

7. Institutions and Organizations Related to Environmental and Social Considerations

7.1 Policy, laws and regulations relevant to an environmental assessment

7.1.1 Environmental assessment policy for sustainable development and environmental conservation (1994)

The policy, approved by the cabinet in 1994, recognises that Environmental Assessments (EA's) seek to ensure that the environmental consequences of development projects and policies are considered, understood and incorporated into the planning process, and that the term ENVIRONMENT is broadly interpreted to include biophysical, social, economic, cultural, historical and political components¹. The policy defines policies, programmes and projects (PPP) requiring EA and EA procedure. Before the Environmental Management Act (EMA) came into force, environmental impact assessments were executed in accordance with this policy.

In response to the policy, work on drafting necessary legislation had started. Then, 15 years later, the Environmental Management Act was finalized in 2007.

7.1.2 Environmental Management Act (No. 7 of 2007)

The Environmental Management Act (EMA) was promulgated in 27 December 2007. Implementation of its operation was notified in the Government Gazette of 6 February 2012 when the following regulations were also notified.

- List of activities that may not be undertaken without an environmental clearance certificate (Government Notice No. 29)
- Environmental Impact Assessment (EIA) Regulations (Government Notice No. 30)

The EMA aims to promote the sustainable management of the environment and the use of natural resources by preventing and mitigating the significant effects of various activities on the environment.

The outline of EMA is shown in Table 7.1.

¹ "Namibia's Environmental Assessment Policy", January 1995 (Directorate of Environmental Affairs, Ministry of Environmental and Tourism)

Table 7.1: Outline of EMA

Title	Main Items
Part I: Definitions and object of act (Section 1 to 2)	Definition of terms, objective of Act.
Part II: Principles of environmental management (Section 3)	Principles of environmental management
Part III: General functions and powers of minister (Section 4 to 5)	Function and powers of the minister
Part IV: Sustainable development advisory council (Section 6 to 15)	Establishment, functions, composition, members' term of office, meetings, administration of sustainable development advisory council, Disclosure of interest.
Part V: Environmental commissioner and environmental officers (Section 16 to 22)	Appointment and functions of environmental commissioner and environmental officers
Part VI: Environmental plans (Section 23 to 26)	Objectives of the plan, obligation for formulating the plan, the approval process, compliance with the plans
Part VII: Environmental assessment (Section 27 to 31)	Listing activities that need an environmental clearance certificate, provisions relating to listing of activities, procedures for identifying competent authorities
Part VIII: Environmental assessment process (Section 32 to 43)	Application for an environmental clearance certificate, procedure of assessment, environmental commissioner's review and decision. Amending conditions, duration, prohibition on transfer, suspension/cancellation of environmental clearance certificate.
Part IX: Special provisions relating to environmental assessments (Section 44 to 48)	Consultation, appointment of external specialist, access to environmental information, international environmental agreement
Part X: General provisions (Section 49 to 58)	Delegation of the powers of environmental commissioner, appeals to minister, offence, forfeiture, formulation of relevant regulations, commencement of Act

Source: Environmental Management Act (No.7 of 2007)

7.1.2.1 Regulations and guidelines in preparation related to EMA

The following draft regulations/guidelines were announced in the government gazette on April 2008. As of June 2014, none of them have been finalized yet.

- Regulations for Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA)
- Procedures and Guidelines for Strategic Environmental Assessment (SEA) and Environmental Management Plan (EMP)
- Draft Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP)

The officer of the Department of Environmental Affairs of the Ministry interviewed by the JICA Project Team, mentioned that these draft regulations/guidelines were still being revised and it was not certain how long it would take to finalize.

7.1.3 NDP4 (2012/13 – 2016/17)

In NDP4, published in July 2012, Environmental Management is regarded as one of the key elements of supportive institutional environments for sustainable economic development. The environmental strategy for NDP4 and beyond includes:

- The implementation and enforcement of EMA, particularly the use of strategic environmental assessments to guide development decision-making,

- The development of an integrated (including spatial) planning,
- The implementation of the Community Based Natural Resource Management (CBNRM) programme,
- Improving implementation policy and legislative frameworks,
- Increase public access to environmental information,
- Strengthen inter-ministerial, non-governmental and donor coordination and harmonisation,
- Adopt Public-Private-Community-Partnerships, and
- Develop new initiatives such as Natural Resources and Environmental Governance Programmes.

7.2 Procedure for environmental assessment

7.2.1 SEA

In the EMA, SEA is not explicitly prescribed. Thus, the following explanation relies on information from the “Draft” Regulations for Strategic Environmental Assessment and Environmental Impact Assessment (Draft Regulation)” and “Draft” Procedure and Guidelines for Strategic Environmental Assessment and Environmental Management Plan (Draft Procedure and Guidelines).

SEA is the assessment process required for policies, plans and programmes while EIA is for specific projects. Schedule 1 (Screening list of policies/plans/programmes/projects subject to full environmental assessment) of the Draft Regulations specifies the activities that require SEA as follows².

- Construction and related activities, which include power generation, supply and transmission, facilities for hazardous substances, public roads, railways, harbours, airports, facilities associated with aquaculture, communication networks, canals, dams, reservoirs, tourism facilities, sewage treatment plants, facilities associated with industry, waste disposal and treatment facilities, oil refineries, and bulk supply pipelines (e.g. water, oil, gas, etc.),
- Land use planning and development activities, which include rezoning and land use changes,
- Resource extraction, manipulation, conservation and related activities such as mining, water abstraction, forestry (clearance, reforestation and afforestation), and genetic modification of any organism, and
- Other activities

² Schedule 1 states that it is applicable for EIA, too. However, due to Government Notice No. 29 and 30 on 6 Feb. 2012, it seems realistic that EIA should follow “List of activities that may not be undertaken without environmental clearance certificate”.

7.2.1.1 From application to approval

The SEA procedure is summarized as follows.

[1] Appointment of environmental assessment practitioner (EAP)

The organ of state³ will appoint a qualified EAP. The EAP must have knowledge of and experience in conducting assessments and perform the work relating to the application for an Environmental Clearance Certificate (ECC).

[2] Development of the proposal

The organ of state and EAP must develop the proposal by collecting baseline information to predict likely environmental impacts of the policy/plan/programme (P/P/P). The information could include alternatives, affected parties, potential impacts and benefits, issues, mitigation and optimisation possibilities.

[3] Determination if the P/P/P is likely to have significant environmental effects.

The organ of state and EAP will determine whether or not a proposed P/P/P is likely to have significant environmental effects.

[4] Preparation of a baseline report

[4-1] If it is established that the P/P/P is unlikely to have significant environmental effects, the organ of state must prepare a baseline report with a draft environmental management plan for an application for an Environmental Clearance Certificate (ECC).

[4-2] If determining that the P/P/P is likely to have significant environmental effects, the organ of state must prepare baseline report with the terms of reference for full-SEA.

[5] Submission of application / notification

[5-1] If the proposed P/P/P was determined to have no significant environmental impacts, the organ of state must submit the following application documents to the competent authority⁴ for ECC:

- Completed application form
- Baseline report
- A draft environmental management plan

[5-2] If the proposed P/P/P is determined to have significant environmental impacts, the organ of state must submit the following notification documents to the competent authority.

³ Organ of state means, in short, any office, ministry or agency of State or administration of local government.

⁴ Competent authority means an organ of state which is responsible, under any law, for granting or refusing an authorisation. In this case, Ministry of Environment and Tourism is the competent authority except as otherwise specifically provided.

- Completed notification form for the intentions to implement SEA
- Baseline report
- Draft environmental management plan
- Terms of reference for full-SEA study

[6] Review of application / notification

The competent authority will review the application/notification. In the review process, the competent authority may invite a specialist for review or the public for comments. In case of P/P/P with significant impacts, the competent authority will ask for assistance of local and/or outside experts, sector ministries, and any other organisations/individuals as considered necessary.

[7] Issue of ECC / Implementation of full-SEA / Submission of application

[7-1] If accepted the application for the P/P/P with no significant environmental impacts, the competent authority will issue an ECC.

[7-2] If the competent authority decides and notifies that the PPP has significant environmental impacts but does not requires a full-SEA, the organ of state will submit the application documents to the competent authority for ECC.

[7-3] If the competent authority decides and notifies that the P/P/P has significant environmental impacts and requires a full-SEA, the organ of state must implement full-SEA. Main components necessary for full-SEA study are as follows:

- Scoping
- Investigation including specialist involvement
- Preparation of the report

[8] Submission of application

On the completion of the full-SEA, the organ of state will submit the following application documents to the competent authority for ECC.

