons	7.4 mtpa	Expansion and dredging, ongoing and planned (CSTN 156-160; CSTN vol. 4, no. 1-5; MSP 34, 51) Note: Construction of a new port planned at Bagamoyo (MSP 56)
	Dar es Salaam	TEUs	375,000	
Lobito Corridor				
		Tons	2 mtpa	Upgrading and expansion planned (MSP 87)
	Lobito	TEUs	40,000	
		Tons	2 mtpa	Upgrading and expansion planned (MSP 87)
	Lobito	TEUs	40,000	
Maputo Corridor				
		Tons	12 mtpa	Rehabilitation and expansion planned (LTSP 116; CSTN vol. 4, no. 17) Note: Construction of a new port planned at Techobanine (MSP 39)
	Maputo	TEUs	150,000	
		Tons	8 mtpa	Rehabilitation and expansion planned (LTSP 116; CSTN vol. 4, no. 17) Note: Construction of a new port planned at Techobanine (MSP 39)
	Maputo	TEUs	100,000	
Nacala Corridor				
		Tons	1 mtpa	Upgrading and expansion planned (MSP 45; BGS 131)
	Nacala	TEUs	45,000	
		Tons	0.7 mtpa	Upgrading and expansion planned (MSP 45; BGS 131)
	Nacala	TEUs	45,000	
North-South Corridor				
		Tons	45 mtpa	Expansion planned (BGSP 14),
	Durban	TEUs	3 million	
		Tons	45 mtpa	Expansion planned (BGSP 14),
	Durban	TEUs	2.8 million	
Trans-Caprivi and Trans-Kalahari Corridors				
		Tons	5 mtpa	Expansion, ongoing and planned (MSP 61-64; BGS 132; CSTN 173-174; BGSP 13; CSTN vol. 4, no. 18-19)
	Walvis Bay	TEUs	250,000	
		Tons	5 mtpa	Expansion, ongoing and planned (MSP 61-64; BGS 132; CSTN 173-174; BGSP 13; CSTN vol. 4, no. 18-19)
	Walvis Bay	TEUs	250,000	

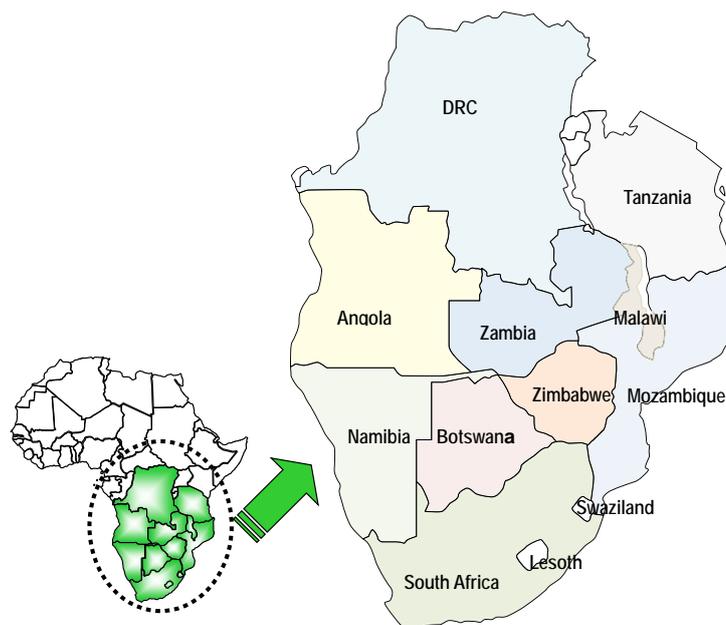
Note: BGS(P) = best guess scenario (project), CSTN = core strategic transport network, LTSP = longer-term strategic project, MSP = member states project, mtpa = million tons per annum, TEU = twenty-foot equivalent unit
Source: SADC, *Regional Infrastructure Development Master Plan, Transport Sector Plan*, August 2012

Appendix G Power Sector Development Issues

G.1 Southern African Power Pool (SAPP)

G.1.1 Overview

The power utilities in 12 of the 15 SADC countries are affiliated with the SAPP to trade power within the region. The member countries are shown in Figure G.1 and Table G.1. However, three of the member countries – Angola, Malawi, and Tanzania – have not (yet) connected to the power grids of the other countries, and therefore are non-operating members at present.



Source: SAPP Power Supply and Demand, August 2012

Figure G.1: SADC Countries Affiliated with the SAPP

Table G.1: SAPP Members

No.	Member	Type	Abbreviation	Country
1	Botswana Power Corporation	OP	BPC	Botswana
2	Electricidade de Mocambique	OP	EdM	Mozambique
3	Electricity Supply Corporation of Malawi	NP	ESCOM	Malawi
4	Empresa Nacional de Electricidade	NP	ENE	Angola
5	SKOM	OP	Eskom	South Africa
6	Lesotho Electricity Corporation	OP	LEC	Lesotho
7	NAMPOWER	OP	NamPower	Namibia
8	Societe Nationale d'Electricite	OP	SNEL	DRC
9	Swaziland Electricity Board	OP	SEB	Swaziland
10	Tanzania Electricity Supply Company Ltd	NP	TANESCO	Tanzania
11	Zimbabwe Electricity Supply Authority	OP	ZESA	Zimbabwe
12	ZESCO Limited	OP	ZESCO	Zambia
13	Hidro Electrica Cahora Bassa	OB	HCB	Mozambique
14	Mozambique Transmission Company	OB	MOTRACO	Mozambique
15	Copperbelt Energy Corporation	ITC	CEC	Zambia
16	Lunsemfwa Hydro Power Company	IPP	LHPC	Zambia

Abbreviations: BPC = Botswana Power Corporation, EdM = Electricidade de Mozambique, ENE = Empresa Nacional de Electricidade (Electricity Angola), ESCOM = Electricity Supply Corporation of Malawi, Eskom = Electricity Supply Commission, HCB = Hidroelectrica de Cahora Bassa, ITC = Independent Transmission Company, IPP = Independent Power Producer, LEC = Lesotho Electricity Company, NP = Non-Operating Member, OB = Observer, OP = Operating Member, SAPP = Southern African Power Pool, SEC = Swaziland Electricity Company, SNEL = Societe Nationale d'Electricite, TANESCO = Tanzania Electric Supply Company Limited, ZESA = Zimbabwe Electricity Supply Authority, ZESCO = Zambia Electricity Supply Corporation Limited

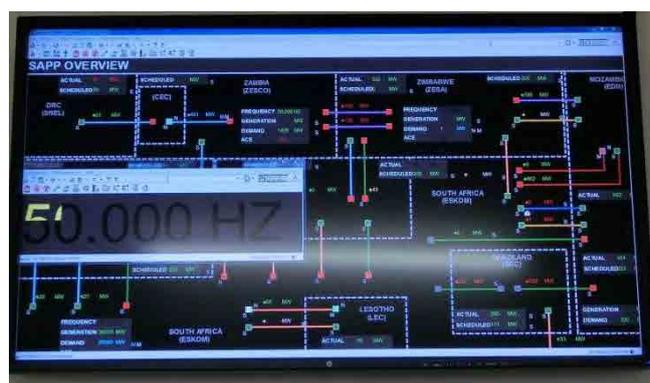
No. 1 to No. 12: national utility company, No. 13 to No. 16: independent company

Source: SAPP Priority Projects as of 6 December 2011

A coordination center of SAPP, with a staff of 10, situated in Harare, as shown in Photo G.1, monitors power trade (see Photo G.2), including frequency (Hz) and active power (MW) traded between utilities of the countries.



Source: JICA Study Team



Source: JICA Study Team

Photo G.1: SAPP Coordination Center in Harare

Photo G.2: SAPP Monitoring System

The current power (MW) traded between countries connected by the SAPP grid (Botswana, DRC, Lesotho, Mozambique, Namibia, Swaziland, South Africa, Zambia, and Zimbabwe) is shown in the monitoring system.

G.1.2 Power Supply and Demand Situation

As shown in Table G.2, the power supply and demand balance of SAPP in 2011 was in deficit taking a 10% reserve into account (i.e., power indispensable for stable grid operation). Four countries – Angola, DRC, Mozambique, and South Africa – have a surplus, although only that of Mozambique (HCB, Hidroeléctrica de Cahora Bassa) is significant, with a generating capacity of 2,075 MW. However, Mozambique can receive only 300 MW firm and 200 MW of non-firm power only from HCB, with the rest of its generated power mainly transmitted from South Africa or Zimbabwe.

Table G.2: Power Supply and Demand Situation in 2011

No.	Country	Utility	Installed Capacity	Available Capacity	2011 Peak Demand	Balance of "b" and "c"	Required Capacity 10% reserve	Balance of "b" and "e"
			(MW)	(MW)	(MW)	d=b-c	e=c x1.1	f=b-e
			a	b	c			
1	Angola	ENE	1,187	990	870	120	957	33
2	Botswana	BPC	202	190	542	▲352	596	▲406
3	DRC	SNEL	2,422	1,170	1,050	120	1,155	15
4	Lesotho	LEC	72	72	125	▲53	138	▲66
5	Malawi	ESCOM	287	287	300	▲13	330	▲43

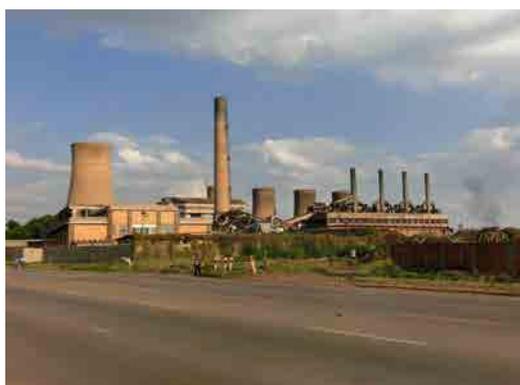
No.	Country	Utility	Installed Capacity (MW)	Available Capacity (MW)	2011 Peak Demand (MW)	Balance of "b" and "c"	Required Capacity 10% reserve	Balance of "b" and "e"
6	Mozambique	EDM	233	174	616	1,633	678	1,621
		HCB	2,075	2,075				
7	Namibia	NamPower	393	360	611	▲251	672	▲312
8	South Africa	Eskom	44,170	41,074	36,664	4,410	40,330	744
9	Swaziland	SEC	70	70	200	▲130	220	▲150
10	Tanzania	TANESCO	1,008	880	890	▲10	979	▲99
11	Zambia	ZESCO	1,812	1,215	1,660	▲445	1,826	▲611
12	Zimbabwe	ZESA	2,045	1,320	2,029	▲709	2,232	▲912
Total SAPP			55,976	49,877	45,557	4,320	50,113	▲236
Total Interconnected to SAPP *			53,514	47,720	43,497	4,223	47,848	▲127

Abbreviations: BPC = Botswana Power Corporation, EDM = Electricidade de Mozambique, ENE = Empresa Nacional de Electricidade (Electricity Angola), ESCOM = Electricity Supply Corporation of Malawi, Eskom = Electricity Supply Commission, HCB = Hidroelectrica de Cahora Bassa, LEC = Lesotho Electricity Company, SAPP = Southern African Power Pool, SEC = Swaziland Electricity Company, SNEL = Societe Nationale d'Electricite, TANESCO = Tanzania Electric Supply Company Limited, ZESA = Zimbabwe Electricity Supply Authority Holdings (Pvt), ZESCO = Zambia Electricity Supply Corporation Limited

Note: * Total SAPP minus non-operating utilities of Angola, Malawi, and Tanzania

Source: Prepared by the JICA Study Team based on *SAPP Power Supply and Demand*, August 2012

The coal thermal power station and transmission line and 330 kV transmission line in Harare are shown in Photos G.3 and G.4, respectively.



Source: JICA Study Team

Photo G.3: Harare Coal Thermal Power Station (not operated at present)

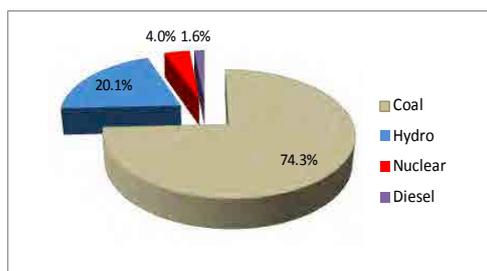


Source: JICA Study Team

Photo G.4: 330 kV Transmission Line in Harare

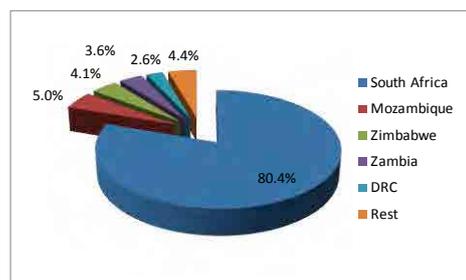
The SADC generation mix is broken out in Figure G.2. In 2010, coal accounted for 74.3% of the electricity supply, with hydro, nuclear, and diesel at 20.1%, 4.0%, and 1.6%, respectively. In addition to hydro, medium- to large-scale renewable energy projects from wind and solar (concentrated solar power) should be promoted as an additional power source as well as for clean energy considerations to mitigate climate change impacts. So far the development of those technologies has been rather slow and their contribution to the generation mix minuscule.

As for the contribution to generation, shown in Figure G.3, South Africa accounts for 80%, with Mozambique, Zimbabwe, Zambia, and the rest accounting for 5.0%, 4.1%, 3.6%, and 2.6% respectively.



Source: Prepared by JICA Study Team based on SAPP Power Supply and Demand, August 2012

Figure G.2: Generation Mix in 2010



Source: Prepared by JICA Study Team based on SAPP Power Supply and Demand, August 2012

Figure G.3: Generation Contribution in 2010

G.1.3 Demand Forecast

The SAPP Pool Plan of 2009 forecasts that about **57,000 MW** of additional power generation capacity will be required by 2025 assuming an annual demand growth rate of 5%. This requirement implies a doubling of regional capacity.

G.1.4 Transmission Line Projects to Meet the Demand

To meet the forecast demand and to optimize the grid interconnection between countries, SAPP is planning the projects shown in Tables G.3 (Transmission Projects to Relieve Congestion), G.4 (Transmission Projects to Interconnect Non-Operation Countries), and G.5 (Transmission Projects associated with New Generation). Figure G.4 presents a map of priority transmission projects.

Table G.3: Transmission Projects to Relieve Congestion

No.	Project Name	Countries	Capacity (MW)	Expected Year
1	ZIZABONA Transmission Line	Zimbabwe, Zambia, Botswana, Namibia	600	2014
2	Central Transmission Corridor	Zimbabwe	300	2013
3	Kafue-Livingstone Upgrade	Zambia	600	2014
4	North West Upgrade	Botswana	600	2014

Source: SADC RIDMP Energy Sector, August 2012

Table G.4: Transmission Projects to Interconnect Non-Operation Countries

No.	Project Name	Countries	Capacity (MW)	Expected Year
1	Zambia–Tanzania	Zambia, Tanzania	400	2016
2	Mozambique–Malawi	Malawi, Mozambique	300	2016
3	Namibia–Angola	Angola, Namibia	400	2016
4	DRC–Angola	DRC, Angola	600	2016

Source: SADC RIDMP Energy Sector, August 2012

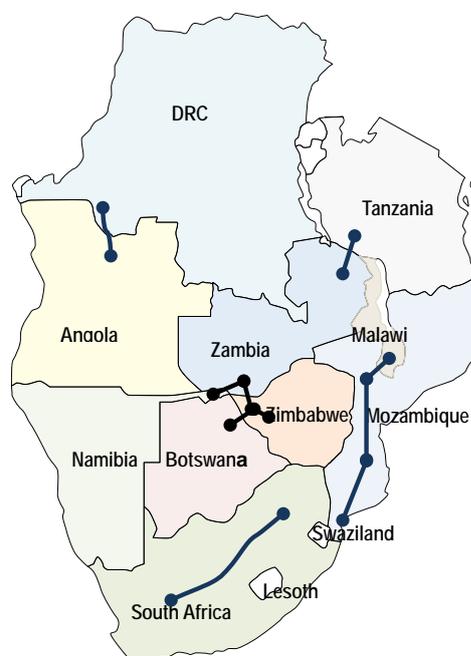
Table G.5: Transmission Projects Associated with New Generation

No.	Project Name	Countries	Capacity (MW)	Expected Year
1	Mozambique Backbone (CESUL)	Mozambique	3,100	2017
2	2nd Mozambique–Zimbabwe	Mozambique, Zimbabwe	500	2017

No.	Project Name	Countries	Capacity (MW)	Expected Year
3	2nd Zimbabwe–South Africa	South Africa, Zimbabwe	650	2017
4	2nd DRC–Zambia	DRC, Zambia	500	2017

Source: SADC RIDMP Energy Sector, August 2012

- Transmission Projects to Interconnect Non-Operation Countries
 - 2015: Mozambique- Malawi
 - 2016: Zambia-Tanzania
 - 2016: DRC-Angola
- Transmission Project to Relief Congestion
 - 2015: RSA Strengthening
 - 2016: ZIZABONA
- Transmission Projects associated with new Generation
 - 2017: Mozambique Backbone



Source: SADC RIDMP Energy Sector Plan, August 2012

Figure G.4 : Priority Transmission Projects

G.1.5 Power Generation Projects to Meet Future Demand

To meet future demand, SADC has prioritized the projects planned by each country as shown in Table G.6 (SAAP Priority Generation Projects, Capacity > 1,000 MW), Table G.7 (SAAP Priority Generation Projects, Capacity < 1,000 MW), Table G.8 (SAPP Utility Integrated Resource Plan Generation Projects), and Table G.9 (Committed Generation Projects in the Medium Term, 2012–2016). Table G.10 presents a summation of Tables G.6 to G.9.

Table G.6: SADC Priority Generation Projects, Capacity > 1,000 MW

Priority Ranking	Project Name	Country/Countries	Capacity (MW)	Technology	Expected Year of Commissioning
1	HCB North Bank	Mozambique	1,245	Hydro	2015
2	Mphanda Nkuwa	Mozambique	1,500	Hydro	2017
3	Batoka	Zambia/Zimbabwe	1,600	Hydro	2022
4	Inga 3	DRC	4,320	Hydro	2018
5	Gokwe North	Zimbabwe	1,400	Coal	2017
6	New PF + FBC	South Africa	6,250	Coal	2026
7	Nuclear	South Africa	9,600	Nuclear	2023
Total			25,915		

Subtotal: Hydro = 8,665 MW, Coal = 7,650 MW, Gas = 9,600 MW

Abbreviations: FBC = fluidized bed combustion; HCB = Hidroelectrica de Cahora Bassa ; PF = pulverized fuel

Source: SADC RIDMP Energy Sector Plan, August 2012

Table G.7: SADC Priority Generation Projects, Capacity < 1,000 MW

Priority Ranking	Project Name	Country	Capacity (MW)	Technology	Expected Year of Commissioning
1	Kariba South Extension	Zimbabwe	300	Hydro	2016
2	Kudu	Namibia	800	Gas	2016
3	Moruple 5 and 6	Botswana	300	Coal	2015
4	Baynes	Namibia	360	Hydro	2018
5	Benga	Mozambique	600	Coal	2015
6	Hwange 7 & 8	Zimbabwe	600	Coal	2016
7	Lunsemfwa Lower	Zambia	255	Hydro	2016
8	Busanga	DRC	240	Hydro	2016
9	Kalungwishi	Zambia	220	Hydro	2016
10	Zongo 2	DRC	120	Hydro	2016
11	Kiwira	Tanzania	200	Coal	2015
12	Kinyerezi	Tanzania	240	Gas	2015
13	Rumakali	Tanzania	520	Hydro	2018
14	Moatiza	Mozambique	300	Coal	2015
15	Mambilima Falls 1 & 2	Zambia	425	Hydro	2019
16	Mpata Gorge	Zambia	543	Hydro	2023
17	Lower Fufu	Malawi	100	Hydro	2015
18	Ruhudji	Tanzania	358	Hydro	2017
	Total		6,481		
Subtotal : Hydro = 3,441 MW, Coal = 2,000 MW, Gas = 1,040 MW					
Source: SADC RIDMP Energy Sector Plan, August 2012					

Table G.8: SADC Utility Integrated Resource Plan Generation Projects

Priority Ranking	Project Name	Country	Capacity (MW)	Technology
1	Kobong Pumped Storage	Lesotho	1,200	Hydro
2	Devils Gorge	Zambia	500	Hydro
3	Mpatamanga	Malawi	260	Hydro
4	Songwe	Malawi/Tanzania	340	Hydro
5	Kholombizo	Malawi	240	Hydro
6	OCGT	South Africa	2,370	Gas
7	CCGT Gas	South Africa	3,910	Gas
8	New Wind	South Africa	7,200	Wind
9	Solar PV	South Africa	6,900	Solar
10	Lupane	Zimbabwe	300	Gas
	Total		23,220	
Subtotal : Hydro = 2,540 MW, Gas = 6,580 MW, Wind = 7,200 MW, Solar = 6,900 MW				
Abbreviations: CCGT = combined cycle gas turbine; OCGT – open-cycle gas turbine; PV = photovoltaic				
Source: SADC RIDMP Energy Sector Plan, August 2012				

Table G.9: Committed Generation Projects in the Medium Term (2012–2016)

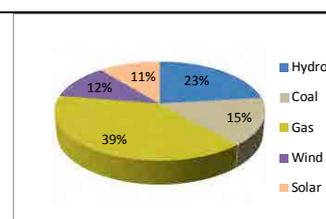
No.	Country	Committed Generation Capacity					Total
		2012	2013	2014	2015	2016	
1	Angola	180	-	80	-	-	260
2	Botswana	600	-	-	-	-	600
3	DRC	430	25	150	-	240	845
4	Lesotho	-	25	40	110	-	175
5	Malawi	-	64	-	-	-	64
6	Mozambique	100	-	265	300	-	665
7	Namibia	92	60	-	-	-	152

No.	Country	Committed Generation Capacity					Total
		2012	2013	2014	2015	2016	
8	South Africa	303	722	6,091	2,961	2,239	12,316
9	Swaziland	-	-	-	-	-	-
10	Tanzania	160	-	-	-	-	160
11	Zambia	56	360	735	40	1,089	2,280
12	Zimbabwe	30	-	140	-	-	170
	Total	1,951	1,256	7,501	3,441	3,568	17,687

Source: SADC RIDMP Energy Sector Plan, August 2012

Table G.10: Summation of Tables G.6 to G.9

	Hydro	Coal	Gas	Wind	Solar	Sub total
Table G.6	8,665	7,650	9,600	-	-	25,915
Table G.7	3,441	2,000	1,040	-	-	6,481
Table G.8	2,540		6,580	7,200	6,900	23,220
Sub-total	14,646	9,650	17,220	7,200	6,900	55,616
Sub-total G.6 to G.8				55,616		
Total G.9 (committed)				17,687		
Total G.6 to G.9				73,303		



Source: JICA Study Team based on data in Tables G.6 to G.9

The subtotals of G.6 to G.8 in Table G.10 shows the generation mix of the SADC priority power generation projects (not committed), with gas accounting for 39% followed by hydro at 23%, coal at 15%, and solar at 11%. When committed generation of 17,678 MW and 39,313 MW (57,000 MW - 17,678 = 39,313 MW, nearly 70% of 55,616 MW) out of planned generation of 55,616 MW is realized by 2025, the power generation capacity will be able meet the forecast additional power demand of 57,000 MW required by 2025 as stated in subsection G.1.3 presenting the Demand Forecast.