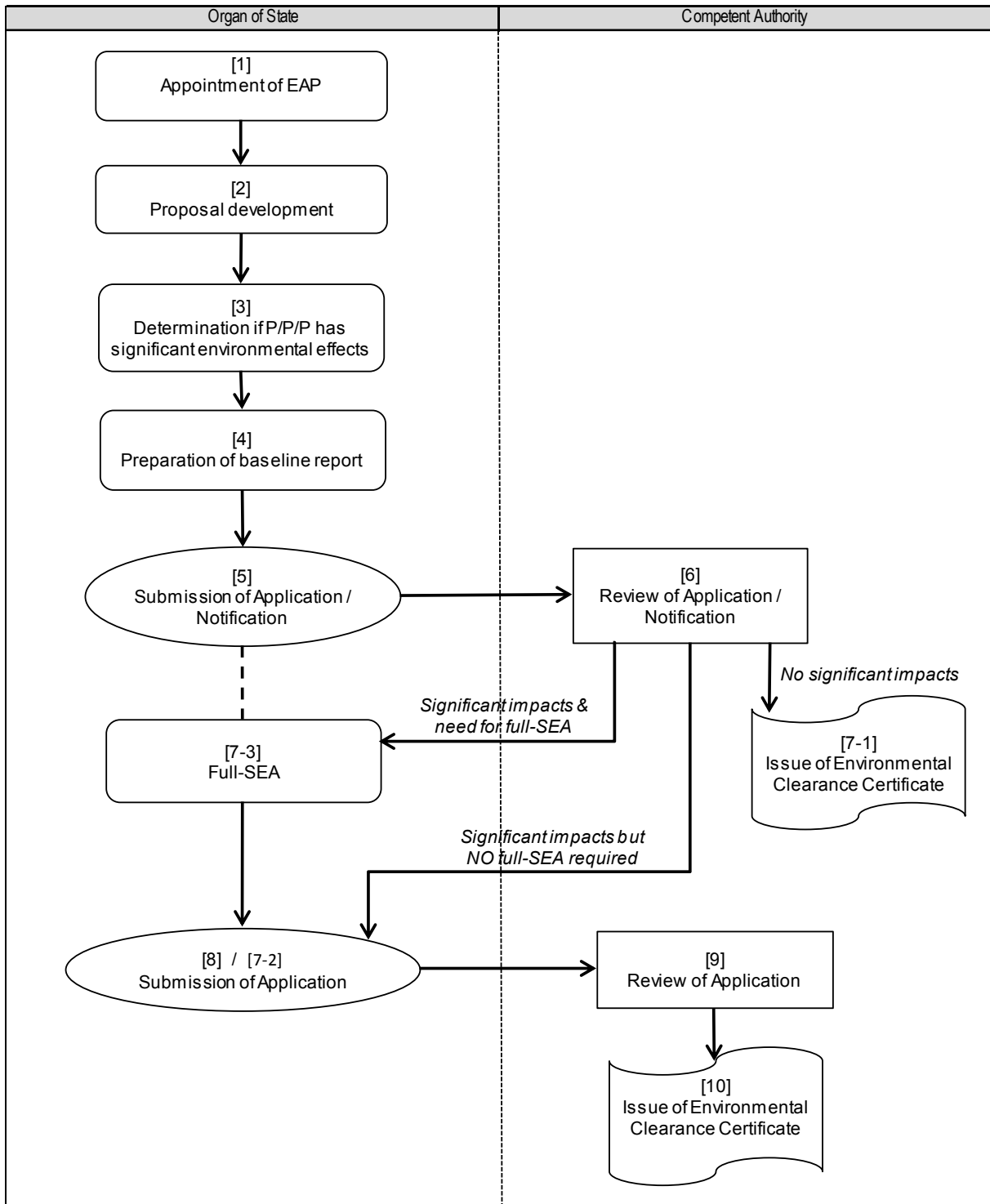
- Completed application form
- A full-SEA report
- A draft environmental management plan

[9] Review of application

The competent authority will review the application documents.

[10] Issue of ECC

If the application is approved, the competent authority will issue an ECC. The EIA process is illustrated in Figure 7.1.



Source: Prepared by JICA Study Team based on “Regulations for Strategic Environmental Assessment and Environmental Impact Assessment (Draft)” and “Procedure and Guidelines for Strategic Environmental Assessment and Environmental Management Plan (Draft)”

Figure 7.1: Workflow of SEA process (tentative)

7.2.1.2 Public consultation

According to the Draft Procedure and Guideline, in the process of full-SEA implementation, public consultation will only be undertaken after consultation and a screening process of the draft SEA report by the organ of state. The public and other stakeholders must be provided with an opportunity to express their opinions on the findings of the SEA process and to use it as a reference point in commenting on the proposed P/P/P. The draft SEA report should be reviewed for finalization in response to the result of public consultation, and in the final SEA report, it should be made clear how the contents of the report have changed or why no changes were made.

7.2.1.3 Record of decisions and appeal

The Draft Procedure and Guidelines assure, similarly as in the EIA process (see (2)), that the records of decisions made by the competent authority should be available to any interested party including the public, and avail any person of an opportunity to appeal to the decision-making authority.

7.2.2 EIA

7.2.2.1 From application to approval

The EIA procedure stipulated in EMA and EIA regulations is summarized below.

[1] Designation of EAP

The proponent⁵ will designate an EAP to manage the assessment process.

[2] Determination if proposed activity is a listed activity

The proponent will determine that the activity for which the application is made is a listed activity (Table 7.2).

[3] Submission of application for ECC

If the proposed activity is a listed activity, the proponent must apply for ECC. An application form is to be submitted to the competent authority (usually, Environmental Commissioner⁶, Ministry of Environment and Tourism).

[4] Registration

The Environmental Commissioner will register the application.

[5] Scoping

After submission of application, the proponent will:

⁵ Proponent means a person who proposes to undertake a listed activity.

⁶ Refer to section 6.2.5 in regard to Environmental Commissioner

- Conduct a public consultation process,
- Open and maintain a register of all interested and affected parties (IAPs),
- Consider all objections and representations received from IAPs,
- Prepare a scoping report, and
- Give all registered IAPs an opportunity to comment on the report.

[6] Submission of the scoping report

The proponent will submit the scoping report with relevant documentation to the Environmental Commissioner. The scoping report must include the following contents:

- The curriculum vitae of the EAP,
- A description of the proposed activity,
- A description of the site on which the activity is to be undertaken and its location,
- A description of the environment that may be affected by the activity,
- An identification of laws and regulations that have been considered,
- Details of the public consultation process,
- A description of the need and desirability of the activity and any identified alternatives to the activity,
- A description and assessment of the significance of any significant effects that may occur as a result of undertaking the activity or identified alternatives,
- Terms of reference for the detailed assessment, and
- A draft management plan.

[7] Consideration of the scoping report and determining the need for assessment.

After receiving the scoping report, the Environmental Commissioner will consider the scoping report and decide whether the activity requires a detailed assessment or not. If necessary, the Environmental Commissioner may consult the relevant organ of state and any other interested or affected party.

In case that the activity requires a detailed assessment, the Environmental Commissioner will determine the scope, procedures and methods of assessment and notify the proponent.

[8] Issues of ECC / Assessment report preparation

[8-1] If the activity does not require a detailed assessment, the Environmental Commissioner will issue an ECC.

[8-2] If the activity requires a detailed assessment, the proponent will instruct EAP to prepare an assessment report. The assessment report must include the followings contents:

- The curriculum vitae of the EAP,
- A detailed description of the activity,
- A description of the environment that may be affected by the activity,
- A description of the need and desirability of the activity and any identified potential alternatives to the activity,
- The methodology used in determining the significance of potential effects,
- A description and comparative assessment of all alternatives,
- A description of all environmental issues and 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,
- An assessment of each identified potentially significant effect,
- A description of any assumptions, uncertainties and gaps in knowledge,
- An opinion as to whether the activity must or may not be authorised, and any conditions to be made for authorisation if the opinion is that it must be authorised, and
- A non-technical summary of the information.

[9] Submission of assessment report

On the completion of the assessment report, the proponent will submit the report to the Environmental Commissioner.

[10] Review

The Environmental Commissioner will review the assessment report and application. The reviewing process includes public hearings.

[11] Issue of ECC

If granted the application, the Environmental Commissioner will issue an ECC.

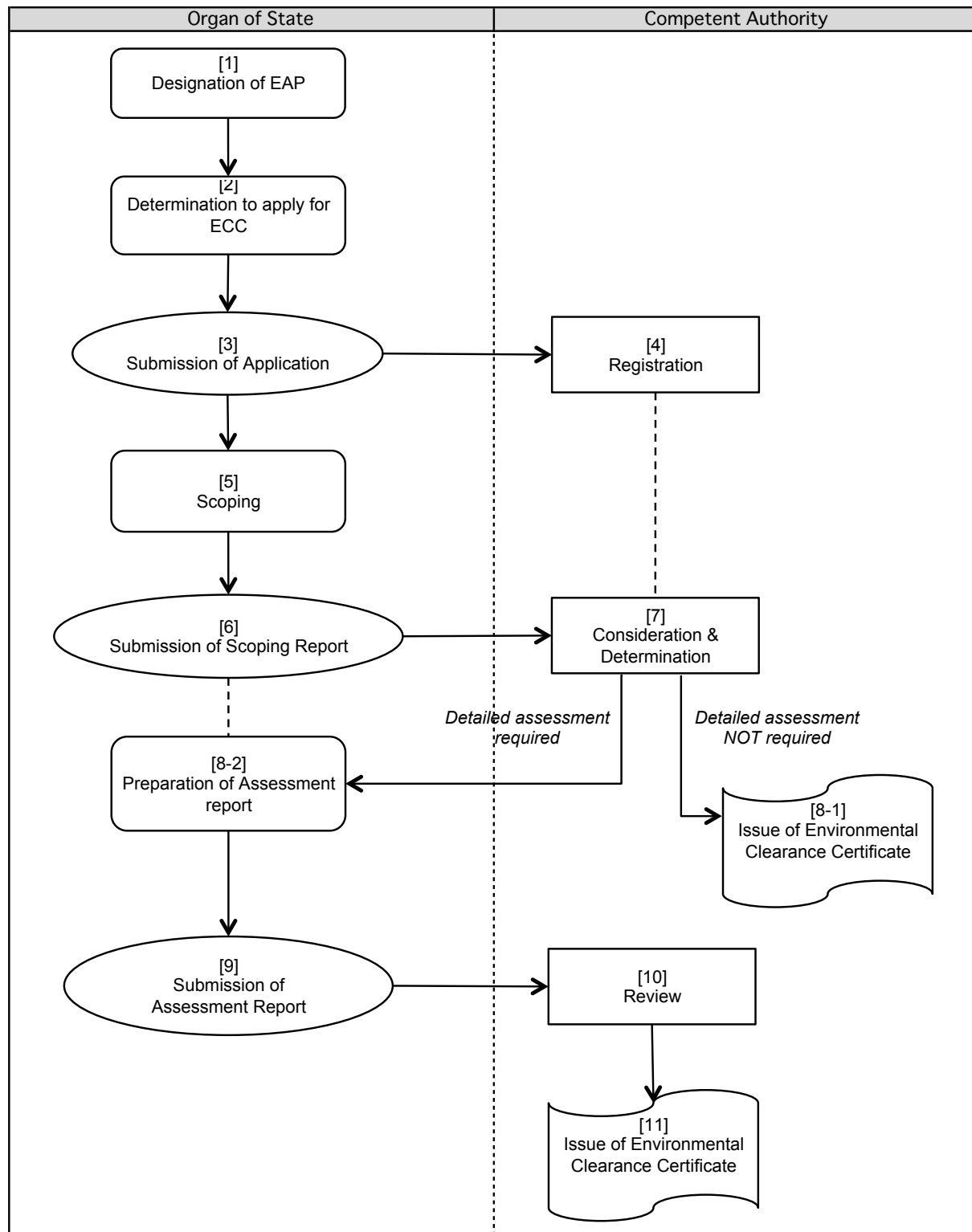
The EIA process is illustrated in Figure 7.2.

Table 7.2: List of activities that may not be undertaken without an Environmental Clearance Certificate

Category	Activities
Energy generation, transmission and storage activities	Construction of facilities for generation of electricity; transmission and supply of electricity; refining of gas, oil and petroleum products; and nuclear reaction, storage or disposal of nuclear fuels, radioactive products and waste.
Waste management, treatment, handling and disposal activities	<ul style="list-style-type: none"> - Construction of facilities for waste sites, treatment and disposal of waste. - Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976. - The import, processing, use and recycling, temporary storage, transit or export of waste.
Mining and quarrying activities	<ul style="list-style-type: none"> - Construction of facilities for any process or activities which requires a licence, right or other form of authorisation, and the renewal of a licence, right or other form of authorisation, in terms of Minerals (Prospecting and Mining Act 1992). - Other forms of mining or extraction of any natural resources. - Resource extraction, manipulation, conservation and related activities. - Extraction or processing of gas from natural and non-natural resources.

Category	Activities
	- Extraction of peat.
Forestry activities	Clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation.
Land use and development activities	<ul style="list-style-type: none"> - Rezoning of land from residential use to industrial or commercial use; light industrial use to heavy industrial use; agricultural use to industrial use; and use for nature conservation or zoned open space to any other land use. - Establishment of land resettlement schemes. - Construction of veterinary protected area or game proof and international boundary fences.
Tourism development activities	Construction of resorts, lodges, hotels or other tourism and hospitality facilities.
Agriculture and aquaculture activities	<ul style="list-style-type: none"> - Construction of facilities for aquaculture production. - Declaration of an area as aquaculture development. - Genetic modification of any organism with the purpose of fundamentally changing the inherent characteristics of that organism. - Import, processing and transit of genetically modified organisms. - Pest control. - Release of genetically modified organisms into the environment where an environmental assessment is required by law. - Release of any organism outside its natural area of distribution that is to be used for biological pest control. - Introduction of alien species into local ecosystems.
Water resource developments	<ul style="list-style-type: none"> - Abstraction of ground or surface water for industrial or commercial purposes. - Abstraction of groundwater at a volume exceeding the threshold. - Any water abstraction from a river that forms an international boundary. - Construction of canals and channels including diversion of the normal flow of water in a riverbed and water transfer schemes between water catchments and impoundments. - Construction of dams, reservoirs, levees and weirs. - Construction of industrial and domestic wastewater treatment plants and related pipeline systems. - Irrigation schemes for agriculture. - Construction of other activities in water courses within flood lines. - Construction of other activities within a catchment area - Reclamation of land from below or above the high-water mark of the sea or associated inland waters. - Alteration of natural wetland systems. - Release of brine back into the ocean by desalination plants.
Hazardous substance treatment, handling and storage	<ul style="list-style-type: none"> - Manufacturing, storage, handling or processing of hazardous substance. - Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste. - Bulk transportation of dangerous goods using pipeline, funiculars or conveyors with a throughout capacity of 50 tons or 50 cubic meters or more per day. - Storage and handling of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location. - Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid, petroleum, gas or paraffin.
Infrastructure	<ul style="list-style-type: none"> - Construction of oil, water, gas and petrochemical and other bulk supply pipelines; public roads; railways and harbours; airports and airfields; any structure below the high water mark of the sea; cable ways; communication networks including towers, telecommunication and marine telecommunication lines and cables; motor vehicles and motorcycle racing and test tracks; outdoor racing sites of motor powered vehicles; and masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission. - Route determination of roads and design of associated physical infrastructure where it is a public road; the road reserve is wider than 30 meters; or the road caters for more than one lane of traffic in both directions.
Other activities	<ul style="list-style-type: none"> - Construction of military demonstration and testing sites - Construction of cemeteries, camping, leisure and recreation sites

Source: "List of Activities that may not be undertaken without environmental clearance certificate: Environmental Management Act, 2007", 6 February 2012 (Government Gazette of the Republic of Namibia)



Source: Prepared by JICA Study Team based on “Environmental Management Act (No. 7 of 2007) and “Environmental Impact Assessment Regulations (Feb. 2012)”

Figure 7.2: Workflow of the EIA process

7.2.2.2 Public consultation

As mentioned in 7.2.2.1, public consultation should be conducted during scoping and after the

Environmental Commissioner confirms that the application and assessment report comply with the Act and relevant regulations. According to section 21 of the EIA Regulation, the person conducting the public consultation process must notify all potential IAPs of the application, ensure all the relevant information is made available to potential IAPs, and provide reasonable opportunity for potential IAPs to comment on the application.