Figure G.5 shows the SADC Priority Generation Projects (except those in South Africa) that were not committed as of August 2012. Large hydropower projects are located mainly along the Zambezi River and its tributaries, in Mozambique, Zambia, and Zimbabwe. Small to medium hydropower projects are located in western Tanzania, Malawi, and eastern Zambia. Gas turbine or coal thermal power projects are located in Botswana, Mozambique, Namibia, and Zimbabwe.

Table G.11 shows forecast generation power for each countries by 2025 taking the available capacity at present in Table G.2, the additional generation committed in Table G.9, and the additional generation not committed in Tables G.6 to G.8.

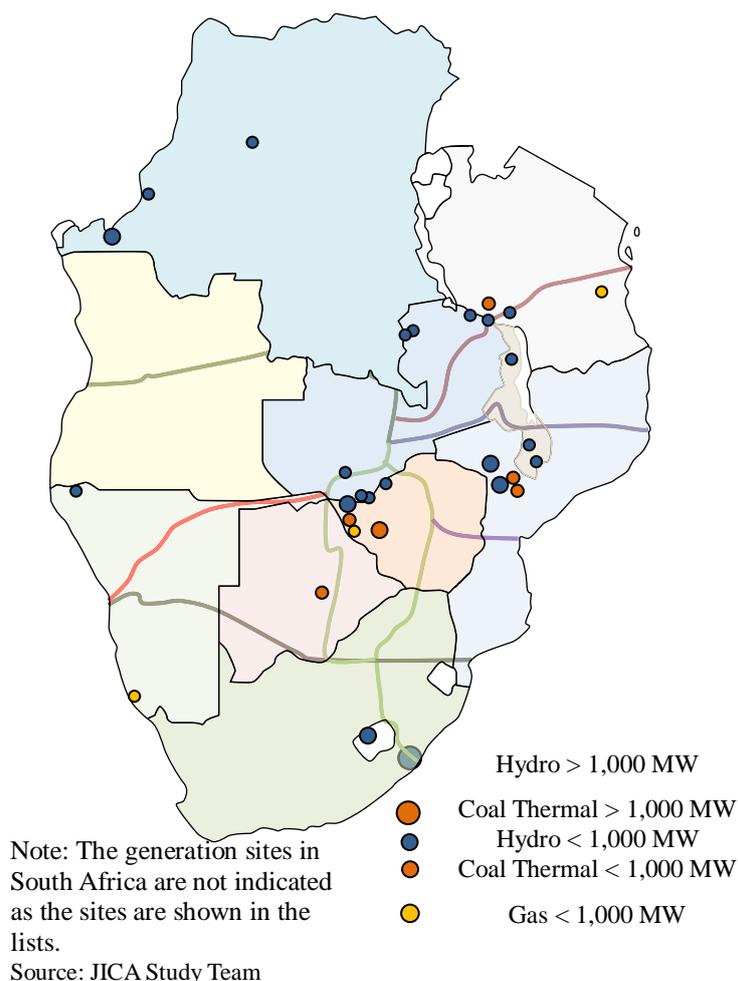


Figure G.5: Location of SAPP Priority Generation Projects

Table G.11: Forecast of Generating Power by 2025

	Available Capacity At Present (MW)	Additional Generation Committed (MW)	Additional Generation Not Committed (MW)	Additional Total (MW)	Total by 2025 (MW)
	a	b	c	d=b+c	e=a+d
South Africa	41,074	12,316	36,230	48,546	89,620
DRC	1,170	845	4,680	5,525	6,695
Zimbabwe	1,320	170	3,900	4,070	5,390
Mozambique	2,249	665	3,645	4,310	6,559
Zambia	1,215	2280	2,243	4,523	5,738
Tanzania	880	160	1,488	1,648	2,528
Lesotho	72	175	1,200	1,375	1,447
Namibia	360	152	1,160	1,312	1,672
Malawi	287	64	770	834	1,121
Botswana	190	600	300	900	1,090
Angola	990	260	0	260	1,250
Swaziland	70	0	0	0	70
Total	49,877	17,687	55,616	73,303	123,180

Source: JICA Study Team based on data from Tables G.6 to G.8

G.2 Challenges in Power Sector

The SADC Regional Infrastructure Development Master Plan (RIDMP), 2012, lists the following challenges in the power sector, almost of which were also identified during the interviews conducted by the JICA Study team in the focus countries in August and November 2012.

(1) National Interests Overriding Regional Planning

There is a tendency of the utilities to plan independently disregarding regionally coordinated planning. There is also no clear endorsement of regional projects by SADC governments and for the implementation of SAPP Plan in general. Lessons can be learnt from the Economic Community of West African States (ECOWAS) where governments sign-off projects for the West African Power Pool (WAPP) to implement.

(2) Tariff Gap (non-cost reflective tariffs)

Currently, tariffs for most utilities do not reflect the costs of supply. SADC Member States have agreed on a 5-year plan to introduce cost-reflective tariffs in the region, but this has not been achieved. Member States would also require that utilities operate efficiently (e.g., ensuring collection of revenue, servicing of equipment, and avoidance of power theft) prior to introduction of cost-reflective tariffs.

(3) Lack of Project Preparation Capacity

Project preparation capacity is limited. Although most projects are technically feasible, they are not structured or documented in bankable form to attract investment.

(4) Lack of Credible Off-takers/Power Purchase Agreements to Underpin Projects

The region has been largely relying on Eskom to purchase power since most projects are too big for the demand of a single country except for South Africa. Eskom has also its Integrated Resource Plan (IRP) to implement and has thus not been able to sign power purchase agreements (PPAs) for most projects floated in the region. An option is to assess the potential of large electricity users such as mines and large industries to also underwrite projects for implementation. Since PPA negotiations take a long time. Since currently there are no guidelines for PPA agreements, some form of standardization would be beneficial.

(5) Too Many Levels of Planning (utility, national, and regional levels)

Planning for projects occurs at the level of utilities, Member States, and SAPP, which often fails to provide coordination to give priority to regional projects of importance. National IRPs take precedence over the SAPP Pool Plan in terms of focus of Member States.

(6) Lack of Competitive Industry/Market Structures at the National Level (single buyer model)

There is no regulatory framework that encourages competition especially for off-takers. Although Electricity Acts have been revised to allow IPPs, the single buyer model whereby the utility is the buyer is still prevalent. If the utility is not able to absorb the generated power, then often the project has no market to sell the power and hence no financing.

(7) Weak Regulatory Framework

Member States have different regulatory environments hence presenting a challenge for cross-border projects and electricity trading. Certain policies necessary to effectively support

electricity infrastructure development do not exist, e.g., on tariff setting and where policies exist some are not fully being implemented such as on the commercialization of utilities. There is also no clarity on cost pass through. However, the Regional Electricity Regulators Association of Southern Africa (RERA) now has cross-border regulatory guidelines that can support development of regulatory frameworks.

(8) Weak Project Sponsors/Developers in Terms of Balance Sheet

Utilities themselves are not creditworthy and do not qualify to borrow as their balance sheets are weak. An exercise to rate utilities in the region indicated that only three of nine could be considered creditworthy. Utilities and IPPs are also not able to finance their equity partly due to poor revenue inflow or an inability to raise equity.

(9) Uncoordinated Fund Raising

There is no standing plan for raising funds for projects in the region. A few investors' conferences have been organized but these have not been organized a regular timeframe. SADC mobilizes funding as part of its mandate but Member States also raise funding to implement their own IRPs. The projects being developed at the Member State level will have regional impacts and therefore qualify for coordinated fund raising.

(10) Small Size of Projects Relative to Electricity Markets in Some Countries

Projects promoted in most SADC countries produce power that cannot be absorbed in the originating country due to small demand. These projects can only proceed if there is a guaranteed market in other SADC countries, creating a large market and hence justifying investment in the region.

(11) Risk Allocation

Preparation of projects demands a substantial allocation of financial resources to reach a point of financial closure. Often this is not planned for and hence projects experience significant delays in reaching implementation.

(12) Currency Indexing

The major off-taker, Eskom, pegs its currency in the South African rand (ZAR) and yet in other Member States the USD may be the currency used for sourcing. This presents risks to generators, transmitters, and off-takers.

(13) Weak Capacity of the Regional Institutions Relative to Challenges and mandates

The demands on SADC Energy Division, SAPP and RERA are high compared to what their limited staff compliments can manage and this also affects the pace at which projects can be driven and coordinated

G.3 Power Accessibility along the Corridors

G.3.1 Methodology to Assess Power Accessibility

Power accessibility for corridor sections was analyzed based on power supply capability and grid accessibility. The current power supply and demand status of each country was examined by referring to the latest SAPP report. The power supply capability of each country was analyzed based on the power generation development plans and projected power demand increase in the SADC RIDMP along with data collected by the JICA Study Team. The grid

accessibility of each country was analyzed based on the existing power grid and expansion plan as it affects each corridor route.

G.3.2 Corridor Sections

Power supply capabilities of corridor sections depend on the power supply capability of the countries traversed. In this study grid accessibility was analyzed by examining selected corridor sections by country. Figure G.6 and Table G.12 present the sections analyzed. Figures G.7 to G.13 present maps of power grids and corridor(s) in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe, respectively.

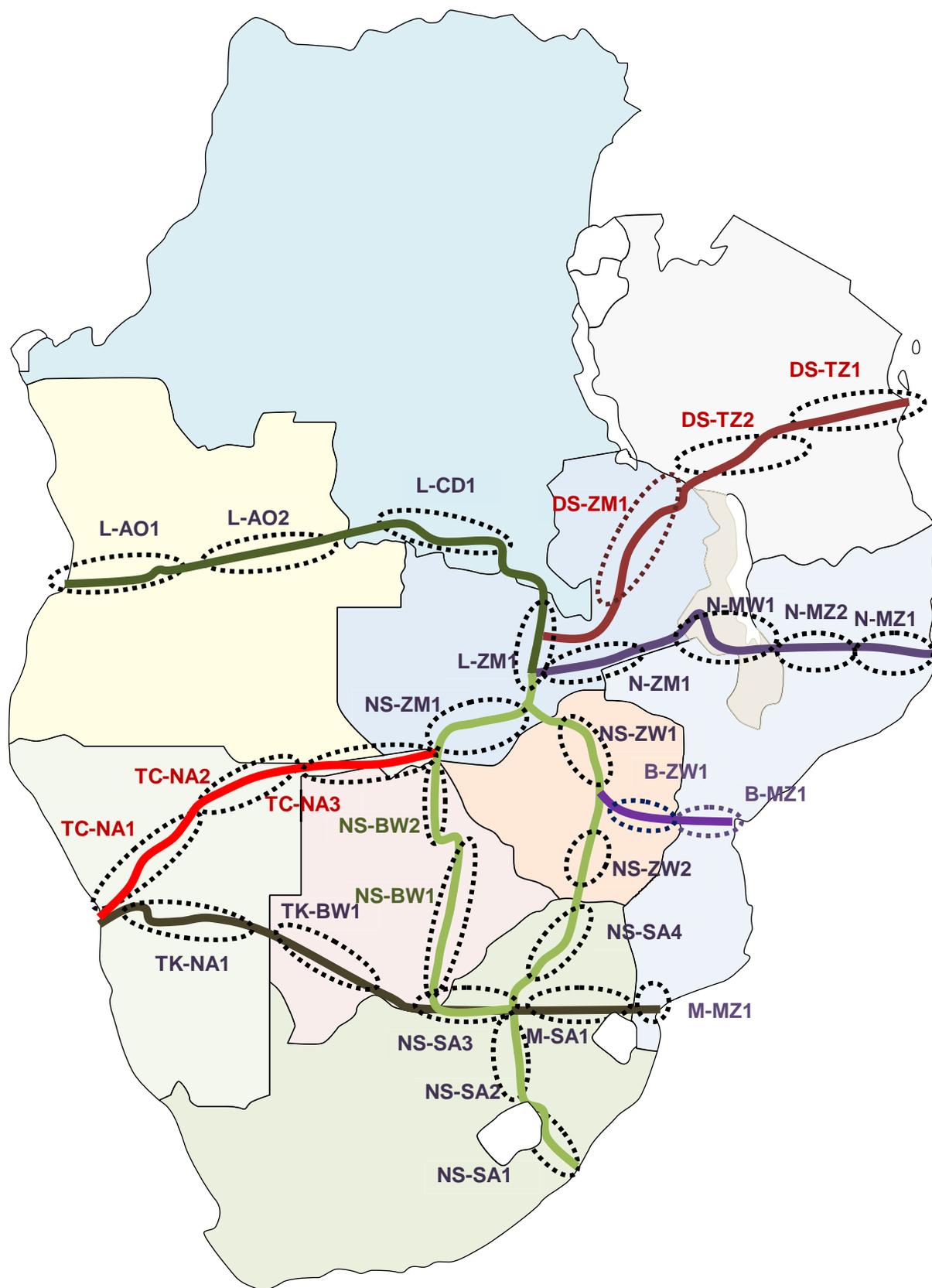


Figure G.6: Corridor Sections for Analyzing Power Accessibility

Table G.12: Analysis of Corridor Sections

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
1. Beira Corridor	Mozambique	B-MZ1	<p>Mozambique has sufficient power supply capacity with HCB (2,075 MW) in Tete Province mainly exporting to South Africa through HVDC. The grid of the country is divided into two, one in the northern and central regions and connected to HCB, and the other in the southern region, where power is mainly imported from South Africa. Over the medium term, large-scale hydropower and coal thermal generation plants are planned (e.g., HCB North Bank HPP, 1,245 MW); Mphanda Nkuwa HPP, 1,500 MW); Benga Coal TPP, 600 MW); Moatize Coal TPP, 300 MW). All power generation is located in the central Zambezi Basin. To transmit the generated power to the southern region and export it to South Africa, a Mozambique backbone transmission line connecting the power generation areas with the Maputo area is planned. When both the planned generation plants and transmission lines are realized, sufficient power will be available in both the central region and the Maputo area.</p>	<p>A 1 cct, 220kV transmission line from HCB ends at Chibata on the corridor. Power reliability is relatively high, and sufficient supply capacity can be secured.</p>
			<p>Not available at present. When a large capacity of hydro and/or coal power plants in Tete province and HVDC is completed, sufficient power will be available.</p>	<p>Easy to access everywhere along the corridor.</p>
	Zimbabwe	B-ZW1	<p>Zimbabwe is facing a chronic power shortfall. In 2011, peak demand and available generating capacity were 2,230 MW and 1,320 MW, respectively. Power sources include the Kariba North HPP (49%), the Hwange TPP (32%), small thermal (4%), and imports (15%). A Kariba South HPP extension (300 MW) and a Hwange TPP extension (600 MW) are being procured. Only after those power stations commence generation in 3–5 years will domestic power supply and demand be balanced.</p> <p>Supplying power for future increased domestic demand and industrial demand, realization of the Batoka Gorge HPP (1,600 MW, to be jointly developed with Zambia), and Gokwe North TPP (1,400MW) are indispensable.</p>	<p>The 330 kV transmission line runs along the corridor, while two 330 kV substations are located near Harare and the Mutare border crossing with Mozambique. Also, 132 kV substations are located in Marondera and Rusape between Harare and Mutare. Therefore, it is easy to access highly reliable power in the Harare and Mutare areas and easy to access less reliable power in the Marundera and Rusape areas.</p>
			<p>Not available unless power is imported from the SAPP.</p>	<p>Easy to access around Harare and Mutare. Easy to access less reliable power around Marundera and Rusape at present.</p>

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
2. Dar es Salaam Corridor	Tanzania	DS-TZ1 & DS-TZ2	Not a focus country of this study.	Not a focus country of this study.
	Zambia	DS-ZM1	<p>In 2011, peak demand and available generation capacity were 1,660 MW and 1,215 MW, respectively. The shortfall has occurred mainly because two units (180 MW x 2) of Kariba North HPP (180 MW x 4 in total) were under rehabilitation. The shortfall was mainly because two units (180 MW x 2) of the Kariba North HPP (180 MW x 4 in total) were under rehabilitation. The rehabilitation of the first unit will be completed by the end of 2012 and the rehabilitation of the second unit will be completed by the end of 2013.</p> <p>Plans for power generation by Independent Power Producers (IPPs) are being realized. Construction of the Maamba coal TPP (300 MW) has been started, and the negotiation of a power purchase agreement is ongoing on the Emco (India) coal TPP Power Plant (300 MW), the Ndola Heavy Fuel Oil Thermal Power Plant (50 MW) is under construction, and the Kabompo HPP is planned to be constructed by Copperbelt Energy Corporation.</p> <p>Zambia has sufficient hydropower potential, and is developing hydropower plants on the Zambezi River and its tributaries. The Kariba North extension (360 MW) will be completed in 2013, the construction of Itezhi–Tezhi HPP (120 MW) will start soon via a special purpose vehicle, construction of the Kafue Lower HPP (750 MW) has started, and the Batka HPP (1,600 MW, jointly developed with Zimbabwe) is listed for future priority generation development. Therefore, when the IPP power plants and large-scale hydropower plants are realized, Zambia will have sufficient power supply capacity.</p> <p>Available after committed projects are completes.</p>	<p>As only a 1 cct, 66 kV transmission line runs along most of the corridor, between Kapiri Mposhi (branch point) and Nakonde (the border with Tanzania); power supply reliability is low.</p> <p>A 1 cct, 220 kV transmission line crosses the corridor at Pensulo, where there is a 220/110 kV substation. Reliable power can be supplied only in the area around Pensulo (eastern Serenje).</p> <p>Easy only around Serenje; otherwise not easy.</p>
3. Lobito Corridor	Angola	L-AO1 L-AO2	<p>In 2011, peak demand and available generation capacity were 990 MW and 870 MW, respectively. Committed additional power generation accounts for 260 MW. However, there is no additional initiative in the list of SADC priority projects. Power supply capability is insufficient for the medium to long term.</p> <p>Available at present.</p>	<p>While there is a grid between Lobito and Huambo along the corridor, it is not operated at present. Grid accessibility is available only in Lobito area.</p> <p>Not easy to access.</p>

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
	DRC	L-CD1	Not a focus country of the study.	Not a focus country of the study.
	Zambia	L-ZM1	Please refer to the table section on the Dar es Salaam Corridor.	The corridor is traversed by 3 cct 300 kV, 4 cct, and 2 cct transmission lines through Lusaka, Kabwe, Kitwe, and Chingla (on the border with the DRC). Since there are 300 kV substations at Lusaka, Kabwe, Kitwe, and Chingla, reliable power can be secured in the area.
	Available completion of committed projects.			Somewhat easy to access
4. Maputo Corridor	Mozambique	M-MZ1	As the power grid of Maputo is not connected to HCB, the power supply is insufficient even with imports from South Africa. Mozambique has applied for the ODA loan from Japan for the Maputo 110 MW CCGT, with completion expected by 2015 IPPs are planning to proceed with gas turbine plants, including a 140 MW by a joint venture of EdM and Sasol, a 100 MW plant by a joint venture of Gigawatt and private companies in Mozambique, and a 107 MW plant by Aggreko Plc to serve peak demand. When these projects are completed, power supply capability will be sufficient for the medium term.	It is easy to access power everywhere along the corridor at present because there are 220 kV transmission lines and substations along the corridor.
			A Mozambique regional transmission backbone (AC 400 kV and DC 500 kV having transmitting capacity of 900 MW and 2,650 MW, respectively) is planned to transmit the power to be generated in Tete Province. The HCB North Bank HPP (1,245 MW), the Mphanda Nkuwa HPP (1,500 MW), the Benga Coal TPP (600 MW initially), and the Moatize Coal TPP (300 MW initially) are planned, to serve the Maputo area and South Africa. After completion of these projects, the Maputo area will have sufficient power supply capacity.	
	Not available unless power is imported from the SAPP or the Mozambique backbone transmission line is completed. After completion of these projects, sufficient power will be available in Maputo.			Easy to access everywhere along the corridor.
	South Africa	M-SA1	In 2011, peak demand and available generation capacity were 36,444 MW and 41,074 MW, respectively, which means that the power supply capability was almost balanced with the peak demand plus required capacity for stable power system operation, taking a 10% margin into account (36,444 MW x 110% = 40,088 MW). At present, Eskom is	Since almost all existing coal thermal power stations are located near the Maputo Corridor, strength grids are established. It is easy to access to reliable grids along the corridor..