7.2.2.3 Record of decisions and appeals

According to section 38 of the EMA, the Environmental Commissioner must keep a record of decisions in the prescribed form, which should be made available for public inspection at his/her office during office hours. In addition, sections 50 and 51 of the EMA provide that any person aggrieved by a decision of the Environmental Commissioner may appeal to the Minister of MET, and if this does not resolve the issue, an appeal may be lodged with the High Court against such decision by the Minister.

7.2.3 Gaps between environmental assessment procedures in Namibia and ‘JICA Guidelines for Environmental and Social Considerations’ (JICA guidelines)

Namibia’s environmental assessment procedure, as discussed above, is fairly well-formed and does not significantly deviate from the JICA guidelines. In respect of impacts to be assessed, there are differences between the impacts listed in the JICA guidelines and those in the Draft Regulation (SEA/EIA) as well as Draft Procedures and Guidelines (SEA/EMP) of Namibia. Table 7.3 lists the impacts to be assessed just for comparison. The Namibia’s list in Table 7.3 only refers to Schedule 3 attached to the Draft Regulations, which clearly states that the issues shall not be limited to them. Although not the same words and expressions are used, issues listed in JICA guidelines, inter alia, socioeconomic ones are also taken into consideration in Namibia’s documents implicitly or explicitly.

However, it should be noted that no attention is paid to involuntary resettlement and land acquisition issues in any legislation and other documents related to environmental assessment. In general, involuntary resettlement due to forced eviction for project implementation is recognized as one of the most critical adverse effects. Especially, those who have no legal right to land they live on are most vulnerable to the effects because they are usually not entitled to compensation for their losses.

In Namibia, it seems that land acquisition appears as a financial and administrative issue for the organ of state and/or the proponent proposing P/P/P rather than an environmental issue.

Table 7.3: Environmental impacts to be assessed

	Namibia’s Draft Regulations, Draft Procedures & Guidelines (2008)	JICA guidelines
Issue	<ul style="list-style-type: none"> - Air - Water - Soil - Climatic factors - Biodiversity, fauna & flora 	<ul style="list-style-type: none"> - Air - Water, water usage - Soil - Climate change - Ecosystem, fauna & flora - Waste

	Namibia's Draft Regulations, Draft Procedures & Guidelines (2008)	JICA guidelines
	<ul style="list-style-type: none"> - Human health - Cultural heritage including architectural & archaeological heritage - Landscape - Material assets - Population <p>(In respect of likely affected people)</p> <ul style="list-style-type: none"> - Reliance on the resources likely affected - Level of education & literacy - Socio-economic status of the communities - Level of community organisation - Degree of homogeneity of the public involved - Any previous conflict or lack of consultation - Social, cultural or traditional norms within the community 	<ul style="list-style-type: none"> - Noise & vibrations - Ground subsidence - Offensive odours - Geographical features - Bottom sediment - Global warming - Infectious diseases (e.g. HIV/AIDS) - Accidents - Working conditions (including occupational safety) - Cultural heritage - Involuntary resettlement - Migration of population - Local economies (e.g. employment, livelihood) - Land use & utilization of local resources - Social institution such as social capital and local decision-making institutions - Existing social infrastructure and services - Vulnerable social groups (e.g. the poor, indigenous peoples) - Local conflicts of interest - Equality of benefits and losses - Limitation of accessibility to information, meetings, etc. on a specific person or group - Equality in the development process - Gender - Children's right
Assessment perspective	<ul style="list-style-type: none"> - Positive & negative effects - Short, medium, & long-term effects, Temporary & permanent effects - Secondary, cumulative & synergistic effects 	<ul style="list-style-type: none"> - Trans-boundary or global scale impacts - Impacts occur throughout the life cycle of the project, direct & immediate impacts - Secondary & cumulative impacts - Derivative of impacts, impacts of other activities indivisible from the project

Source: "Guidelines for Environmental and Social Considerations (Translation of Japanese Version)", April 2010 (JICA); "Schedule 3, Regulations for Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA)" (Draft), April 2008 (MET)

7.3 Other relevant environmental legislation

There are a number of sectoral legal instruments to be consulted depending on the nature of the proposed PPP in respect of the environmental assessment concerned. Table 7.4 only lists and summarises the key legislation among others, supposed to be the most likely to affect environmental and social considerations of the Master Plan.

Table 7.4: Other key environmental legislations

Title	Responsible government agency	Main points
Nature Conservation Ordinance (No. 4 of 1975) and Nature Conservation Amendment Act (No. 5 of 1996)	Ministry of Environment and Tourism (MET)	<ul style="list-style-type: none"> - The Ordinance governs the conservation of wildlife and protected areas. - Amendments made to take into account the establishment of conservancies and Wildlife Councils. - Stipulating: establishment of Nature Conservation Board, and game park/nature reserves; restriction of the right to enter there, prohibition of certain acts therein; and rules in relation to hunting of game and other wild animals, problem animals, protection of fish in inland waters and indigenous plants. - The Ordinance will be replaced by the Parks and Wildlife Management Bill (under preparation).
Pollution Control and Waste Management Bill (Third Draft, September 2003)	MET	<ul style="list-style-type: none"> - The Bill is still under preparation. - The Bill aims to prevent and regulate the discharge of pollutants to the air, water, and land, to make provision for the establishment of an appropriate framework for integrated pollution prevention and control, regulate noise, dust and odour pollution, and to establish a system of waste planning and management. - The Minister may make regulations establishing standards, objectives or requirements in relation to: air/water quality and activities liable to cause air/water pollution; any activities relating to waste, including disposal, that are liable to cause pollution; and hazardous substances. - The Minister may make regulations concerning noise, dust or odour (e.g. emission standard). - Requirement of: air pollution license to discharge any pollution from any industrial or commercial activity to the air; and water pollution license to discharge pollutants or waste into any water or watercourse. - Requirement of integrated pollution control license to undertake prescribed industrial or commercial activity which creates a risk of pollution to more than on environmental medium. - Requirement of: waste management licence to collect, transport, store, treat; recover or dispose of waste or hazardous waste; waste site licence to own a waste site; waste import licence to import non-hazardous waste for recycling or for use as a raw material; and waste export licence to export waste from Namibia.
Water Resources Management Act (No. 11 of 2013)	Ministry of Agriculture, Water and Forestry (MAWF)	<ul style="list-style-type: none"> - The Act aims to ensure that the water resources of Namibia are managed, developed, used, conserved and protected. - Requirement of licence for: abstracting and using water from a water resource; drilling or constructing borehole; groundwater disposal; and discharge of wastewater, effluent or waste. - Limitations or prohibitions of activities in a water protection area. - Obligation on the person authorised over any area in which any activity may cause pollution, to provide and operate systems for discharge of effluent, wastewater and waste. - The Minister may impose restriction or limitations of water abstraction from an aquifer. - The Minister may declare an area to be a water protection area in order to protect and enhance any water resource, riverine habitat, watershed, ecosystem or other environmental resource. - The Minister may prohibit or regulate the use of any wetland.
Forest Act (No. 12 of 2001) and Forest Amendment Act (No. 13 of 2005)	MAWF	<ul style="list-style-type: none"> - The Act provides for the protection of the environment and the control and management of forest fires. - Forests are classified into state forest reserves, regional forest reserves, and community forests. - Requirement of a licence to construct a road or a building in a forest reserve.
Marine Resources Act (No. 27 of 2000)	Ministry of Fisheries and Marine Resources (MFMR)	<ul style="list-style-type: none"> - The Act provides for the conservation of the marine ecosystem and the responsible utilization, conservation, protection and promotion of marine resources on a sustainable basis; and for that purpose to provide for the exercise of control over marine resources - Key stipulations include: prerequisites to harvest marine resources, right to harvest marine resources for commercial purposes, exploratory right to harvest marine resources, fisheries agreement, quotas, and licensing of fishing vessels
National Heritage Act (No. 27 of 2004)	Ministry of Youth, National Services, Sport and Culture	<ul style="list-style-type: none"> - The Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. - The Act extends the protection of archaeological and historical sites to private and communal land. - Requirement of permit to carry out works or activities in relation to heritage places.

Title	Responsible government agency	Main points
		- Requirement of permission to undertake the development and/or construction work (e.g. road, power line, pipeline, canal, and bridge) within the area declared conservation area on the ground of its historic, aesthetic or scientific interest.

Source: Respective legislation listed above, Chapter 11 Namibia in "SADC Environmental Legislation Handbook 2012" (Development Bank of Southern Africa), and "Environmental Law and Policy in Namibia: Toward Making Africa the Tree of Live (Second Edition 2013)", Oliver C. Ruppel / Katharina Ruppel-Schlichting

Regarding global agreements, major relevant conventions which Namibia has endorsed are as follows (Table 7.5).

Table 7.5: Relevant global agreements

Title	Objective of the agreement	Namibia
Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat	The conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world	Signed in 1995
United Nations Convention on Biological Diversity (UNCBD)	<ul style="list-style-type: none"> The conservation of biological diversity The sustainable use of the components of biological diversity The fair and equitable sharing of the benefits arising out of the utilization of genetic resources 	Signed in 1992 Ratified in 1997
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	To ensure that international trade in specimens of wild animals and plants does not threaten their survival	Accession in 1990 Entry into force in 1991
Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention)	<ul style="list-style-type: none"> To provides a global platform for the conservation and sustainable use of migratory animals and their habitats To lay the legal foundation for internationally coordinated conservation measures throughout a migratory range of animals 	Not yet signed Only signed a MOU of African Marin Turtles protection in 2006
United Nations Convention to Combat Desertification in those Countries Experiencing serious Drought and/or Desertification, Particularly in Africa (UNCCD)	To combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, with a view to contributing to the achievement of sustainable development in affected areas	Signed in 1994 Ratified in 1997
International Convention for the Prevention of Pollution from Ships (MARPOL)	To prevent the pollution of the marine environment by the discharge of harmful substances or effluents containing such substances by ships from operational or accidental causes	Signed in 2002 Entry into force in 2003

Source: "Review of Policy and Legislative Support to the Sustainable Use of Wetlands in the Zambezi Basin, Final Report (Namibia)", June 2007, Shirley Bethune and Dr. Oliver C. Ruppel.
Homepage of each Convention

In Namibia, 5 sites are inscribed as registered wetlands under the Ramsar Convention (Table 7.6).

Table 7.6: Ramsar sites in Namibia

Name of sites	Date of designation	Area (ha)
Bwabwata-Okavango	2013/12/13	46,964
Etosha Pan, Lake Oponono & Cuvilai drainage	1995/8/23	600,000
Orange River Mouth		500
Sandwich Harbour		16,500
Walvis Bay		12,600

Source: Data downloaded from <https://rsis.ramsar.org/> (Ramsar Sites Information Service)

7.4 Policies and legislations related to land

7.4.1 Land policies and legislations

The National Land Policy, issued in 1998, is based upon the principles enunciated in the Constitution and on the national commitment to redress the social and economic injustices inherited from the colonial past. The policy is divided into urban land and rural land. Main issues in urban land are establishment of adequate proclamation procedures, access to affordable land for the poor and disadvantaged sector of society, and upgrading of informal squatter settlements. Regarding rural land, the policy calls for equal access to all forms of tenure given equal security and protection status, restitution of land rights abrogated by colonial and South African authorities, and implementation of land reform to promote equitable distribution of agricultural land. In addition, decentralization of land administration is a common agenda.

An outline of the **National Land Tenure Policy** is well explained in *Oliver C. Ruppel / Katharina Ruppel-Schlichting*⁷ as quoted below;

The 2003 National Land Tenure Policy covers all land tenure systems in urban, communal, commercial (freehold) and resettlement areas, and is intended to guide all land tenure rights in Namibia. The policy promotes the sustainable utilisation of land and other resources. By regulating different land tenure rights, it provides secure tenure for informal urban settlers, farm workers and occupiers (those who have been employed less than ten years on a single farm and do not have secure tenure elsewhere). Furthermore, it provides guidelines on compensation for occupiers of expropriated land.

As of November 2014, according to MLR, this National Land Tenure Policy is still a draft form. Since overall Namibia's land policy is currently under thorough review and will be revised soon, this Policy is not effective any longer.

The Agricultural (Commercial) Land Reform Act (No.6 of 1995) enables the redistribution of freehold land to the previously disadvantaged for agricultural purposes under the willing seller, willing buyer principle⁸.

The Communal Land Reform Act (No.5 of 2002) defines the allocation of rights to communal farmers and traditional authorities over communal land and its administration to improve the use of communal land and to reduce irregularities and constraints regarding livelihood strategies⁴⁶.

Currently, **the Land Bill** is in preparation to become an integrated Act associated with land. It is expected to replace the Agricultural (Commercial) Land Reform Act and the Communal Land Reform Act.

⁷ "Environmental Law and Policy in Namibia: Toward Making Africa the Tree of Live (Second Edition 2013)", Oliver C. Ruppel / Katharina Ruppel-Schlichting

⁸ Chapter 11 Namibia in "SADC Environmental Legislation Handbook 2012" (Development Bank of Southern Africa)

The Flexible Land Tenure Act (No.4 of 2012) attempts to create alternative forms of land title that are simpler and cheaper than the existing forms in order to provide security of title for persons who live in informal settlements or who are provided with low income housing.

7.4.2 Land acquisition

In relation to the issue of land acquisition, Article 16 of **the Constitution** states that the State or a competent body or organ authorised by law may expropriate property in the public interest subject to the payment of just compensation. Section 26 of **the Agricultural (Commercial) Land Reform Act** provides for the payment of just compensation for any commercial agricultural land expropriated or any right in such commercial agricultural land expropriated in accordance with Article 16 of the Constitution. In respect of communal land, Section 16 of **the Communal Land Reform Act** states that the land may be withdrawn from any communal land area for any purpose in the public interest and just compensation should be paid for the persons who hold rights on such land.

Compensation Policy Guidelines for Communal Land (Cabinet Decision No. 17th/15.09.09 /033 of 15 Sept. 2009) provides details how compensation shall be determined and what kind of compensation options shall be given to the affected landowners when communal land is taken for township expansion or other public sector development projects. Compensation options are summarized in Table 7.7.

Table 7.7: Compensation options for communal land owners

Applicability criteria	Compensation to be provided
<p>Option 1: Affected communal land of more than 500m² on which there is a homestead, cultivated land, uncultivated land and any other improvements</p>	<ul style="list-style-type: none"> • Two residential erven measuring at least 500m² in size in the proclaimed town with municipal services (i.e. water supply and/or electricity); or Alternative land of similar size as the one which has been expropriated in order to continue with their farming activities (subject to availability) • Compensation money for other improvements (i.e. cultivated land, grazing land/uncultivated land, structures, and fruit-bearing trees) affected by land acquisition or displacement • Disturbance allowance
<p>Option 2: Affected communal land of less than 500m² on which the improvements are of a permanent or temporary nature which are utilized for other purpose including dwelling</p>	<ul style="list-style-type: none"> • Compensation money for structure <ul style="list-style-type: none"> - For structures constructed of corrugated iron materials which are not of a permanent nature: N\$ 10,000 and transportation - For conventional buildings (Brick walls, IBR roof, grano or tiled floors): N\$3000/m² and transportation • Compensation money for fruit-bearing trees and/or cultivated land • Disturbance allowance <p>Where the affected person opts to be given alternative land elsewhere in order to continue with their farming activities,</p> <ul style="list-style-type: none"> • The government shall strive to provide the affected person with alternative land of similar size, ideally, within the same traditional authority jurisdiction. • Compensation money for being deprived of the right of use of the land and other improvements (i.e. cultivated land, grazing land/uncultivated land, structures, and fruit-bearing trees) • Disturbance allowance