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
			constructing the Kusile coal TPP (800 MW x 6 units = 4,800 MW) to be commissioned in 2014 to 2018 unit by unit, the Medupi coal TPP (800 MW x 6 units = 4,800 MW) to be commissioned in 2013 to 2017 unit by unit, the Ingula Pumped Storage HPP (1,332 MW) to be commissioned in 2014), and an additional 100 MW.	
			There will be sufficient power supply capability after completion of committed projects.	Easy to access everywhere along the corridor.
5. Nacala Corridor	Mozambique	N-MZ1	Please refer to the table section on the Beira Corridor.	Since a 1 cct, 220 kV transmission line comes to Nampula from HCB, the reliability of power is relatively high. The power flow is forecast to be full along the 110 kV transmission line between Nampula and Nacala. Mozambique has applied for a Japanese ODA loan for a project titled Reconfiguration of the Nampula–Monapo–Nacala and Nampula–Meto–Pemba at Namialo and Building of a New 40 MVA, 110/33 kV at Namialo. The reliability of power and supply capacity between Nampula and Nacala will increase when the project is completed.
			Not available at present. When large capacity hydro and/or coal power plants in Tete Province and transmission line enhancements are completed, sufficient power will be available.	Easy to access
		N-MZ2	Same as N-MZ1 above	A 110 kV transmission line, branched from a 220 kV line at Alto Molocue, crosses at Cuamba, where there is a 110 kV distribution substation. Power can be secured around Cuamba.
		Not available at present. When large capacity hydro and/or coal power plants in Tete Province and transmission line enhancements are completed, sufficient power will be available.	Not easy to access	

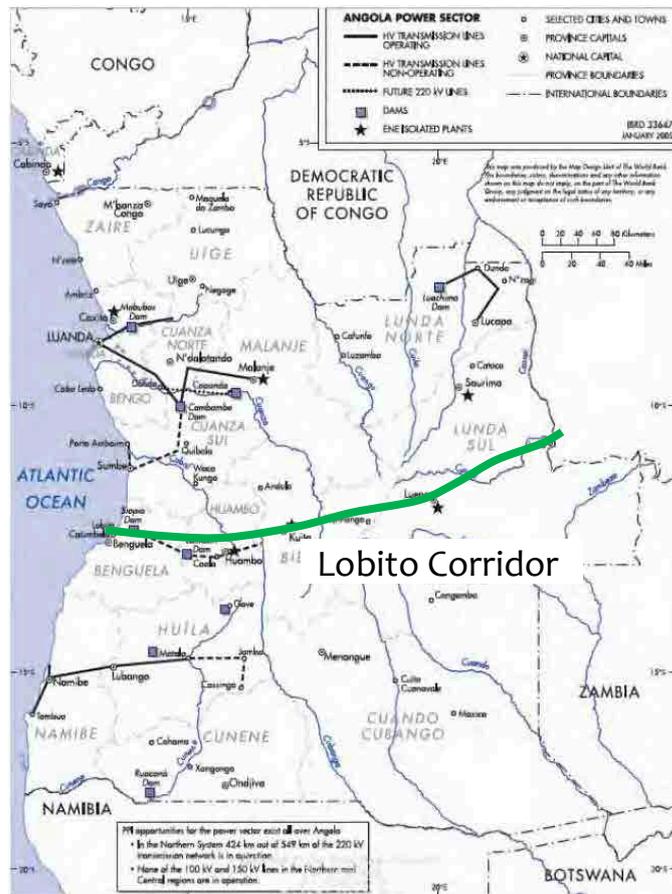
Corridor	Country	Section	Power Supply Capability	Grid Accessibility
	Malawi	N-MW1	<p>Installed generation capacity (278 MW) is much less than the demand (300 MW) during the peak season (2011–12). Since Malawi is the one of three countries in the SAPP that is not connected to the SAPP grid, it cannot import power from its neighboring countries. Kapichira Phase II (64 MW) will commence operation in 2013, but power supply capacity will still be short of the demand. A feasibility study for a 400 kV 300 MW grid interconnecting the concentrated power generation in Mozambique (i.e., between Phombeya Substaion in Malawi and Matambo Substation in Mozambique) has been completed. Mpatamanga HPP (260 MW), Kholombizo HPP (240 MW), Lower FuFu HPP (100 MW), and Songwe HPP (300 MW, jointly developed with Tanzania) are planned in the medium term, but since these are only at the feasibility stage or the stage of seeking investors, it will take at least five years before they become operational. Some mining companies have applied for power supply, about 100 MW in total, but due to the shortage of generating power, the mining operations have not commenced. Urgent development of hydropower or coal thermal generation is required to begin such mining, with envisaged job creation of at least 1,000 jobs per mine.</p>	<p>Since a 1 cct, 132 kV transmission line runs north to south along the corridor, grid accessibility is not difficult. However, line reliability is low since it is 132 kV. A feasibility study for a 220 kV transmission line, the so-called Malawi Backbone, between northern Blantyre (Nkula B HPP) and Lilongwe has been completed and financing is sought. When the backbone transmission line is completed, the reliability of the power will increase.</p>
			<p>Not available unless the grid is connected to the SAPP</p>	<p>Easy to access to 132 kV (but therefore with less reliability)</p>
	Zambia	N-ZM1	<p>Please refer to the table section on the Dar es Salaam Corridor.</p>	<p>There is no trunk transmission line along the road between Lusaka and Chipata (near the border with Malawi at Mchinji) at present. A 330 kV transmission line is being constructed between Lusaka and Pensulo (northeast of Lusaka and Chipata) to interconnect Malawi in the future. At present, only the Lusaka and Chipata areas can easily access reliable power.</p>
			<p>Available with committed projects.</p>	<p>Easy to access only around Lusaka and Chipata</p>

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
6. North-South Corridor	Zambia	NS-ZM1	Please refer to the table section on the Dar es Salaam Corridor.	Since a 1 cct, 220 kV transmission line runs along the corridor, and there are 220 kV substations at Lusaka, Muzuma (near Choma), and at Livingstone, reliable power can be secured around these areas (only). An additional (1 cct, 330 kV) transmission line has been proposed along the same route.
			Available with committed projects.	Easy to access only around Lusaka, Choma, and Livingstone
	Zimbabwe	NS-ZW1	Please refer to the table section on the Beira Corridor.	It is easy to access power only around Harare, Chinhoyi, and Kariba. A 1 cct, 330 kV transmission line crosses only at Tokwe, near Masvingo, where there is a 330 kV substation. Only the Masvingo area can easily access a reliable grid.
			Not available unless power is imported from the SAPP	Easy to access only around Harare and Masvingo.
	Zimbabwe	NS-ZW2	Please refer to the table section on the Beira Corridor.	Transmission lines (2 or 3cct, 330 kV) run along the corridor, there are 330 kV substations at Alaska (near Chinhoyi, in northern Zimbabwe) and Kariba (on the border with Zambia), around where reliable power can be secured.
			Not available unless power is imported from the SAPP.	Easy to access only around Harare, Chinhoyi, and Kariba.
Botswana	NS-BW1	Botswana is facing huge shortfall of power, as it formerly imported power from South Africa. In June 2012 peak demand was recorded at 578 MW, of which domestic generated power was only 292 MW only, and the rest imported from the Electricity Supply Commission of South Africa. The power purchase contract between the Botswana Power Corporation and Eskom will terminate at the end of 2012, at which time all four units of Morupule B Coal TPP (generating 600 MW in total) will be put into	A 220 kV line runs between Gaborone to near Francistown along the North-South Corridor. There are 220 kV substations at Gaborone, Panapye, Serule, and Francistown, around which there is easy	

Corridor	Country	Section	Power Supply Capability	Grid Accessibility
			operation. In 2013, the power supply will exceed the peak demand, but after that there will be a power shortfall unless new generating plants are constructed and/or power is imported, from Mozambique or Zambia, via the SAPP. The Government of Botswana is calling for an independent power producer to construct two coal thermal plants, 150 MW each, on the premises of Moruple B. Sufficient power can be secured only after completion of the Moruple B extension.	access to reliable power. With the transmission of power generated at Moruple B 600 MW, 400 kV transmission lines and 400 kV substations are under construction at Isang (30 km north of Gaborone) Palapye, and Pokoje (50 km east of Serule), the 220 kV grid will be more reliable.
			Possible only after completion of Moruple B extensions of No. 5 and No. 6 (150 MW each).	Easy to access only around Gaborone, Palapye, and Francistown
		NS-BW2	Same as NS-BW1 above.	110 kV transmission line ends at Dukwe, no other area where easy to access.
			Same as NS-BW1 above.	Easy to access only around Dukwe, but with less reliability.
	South Africa	NS-SA1 NS-SA2 NS-SA3	Please refer to the table section on the Maputo Corridor.	There is no major grid between Pretoria and Musina on the South Africa-Zimbabwe border. Also, there is no major grid between Pretoria and Lobatse on the Botswana-South South Africa border. Only in the Johannesburg/Pretoria (Gauteng) and Durban areas are there are reliable grids.
			Sufficient power supply capability after completion of committed projects.	Easy to access only in the Johannesburg/Pretoria (Gauteng) and Durban areas,
7. Trans-Caprivi Corridor	Namibia	TC-NA1 TC-NA2 TC-NA3	In 2011, peak demand and available generation capacity were 611 MW and 360 MW, respectively, which indicates a huge power supply shortage. The committed generation projects, which will be completed within few years, amount to 152 MW in total. Even adding this amount, total generating capacity will only be 512 MW, which is still less than demand in 2011. The Kudu Gas Combined Cycle Project (800 MW) is listed as a priority SADC project, with completion expected in 2016. When the project is realized, Namibia may have sufficient supply capacity.	The following transmission lines run along the corridor: (i) a 220 kV transmission line between Walvis Bay and Tsumeb, with 220 kV substations in the section; (ii) a 132 kV transmission line runs between Tsumeb and Calai, with substations at both ends; and (iii) a 150 kV DC transmission line between Calai and Katima Mulilo.

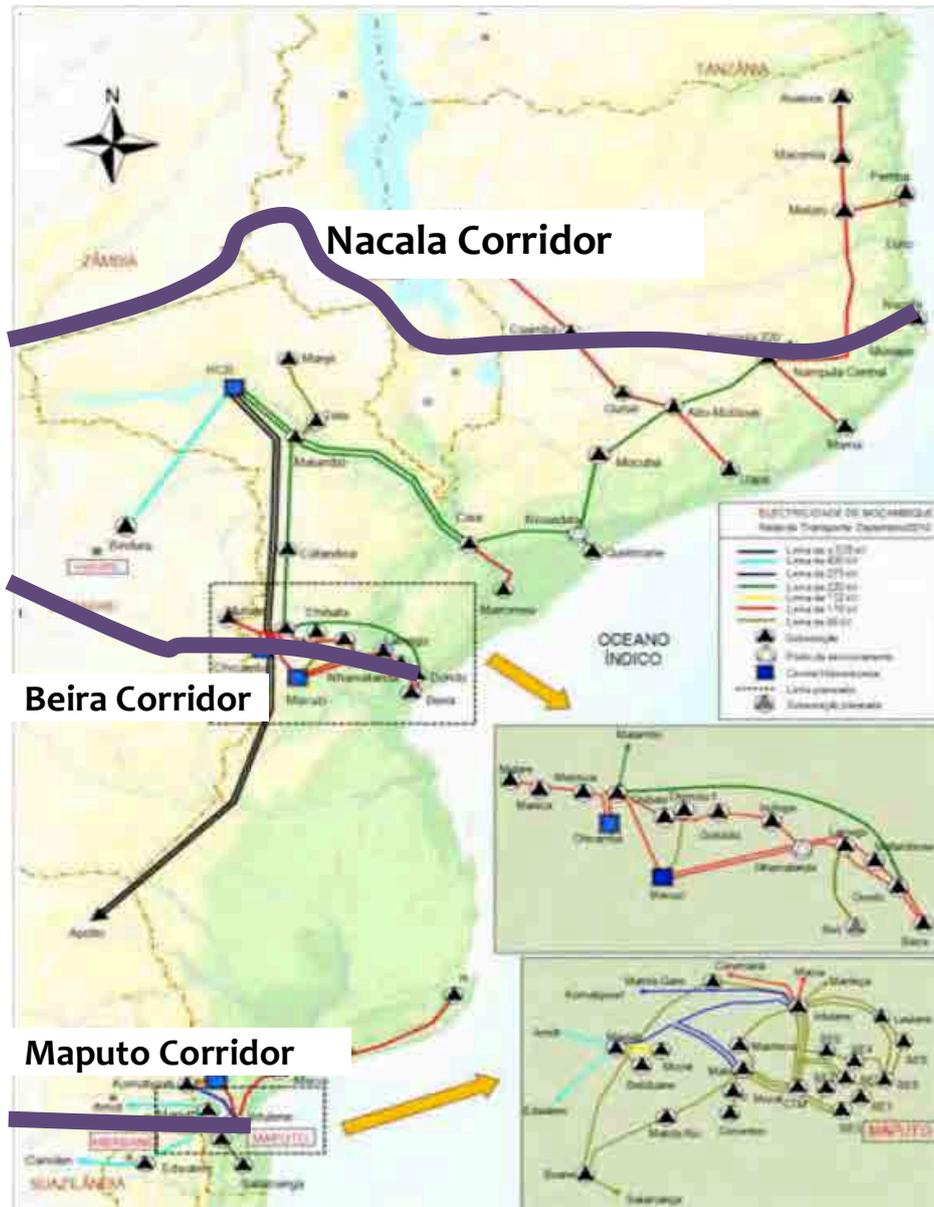
Corridor	Country	Section	Power Supply Capability	Grid Accessibility
			Not available unless the Kudu Gas Combined Cycle Project (800 MW) is developed.	Easy to access reliable power only between Walvis Bay and Tsumeb.
8. Trans-Kalahari Corridor	Namibia	TK-NA1	Please refer to the table section on the Trans-Capriivi Corridor.	Along the corridor a 220 kV transmission line runs between Walvis Bay and Windhoek via Okahandja; only in the section, is it easy to access to the grid.
			Not available unless Kudu Gas Power (800 MW) is developed.	Easy to access reliable power only around Walvis Bay, Okahandja, and Windhoek.
	Botswana	TK-BW1	Please refer to the table section on the North-South Corridor.	There is no transmission line and no plan to install a transmission line along the corridor.
			Possible only after completion of Moruple B extensions of No. 5 and No. 6 (150 MW each).	Impossible to access except in the Gaborone area.

Abbreviations: CCGT = Combined Cycle Gas Turbine, EdM = Electricidade de Mozambique, Eskom = Electricity Supply Commission, HCB = Hidroeléctrica de Cahora Bassa, HPP = hydropower plant, HVDC = high-voltage direct current, IPP = independent power producer, ODA = official development assistance, SADC = Southern African Development Community, TPP = thermal power plant
Source: JICA Study Team



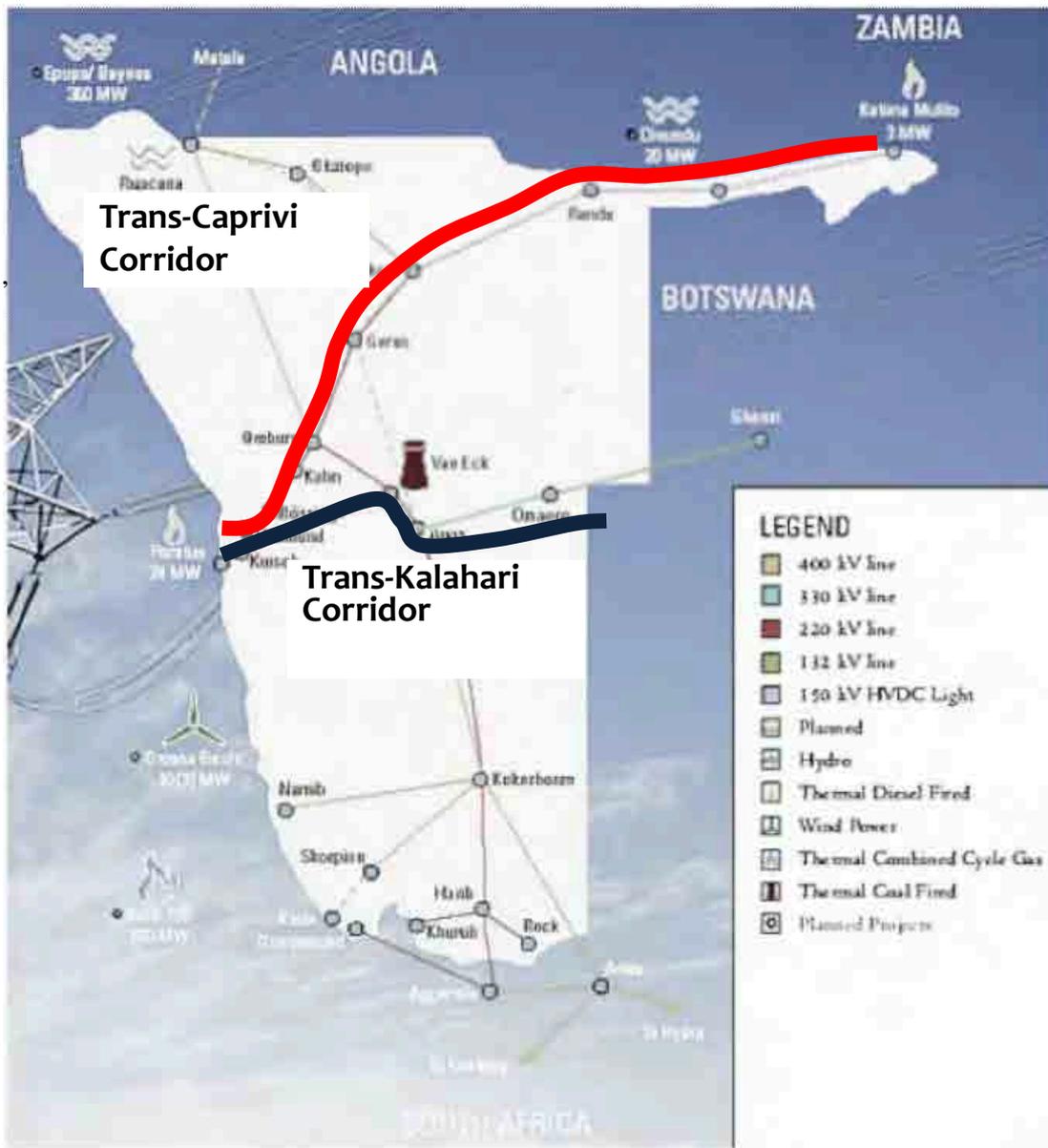
Source: Empresa Nacional de Electricidade (Electricity Angola) Power Grid

Figure G.7: Angola Power Grid and Corridor



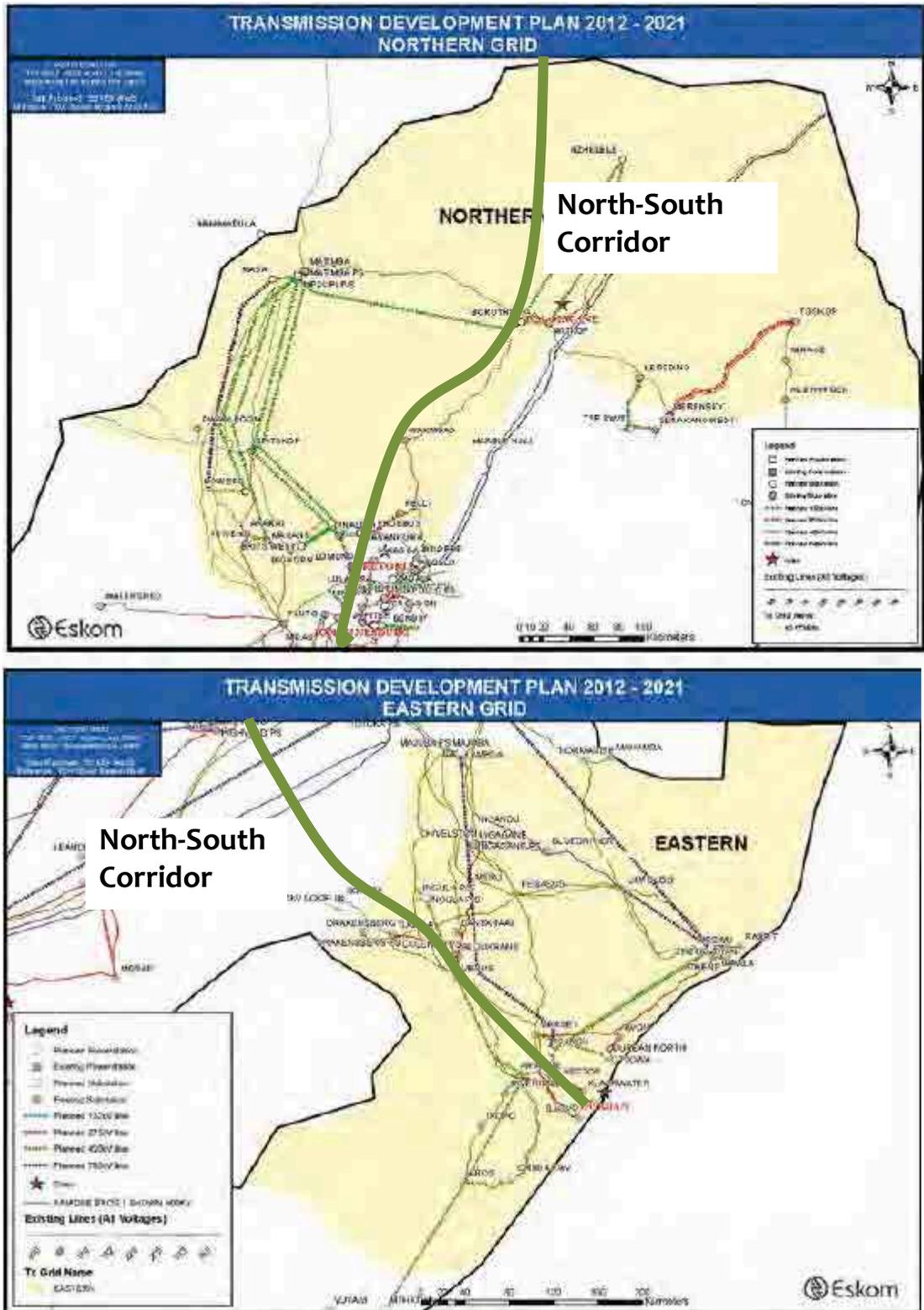
Source: Electricidade de Moçambique (EdM) Power Grid