Source: Compensation Policy Guidelines for Communal Land, 15 September 2009, GRN

7.5 Organizational situation of agencies and institutions involved

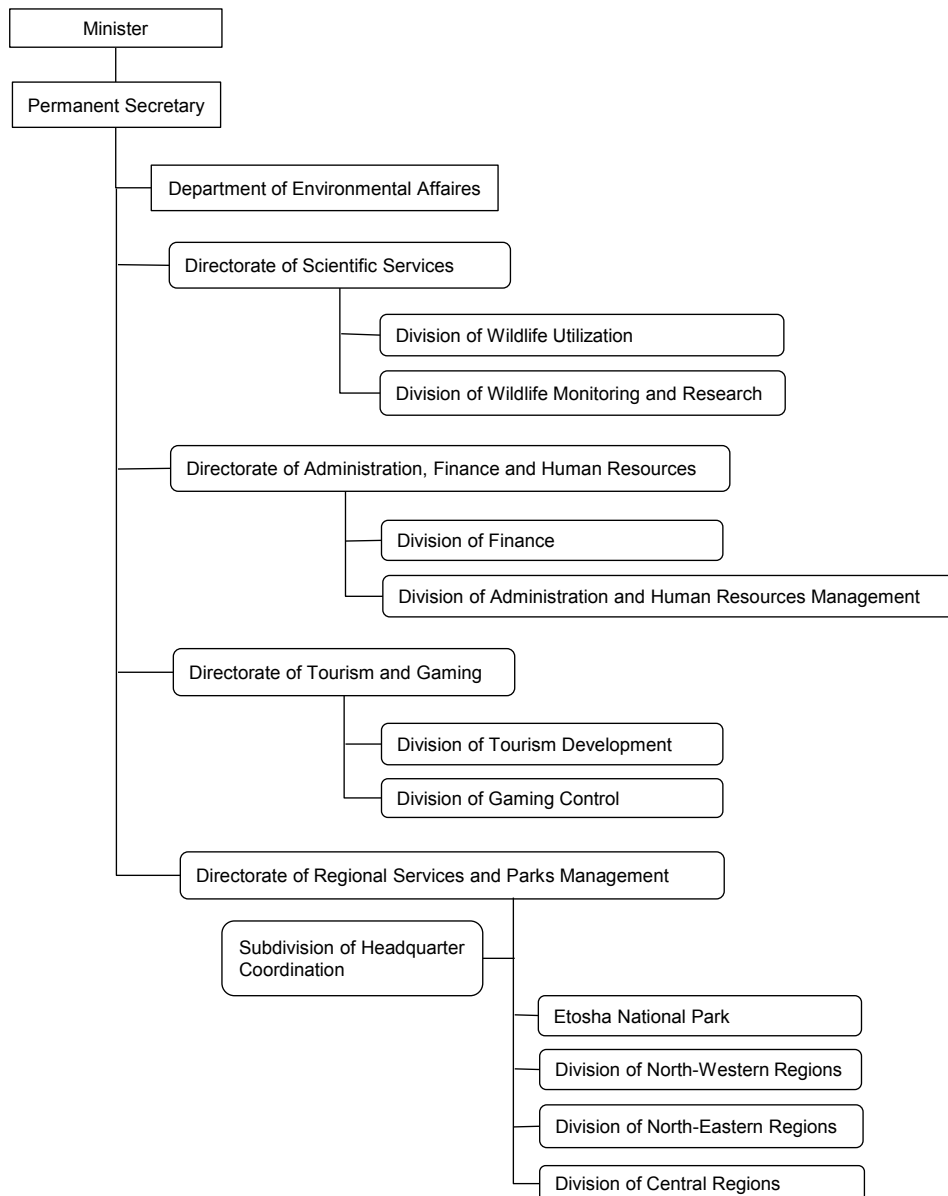
7.5.1 Ministry of Environment and Tourism (MET)

Ministry of Environment and Tourism (MET) is the organization primarily responsible for environmental protection and management including authorization of SEA and EIA. The mission of MET is to promote biodiversity conservation in the Namibian environment through the sustainable utilization of natural resources and tourism development for the maximum social and economic benefit of its citizens⁹.

The MET consists of one department and four directorates:

- Department of Environmental Affairs,
- Directorate of Scientific Services,
- Directorate of Administration, Finance and Human Resources,
- Directorate of Tourism and Gaming, and
- Directorate of Regional Services and Parks Management.

⁹ <http://www.met.gov.na/>



Source: "Detailed Planning Survey on the Project on Master Plan for Development of an International Logistics Hub for SADC Countries (Japanese version)", December 2013 (JICA)

Figure 7.3: Organization chart of MET

7.5.1.1 Sustainable Development Advisory Council

The Sustainable Development Advisory Council (so-called Advisory Council) has been established in accordance with EMA. The Advisory Council must perform the following functions:

- Promote cooperation and coordination between organs of state, non-governmental organizations, community based organisations, the private sector and funding agencies, on environmental issues relating to sustainable development,
- Advise the minister on:
 - ✓ The development of a policy and strategy for the management, protection and use of the environment,

- ✓ The conservation of biological diversity, access to genetic resources in Namibia and the use of components of the environment in a way and at a rate that does not lead to the long-term decline of the environment, thereby maintaining its potential to meet the needs and aspirations of present and future generations,
- ✓ Appropriate methods of monitoring compliance, and
- ✓ The need for, and initiation or amendment of legislation, on matters relating to the environment.

The Advisory Council, consisting of 8 members from both the government and private sector, was appointed and inaugurated in January 2013. It means that the EMA was finally implemented 5 years later after its promulgation.

7.5.1.2 Environmental Commissioner

The Environmental Commissioner is responsible for controlling the entire SEA and EIA process. The major functions of the Environmental Commissioner, provided in the EMA, are:

- Advise organs of state on the preparation of environmental plans,
- Receive and record applications for environmental clearance certificates,
- Determine whether a listed activity requires an assessment,
- Determine the scope, procedure and methods of an assessment,
- Review the assessment report,
- Issue environmental clearance certificates,
- Maintain a register of environmental assessments undertaken,
- Maintain a register of environmental clearance certificates issued and environmental plans approved, and
- Conduct inspections for compliance monitoring.

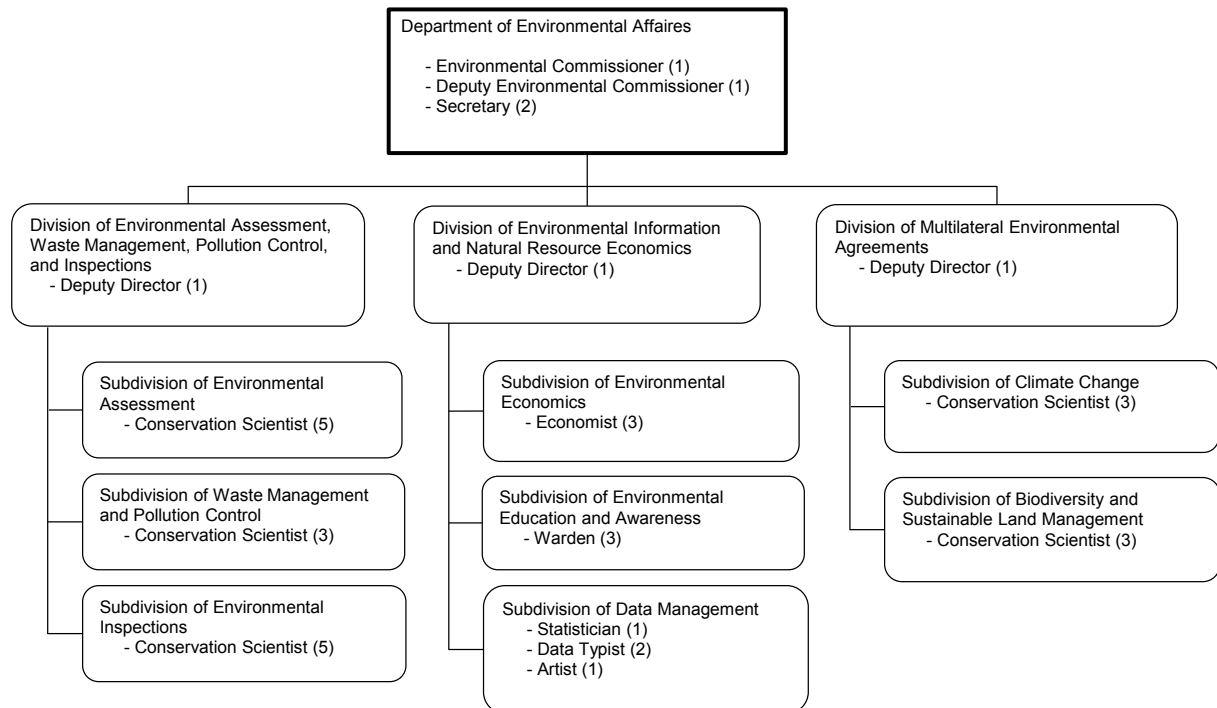
The Environmental Commissioner was appointed and took office from March 2012.

7.5.1.3 Department of Environmental Affairs (DEA)

The mission of the DEA is to actively promote and maintain the welfare of the people by adopting policies aimed at maintaining ecosystems, essential ecological processes and biological diversity of Namibia and utilising living resources on a sustainable basis for the benefit of all Namibians, both present and future¹⁰. The DEA guides and reviews EIAs. It has broad environmental responsibilities, including overseeing Namibia's compliance with various United Nations conventions and the implementation of a variety of programmes related to these conventions. The DEA is also in charge of pollution control and waste management, and overall coordination of environmental issues

¹⁰ <http://www.met.gov.na>

within the Namibian government¹¹.



Note: Under the name of dept./division/subdivision, staff is categorised by qualifications. The figure in brackets is the number of staff.
Source: "Detailed Planning Survey on the Project on Master Plan for Development of an International Logistics Hub for SADC Countries (Japanese version)", December 2013 (JICA)

Figure 7.4: Organization chart of DEA, MET

7.5.1.4 Directorate of Regional Services and Parks Management (DRSPM)

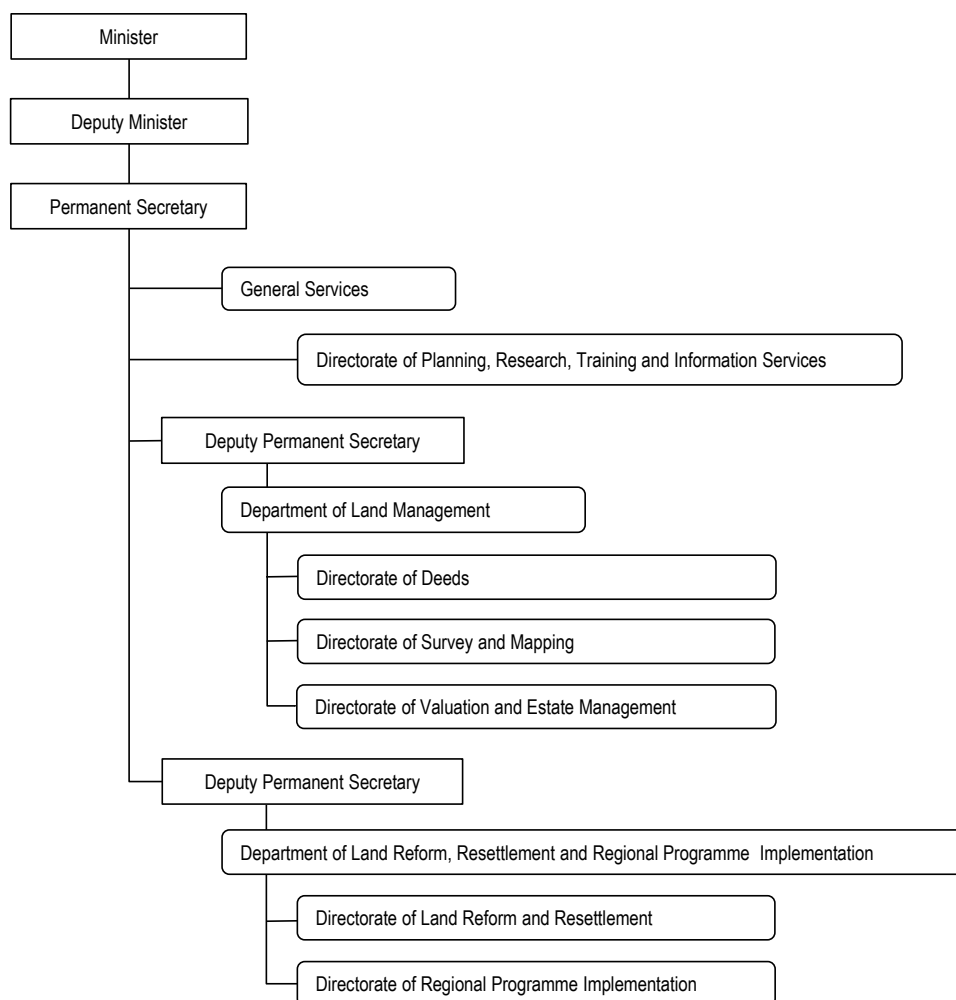
The mission of the DRSPM is to promote the conservation of natural resources and wildlife habitat in Namibia, and to ensure the sustainable use of wildlife resources. Major tasks of DRSPM are⁸:

- Improve and monitor the implementation of park and wildlife management plans,
- Sustainably manage Namibia's protected areas,
- Manage and regulate the utilization of renewable natural resources on a sustainable basis and to strive for biodiversity conservation, maintenance and restoration,
- Protect and facilitate the sustainable use of biodiversity in commercial and communal areas,
- Promote formation and management of conservancies, and
- Enhance effective prevention of wildlife crime and enforcement of national wildlife protection legislation.

¹¹ Chapter 11 Namibia in "SADC Environmental Legislation Handbook 2012" (Development Bank of Southern Africa)

7.5.2 Ministry of Lands and Resettlement (MLR)¹²

The Ministry of Lands and Resettlement (MLR) is the main actor in the planning and administration of land in the country. The ministry has two main technical departments: the Department of Land Management, and the Department of Land Reform, Resettlement and Regional Programme Implementation. These departments are divided into several directorates.



Source: Prepared by JICA Study Team based on the information obtained from MLR

Figure 7.5: Organization chart of MLR

When a development project requires land acquisition on communal land, MLR is responsible for land valuation to determine proper compensation. Division of General Valuation under the Directorate of Valuation and Estate Management is in charge of land valuation. The Directorate of Survey and Mapping, under the Dept. of Land Management, provides map information for the planning exercises to government, private institutions and the public.

¹² “Environmental and Social Considerations in Detailed Planning Survey (Technical Cooperation for Development Planning)” for the Project on Master Plan for Development of an International Logistics Hub for SADC Countries in the Republic of Namibia (http://www.jica.go.jp/english/our_work/social_environmental/id/africa/category_a_b_fi.html)

7.5.3 Other agencies and institutions involved

- When a development project is planned within the area of a municipality, town or village, consultation with and authorization of respective local authorities and the Ministry of Regional and Local Government, Housing and Rural Development (MRLGHRD) is essential. Regarding projects in communal areas, consultation with and authorization of the traditional authority concerned as well as MRLGHRD is required.
- The Ministry of Agriculture, Water and Forestry (MAWF) is responsible for conservation and management of water resources (Directorate of Water Resource Management), forests (Directorate of Forestry) and soil (Directorate of Extension and Engineering Services).
- The Ministry of Fisheries and Marine Resources (MFMR) is responsible for protection and management of marine resources.

8. Baseline Survey for SEA

8.1 Assessment of the current natural and social environment

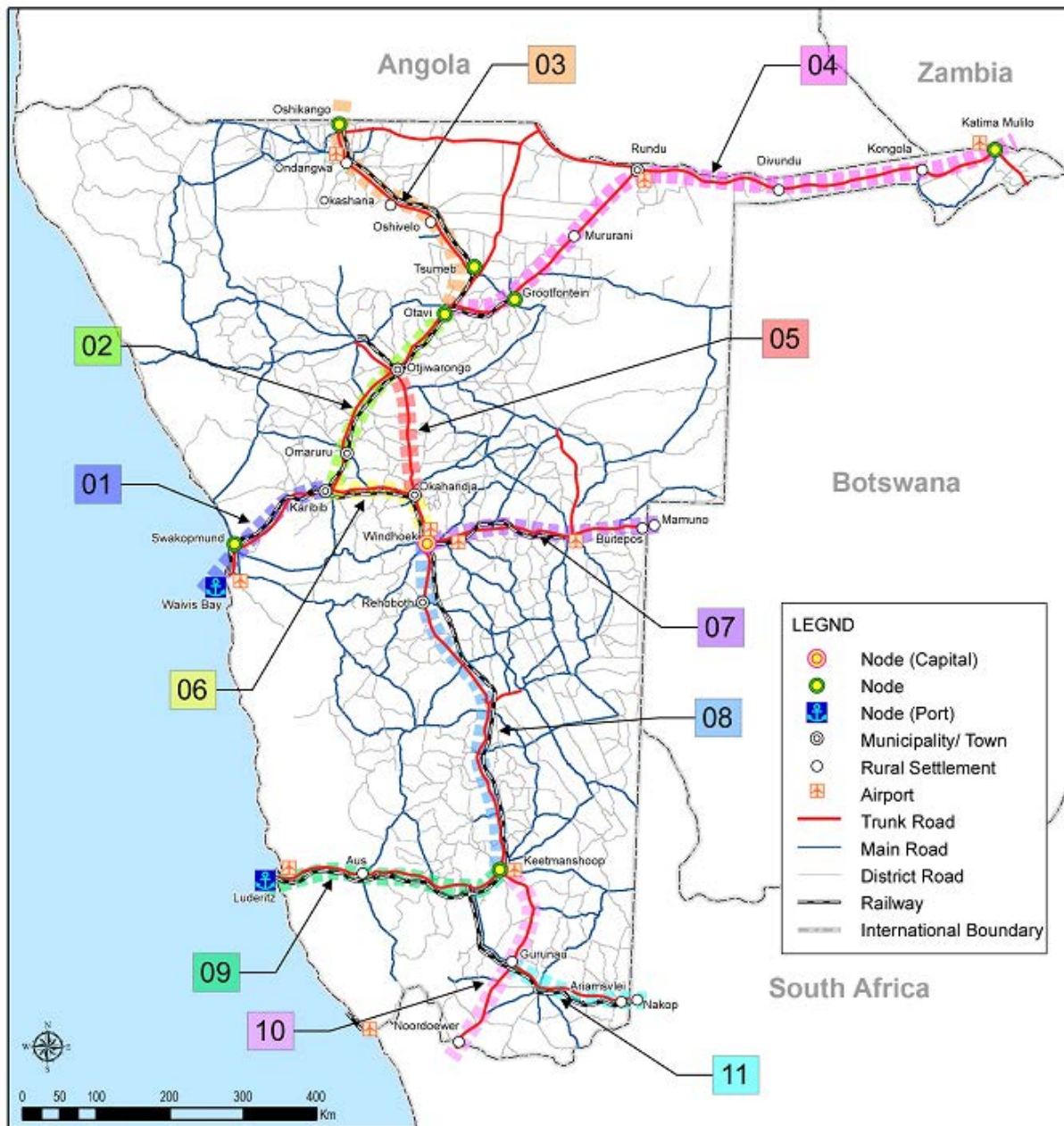
The baseline survey for SEA was conducted by the local consultant in order to understand the current natural and social environment and to conduct initial identification of possible impacts of the Master Plan with a preliminary scoping exercise.