Figure G.9: Mozambique Power Grid and Corridors



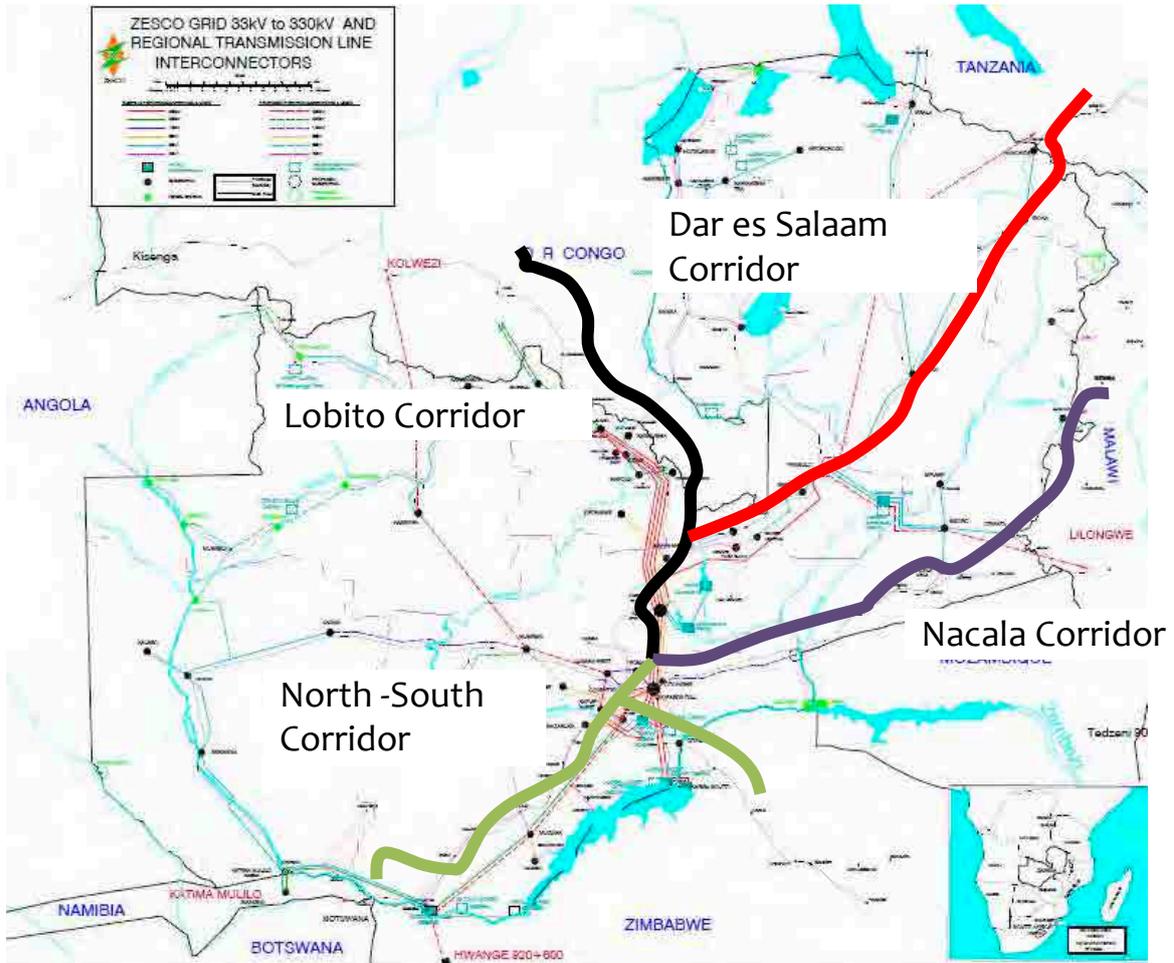
Source: NamPower

Figure G.10: Namibia Power Grid and Corridors



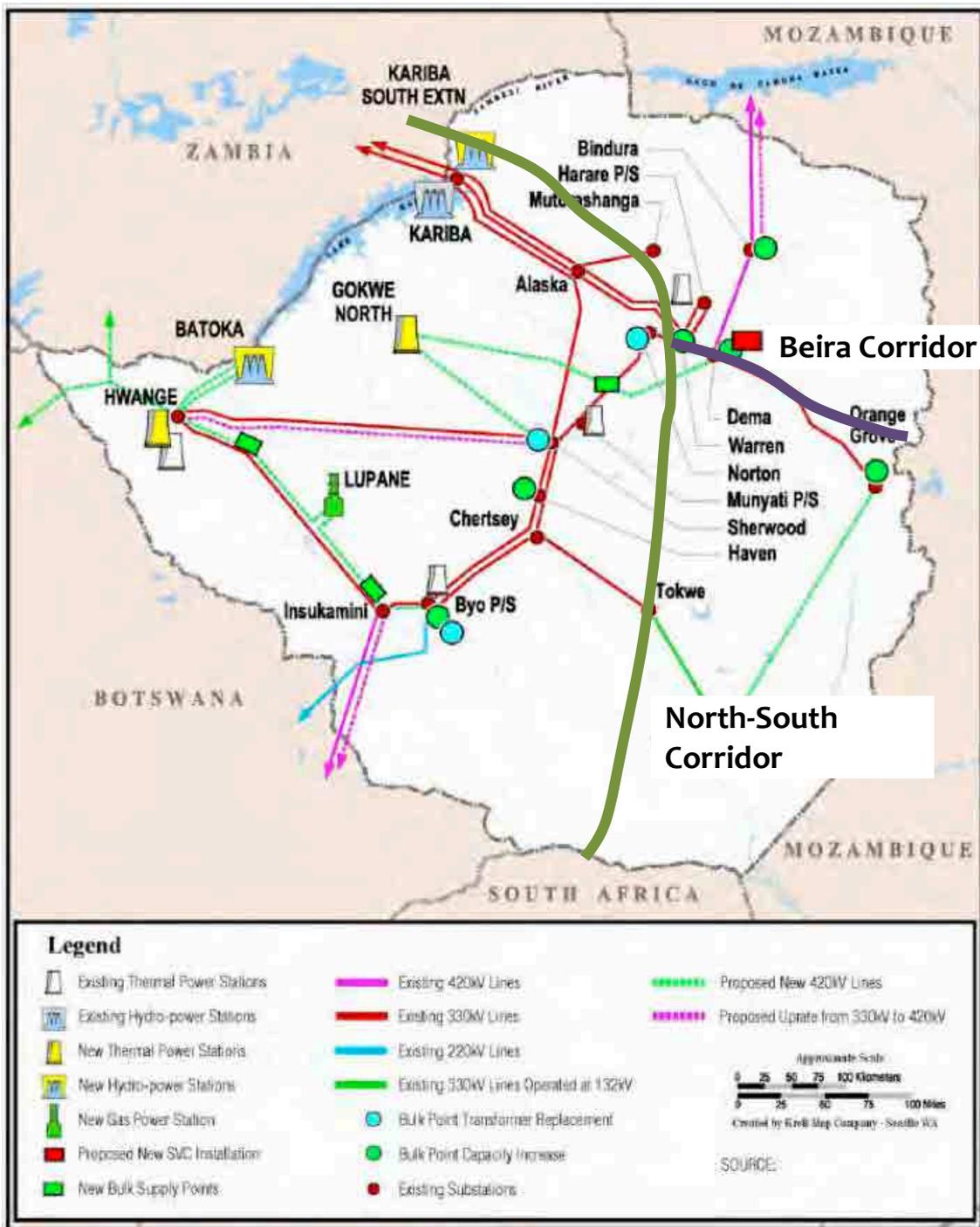
Source: Electricity Supply Commission (Eskom)

Figure G.11: South Africa Power Grid and Corridors



Source: Zambia Electricity Supply Corporation Limited (ZESCO) Power Grid

Figure G.12: Zambia Power Grid and Corridors



Source: Zimbabwe Electricity Supply Authority Holdings (ZESA) Holdings (Pvt)

Figure G.13: Zimbabwe Power Grid and Corridor

Appendix H Water Sector Development Issues by Country

H.1 Water Sector Review / Botswana

Country	Botswana	Capital	Gaborone
Corridors	North-South, Trans-Caprivi, Trans-Kalahari,		
Sources	Documents from the Ministry of Minerals, Energy and Water Resources (MMEWR); Department of Water Resources, Ministry of Agriculture; Department of Water Affairs (DWA); Water Utility Corporation (WUC); SADC; Permanent Okavango Water Basin Commission, OKACOM; Zambezi Watercourse Commission, ZAMCOM (Final Report of the National Scoping Study for the Botswana, 31 May 2012); Centre for Applied Research; and the African Development Bank (AfDB)		

1. Current Status/General Background

Water Resources

Water availability is an important issue that affects economic activities of a corridor. Total annual water availability per capita in Botswana is 6,372 m³. Per capita groundwater availability is 1,280 m³. Mean annual rainfall is 416 mm, ranging from 250 mm in the southwest to a maximum of 650 mm/year in the north. Over 90% of the rainfall occurs during the rainy season (November to March).

In Botswana, water resources are composed of surface water and groundwater, which are used for domestic, agricultural, commercial, and industrial purposes. Botswana is generally a dry country, with little surface water except in the north and east. The country has two main perennial rivers: the Okavango River and the Chobe River in the north. The Okavango River flows from the Angolan highlands down to the Delta in Botswana. The Chobe River flows into the Zambezi River. Other rivers are seasonal flows since there is little rainfall in the river courses. The Limpopo River and its tributaries flows from the eastern border between Botswana and South Africa. Surface water resources are the main source of water supply for urban areas. Water from dams and rivers supplies one-third of national water consumption. Gaborone dam is the largest with a storage capacity of 141.4 million m³. In Botswana, groundwater is a very important water resource for agriculture, the mining industry, and rural water supply particularly in the central and western parts of the country.

Water demand is projected to increase to 186.5 million m³ per annum by 2035 (compared to about 88.3 million m³ per annum in 2005). Thus, the yields from the existing dams are lower than forecast water requirements.

Various state agencies are involved in the water sector. The Ministry of Mineral Energy and Water Resources (MMER) has responsibility for policy in the sector. DWA is responsible for supplying groundwater to major villages and all smaller settlements through the District Councils. Most of the rivers in Botswana (the Okavango, Zambezi, Orange, and Limpopo) are trans-boundary resources. These river basins are managed and supported technically by commissions established by the riparian states. The Permanent Okavango River Basin Water Commission (OKACOM) was created in 1994 by Botswana and Namibia, and the agreement to establish the Zambezi Watercourse Commission (ZAMCOM) was signed in 2004 by the eight riparian states sharing the basin. The Orange/Senqu River Basin Commission (ORASECOM) was created in 2002 by Botswana, Lesotho, Namibia, and South Africa, while the agreement to establish the Limpopo River Basin Commission (LIMCOM) was signed in 2004 by Botswana, Mozambique, South Africa, and Zimbabwe.

Water Supply

Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. According to the World Health Organization (WHO), in 2010, 99% of the urban population in Botswana was using improved drinking water sources, while the figure for rural areas was 92%; nationally, the percentage was 96%. However, water supply is not provided round the clock in all service areas due to the shortage of water resources.

WUC only supplied potable water to towns and cities until 2009. Implementation of water sector reforms in 2009 led to WUC supplying potable water to villages as well wastewater services throughout the country.

Botswana is largely a dry country that relies heavily on groundwater for water supplies for domestic, agriculture, and industrial uses. Groundwater supplies an estimated 80% of the country's water supply needs. Most rural villages are wholly dependent on groundwater as is the mining industry. There are more than 25,000 officially registered boreholes in Botswana of which 10,000 are owned by the government. Surface water is also utilized for water supply to meet the increased demand for water through the building of reservoirs and dams. A list of dams developed in Botswana for water supply follows.

Dam	Capacity (Mm ³)	Yield (Mm ³ /Annum)	Supply Region
Gaborone	141.4	9.4	Greater Gaborone
Letsibogo	100	30.8	Eastern Corridor through NSC
Shashe	85	25.3	Francistown cluster
Ntimbale	26.4	2.95	North East and Tutume Sub District
Bokaa	18.5	4.9	Greater Gaborone
Nnywane	2.3	1.9	Greater Gaborone
Total	373.6	75.25	

Source: Ministry of Mineral Energy and Water Resources, 2012

Irrigation

Irrigation is an important issue for agricultural land that receives inadequate rainfall. Three dams have been designed for multipurpose use: (i) Lotsane, with a capacity to irrigate 350 ha, has been completed; (ii) Thune, with a capacity to irrigate 350 ha, is under construction; and (iii) Moseitse, with a capacity to irrigate 300 ha, is still in the development pipeline.

The Boteti River, south of Maun, which started to flow again in 2008 after more than 20 years of not flowing, has enough water to irrigate quite a large number of hectares. To date, 180 ha of suitable land has been identified. Bids are now sought from those interested in investing in the irrigation project.

Another planned source of water is extraction from the Chobe/Zambezi Rivers. Negotiations with the other riparian nations for acquisition of this resource has been concluded and a maximum of 495 million m³ can be drawn off; about 150 million m³ will ultimately be required to meet national demand, while the balance will be used for agriculture. It is expected that over 30,000 ha will be irrigated in the Pandamatenga area of Chobe District.

The Ministry of Agriculture has made a decision try to utilize existing wastewater for irrigation purposes. AfDB has agreed to provide grant for a feasibility study to assess all "gray water" sources in Botswana. They will also make recommendations for use and the design of wastewater-related projects nationwide.

Various state agencies are involved in the irrigation subsector. The Ministry of Agriculture has the responsibility to develop irrigation policy and strategy in Botswana. The agricultural sector is composed of two distinct farming systems, commercial and traditional systems that both engage in crop and livestock production. The difference between commercial and traditional farming is based on land tenure, the use of technology, and marketing as opposed to the consumption of production. No recent figures on irrigation technology are available, but in 1992, 15% of the equipped area used surface irrigation, 65% used sprinkler irrigation, and 20% localized irrigation. Generally, irrigation is used for the production of vegetables and citrus crops. Depending on the amount of flooding, there are up to 6,500 ha of recession agriculture in the North West and Chobe districts, along the Okavango and Chobe Rivers. The country has 2.9 km³ of renewable water resources, 46% of which are used for agriculture.

2. Bottlenecks and Major Development Issues

Water Resources

The surface and groundwater resources of Botswana are limited and available resources are under pressure compared to those in other Southern African countries due to arid climatic conditions and the location of surface watercourses. Very limited groundwater recharge along with low and variable rainfall and high rates of evaporation make the resource finite and nonrenewable. The National Water Master Plan of 2006 called for water demand management because about 46% of the country's developed water resources are wasted through losses and inefficient water use.

Water Supply

Botswana has a very limited water supply that is inadequate for its increasing population, and this shortage is exacerbated by periodic droughts. Water losses in the distribution system (reported to be between 18% and 90% by DWA and the Water Utilities Corporation) need to be reduced and water use efficiency in the industrial and institutional sectors needs to be increased.

The water lost through pipe leakages, pipe bursts, and unaccountable water use amounted to 24% of total use in 2007. The Government of Botswana therefore decided to install prepaid water meters in major villages and rural communities across the country in an attempt to reduce wastage. Unfortunately, the rural water supply remains unstable due to a deterioration of utilities and recurrent droughts. The tariff cannot support WUC operations, and needs to be increased gradually to an economic level. The government subsidy for the water supply sector is about 40%

Irrigation

The main vegetables produced under irrigation are cabbage, green mealies, tomatoes, spinach, carrots, and onions. Yields are only about 50% of potential, a consequence of unskilled farmers and maintenance personnel. Constraints facing irrigation operation and maintenance include the lack of management and operational skills, and a shortage of spare parts for irrigation systems. Technical assistance is needed to improve the skill levels of ministry personnel, farmers, and others in the irrigation field. Assistance could entail the stationing of skilled personnel in Botswana to assist all sectors. There is currently about 2,000–3,000 ha of irrigated land in Botswana, mostly small-scale. The Ministry has eight professional irrigation officers with a BSc in Soil and Water Conservation Engineering and only one irrigation engineer at managerial level.

About 13,000 ha have been identified as suitable for irrigation on the basis of soil and water availability in the Limpopo, Okavango, and Chobe River basins. However, this figure is based on major surface water resources and thus does not take into account the potential for small-scale irrigation from minor surface water or groundwater resources both of which are limited by climate, hydrogeology, and topography. From the 1,439 ha (2002) developed for full/partial control irrigation, only about 620 ha were irrigated in the dry season. The rest were not being irrigated owing to factors such as a lack of water, poor marketing, and the high cost of irrigation.

H.2 Water Sector Review / Malawi

Country	Malawi	Capital	Lilongwe
Corridors	Dar es Salaam, Nacala		
Sources	Documents from the Ministry of Agriculture and Water Development (MAWD), Department of Water Resources; the Ministry of Agriculture and Water Development, Department of Irrigation Services; the Lilongwe Water Board; the Blantyre Water Board; the AfDB Malawi Country Office; WHO; and SADC		

1. Current Status/General Background

Water Resources

Water availability is an important issue that affects economic activities of a corridor. Total water availability per capita in Malawi is 1,164 m³. Per capita groundwater availability is 193 m³. Mean annual rainfall is 1,181 mm, ranging from 725 mm in the low-lying area to a maximum of 2,500mm/year in the south and northern highlands areas. Over 95% of the rainfall occurs during the rainy season (November to April).

The only comprehensive dam records were made during the National Water Resources Master Plan Study in 1986, which came up with a total of 749 impoundments, the majority of which (over 60%) were in the South Rukuru and Ruo River basins. Most of these dams were constructed in the 1950s mainly to supply drinking water for livestock. The dams that can be classified as large ones in Malawi have mainly been developed by Water Boards for urban water supply. These include: (i) Lunyangwa Dam in Mzuzu, (ii) Chitete Dam in Kasungu, (iii) Kamuzu I and II Dams in Malingunde, Lilongwe; (iv) Mpira Dam in Ntcheu; (v) Mulunguzi Dam in Zomba; and (vi) Mudi Dam in Blantyre.

Groundwater resources are also important in Malawi. The Dispersed Borehole Construction Programme is solely funded by the Government of Malawi in an effort to achieve the Millennium Development Goal of halving the population without access to potable water by 2015. The Lilongwe West Groundwater Project has been funded with Japanese grant assistance. The project has drilled a total of 296 boreholes in Lilongwe West.

The Department of Water Resources is responsible for water resource development and management in Malawi. It performs the following functions: (i) monitoring and assessing the availability of surface and groundwater resources both in terms of quantity and quality, (ii) coordination and carrying out of the planning, development and management of surface water and groundwater resources through dams, boreholes, and shallow wells; and (iii) assisting the Water Resources Board in the administration of the Water Resources Act and water rights, wastewater discharge permits, and the like.

The Zambezi River and Rovima River are shared with other countries. The Zambezi River Basin is managed by the ZAMCOM.

Water Supply

Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. According to WHO, 95% of Malawi's urban population used improved drinking water sources in 2010, while the figure for rural areas was 80%; nationally, the percentage was 83%. However, water supply is not provided round the clock in all service areas due to the shortage of water resources.

Lilongwe is capital city of Malawi located in the center of the country along the Nacala Corridor, while Blantyre is the country's second largest city, located in southern Malawi, along the Nacala Corridor. The Lilongwe Water Board (LWB) and Blantyre Water Board (BWB) distribute potable water in these urban areas and their surroundings.

LWB's five-year plan (2012–2017) aims to improve the supply of water to the city of Lilongwe and the surrounding area. The total population of Lilongwe is about 900,000, but the service population is only about 600,000, implying a present service population rate of about 67%. A service rate of 100% is targeted by 2035 with investment in infrastructure. LWB has a total of 42,000 house connections. The

non-revenue water ratio is 33% at present, with the target set at 25%. Water resources are supplied by Kamuzu Dams 1 and 2 on the Lilongwe River.

The Blantyre Water Board aims to meet the current and projected demand of Blantyre and its surrounding areas. The total population of Blantyre and the surrounding area is about 880,000, and the present service population rate is about 90%. House connection numbers total 34,000. The non-revenue water ratio was 37% in 2012 after implementation of a European Union/European Investment Bank project that has reduced it from 52% in 2009; a target of 25% is to be achieved in 2013. Water resources are taken from the Walker's Ferry raw water intake on the Shire River (elevation 350 m) and sent to the Blantyre (elevation 1,200 m) via 26-km transmission mains. Distribution pipes that were installed in Blantyre in the 1970s and 1980s were made mainly of asbestos cement.

A 2008 study (*Saving Community Water Kiosks in Malawi*, by Water Aid/Frank Lawson) found that about 53% of households bought water from kiosks located within their areas, 26% had individual connections, 13% bought water from another house plot, 2% had shallow wells on their plots, and 5% drew water from other sources such as boreholes and streams.

Irrigation

Irrigation is an important issue for agricultural land that receives inadequate rainfall. Recent data showed a total irrigated area of 93,000 ha, including 43,000 ha in smallholder farmers and 50,000 ha in estates. This area was to increase to 200,000 ha with implementation of a Green Belt Initiative. Smallholder farmers have land of 0.3–0.5 ha, with rice as the main crop. Commercial holders (estates and individual farmers) average 1,200 ha and 1 ha, respectively, and the main crop is sugarcane

The Ministry of Agriculture and Water Resources, Department of Irrigation is responsible for developing irrigation policy and strategy in Malawi.

The National Irrigation Policy and Development Strategy of 2001 was being revised in 2012 and awaits cabinet approval. The Government of Malawi has embarked on large-scale irrigation development based on the Malawi Growth and Development Strategy (MGDS). In addition, the following irrigation projects are being implementing to develop the irrigation schemes:

- (i) the Green Belt Initiative (GBI), which aims to develop 72,040 ha by 2016, with funding from the Government of Malawi;
- (ii) the Smallholder Crop Production and Marketing Project (SCPMP), which aims to develop 1,671 ha by the end of 2012, funded by AfDB grant aid;
- (iii) the Irrigation Rural Livelihood and Agricultural Development Project (IRLDAP), to rehabilitate four government schemes totaling about 1,797 ha, and construct 560 ha and 127 ha of small- and mini-scale irrigation schemes, respectively, by June 2012, financed by the World Bank and the International Fund for Agricultural Development (IFAD);
- (iv) the Small Farms Irrigation Project (SFIP), to construct two irrigation schemes covering 1,660 ha, and provide training of staff and farmers and establish water users associations, funded an Arab Bank for Economic Development in Africa (BADEA, from the French acronym) loan;
- (v) the Malawi Irrigation Development Support Programme (MIDSUP), to develop 900 ha of irrigation land and train farmers by 2015, funded by the Government of Malawi;
- (vi) the Agriculture Infrastructure Support Project (AISP), to develop 2,330 ha for irrigated sugarcane and various crops by 2014, funded by AfDB grant aid;
- (vii) the Development of Medium Scale Irrigation Project (MIDP), to develop of 100 ha in Machnga and Mulanje districts by 2014, funded by JICA grant aid, and
- (viii) the Rural Infrastructure Development Programme (RIDP), to build administrative capacity for the development of irrigation by 2015.

2. Bottlenecks and Major Development Issues

Water Resources

According to monitoring data of the Department of Water Resources, the water level of Lake Malawi has been decreasing every year recently. Over the last decade it has decreased about 1 m during the high water level season (April) and 60 cm during the low water level season (December). The Shire River, the main outflow of Lake Malawi, is the most important watercourse in the country. Control of the water level of Lake Malawi is the most effective measure to promote Shire River development. Groundwater resources are usually found in a weathered fracture zone 20–30 m below the surface and alluvial deposits with small yields (0.25–0.50 l/s). Therefore, most urban water supply systems use surface water, while groundwater can be used for rural water supply through with hand pumped boreholes. A major issue regarding groundwater is the high salinity in the alluvial aquifer in the Lower Shire valley.

Water Supply

LWB faces both financing and technical bottlenecks. The water board has low operating tariffs compared with its operating costs, which limits its capacity to rehabilitate and extend plant and network systems. Also, increased vandalism has led to a loss of water and non-revenue use. Consequences of the lack of an adequate investment budget include physical leakage from the distribution network and limited water sources compared with demand.

BWB also faces financing and technical bottlenecks. The water board is paying MWK 125 million (43% of total operating cost) for power due to the high heads for the pumping of raw water (850 m pump heads from water intake to reservoir). Some of the infrastructure dates back to 1963 and most requires maintenance. While water demand has been increasing, investment in infrastructure has lagged. The water supply service time is limited due to a shortage of water resources. A so-called Joint Sector Review report noted that in Blantyre only 30% of the service area had 24-hour supply, while 18% of the service area receives water for 18–24 hours, 31% receives water for 12–18 hours, and 21% receives water for less than six hours per day.

In addition, only 63% of water points in Malawi are functional. Investment in existing water and sanitation infrastructure is required in both urban and rural areas.

Irrigation

Irrigation bottlenecks include mainly administrative and financing matters. Administrative issues relate to inadequate capacity to implement irrigation programs (e.g., an inadequate number of trained personnel, high job vacancy rates in the public sector). Financing issues relate to the low investment in irrigation development. Only 93,000 ha have been developed out of a potential of over 400,000 ha. The inability of farmers to meet operating and maintenance costs especially for pump-based schemes is an issue; some farmers are unable to buy fuel and spare parts, or pay pump maintenance costs

Other bottlenecks include the lack of sufficient water resources in most of bodies of water due to effects of climate change and environmental degradation. This leads to underutilization of the irrigated area. Also, in some areas, landowners are unwilling to let their land be used for irrigation.

H.3 Water Sector Review / Mozambique

Country	Mozambique	Capital	Maputo
Corridors	Beira, Maputo, Nacala		
Source	Documents from ARA-Sul (Administração Regional de Águas Sul); Technical Department, Ministry of Agriculture; National Directorate of Agrarian Services; SADC; FAO;and WHO		
<p>1. Current Status/General Background</p> <p><u>Water Resources</u></p> <p>Water availability is an important issue that affects economic activities of a corridor. Total water availability per capita in Mozambique is 9,699 m³. Per capita groundwater availability is 940 m³. Mean annual rainfall is 1,032 mm, ranging from 500 mm in the low-lying southern area to a maximum of 2,500 mm/year in the northern highlands.</p> <p>The water resources development potential of Mozambique is relatively high compared to that of other Southern African countries. However, climate variability is high, with periodic severe floods and droughts. The country has several perennial rivers. Most of its major rivers flow across national boundaries, e.g., the Zambezi, Save, Buzi, Rovuma, Maputo, Umbeluzi, Limpopo. The Zambezi River Basin is managed by the ZAMCOM, while the Limpopo River Basin is managed by the LIMCOM. The agricultural sector (mainly irrigation) accounts for 81% of total water consumption, while domestic water supply accounts for about 17% and industry use for 2%. The groundwater potential is considerable and lies in the alluvial formation of the various rivers. However, the Limpopo River Basin in Mozambique has low potential because of poor water quality with high conductivity.</p> <p>Various state agencies are involved in the water sector. The National Water Directorate (DNA, Direcção Nacional de Águas) is responsible for water resource development and management. The Mozambican National Urban Water Investment and Asset Holding Fund (FIPAG) is water authority that manages, operates, and maintains the country's urban water supply system. There are five regional Water Management Units (ARA, Administração Regional de Águas) for bulk water provision and large dam management. The water resources management organization ARA-Sul under the Ministry of Public and Housing is responsible for providing water resources to all economic and social sectors in southern Mozambique, with its service area including the provinces of Maputo, Gaza, and Inhambane. The Maputo water supply company has responsibility for providing irrigation water resources in its service area.</p> <p><u>Water Supply</u></p> <p>Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. According to WHO, 77% of Mozambique's urban population used improved drinking water sources in 2010, while the figure for rural areas was only 29%; nationally, the percentage was 47%, significantly less than the MDG target of 70%. The urban water supply systems, established and managed by FIPAG, consist of treatment facilities and distribution systems with house connections and/or kiosks. In general, water resources are supplied by ARA from dams through conveyance pipes as bulk water. The rural water supply systems are managed and operated by community level water user's associations that operate boreholes equipped with hand pumps or small diameter water supply systems.</p> <p><u>Irrigation</u></p> <p>Irrigation is an important issue for agricultural land that receives inadequate rainfall According to the FAO, the total potential irrigation area of the country was about 118,120 ha, 34% of which was actually irrigated, mainly with large schemes of over 500 ha. Of the area actually irrigated, 50% use sprinkler irrigation, 42% used surface irrigation, and 8% used drip irrigation. The main irrigated crops are sugar cane, rice, citrus, and vegetables. Irrigation mainly depends on surface water stored in dams, while other water sources for irrigation include boreholes and shallow wells, used by smallholders.</p>			

Various state agencies are involved in irrigation in Mozambique. The Ministry of Agriculture is responsible for developing policy and strategy of the irrigation sector. The investment plan framework for the irrigation sector is prepared based on the ten-year development strategy (May 2011). The Ministry of Agriculture convened a conference for its investment plan in August 2012. Others involved in the irrigation sector include the Ministry of Industry, the Ministry of Public Works, and the private sector.

The investment plan framework consists of two five-year phases. Total cost is estimated at USD 1,248 million. Irrigation schemes already financed by international development partners included USD 90 million by the World Bank, USD 40 million by AfDB, and USD 20 million by BADEA. Investment comes not only from the public sector, but also from the private sector, including combination public-and private-sector investment. Irrigation schemes developed cover a total 80,000 ha, including water intakes.

2. Bottlenecks and Major Development Issues

Water Resources

Most major rivers in Mozambique are located downstream of shared river courses. The shared river courses in SADC countries are managed by river basin organizations such as ZAMCOM. The management of shared river courses is of particular importance for Mozambique, especially considering floods such as that in January 2012 in the low land in the southern part of the country. Water resources development potential in Mozambique varies considerably by time period and location because of the uneven distribution of rainfall and water resources. Northern Mozambique receives 1,000–2,500 mm of annual rainfall, but Southern Mozambique receives 400–1,000 mm. About 60%–80 % of annual rainfall falls from December to March.

Water Supply

The percentage of population with improved drinking water resources in most SADC countries exceeds 95% in urban areas and 70% in rural areas, but in Mozambique has the percentage in 2010 was only 77% for urban areas and 29% in rural areas. Rehabilitation and expansion of the water supply systems is required in both urban and rural areas from the viewpoint of basic human needs. In addition, the development of new water resources is required for urban water supply systems considering that the water demand of urban areas will increase as economic activity increases. Another bottleneck of the urban water supply is the high ratio of non-revenue water; because of poor operation management, physical water losses in the deteriorated distribution networks and illegal connections.

Irrigation

A major issue concerning irrigation projects is the limited number of general contractors, especially those capable of constructing irrigation infrastructure in remote locations. Accordingly, the Ministry of Agriculture has proposed capacity building for small-scale general contractors, including training in operations and maintenance of construction machinery, and preparation work for tendering. Enhancement of irrigation management/water use management is also required due to the poor quality of irrigation operations and maintenance.

H.4 Water Sector Review / South Africa

Country	South Africa	Capital	Pretoria
Corridors	Maputo, North-South, Trans-Kalahari		
Sources	Documents from the Water Resources Commission (WRC), Department of Water Affairs (DWA) and Department of Agriculture, Forestry and Fisheries; Directorate of Water Use and Irrigation Development; City of Tshwane; Orange-Senqu River Commission (ORASECOM); the World Bank's South Africa Office; WHO; and SADC		

1. Current Status/General Background

Water Resources

Water availability is an important issue that affects the economic activities of a corridor. Total water availability per capita in South Africa is 1,007 m³. Per capita groundwater availability is 103 m³. Mean annual rainfall is 495 mm, ranging from 100 mm in the southwest to a maximum of 750 mm in the northeast. Over 90% of the rainfall occurs during the rainy season (October to April).

Most of the major rivers in South Africa (the Orange-Senqu, Buzi, Rovuma, Maputo, Umbeluzi, and Limpopo) are shared with other countries. The Orange-Senqu Basin is managed by ORASECOM, while the Limpopo River Basin is managed by LIMCOM. The largest is the Orange-Senqu River Basin, which originates in the Lesotho Highlands in Lesotho, and extends through South Africa, Botswana, and Namibia, from where it drains into the Atlantic Ocean. About 64% of the Orange-Senqu River Basin is in South Africa. Mean annual rainfall in the river basin is 365 mm. The annual runoff in South Africa is 53% of the basin's total (12,000 million m³). The Limpopo River basin has an annual runoff of 5,100 million m³ in South Africa; it drains into Indian Ocean through Mozambique. South Africa has 193 major dams (i.e., of more than three million m³), with total dam capacity estimated at 28,350,208 million (28.35 billion) m³.

Groundwater is an important water source in South Africa. Most groundwater is pumped up in limited quantities from fractured rock formations. Sandstone aquifers are distributed along the restricted area of the west and south coasts. Over 190,000 boreholes were confirmed in South Africa by a SADC study, and these are utilized mainly for rural water supply. The Department of Water Affairs and Forestry (DWAF) prepared the National Water Resource Strategy (NWRS) in 2004 based on the requirements for integrated water resources management (IWRM) and the National Water Act (Act 36 of 1998). The NWRS recommended management and conservation of water resources by several methods. The most important requirement for water resources management is water demand management and conservation due to the country's limited water resource potential. In a recent year total water use amounted to 18,965 m³, with irrigation accounting for 80%, domestic use for 11%, and industrial including mining for 9%.

The WRC, established under the Water Research Act (Act No 34 of 1971), undertakes water resources research activities for DWAF. It is a semi-independent agency, but reports to the Minister of Water Affairs. Its 2012 budget was ZAR 180 million (20% of overheads and 80% for research cost), 10% of which is funded by international development partners (e.g., the UN Educational, Scientific and Cultural Organization, UNESCO; the UN Environment Programme, the Bill and Melinda Gates Foundation). Research is carried out via contracts with consultants and universities under the guidance and management of the Research Manager of WRC. Contractors are selected based on technical proposals. About 300 research projects per year are carried out under the management of 15 research managers. The research covers (i) water resources management, (ii) water-linked eco-systems, (iii) water use, and (iv) water for agriculture.

Water Supply

Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. Various state agencies have responsibility for water supply. DWA is responsible for developing policy and strategy, as well as leading and regulating the water sector in South Africa. It performs its functions based on the National Water Act (1998) and Water Services Act (1997). It is involved in the national planning of water resources and controls all water use in the

country and development of infrastructure. Water Services Authorities (WSAs) are responsible for the delivery of water services to their customers. Water Service Providers (WSPs) provide water and sanitation services for municipal governments.

DWA oversees and regulates 166 water service authorities in the country. It plans and reviews infrastructure projects for each water service. It prepares a database for project monitoring. DWA owns most of the country's large-scale dams and national water transfer schemes. The Regional Water Boards are the large bulk water providers. Irrigation Boards manage regional bulk water supply to Water Users Association. Municipalities are responsible for water supply in cities and towns.

According to WHO, 99% of South Africa's urban population used improved drinking water sources in 2010, while the figure for rural areas was 79%; nationally, the percentage was 91%.

In South Africa, free basic water (FBW) and sanitation services are provided to all households below the poverty line. According to DWA, 86% of the population was served with FBW in 2011. DWA focuses on the development of old homeland areas (poor areas), which have not been meeting the 2014 targets of the five-year water services development plan.

In July 2012 DWA prepared the Provincial Infrastructure Project Workbook for Ngaka Modiri Molema District Municipality prepared DWA with funding from a regional bulk infrastructure grant (RBIG) because the District Municipality lacked sufficient planning capacity.

The current status of regional bulk water projects along the North-South Corridor (i.e., the N1, N3, and N4 corridors, in Limpopo Province, North West Province, Free State Province, Mpumalanga Province, Kwazulu Natal Province) has been summarized for the current study by DWA, Water Service Planning and Infrastructure. A total of 72 regional bulk water projects have been identified, 27 of which were reported as at the conceptual stage, 16 at the feasibility study stage, 4 at the design stage, 12 awaiting funding, and 13 at the construction stage. The projects are funded through RBIGs. The main components of the regional bulk water projects include water pipeline installation (70%) and reservoir construction (14%), while other include treatment utilities and reticulation. Projects are classified as new infrastructure and rehabilitation, with about 54% in the former category.

Irrigation

Irrigation is an important issue for agricultural land that receives inadequate rainfall. About 1.6 million ha are irrigated (2012), with the areas under irrigation covering about 20%–25% of total agricultural land. DWA allocates water for irrigation. It is currently negotiating a deal that will allow for the acquisition of water for 30 ha or less without a license. The main irrigated crops are lucerne, wheat, maize, vegetables, pastures, and grapes. Western Cape Province has the largest irrigation area in South Africa.

Major irrigation schemes and development plans along economic corridors include the following:

- (i) the North South Corridor: the Limpopo Irrigation Scheme (the Food and Agricultural Organization, FAO, estimated the irrigation potential of the Limpopo basin to be 131,500 ha in South Africa).
- (ii) the Maputo Corridor: the Makhathini Master Plan has been prepared for the development of agricultural areas in the municipalities of Jozini and uMhlabuyalingana in the uMkhanyakude District Municipal Area; and
- (iii) the Trans-Kalahari Corridor: the Vaalharts/Taung Irrigation Scheme, the largest irrigation scheme in South Africa, covers about 36,000 ha.¹

¹ According to the Final Report of the Feasibility Study and Business Plan on the Rehabilitation/Upgrading of Bulk Water Infrastructure within the Vaalharts/Taung Irrigation Region, August 2011, 15,000–25,000 work-months will be created).

At present about 50,000 small-scale irrigation schemes are operated. In March 2007, WRC published *A Rough Guide for Irrigation Development Practitioners* for the participatory revitalization of smallholder irrigation schemes.

The Ministry of Agriculture is responsible for developing policy and strategy for the irrigation sector in South Africa.

2. Bottlenecks and Major Development Issues

Water Resources

According to DWA, total available water resources are larger than total water requirements at the national level. However, available water resources do not reach the water requirements in half of the country's water basins. Water requirements are influenced by population and economic activities. Therefore, the Government of South Africa has proposed a water demand management project in 62 urban centers as its member state priority number one project for SADC water sector infrastructure development.

Old, abandoned mines (e.g., more than 100-year-old gold fields) create a risk of the flooding of mine water into the environment. Groundwater levels will reach the surface within some years. Mine water has high salinity and is strongly acidic (pH 2). Water spilling out of mines is a major concern in Johannesburg. The World Bank is working with DWA, the Department of Finance, and the Trans Caledon Tunneling Authority to address this pollution issue with technical assistance.

Water Supply

DWA is seeking official development assistance due to its lack of funds for development and rehabilitation for bulk water development and water service. Infrastructure problems have developed as a consequence of the lack of investment for many years due to funding constraints. The National Water Infrastructure Framework indicates that ZAR 600 million is required over the next 10 years, but only half of this required amount is available. Operation and maintenance problems frequently arise in the water supply system due to a lack of funds for maintenance. A 2011 WRC estimated non-revenue water in South Africa is at 36.8%, varying from 20% to more than 50% depending on the operation and management conditions of the municipality.

Currently, non-revenue water for the City of Tshwane (Pretoria) is 25.6%, which is below the estimated national average based on 2010/2011 data from DWA. In order to reduce non-revenue water by 1% per year using technical water demand management interventions will require significant budget, dedication of the entire Water and Sanitation Division, and support and buy-in from the other departments and divisions.

In 2010, DWA instructed water users from the Integrated Vaal River System (including the City of Tshwane) to lower the total projected water demand for 2015 by an average of 15%. Other municipalities will have to reduce their projected demand by more than 15% and some less. Based on 2008-2009 data, the City of Tshwane was instructed to reduce its total projected water demand for 2015 by 7%.

Irrigation

Generally, irrigation water availability is decreasing due to inadequate rainfall, conveyance loss of transferred water, and increasing water demand. Fruits and vine products are the main agricultural export products of South Africa. In the southern coastal area, the rainfall season is from May to August (winter season). However, fruits and vineyards require water from October to March (summer season). Accordingly, it is a major development issues to secure water in the summer season in the southern coastal area.

H.5 Water Sector Review / Zambia

Country	Zambia	Capital	Lusaka
Corridors	Dar es Salaam, Lobito, North-South, Trans-Caprivi		
Sources	Documents from the Ministry of Local Government and Housing (MLGH), Department of Housing and Infrastructure Development; Ministry of Agriculture and Livestock, Department of Agriculture; Lusaka Water and Sewerage Company (LWSC); AfDB's Zambia Office; SADC,FAO; and WHO		

1. Current Status/General Background

Water Resources

Water availability is an important issue that affects economic activities of a corridor. Total water availability per capita in Zambia is 8,336 m³. Per capita groundwater availability is 1,477 m³. Mean annual rainfall is 1,020 mm, ranging from 250 mm in the southern area to a maximum of 2,500 mm in the northern area. Over 90% of the rainfall occurs during the rainy season (November to March).

The National Water Policy 2010 estimated that Zambia's annual renewable surface water to be 100 km³ per year and annual renewable groundwater potential of 49.6 km³. Zambia's two main river basins are of the Zambezi and Congo Rivers. ZAMCOM is the management body for the Zambezi. Zambia has built five large dams and has about 1,700 small dams, although there is considerable potential to development additional facilities. The largest surface body of water is the Kariba dam reservoir on the Zambezi River, which is shared with Zimbabwe. Total reservoir capacity at maximum retention level is about 185 × 10⁹ m³. The hydropower capacity of the Kariba dam is 720 MW at the north bank (the Zambia side) and 750MW at the south bank (the Zimbabwe side). A nationwide inventory carried out by the Government of Zambia estimated that are 11,000 boreholes and 22,000 protected wells in the country (1998). The 2000 Census Report of Zambia estimated average water supply at 49.1% and access has not increased significantly from this level. According to the National Irrigation Strategy and Plan, the potential area for irrigation is about 400,000 ha, but total irrigated area is estimated at about only 100,000 ha.

Various agencies are in charge of water resources in Zambia. The Ministry of Mines, Energy and Water Development is responsible for policy in the water sector. The National Water Policy 2010 prepared by the Ministry of Mines, Energy and Water Development revised the National Water Policy 1994. The revised National Water Policy embraces modern principles of water resources management and endeavors to deal with the daunting challenges of poverty reduction.

Water Supply

Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. Water supply infrastructure is old and malfunctioning in urban water supply areas as a result of a lack of investment in distribution networks over the past three decades. However, demand from urban areas along corridors has been increasing and service ratios are low. The service ratio of water supply is low even in Lusaka, which has a population of 2.0 million but a service population of only 1.6 million in 2011. Also, there are many physical losses to the system and commercial water losses, with unaccounted-for-water estimated at about 47% in 2010.

According to WHO, 87% of Zambia's urban population used improved drinking water sources in 2010, while the figure for rural areas was 46%; nationally, the percentage was 61%, significantly less than the MDG target of 70%.

Kiosk systems are operated for to supply safe water to poor housing areas. The Lusaka Water and Sewerage Company (LWSC) initiated a prepaid meter system pilot project in 2008. LWSC plans to extend this pilot project to government offices since the government is sometimes late in paying water fees due delays in budgetary allocations.

Rural water supply projects are undertaken with the assistance of development partners. However, rural areas have not had sufficient funds for investments in water supply. The rural water supply system is mainly composed of boreholes with hand pumps, without a distribution network. All projects

have been carried out with grant assistance (e.g., from JICA in Luapula Province, from AfDB in Northern Province).

Various agencies have responsibility for irrigation in Zambia. The National Water Supply and Sanitation Council (NWASCO) seeks to improve sector performance. The Department of Housing and Infrastructure Development, Ministry of Local Government and Housing (MLGH), is responsible for rural and urban water supply.

Irrigation

Irrigation is an important issue for agricultural land that receives inadequate rainfall. The total irrigation area is about 182,000 ha. About 75% of irrigation schemes are for commercial base farming and 25% for smallholder farmers. The main crops are wheat, maize, cotton, soybeans, tobacco, vegetables, coffee, rice, and sugarcane. There are 1,990 small dams for irrigation use. The Northern Province has abundant rainfall, while the Western Province has less rain. Productivity is highest in the Copperbelt Province.

The agricultural land use pattern has been divided into three Agro-Ecological Regions by the Technical Services Branch of the Department of Agriculture (1997) since agriculture in Zambia mainly depends on rainfall and soils. Agro-Ecological Region I is characterized by low rainfall (less than 800 mm per year), located in southern Zambia, has a relatively short growing season, generally 80–120 days. Agro-Ecological Region II, in central Zambia, the area of the country with the most fertile soil, receives 800–1,000 mm of annual rainfall and has a growing season of 100–140 days. Agro-Ecological Region III, in northern Zambia, receives 1,000–1,500 mm of annual rainfall and has a growing season of 100–140 days. However, soil acidity and texture limits production to a few tolerant crops, unless liming is practiced.

Various agencies are responsible for irrigation in Zambia. The Ministry of Agriculture and Livestock's Department of Agriculture is responsible for developing sector policy and strategy.

The World Bank has financed bulk water irrigation infrastructure development under the Irrigation Development Support Project (IDSP). The project objectives are to increase yields per hectare and the volume of products marketed by smallholders benefitting from investments in irrigation in selected sites. Project components include: (i) irrigation agriculture support services, (ii) public infrastructure provisions, (iii) private and cooperative investment, and (iv) management and coordination. The project duration is from 2011 to 2018, with the World Bank providing USD 115 million and the Government of Zambia providing 85 million. Phase 1 of the project covers 10,000 ha in the Copperbelt, Central, and Lusaka Provinces, while Phase 2 will cover sites in the North Western, Central, Muchinga, and Eastern Provinces.

2. Bottlenecks and Major Development Issues

Water Resources

Annual rainfall in the south of the country, at 250 mm. Such low precipitation often results in droughts that adversely affect the rainfed agriculture prevalent in southwestern Zambia (this part of the country lacks sufficient irrigation facilities). Since internationally shared watercourses in Southern Africa are managed by the SADC protocol on shared watercourse systems, Zambia has no water conflicts with other countries on its three shared international surface water resources (i.e., the Zambezi River, the Congo River, and Lake Tanganyika).

Water Supply

Currently, a bottleneck/constraint in Lusaka water supply is insufficient system capacity compared with potential demand. There has not been any investment in distribution networks and water resources over the past three decades. On the other hand, water demand has increased rapidly with urbanization and industrialization. The high level of non-revenue water (estimated at about 47% in 2011) is also a major issue; the main causes are pipe bursts, leakages in service mains, malfunctioning meters, leaking storage reservoirs, unmetered connections, water theft, illegal connections, and errors in data handling. In response, the Government of Zambia and the Millennium Challenge Corporation of the United

States agreed in March 2012 to implement a US\$355 million “compact” grant project to improve water service, sewage, and drainage in Lusaka. The budget for the water supply sector portion of the project was estimated at about US\$103.9 million. The project is focused on the rehabilitation of Lusaka’s water treatment works, distribution mains and systems, pumping stations, and distribution centers. This project also includes a non-revenue water reduction program. The detailed design of this urgent project is expected to be completed by April or May 2013, with project completion scheduled in 2018.

Irrigation

Generally, irrigation water availability is decreasing due to inadequate rainfall and the deterioration of irrigation utilities. It is difficult to maintain good operation and maintenance of irrigation infrastructure because there has not been any investment for a long time. Although many irrigation development feasibility studies have been carried out, most projects have not yet been implemented due to financial constraints.

H.6 Water Sector Review / Zimbabwe

Country	Zimbabwe	Capital	Harare
Corridors	Beira, North-South		
Source	Documents from the Ministry of Water Resources Development and Management (MWRDM), Department of Water Resources Management; the Ministry of Agriculture and Water Resources, Department of Irrigation; the Zimbabwe National Water Authority (ZINWA); Harare Water; AfDB's Zimbabwe Office; SADC; and WHO		

1. Current Status/General Background

Water Resources

Water availability is an important issue that affects economic activities of a corridor. Total water availability per capita in Zimbabwe is 1,605 m³. Per capita groundwater availability is 127 m³. Mean annual rainfall is 657 mm, ranging from 250 mm in the west to a maximum of 1,250 mm in the east. Over 90% of the rainfall occurs during the rainy season (November to April). Total annual water use in Zimbabwe is 5,750 million m³, of which 60% is used by agriculture, 23% by industry and mining, and 7% by domestic users.

The major river systems in Zimbabwe are the Zambezi, Okavango, Limpopo, Save, and Buzi. These rivers are shared with other countries. The Zambezi River Basin is managed by the ZAMCOM, the Okavango River Basin is managed by OKACOM, and the Limpopo River Basin is managed by LIMCOM. The country has 81 major dams (i.e., with a storage capacity of more than three million m³). The largest surface body of water is the Kariba dam reservoir on the Zambezi River, which is shared with Zambia. Total reservoir capacity at maximum retention level is about 185,000 million m³. The hydropower capacity of the Kariba dam is 720MW at the north bank (the Zambian side) and 750MW at the south bank (the Zimbabwean side). Groundwater availability in Zimbabwe is about 8% of total water availability and mainly occurs in low permeable rocks (61%) and fissured aquifers (24%).

Various agencies have responsibility for water resources in Zimbabwe. MWRDM is responsible for policy in the sector. Water resources development and management is of national interest. MWRDM is to ensure the availability of water to all beneficiaries and the equitable and efficient allocation of the available water resources for the development of all sectors. MWRDM is also responsible for the design, construction, and maintenance of dams. It provides raw water to water supply authorities in urban and rural areas (the price is currently USD 12 /1,000 m³).

ZINWA is the national authority implementing water-related development. ZIMRA's role was established in the Zimbabwe Water Authority Act of 1998 and the Water Act of 1998. Seven catchment areas were established in the country, each with a catchment council as a management body directly under the Ministry of Water Resources Development and Management. A ZINWA manager is assigned for the each catchment council to serve a secretariat function. The water sector in Zimbabwe is stakeholder-driven involving water users (e.g., farmers, domestic users, mining users)..

Water Supply

Water supply has important implications for maintaining basic human needs and economic activities along an economic corridor. According to WHO, 98% of Zimbabwe's urban population used improved drinking water sources in 2010, while the figure for rural areas was only 69%; nationally, the percentage was 80%, which corresponds to the MDG. However, actual water service level is low due to deteriorated infrastructure, a consequence of the lack of investment over the past 20 years. Another issue is the high percentage of non-revenue water (about 57%).

Notably, there was an outbreak of cholera in Harare in 2008 due to the poor operation and maintenance of the water supply infrastructure. The existing water resources of Harare are Lakes Chivero and Manyame, and the Seke and Harava dams are located downstream of Harare. Wastewater treatment plants at Firlie, Crowborough, Hatcliffe, Marlborough, and Donnybrook treat 54 ML/d against a sewage inflow of 219 ML/d. The balance of 165 ML/d flows into the river without proper treatment and eventually reaches the dams.

Beitbridge at the border of Zimbabwe and South Africa is a key location along the North-South Corridor, while Mutare is located on the border with Mozambique along the Beira Corridor. Both cities have water supply problems in terms of quantity and quality

MWRDM's Department of Water Resources Management is responsible for water resource and supply management in Zimbabwe.

Irrigation

Irrigation is an important issue for agricultural land that receives inadequate rainfall. While the irrigation area in the country is estimated at around 210,000 ha, in 2000 the actual operated area was only 80,000 ha (40%) because of operation and maintenance problems. The main water source for irrigation is surface water stored in dams. Other water sources are boreholes, shallow wells, springs, and sand dams. The irrigation sector has mainly used sprinkler and center pivot systems, which require energy as well as the maintenance of pumps and pipelines.

The principal objective of Zimbabwe's irrigation development strategy is to exploit the agricultural production potential of the country to achieve food self-sufficiency at the national level. Specific objectives of the strategy are to rehabilitate and expand irrigated agriculture, improve irrigation water use efficiency, develop irrigation systems, and address waterlogging problems in irrigation areas.

Zimbabwe has a 20-year irrigation development program that consists of two phases. In the short to medium term (2011–2015), it will cover 220,000 ha, focusing on poverty reduction, at an estimated cost of USD 523 million. In the long term it will cover 600,000 ha, developing large-scale irrigation schemes, utilizing water resources taken from trans-boundary water resources such as Zambezi River and Kariba dam, at an estimated cost of USD 1,600 million (1.6 billion).

The Ministry of Agriculture is responsible for developing irrigation policy and strategy, as well as leading and regulating the irrigation sector in Zimbabwe.

2. Bottlenecks and Major Development Issues

Water Resources

There are 81 major dams with a total capacity of about 99,008,400 million m³ in Zimbabwe. However, current utilization of dams is very low due to siltation and poor maintenance. In addition to the low utilization of dams, a large volume of water loss and leakage occurs due to the deterioration of irrigation systems and water supply networks.

Water Supply

Harare is a key location along the North-South Corridor and the Beira Corridor. However, as noted, there was an outbreak of cholera in Harare in 2008 due to poor water supply and sanitation service. Such outbreaks are more likely to occur in cases like Harare in which water supply and sanitation infrastructure has not been maintained in good condition. If a disease outbreak occurs along a corridor, the economic corridor function will be lost. Therefore, the selection of infrastructure projects should take into account the need for clean water.

Currently, the bottleneck/constraint on water supply in Harare is insufficient system capacity, i.e., the demand for water has exceeded supply capacity. Available water times range between 24 hours/day and two days a week. Frequent breakdowns resulting from aging infrastructure lead to frequent power failures. A high level of non-revenue water is also a major issue. The main causes of non-revenue water are malfunctioning meters, leakage, pipe bursts, water theft, and illegal connections.

Irrigation

Most irrigation utilities in Zimbabwe have deteriorated. It is difficult to maintain good operation and maintenance because there has not been any investment for a long time. Although many irrigation development feasibility studies were carried out in the last 10 years, most projects have not been implemented due to financial constraints.

Appendix I Environmental and Social Considerations

I.1 Baseline Features of the Natural and Social Environment in the Focus Countries

The study area covers Southern Africa. The general situation of the natural environment and social environment in the focus countries traversed by the eight priority corridors are shown in Table I.1.

Table I.1: General Situation of the Natural and Social Environment in the Focus Countries

Country	Natural Environment	Social Environment
Angola	<p>Area: 1,246.7 thousand km² Capital: Luanda Angola is located in the Atlantic Ocean Coastal Area and borders the DRC, Namibia, and Zambia. Topographically, Angola has four principal natural regions: an arid coastal lowland, stretching from Namibia to Luanda and characterized by low plains and terraces; green hills and mountains, rising inland from the coast into a great escarpment; a large area of high inland plains of dry savanna, called the high plateau (planalto), which extends eastward and southeast from the escarpment; and rainforest in the north and in Cabinda. Elevations generally range from 910 to 1,800 m. Angola has two seasons, a dry season (May to October) and a hot rainy season (November to April). Average rainfall in Luanda is approximately 300 mm.</p>	<p>The Republic of Angola became independent from Portugal on 11 November 1975. However, there was a civil war from 1975 to 2002.</p> <p>Population: 18 million (July 2011 est.) Language: Portuguese (official; Bantu and other languages are also spoken) Ethnic groups: Ovimbundu 37%, Kimbundu 25%, Bakongo 13%, Mestico (mixed European and native African) 2%, European 1%, other 22% Urban population: 59% of total population (2010); a 4% annual rate of increase in urban population is projected (2010-15) HIV/AIDS adult prevalence rate: 2% (2009 est.)</p>
Botswana	<p>Area: 581.7 thousand km² Capital: Gaborone Botswana is a landlocked country bordering on Namibia, South Africa, Zambia, and Zimbabwe. Most of the country's area is covered by plateau and 70% is covered by the Kalahari Desert. Botswana has a predominantly subtropical climate. The average maximum temperature of major cities is 39 to 44°C, while the minimum temperature is -5 to -15°C. The rainfall season is from October to March. Average annual rainfall ranges from about 500 mm in the extreme northeast, to less than 250 mm in other parts of the country.</p>	<p>The country became independent from the United Kingdom as the Republic of Botswana on 30 September 1966.</p> <p>Population: 2 million (July 2012 est.) Language: English (official; Setswana, Kalanga, Sekgalagadi, and other languages are also spoken) Ethnic groups: Tswana (or Setswana) 79%, Kalanga 11%, Basarwa 3%, and others including Kgalagadi and Caucasians 7% Urban population: 61% of total population (2010); a 2.3% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 24.8% (2009 est.)</p>
(Democratic Republic of Congo)	<p>Area: 2,345.4 km² Capital: Kinshasa The country is located at the heart of Sub-Saharan Africa bordering on nine countries: Angola, Burundi, the Central African Republic, the Republic of Congo, Rwanda, South Sudan, Tanzania, Uganda, and Zambia. Climatic zones in the country are tropical; hot and humid in the equatorial river basin; cooler and drier in the southern highlands; and cooler and wetter in eastern highlands; north of the</p>	<p>The country became independent from Belgium as the Republic of Congo, on 30 June 1960, and it was renamed the Democratic Republic of Congo in 1964. Even after the independence, conflicts have continued including the Second Congo War.</p> <p>Population: 73.6 million (July 2012 est.) Language: French (official; Lingala, Kingwana, Kikongo, and Tshi lubaare also spoken) Ethnic groups: over 200 African ethnic groups</p>

Country	Natural Environment	Social Environment
	<p>equator the wet season is from April to October) and the dry season from December to February; south of the equator the wet season is from November to March and the dry season from April to October. Annual rainfall is 2,000 mm in some places (e.g., the Congo Rainforest, the second largest rainforest in the world).</p>	<p>of which the majority are Bantu; the four largest tribes (Mongo, Luba, Kongo [all Bantu], and the Mangbetu-Azande [Hamitic) account for about 45% of the population Urban population: 35% of total population (2010); a 4.5% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: NA</p>
Malawi	<p>Area: 118 thousand km² Capital: Lilongwe Malawi is a landlocked country in south central Africa (in the northeastern part of the Southern Africa region) bordering on Mozambique, Tanzania, and Zambia. More than 20% of the country's area is covered by water bodies such as Lake Malawi. The Great Rift Valley runs through the country from north to south as does Lake Malawi. Malawi has a subtropical climate, which is relatively dry and strongly seasonal. The warm, wet season stretches from November to April and cool, dry winter season is from May to August. In addition, frost may occur in isolated areas in June and July. A hot, dry season lasts from September to October. Annual average rainfall varies from 725 mm to 2,500 mm.</p>	<p>The country became independent from the United Kingdom, as the Republic of Malawi, on 6 July 1964. Population: 16.3 million (July 2012 est.) Language: Chichewa/English (official; Chinyanja, Chiyao, Chitumbuka, Chisena, Chilomwe, Chitonga. and other languages are also spoken) Ethnic groups: Chewa 32.6%, Lomwe 17.6%, Yao 13.5%, Ngoni 11.5%, Tumbuka 8.8%, Nyanja 5.8%, Sena 3.6%, Tonga 2.1%, Ngonde 1%, and others 3.5% Urban population: 20% of total population (2010); a 5.3% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 11% (2009 est.)</p>
Mozambique	<p>Area: 801.6 thousand km² Capital: Maputo Mozambique is located on the southeast coast of Africa and borders on Malawi, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. Mozambique has a tropical climate with two seasons, a wet season from October to March and a dry season from April to September. However, climatic conditions vary depending on altitude. Rainfall is heavy along the coast and decreases in the north and south. Annual precipitation varies from 500 to 900 mm.</p>	<p>The country became independent from Portugal as the Republic of Mozambique, on 25 June 1975. However, there was a civil war from 1977 to 1992. Population 23.5 million (July 2012 est.) Language: Portuguese (official; Emakhuwa, Xichangana, Cisena, Elomwe, Echuwabo, and other languages are also spoken) Ethnic groups: African 99.66% (Makhuwa, Tsonga, Lomwe, Sena, and others), Europeans 0.06%, Euro-Africans 0.2%, Indians 0.08% Urban population: 38% of total population (2010); a 4% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 11.5% (2009 est.)</p>
Namibia	<p>Area: 825.4 thousand km² Capital: Windhoek Namibia is located on the Atlantic Ocean, and borders Angola, Botswana, and South Africa, and Zambia. Areas include the Desert Central Plateau, the Namib Desert, the Great Escarpment, the Bushveld, and the Kalahari Desert.</p>	<p>The country became independent from South Africa, as the Republic of Namibia, on 21 March 1990, after the Namibian War of Independence from 1966 to 1988. Population: 2 million (July 2012 est.) Language: English (official; Oshivambo, Herero, and Nama are also spoken) Ethnic groups: black 87.5%, white 6%, mixed 6.5% (about 50% of the population are of the Ovambo tribe and 9% of the Kavangos tribe; other ethnic groups include Herero 7%, Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, and Tswana 0.5%) Urban population: 38% of total population (2010); a 3.3% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 13.1% (2009 est.)</p>

Country	Natural Environment	Social Environment
South Africa	<p>Area: 1,221 thousand km² Capital: Cape Town (legislative), Pretoria (administrative), and Bloemfontein (judicial) South Africa is located in the southernmost part of Africa and has more a coastline of more than 2,500 km on the South Atlantic and the Indian Oceans. Most of the surface area is covered by plateau. South Africa has a generally temperate climate. Rainfall generally falls during the summer (November through March), although in the southwest, around Cape Town, rainfall occurs in the winter (June to August). Average rainfall varies considerably from west to east. In the northwest, annual rainfall is often below 200 mm. In contrast, much of the eastern Highveld receives 500 to 900 mm of rainfall per year, and occasionally more than 2,000 mm. A large area of the center of the country receives about 400 mm or rainfall.</p>	<p>The country became independent from the United Kingdom, as the Republic of South Africa, on 31 May 1910. Even after independence, the country continued its racial segregation policy (apartheid) until 1994.</p> <p>Population: 48.8vmillion (July 2012 est.) Official languages: IsiZulu/IsiXhosa/Afrikaans/ Sepedi/English/Setswana/Sesotho/Xitsonga/ siSwati/Tshivenda/isiNdebele Ethnic groups: black African 79%, white 9.6%, colored 8.9%, Indian/Asian 2.5% (2001 census) Urban population: 62% of total population (2010); a 1.2% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 17.8% (2009 est.)</p>
(Tanzania)	<p>Area: 947.3 thousand km² Capital: Dodoma Tanzania is mountainous in the northeast, where Mount Kilimanjaro (Africa's highest peak) is located. Lake Victoria (Africa's largest lake) and Lake Tanganyika (the continent's deepest lake and well known for unique fish species) is located in the northwest, and Lake Nyasa is located in southwest. Central Tanzania comprises a large plateau, with plains and arable land. Zanzibar is lies off the eastern coast. Tanzania generally has a tropical climate. However, in the highlands, temperatures range between 10 and 20°C during the cold and warm seasons, respectively. The rest of the country has temperatures that rarely fall below 20°C. The hottest period extends between November and February (25–31°C) while the coolest period occurs between May and August (15–20°C). The annual average temperature is 32°C. Tanzania has two major rainfall regions, unimodal (December–April) and bimodal (October–December and March–May). The former is in the southern, southwestern, central, and western parts of the country, while the latter is found to the north and northern coast. Average annual rainfall is very low in the inland area (less than 100 mm), average in the highland and coastal areas, and high in lake areas.</p>	<p>The country became independent from the United Kingdom, Tanganyika on 9 December 1961 and Zanzibar on 10 December 1963. The two merged on 26 April 1964, forming the Republic of Tanzania.</p> <p>Population: 43.6 million (July 2012 est.) Language: Kiswahi/English(official; Kiunguja, Arabic, and other languages are also spoken) Ethnic groups: mainland - African 99% (of which 95% are Bantu consisting of more than 130 tribes), while the other 1% include Asians, Europeans, and Arabs) Urban population: 26% of total population (2010); a 4.7% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 5.6% (2009 est.)</p>
Zambia	<p>Area: 752.6 thousand km² Capital: Lusaka Zambia is a landlocked country in south central Africa bordering on seven countries: Angola, DRC, Malawi, Mozambique, Namibia, Tanzania, and Zimbabwe. Zambia has a tropical climate and consists mostly of high plateau, with some hills and mountains, dissected by river valleys. There are two main seasons, a rainy season (November to April) corresponding to summer,</p>	<p>The country became independent from the United Kingdom, as the Republic of Zambia, on 24 October 1964.</p> <p>Population: 14.3million (July 2012 est.) Language: Bemba/Nyanja/Tonga/Lozi/ Lunda/Kaonde/ Luvale /English (official; Chewa, Nsenga, Tumbuka, Lala, and other language are also spoken) Ethnic groups: African 99.5% (including Bemba, Tonga, Chewa, Lozi, Nsenga,</p>

Country	Natural Environment	Social Environment
	and a dry season (May/June to October/November), corresponding to winter. Average rainfall is in the range of 500 to 1,400 mm.	Tumbuka, Ngoni, Lala, Kaonde, Lunda, and other African groups), as well as others, 0.5% (including Europeans, Asians, and Americans) (2000 Census) Urban population: 36% of total population (2010); a 3.2% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalency rate: 13.5% (2009 est.)
Zimbabwe	Area: 390.6 thousand km ² Capital: Harare Zimbabwe is a landlocked country in Southern Africa bordering on Botswana, Mozambique, South Africa, and Zambia. Most of the country is elevated in the central plateau (high veld) stretching from the southwest to the northwest at altitudes between 1,200 and 1,600 m. The summer rainy season lasts from November to March. It is followed by a transitional season, during which both rainfall and temperatures decrease. The cool, dry season follows, lasting from mid-May to mid-August. Finally, there is a warm, dry season, which lasts until the onset of the rains. The higher areas in the east and the highveld receive more rainfall and are cooler than the lower areas. Temperatures on the highveld vary from 12–13° C in winter to 24°C in summer. On the lowveld the temperatures are usually 6°C higher, and summer temperatures in the Zambezi and Limpopo valleys average between 32° and 38°C. Rainfall decreases from east to west. The eastern mountains receive more than 1000 mm annually, while Harare receives an average of 810 mm and Bulawayo 610 mm. The south and southwest receive little rainfall. Seasonal shortages of water are common.	The country proclaimed independence from the United Kingdom as Rhodesia on 11 November 1965, with recognition as the Republic of Zimbabwe on 18 April 1980. During the Rhodesia n period there was a war between white settlers and black African nationalists. Population: 12.6 million (July 2012 est.) Language: English (official; Shona and Sindebele are also spoken) Ethnic groups: African 98% (Shona 82%, Ndebele 14%, other 2%), mixed and Asian 1%, white less than 1% Urban population: 38% of total population (2010) Rate of urbanization: a 3.4% annual rate of increase in urban population is projected (2010-15 est.) HIV/AIDS adult prevalence rate: 14.3% (2009 est.)

Note: The Democratic Republic of Congo and Tanzania are not focus countries of this study, but are included in the table (in parentheses) as certain corridors traverse their territory.

Sources: (i) homepages of the focus country governments, 2012; (ii) CIA, *The World Fact Book*, 2012

[<https://www.cia.gov/library/publications/the-world-factbook>]; and (iii) Wikipedia Foundation, Internet Encyclopedia Wikipedia [<http://en.wikipedia.org>]

I.2 Legislation Related to Environmental Impact Assessment

I.2.1 Introduction

Each of the eight focus counties (and two other relevant countries, the DRC and Tanzania) has legislation relevant to Environmental Impact Assessment (EIA). Table I.2 summarizes lists the relevant legislation and the organization(s) responsible for implementation. The following subsections provide more details on the situation country by country.

Table I.2: Environmental Impact Assessment Legislation and Responsible Organizations in the Focus Countries

Country	Legislation	Organization(s)
Angola	<ul style="list-style-type: none"> Environment Framework Act, No. 5/98 of 19 June 1998 Decree on Environmental Impact Assessment, No. 51/2004 of 23 July 2004 	National Directorate for the Prevention and Evaluation of Environmental Impact, Ministry of Environment (Ministerio do Ambiente)
Botswana	<ul style="list-style-type: none"> Environmental Impact Assessment Act, No. 6 of 2005 	Department of Environmental Affairs, Ministry of Environment, Wildlife and Tourism
(DRC)	<ul style="list-style-type: none"> Environmental Protection Act, No.11/009 of 9 July 2011 Mining Code, Law No. 007/2002 (Code Minier) Mining Regulations, Decree No. 038/2003 of 26 March 2003 [contain environmental considerations] 	The Group for Environmental Studies of Congo (Groupe d'Etudes Environnementales du Congo), Ministry of Environment, Nature Conservation and Tourism
Malawi	<ul style="list-style-type: none"> National Environmental Management Act, No. 23 of 1996 	Environmental Affairs Department in Ministry of Environmental and Climate Change
Mozambique	<ul style="list-style-type: none"> The Environment Law (Lei do Ambiente), Law No. 20/97, of 1 October The EIA process is set out in Regulations on the EIA Process, Decree No. 45 of 2004 	Ministry for Coordination of Environmental Action (Ministério para a Coordenação da Acção Ambiental)
Namibia	<ul style="list-style-type: none"> Environmental Management Act, No. 7 of 2007 	Department of Environmental Affairs, Ministry of Environment and Tourism
South Africa	<ul style="list-style-type: none"> National Environmental Management Act, No. 107 of 1998 as amended in 2003 and 2004 Environmental Impact Assessment Regulations, R543 on 18 June 2010 	Department of Environmental Affairs
(Tanzania)	<ul style="list-style-type: none"> Environmental Management Act, No. 20 of 2004 Environmental Impact Assessment and Audit Regulations, Government Notice No. 349 of November 2005 	Division of Environment (headed by the Minister of State) in the Vice President's Office (Environment)
Zambia	<ul style="list-style-type: none"> Environmental Management Act 2011 (No. 12 of 2011) Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, SI No. 28 of 1997 	Ministry of Tourism, Environment and Natural Resources
Zimbabwe	<ul style="list-style-type: none"> Environmental Management Act, Chapter 20:27 of 2002 	Ministry of Environment and Natural Resources

Note: The Democratic Republic of Congo and Tanzania are not focus countries of this study, but are included in the table (in parentheses) as certain corridors traverse their territory.

Sources: (i) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*; (ii) homepages of the focus country governments (2012); and (iii) the Food and Agricultural Organization [FAO, <http://faolex.fao.org/>)]

I.2.2 Angola

The National Directorate for the Prevention and Evaluation of Environmental Impact in the Ministry of Environment (Ministerio do Ambiente) is responsible for EIAs in the country. The Environment Framework Act (Lei Bases do Ambiente), No. 5/98 of 19 June 1998, sets out the EIA process in the country. Detailed procedures are presented in the Act and projects that require an EIA are prescribed in the Decree on Environmental Impact Assessment (Decreto No. 51/2004 de 23 de Julio, sobre Avaliacion de Impactes Ambientais), No. 51/2004 of 23 July 2004. These include projects in the following sectors: (i) agriculture, fisheries, and forestry; (ii) extractive industries, such as petroleum, mining, and dredging; (iii) energy industries; (iv) glass industries, (v) chemical industries; and (vi) infrastructure projects. Table I.3 sets out the required contents of an EIA report in Angola.

Table I.3: Required Contents of an Environmental Impact Assessment Report in Angola

- | |
|--|
| <ul style="list-style-type: none"> a. A nontechnical summary of the project b. A description of the planned activities c. A general description of the environmental situation in the location planned for the activity d. A summary of opinions and criticisms collected through public consultation e. A description of the possible environmental and social changes caused by the project f. An indication of the measures envisaged to eliminate or minimize the negative social and environmental effects g. An indication of the systems envisaged for controlling and monitoring the activity |
|--|

Sources: (i) Decree on Environmental Impact Assessment No. 51/2004 of 23 July 2004; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.3 Botswana

The Department of Environmental Affairs in the Ministry of Environment, Wildlife and Tourism is the responsible for EIAs in the country. EIAs are provided for by the Environmental Assessment Act, No. 10 of 2011. Under the Act, the Environmental Assessment Regulations prescribes the projects that require EIAs in its Schedule 1. Table I.4 sets out the required contents of an EIA report in Botswana.

Table I.4: Required Contents of an Environmental Impact Assessment Report in Botswana

<p>The structure and content of the environmental impact statement prescribed should at the minimum contain the following:</p>
--

- | |
|--|
| <ul style="list-style-type: none"> a. The name of applicant and consulting team b. Executive summary (also referred to as a nontechnical summary) c. Introduction d. Policy, legal, and administrative framework e. Description of the project f. Description of baseline environment g. Public consultation h. Identification and assessment of environmental impacts i. Considerations of trans-boundary impacts j. Analysis of alternatives k. Mitigation measures l. Archeological impact assessment m. Environmental management plan |
|--|

- | |
|------------------------------------|
| n. Conclusions and recommendations |
| o. References |
| p. Appendices |

Sources: (i) Environmental Assessment Act, No. 10 of 2011 (Form E); and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.4 Democratic Republic of Congo

The Group for Environmental Studies of Congo (Groupe d'Etudes Environnementales du Congo) organized under the Ministry of Environment, Nature Conservation and Tourism is responsible for the EIA process in the country. The Environmental Protection Act (Loi No. 11/009 du 09 Juillet 2011 Portant Principes Fondamentaux Relatifs a La Protection de L'environnement), No.11/009 of 9 July 2011, sets out the EIA process in the country. However, since the Act was promulgated only recently after a long drafting stage, detailed regulations have not yet been established. Under the Act, construction or exploitation of all activities relating to industrial, commercial, agricultural, forestry, mining, and telecommunications projects, and any other activities that may have an impact on the environment, are subject to environmental and social impact studies and an environmental management plan, prior to approval from the competent authority.

I.2.5 Malawi

The Environmental Affairs Department (EAD) of the Ministry of Environment and Climate Change Management (the ministry was reorganized in 2012) is responsible for the EIA process in the country. EAD also maintains a register of all projects currently being appraised under the EIA requirements of the Environment Management Act, No. 23, of 1996. As key actors in the EIA process, the roles and responsibility of the Environmental Affairs Department (EAD) as the general facilitator, the Technical Committee on the Environment, the National Council for the Environment, the Ministry of Economic Planning and Cooperation and the Sectoral/Line Ministries, are provided in the Guidelines for Environmental Impact Assessment in Malawi (1997).

The National Environmental Management Act, No. 23, of 1996, sets out the environmental assessment process in Malawi. Under section 24(1) of the Act, the projects requiring an EIA are prescribed in an attached list. The EIA procedure includes screening, scoping, terms of reference and EIA, and managing compliance with EIA results. Table I.5 presents the required contents for an EIA report in Malawi.

Table I.5: Required Contents of an Environmental Impact Assessment Report in Malawi

- | |
|--|
| a. Detailed description of the project and the activities for project implementation |
| b. Description of the segment/segments of the environment likely to be affected by the project and the means for identifying, monitoring, and assessing the environmental effects of the project |
| c. Description of the technology and method/process to be used in the implementation of the project and any available alternative technology, method, or process, and reasons for not employing the alternative technology, method, or process |
| d. Reasons for selecting the proposed site of the project as opposed to any other available alternative site |
| e. Detailed description of the likely impact the project may have on the environment and the direct, indirect, cumulative, short-term, and long-term effects on the environment of the project |
| f. Identification and description of measures proposed for eliminating, reducing, or mitigating any anticipated adverse effects of the project on the environment |

- | |
|--|
| <ul style="list-style-type: none">g. Indication of whether the environment of any other country or of areas beyond the limits of national jurisdiction is/are likely to be affected by the project and the measures to be taken to minimize any damage to the environmenth. Outline of any gaps, deficiencies, and the adverse environmental concerns arising from the environmental impact assessment and from the compilation of the environmental impact assessment reporti. Concise description of the method used by the developer to compile the information required under this section |
|--|

Sources: (i) Environment Management Act, No. 23 of 1996; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

The present Environmental Management Act (No. 23 of 1996) is still effective. However, a draft new Environmental Management Act is being considered to replace the present Act and may be approved in 2013. The bill includes: (i) an environmental management authority with autonomy for the environment, (ii) issues related to biotechnology/biosafety and climate change, and (iii) environmental inspectors.

The EIA Guidelines (1997), which cover mining, irrigation and drainage, sanitation, and waste projects, will also be revised accordingly thereafter depending on available personnel in the Ministry. Also, guidelines for water, land development and human settlement, and transport will be prepared later.

1.2.6 Mozambique

The Ministry for Coordination of Environmental Action (Ministério para a Coordenação da Acção Ambiental) is responsible for the EIA process in the country. All projects for which EIAs are required must be approved by the ministry as the supervising authority at each level of the process (e.g., project application, terms of reference for environmental study [screening], submission of environmental report).

The projects for which EIAs are required are provided in the annex to Presidential Decree No. 45 in 2004 (Presidential Decree, Regulamento de Avaliação Impacto Ambiental, 2004/45). The identified projects are classified into three categories based on the degree of environmental impact. Project that may have a significant impact are classified as Category A, projects that do not significantly affect communities or environmentally sensitive areas are classified as Category B, and projects that are likely to have an insignificant, negligible, or minimal effect on the environment (not likely to be irreversible) are categorized as Category C. Category A projects require an environmental assessment at the level of an EIA, while Category B projects require a Simplified Environmental Assessment/Simplified Environmental Report (SEA/SER). In case of Category C, since benefits of the project clearly outweigh the negative impacts, such projects do not require either an EIA or SEA/SER.

Related to the EIA legislation, some amendments to regulations on environmental auditing, environmental quality, and resettlement were enacted in 2012. Also, Presidential Decree 2004/45 is to be updated in 2013.

Table I.6 sets out the required contents of an EIA report in Mozambique.

Table I.6: Required Contents of an Environmental Impact Assessment Report in Mozambique

- | |
|--|
| <ul style="list-style-type: none"> a. A nontechnical summary covering the main issues and conclusions b. The legal and planning context of the activity c. A description of the activity and its alternatives in the planning, construction, operation and, in the case of a short-term activity, decommissioning phases d. Geographical location of the area of influence of the activity, as well as a description of the baseline environmental situation e. A comparison of the alternatives and a prediction of the environmental impacts of each alternative with and without mitigation measures applied f. Identification and assessment of the impacts and mitigation measures g. An environmental management plan that includes the monitoring of impacts, environmental education, and accident prevention and contingency plans h. Names of the team members that carried out the study i. A report on the public participation program |
|--|

Sources: (i) Presidential Decree of No. 45 in 2004; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.7 Namibia

The Department of Environmental Affairs (DEA) in the Ministry of Environment and Tourism is responsible for EIAs in Namibia. The Environmental Management Act, No. 7, of 2007, sets out the EIA process in the country. Part VII, Section 27(2), lists the projects subject to the EIA process: (i) land use and transformation; (ii) water use and disposal; (iii) resource removal, including natural living resources; (iv) resource renewal, (v) agricultural processes; (vi) industrial processes; (vii) transportation; (viii) energy generation and distribution; (ix) waste and sewage disposal; (x) chemical treatment; (xi) recreation; and (xii) any other area that the Minister considers necessary for the purpose of listing. Table I.7 sets out the required contents for an EIA report in the country.

Table I.7: Required Contents of an Environmental Impact Assessment Report in EIA report in Namibia

- | |
|--|
| <ul style="list-style-type: none"> a. Executive summary b. Policy, legal, and administrative framework c. Project description (description of the project's geographic, ecological, social, and temporal context, including any offsite investments that may be required) d. Baseline data (description of relevant physical, biological, and socio-economic conditions) e. Environmental impacts (identification of beneficial and adverse impacts from the proposed project; mitigation measures and any residual negative impacts that cannot be mitigated should be identified; opportunities for environmental enhancement should be explored; the extent and quality of available data, key data gaps, and uncertainties associated with predictions should be identified/estimated; areas that do not require further attention should be specified) f. Analysis of alternatives; systematic comparison of the proposed investment design, site, technology, and operational alternatives in terms of their potential environmental impacts g. Mitigation plan (identification of feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels, and estimation of the potential environmental impacts) h. Environmental management and training (assessment of the existence, role, and capability of environmental units on-site, or at the agency and ministry level) i. Environmental monitoring plan (e.g., specification of the type of monitoring) j. Appendices <ul style="list-style-type: none"> (i) list of environmental assessment preparers – individuals and organizations (ii) references – written materials used in study preparation. |
|--|

- (iii) record of interagency/forum/consultation meetings – including lists of both invitees and attendees (the record of consultations for obtaining the informed views of the affected people and local NGOs should be included; the record should specify any means other than consultations that were used to obtain the views of affected groups)

Source: United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.8 South Africa

The Department of Environmental Affairs in the Ministry of Water and Environmental Affairs is the responsible organization for EIAs. However, the provincial governments are also involved in the EIA process, as they are assigned as competent authorities to provide guidelines, information, and advice as per Act and Regulations.

Under the National Environmental Management Act, No. 107, of 1998 as amended in 2003 and 2004, Government Notice R386 of 2009 prescribes the list of the projects for which basic assessment is mandated, and R387 of 2009 prescribes the list of the projects for which full EIAs are mandated. Table I.8 sets out the required contents for an EIA report in South Africa.

Table I.8: Required Contents of an Environmental Impact Assessment Report in EIA Report in South Africa

- a. Details of the environmental assessment practitioner who compiled the report and his/her expertise to carry out an environmental impact assessment
- b. Detailed description of the proposed activity
- c. Description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is a linear activity, a description of the route of the activity; or if it is an ocean-based activity, the coordinates where the activity is to be undertaken
- d. Description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic, and cultural aspects of the environment may be affected by the proposed activity
- e. Details of the public participation process including:
 - (i) Steps undertaken in accordance with the plan of study
 - (ii) A list of persons, organizations, and organs of state that were registered as interested and affected parties
 - (iii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the environmental assessment practitioner to those comments
 - (iv) Copies of any representations, objections and comments received from registered interested and affected parties
- f. Description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity. If no alternatives are identified or presented, the environmental assessment practitioner must provide the competent authority with a detailed, written motivation as to why none have been identified and assessed
- g. Indication of the methodology used in determining the significance of potential environmental impacts
- h. Description and comparative assessment of all alternatives identified during the environmental impact assessment process
- i. Summary of the findings and recommendations of any specialist report or report on a specialized process
- j. Description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- k. Assessment of each identified potentially significant impact, including
 - (i) Cumulative impacts

- (ii) The nature of the impact
- (iii) The extent and duration of the impact
- (iv) The probability of the impact occurring
- (v) The degree to which the impact can be reversed
- (vi) The degree to which the impact may cause irreplaceable loss of resources
- (vii) The degree to which the impact can be mitigated
- l. Description of any assumptions, uncertainties and gaps in knowledge
- m. Reasoned opinion as to whether the activity should or should not be authorized, and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorization
- n. An environmental impact statement which contains:
 - (i) A summary of the key findings of the environmental impact assessment
 - (ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- o. A draft environmental management program
- p. Copies of any specialist reports and reports on specialized processes
- q. Any specific information that may be required by the competent authority
- r. Any other matters required in terms of section 24(4)(a) and (b) of the Act

Source: United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.9 Tanzania

The Division of Environment (headed by the Minister of State – Environment) in the Vice President’s Office is responsible for the EIA process in the country, which is set out in the Environmental Management Act, No. 20, of 2004. The Environmental Impact Assessment and Audit Regulations, Government Notice No. 349 of November 2005, sets out the projects for which an EIA is required in its first schedule.

The EIA procedure includes EIA registration, screening, scoping and terms of reference, environmental impact statements (EISs), and review of environmental impact statements. An EIS is submitted to the authority by the developer as the result of the EIA. The EIS must include an executive summary, and a nontechnical study must be prepared in both Kiswahili and English as per the requirements specified in Regulation 18 of the EIA and Audit Regulations. Table I.9 sets out the required contents for an EIA report in Tanzania.

Table I.9: Required Contents of an Environmental Impact Assessment Report in Tanzania

- a. Executive summary
- b. Acknowledgement
- c. Acronyms
- d. Introduction
- e. Project background and description
- f. Policy, administrative, and legal framework
- g. Baseline or existing conditions
- h. Assessment of impacts and identification of alternatives
- i. Impact management and environmental mitigation measures
- j. Environmental and social management plan
- k. Environmental and social monitoring plan
- l. Resource evaluation or cost-benefit analysis
- m. Decommissioning
- n. Summary and conclusions
- o. References
- p. Appendices

Sources: (i) Environmental Impact Assessment and Audit Regulations, Government Notice No. 349 of November 2005; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.10 Zambia

The Ministry of Tourism, Environment and Natural Resources is the responsible for the EIA process in the country. Under the ministry, the Environmental Council of Zambia is the major environmental institution in Zambia and the main lead agency on matters pertaining to EIAs.

EIAs are required by the Environmental Management Act (No. 12 of 2011), which superseded the Environmental Protection and Pollution Control Amendment Act (Act 12 of 1999). The EIA process was formalized in the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, which were promulgated through Statutory Instrument No. 28 of 1997. Projects for which EIAs are required are set out in section 7(2) and attached schedules of the EIA Regulations of 1997. As listed in the second schedule of the regulation, EIAs are required for projects in the following categories: urban development, transportation, dams, rivers and water resources, mining (including quarrying and open cast extraction, forestry-related activities, agriculture, processing and manufacturing industry, electrical infrastructure, waste disposal, and projects affecting nature conservation areas. Table I.10 sets out the required contents for an EIA report in Zambia.

Table I.10: Required Contents of an Environmental Impact Assessment Report in Zambia

<ol style="list-style-type: none">a. Description of the project, and reasonable alternatives, which may begin or increase operations to provide materials or services to the proposed projectb. Description of the proposed site and reasons for rejecting other alternative sitesc. Brief description of the site and the surrounding environment specifying any information necessary to identify and assess the environmental effects of the projectd. Description of the raw material inputs into the project and their potential environmental effectse. Description of the technology and processes that shall be usedf. Description of the products and byproducts of the projectg. Environmental effects of the project, and reasonable alternatives, including the direct, indirect, or cumulative, short-term, and long-term effectsh. Socio-economic impacts of the project, such as resettlement of affected peoplei. Impact management plan containing a description of measures proposed for preventing, minimizing, or compensating for any adverse impact, and enhancing beneficial effects, and measures to monitor effluent streams or important environmental features that may be affected by the projectj. Indication of whether the environment of any neighboring state is likely to be affected
--

Sources: (i) Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, which were promulgated through Statutory Instrument No. 28 of 1997; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.2.11 Zimbabwe

The Ministry of Environment and Natural Resources is responsible for the EIA process in Zimbabwe. The Environmental Management Act, of 2002, Chapter 20:27, sets out the requirements of the practice. The first schedule of the Act prescribes that EIAs are required for developments related to dams and artificial lakes, drainage and irrigation, forestry, housing developments, industry, infrastructure, mining and quarrying, petroleum production storage and distribution, power generation and transmission, tourist, resorts and recreational developments, waste treatment and disposal, and water supply. Several regulations have been promulgated under the Act, providing the specific procedures to be followed, incorporating the modern principles of environmental management. Specifically, the Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations, Statutory Instrument No. 7 of 2007, deals with the EIA procedure, method, and public consultations. The EIA process includes screening, scoping, development of terms of reference, impact assessment,

report preparation, review, and approval. Before preparing the EIA for a prescribed activity, the developer must submit a prospectus to the Director General containing information regarding the EIA and the project. A certificate is issued after approval of the EIA; it is valid for two years from the date of issue and may be extended for not more than a year for a project that has commenced but is not completed within the stipulated period. However, if the project is not commenced within a two-year period, the validity of the certificate expires and a new certificate will need to be applied for. Table I.11 sets out the required contents for an EIA report in Zimbabwe.

Table I.11: Required Contents of an Environmental Impact Assessment Report in Zimbabwe

a.	A detailed description of the proposed project and the activities that will be undertaken during implementation
b.	Reasons for the selection of the proposed site of the project
c.	A detailed description of the direct, indirect, and cumulative short- and long-term impacts the project will have on the various aspects of the environment
d.	Specification of the measures proposed for eliminating reducing or mitigating the anticipated adverse effects of the project
e.	Identification and description of methods for monitoring and managing the adverse environmental effects
f.	An indication of whether the environment of any other country is likely to be affected by the project and the measures that will be taken to minimize any damage to that environment
g.	How the developer plans to integrate biological diversity into the project (where applicable)
h.	A concise description of the methodology used by the developer when compiling the EIA report

Sources: (i) Environmental Management (Environmental Impact Assessments and Ecosystems Protection) Regulations, Statutory Instrument No. 7 of 2007; and (ii) United States Agency for International Development, Southern African Institute for Environmental Assessment, and Development Bank of Southern Africa, *SADC Environmental Legislation Handbook 2012*

I.3 Environmental Impacts in Project Area(s)

I.3.1 Project Affected Area(s)

Table I.12 shows affected areas along the priority corridors.

Table I.12: Affected Areas along the Priority Corridors

Corridor	Area	Major Cities/Towns
1. Beira Corridor (including the Sena and Tete Corridors)	<p>The corridor traverses Mozambique, Zimbabwe, and Zambia along its main route, and one additional country, Malawi, along alternative routes. Start: Port of Beira End: Lusaka</p> <p><i>Beira (MOZ)–Mutare (ZIM)–Harare (ZIM)–Chirundu (ZIM)–Lusaka (ZAM) Route</i></p> <p>Affected provinces include: (1) Sofala (MOZ), (2) Manica (MOZ), (3) Manicaland (ZIM), (4) Mashonaland East (ZIM), (5) Mashonaland West (ZIM), and (6) Lusaka (ZAM)</p> <p>The route follows Mozambique’s National Highway EN6 between Beira and Mature, Zimbabwe’s National Highway A3 and A1, and Zambia’s National Highway T2.</p>	<p><i>Beira-Harare-Lusaka Route</i> Beira (MOZ), Chimoio (MOZ), Matare (ZIM), Harare (ZIM), Chirundu (ZIM), Lusaka (ZAM)</p> <p><i>Tete Route</i> Beira (MOZ), Chimoio (MOZ), Tete (Moz), Blantyre (MAL)</p> <p><i>Sena Route</i> Beira (MOZ), Dondo (MOZ), Villa de Sena (MOZ), Mutarara (MOZ), Nsanje (MAL), Blantyre (MAL)</p>

Corridor	Area	Major Cities/Towns
	<p><i>Beira (MOZ)–Tete (MOZ)–Blantyre (ZAM Route)</i></p> <p>Affected provinces include: (1) Sofala (MOZ), (2) Manica (MOZ), (3) Tete (MOZ), and (4) Southern Province (MAL)</p> <p>The corridor starts from the Port of Beira in Mozambique and follows EN6 and provincial road 102 up to Tete. After Tete, the corridor connects to Blantyre in Malawi following Route 103 in Mozambique, and M6 and M1 in Malawi.</p> <p><i>Sena Route</i></p> <p>Affected provinces include: (1) Sofala (MOZ), (2) Manica (MOZ), (3) Manicaland (ZIM), and (4) Southern Province (MAL)</p>	
2. Dar es Salaam (TAZARA) Corridor	<p>The corridor traverses Tanzania and Zambia. Start point: Port of Dar es Salaam End point: Lusaka Affected provinces include: (1) Pwani (TAN), (2) Morogoro (TAN), (3) Iringa (TAN), (4) Northern Province (ZAM), (5) Central Province (ZAM), (6) Lusaka (ZAM)</p>	<p>Dar es Salaam (TAN), Morogoro (TAN), Iringa (TAN), Mbeya (TAN), Tunduma (TAN), Nakonde (ZAM), Isoka (ZAM), Chinsali (ZAM), Mpika (ZAM), Serenje (ZAM), Kapiri Mposhi (ZAM), Kabwe (ZAM) Lusaka(Zam)</p>
3. Lobito Corridor	<p>The corridor traverses Angola, the DRC, and Zambia. Start: Lobito Port End: Lubumbashi (DRC) Affected provinces include: (1) Benguela (ANG), (2) Huambo (ANG), (3) Bie (ANG), (4) Moxico (ANG), (5) Katanga (formerly Shaba)(DRC), (6) Copperbelt (ZAM), (7) North Western (ZAM)</p>	<p>Benguela (ANG), Lobito (ANG), Balombo (ANG), Kuito (ANG), Luena (ANG), Cameia (ANG), Luau (ANG), Kolwezi (DRC), Lubumbashi (DRC)</p>
4. Maputo Corridor	<p>The corridor traverses Mozambique and South Africa. Start: Maputo Port End: Johannesburg Affected provinces include: (1) Maputo (MOZ), and (2) Mpumalanga (SA)</p> <p>The alternative route for the corridor traverses Mozambique, Swaziland, and South Africa. Affected provinces include: (1) Maputo (MOZ), (2) Lubombo (SWA), (3) Manzini (SWA), (4) Hhohho (SWA), and (5) Mpumalanga (SA)</p>	<p>Maputo (MOZ), Komatipoort (SA), Waterval Boven (SA), Pretoria (SA), Johannesburg (SA)</p>
5. Nacala Corridor	<p>The corridor traverses Mozambique, Malawi, and Zambia. Start: Nacala Port End: Lusaka Affected provinces include: (1) Nampula (MOZ), (2) Niassa (MOZ), (3) Southern Province (MAL), (4) Central Province (MAL), (5) Eastern Province (ZAM), (6) Lusaka (ZAM), (7) Cabodelgado (MOZ), (8) Zambezia (MOZ)</p>	<p>Nacala (MOZ), Namialo (MOZ), Meconta (MOZ), Nampula (MOZ), Ribau (MOZ), Malema (MOZ), Mutuali (MOZ), Cuamba (MOZ), Mandimba (MOZ), Lilongwe (MAL)</p>

Corridor	Area	Major Cities/Towns
6. North-South Corridor	<p>Start: Durban Port End: Lusaka</p> <p>The corridor via Harare traverses South Africa, Zimbabwe, and Zambia. Affected provinces include: (1) KwaZulu-Natal (SA), (2) Free State (SA), (3) Gauteng (SA), (4) Limpopo (SA), (5) Matabeleland South (ZIM), (6) Masvingo (ZIM), (7) Midland (ZIM), (8) Mashonaland East (ZIM), (9) Harare (ZIM), (10) Mashonaland West (ZIM), (11) Lusaka (ZAM)</p> <p>The alternative route via Gaborone traverses South Africa, Botswana, Zimbabwe, and Zambia. Affected provinces include: (1) KwaZulu-Natal (SA), (2) Free State (SA), (3) Gauteng (SA), (4) South East (BOT), (5) Kgatleng (BOT), (6) Central Province (BOT), (7) North East Province (BOT), (8) Matabeleland South (ZIM), (9) Matabeleland North (ZIM), (10) Southern Province (ZAM)</p>	<p>(1) Durban, Johannesburg, Pretoria, Polokwane, Harare, Lusaka</p> <p>(2) Durban, Johannesburg, Gaborone, Victoria Falls, Livingstone, Lusaka</p>
7. Trans-Caprivi Corridor	<p>The corridor traverses Namibia, Zambia, and the DRC Start: Walvis Bay End: Lubumbashi Affected provinces include: (1) Erongo Region (NAM), (2) Otjozondjupa Region (NAM), (3) Okavango Region (NAM), (4) Caprivi Region (NAM), (5) Southern Province (ZAM), (6) Central Province (ZAM), (7) Copperbelt (ZAM), (8) Katanga (DRC)</p>	<p>Walvis Bay, Usakos, Omaruru, Otjiwarongo, Otavi, Grootfontein, Rundu, Katima Mulilo, Livingstone, Choma, Lusaka, Kabwe, Kapiiri Mposhi, Lubumbashi</p>
8. Trans-Kalahari Corridor	<p>The corridor traverse Namibia, Botswana and South Africa Start: Walvis Bay End: Johannesburg Affected provinces include: (1) Erongo Region (NAM), (2) Otjozondjupa Region (NAM), (3) Khomas Region (NAM), (4) Omaheke Region (NAM), (5) Ghanzi Province (BOT), (6) Southern Province (BOT), (7) South East Province (BOT), (8) North West Province (SA), (9) Gauteng Province (SA)</p>	<p>Walvis Bay (NAM), Usakos (NAM), Windhoek (NAM), Gobabis (NAM), Trans Kalahari (NAM), Mamuno (BOT), Kanye (BOT), Lobaste (BOT), Gaborone (BOT), Zeerust (SA), Pretoria (SA), Johannesburg (SA)</p>

Abbreviations: ANG = Angola, DRC = Democratic Republic of Congo, BOT = Botswana, MAL = Malawi, MOZ = Mozambique, NAM = Namibia, SA = South Africa, SWA = Swaziland, TAN = Tanzania, ZAM = Zambia, ZIMM = Zimbabwe

Source: GIS Map of Tripartite Corridors, e-GIS (<http://tmsagis.co.za>) .

I.3.2 Protected Areas along the Priority Corridors

Table I.13 lists protected areas (e.g., national parks, nature reserves, wildlife sanctuaries) located within 10 km of the priority corridors. Adequate study of impacts on such protected areas should be undertaken reflecting the project scheme and scale.

Table I.13: Protected Areas along the Priority Corridors (within 10 km)

Corridor	Protected Areas
1. Beira Corridor (including the Sena and Tete Corridors)	<i>Beira-Mutare-Harare-Lusaka Route</i> (1) Bunga Forest Botanical Reserve (ZIM), (2) Old Mutare (ZIM), (3) Charara Safari Area (ZIM), (4) Hurungwe Safari Area (ZIM) <i>Tete Route</i> None <i>Sena Route</i> (1) Gorongosa National Park (MOZ), (2) Mwabvi Wildlife Reserve (MAL), (3) Lengwe NP (MAL), (4) Michiru Mountain Conservation Area (MAL), (5) Thombari Forest Reserve (MAL)
2. Dar es Salaam (TAZARA) Corridor	(1) Mikumi National Park (TAN), (2) Udzungwa Mountains National Park (TAN), (3) Lavushi Manda National Park (ZAM)
3. Lobito Corridor	(1) Buffalo Partial Reserve (ANG), (2) Kameia National Park (ANG), (3) Man and Biosphere Reserve (DRC), (4) Lufira Biosphere Reserve (DRC)
4. Maputo Corridor	<i>Via Ressano Garcia</i> (1) Kruger National Park (SA), (2) Krokodilpoort Nature Reserve (SA), (3) Nelspruit Botanical Garden (SA), (4) Starvation Creek Nature Reserve (SA), (5) Tullach Mohr Nature Reserve (SA), (6) Witbank Nature Reserve (SA) <i>Via Swaziland</i> (1) Mlawula Ndzindza Nature Reserve (SWA), (2) Hlane National Park (SWA), (3) Milwane Wildlife Sanctuary (SWA), (4) Malolotja National Park (SWA)
5. Nacala Corridor	(1) Namizihu Forest Reserve (MAL), (2) Liwonde National Park (MAL), (3) Mchinji Forest Reserve (MAL), (4) Ngoni Reserve (ZAM), (5) Lower Zambezi National Park (ZAM)
6. North-South Corridor	<i>Via (Durban-Johannesburg)</i> (1) Midmar Nature Reserve (SA), (2) Wagendrift Nature Reserve (SA), (3) Suikerbosrand Nature Reserve (SA), (4) Sondera Nature Reserve (SA), (5) Combretum Game Park (SA), (6) Nylsvrey Nature Reserve (SA), (7) Percy Fyfe Nature Reserve (SA), (8) Kushuku Nature Reserve (SA), (9) Polokwane Game Reserve (SA), (10) Ben Lavin Nature Reserve (SA), (11) Happy Rest Nature Reserve (SA), (12) Hangklip Forest Reserve (SA), (13) Nzehelele Nature Res (SA), (14) Baobab Tree Reserve (SA), (15) Merelani Nature Reserve (SA), (16) Messina Nature Reserve (SA), (17) Nuanetsi Game Ranch (Zimbabwe), (18) Mutirikwi National Park (Zimbabwe), (19) Lake Chivero National Park (Zimbabwe), (20) Lake Manyame Recreation Park (Zimbabwe), (21) Charara Safari Area (Zimbabwe), (22) Hurungwe Safari Area (Zimbabwe)(on the border between Zambia and Zimbabwe) <i>Via Gaborone (in addition to those for Durban-Johannesburg, listed above)</i> (1) Kgaswane Nature Reserve (SA), (2) Madikwe Nature Reserve (SA), (3) Manyelanong Game Reserve (BOT), (4) Mokolodi Nature Reserve (BOT), (5) Kgale Hill Public Park (BOT), (6) Tachila Nature Reserve (BOT), (7) Chobe National Park (BOT), (8) Hwange National Park (ZIM), (9) Matetsi Safari Area (ZIM), (10) KazunaPan National Park (ZIM), (11) Victoria Falls National Park (ZIM), (12) Zambezi National Park (ZIM), (13) Mosi-Oa Tunya National Park (ZIM)
7. Trans-Caprivi Corridor	(1) Namib Naukluft National Park (NAM), (2) Mangetti National Park (NAM), (3) Protected Public Reserve of Mucusso (NAM), (4) Caprivi National Park (NAM), (5) Mosi-oa-Tunya National Park (ZAM)

Corridor	Protected Areas
8. Trans-Kalahari Corridor	(1) Namib Naukluft National Park (NAM), (2) Von Bach Dam Nature Reserve (NAM), (3) Jwana Game Park (BOT), (4) Mokolodi Nature Reserve (BOT), (5) Manyelanong Game Reserve (BOT), (6) Madikwe Nature Reserve (SA), (7) Mariko-Bosveld Nature Reserve (SA), (8) Kgaswane Nature Reserve (SA)

Abbreviations: ANG = Angola, DRC = Democratic Republic of Congo, BOT = Botswana, MAL = Malawi, MOZ = Mozambique, NAM = Namibia, SA = South Africa, SWA = Swaziland, TAN = Tanzania, ZAM = Zambia, ZIMM = Zimbabwe

Sources: (i) GIS Map of Tripartite Corridors, e-GIS (<http://tmsagis.co.za>); and (ii) Map Studio, *Southern and East Africa Road Atlas*, 2007

I.3.3 Environmental Concerns Related to Corridor Development

In the current study a number of interviews of government officials were undertaken to ascertain views related to corridor development. Table I.14 presents the comments and concerns of officials of the various environmental authorities and implementation agencies.

Table I.14: Environmental Concerns/Issues Raised by Government Officials during the Current Study

Country	Environmental Issues Related to Corridor Development (Interview Results)
Botswana	<ul style="list-style-type: none"> • Wildlife disturbance and animal poaching should be considered regarding road development. • As a social issue, during construction and operation of the project, the land use of the area and outbreaks of infectious disease (especially HIV/AIDS and malaria) should be assessed. • At the border, air pollution, waste, and the above-mentioned diseases should be taken account due to the increase in traffic (including drivers and passengers). • Related to mining, (solid/liquid) waste management, including the disposal of chemical and other hazardous wastes should be assessed (there is no adequate landfill for the hazardous wastes). Illegal logging is also an issue. • Considering that development of additional water sources is required, the reuse of water should also be considered.
Malawi	<ul style="list-style-type: none"> • Adequate operation is required in addition to construction. Railway facilities (e.g., track) have been vandalized or stolen, adversely affecting the frequency of operation and perhaps causing abandonment. • The impacts of construction on local people (e.g., heavy dust problems during the dry season) should be considered. • Compensation payments should be based on adequate, updated cost valuations. • Information sharing between the local and national governments is required especially regarding road maintenance projects and rights-of-way. Since not all local people understand that the land belongs to the government, encroachment is often a problem. • Compensation for impacts on residences presents a challenge. Land valuations are often not accepted by the project affected persons (PAPs). Also, sometimes PAPs remain in the area even after compensation is paid and it is a difficult task to move them. In the case of the bypass for city of Lilongwe, government revenue land, farm, and customary land were involved and the negotiation for farmland proved most difficult. • The current shortage of sewage lines to connect factories and the central city water treatment facilities may cause water pollution if there is further industrial development. • All activities require sufficient environmental study prior to project implementation. For example, mining development may be associated with blasting, dust, radiation (in the case of a uranium mine), large excavations, conflict between laborers and local residents, and social/health issues such as

Country	Environmental Issues Related to Corridor Development (Interview Results)
Mozambique	<p>HIV/AIDS. Also, in the case of water development projects (e.g., irrigation), waterborne disease is a concern.</p> <ul style="list-style-type: none"> • In the case of a large-scale development project, a strategic environment assessment may be required. • In the case of industrial development, adequate zoning of the area may be required to minimize the impact on surrounding residents (e.g., from discharge/waste from factories, noise). • Since legislation on protected areas in Mozambique is insufficiently clear regarding permissive activities, adequate mitigation measures based on environmental study may need to be considered.
Zambia	<ul style="list-style-type: none"> • During the transport of heavy chemical materials from South Africa to mining sites, there have been a number of accidents that have led to the spreading of hazardous chemical material in the area. This kind of accident is one of the risks of development of the corridor. • The quality of the water in Lusaka is a major concern at the moment because of the increase in the population of the city. The city still lacks sufficient sewage treatment facilities, and this has been recognized as a millennium challenge by the government. • Impacts on the natural environment should be minimized. A mining project inside the Lower Zambezi National Park was rejected on this basis. Sustainable management of natural resources has been prioritized recently in the country even with respect to economically beneficial project.
Zimbabwe	<ul style="list-style-type: none"> • The quality of the water sources in Harare is a main concern. Pollution is produced by agriculture, industrial activities (solid/liquid waste), and mining (especially from gold mining, in which mercury and cyanide may be used for refining). The cost of water treatment for both quality and quantity is likely to increase. • Waste management should be considered with respect to corridor development. A shortage of sewage plants and pipelines, especially inadequate management of the current broken system, sometimes results in a contamination of drinking water. Also, illegal landfill has caused pollution from Pomona Dam. • Related to the power sector, leakage from transmission plants (transfer oil) is a problem that should be avoided or mitigated. • Related to industrial development, air pollution and effluent waste (solid/waste including hazardous material) is a potential problem that should be avoided or mitigated.

Source: Interviews conducted by the JICA Study Team in August 2012