In the survey, the analysis was performed for each of the key municipalities/towns (= nodes) and logistics corridors which are further divided into several sections as shown in Table 8.1. Geographical locations of the corridors and nodes are depicted in Figure 8.1

Table 8.1: Corridors and nodes analysed in the baseline survey

No.	Sections of Corridors	Trans – Cunene Corridor	Walvis Bay – Ndola - Lubumbashi Development Corridor (WNLDC) (aka Trans–Caprivi Corridor)	Trans – Kalahari Corridor	Trans – Orange Corridor	Node
01	Walvis Bay – Swakopmund –Karibib	x	x	x	x	Walvis Bay Swakopmund
02	Karibib – (Omaruru) –Otjiwarongo – Otavi	x	x			(Otavi)
03	Otavi – Tsumeb – (Oshivelo – Okashana – Ondangwa) – Oshikango	x				Tsumeb Oshikango
04	Otavi – Grootfontein – (Mururani) – Rundu – (Divundu – Kongola) – Katima Mulilo		x			Otavi Grootfontein Katima Mulilo
05	Okahandja – Otjiwarongo	x	x			
06	Karibib – Okahandja – Windhoek			x	x	Windhoek
07	Windhoek – Buitepos/Mamuno			x		(Windhoek)
08	Windhoek – (Rehoboth) – Keetmanshoop				x	(Windhoek) (Keetmanshoop)
09	Keetmanshoop – (Aus) –Lüderitz				x	Keetmanshoop Lüderitz
10	Keetmanshoop – Grunau – Noordoewer				x	(Keetmanshoop)
11	Grunau – Ariamsvlei / Nakop				x	

Source: JICA Study Team



Source: JICA Study Team

Figure 8.1: Diagrammatic view of the corridors and nodes in the baseline survey

8.2 The current environment of corridors and possible impacts

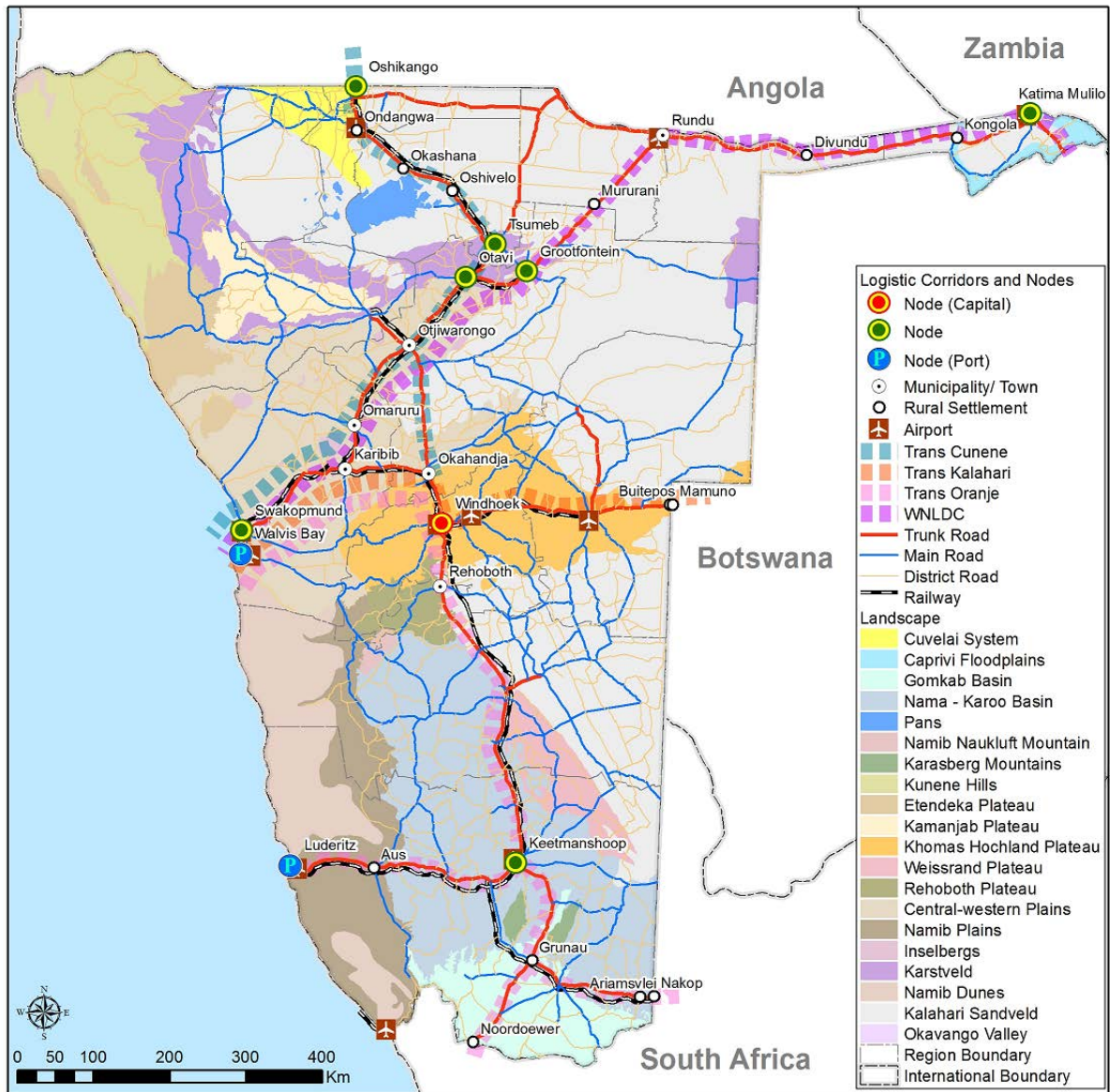
Since the corridors traverse the country in all directions, the environmental situations are quite diverse. In order to make a correct interpretation of the situation, first, it is essential to know the general land use type in Namibia.

Namibia's land is used primarily for conservation and agricultural production, under different regimes of tenure and for different way of use.

- Protected Areas comprise the country's national parks and reserves, mainly for the conservation of wildlife and scenic arid landscapes. They are state land, and make up 18% of the land area. The areas are shown as "Protected areas" in Figure 8.2.
- Communal land is predominantly in the north-west, north and north-east parts of the country, with scattered smaller patches in the remainder. It is called communal since the state has the ownership of the land, but the residents who live on the land are allowed to use the resources it provides. Communal land covers 37% of the land area and is basically controlled by traditional authorities. In most areas of the communal land, farming is usually a combination of small fields for crops (entirely rain-fed) and livestock grazing on common pastures. These and other natural resources (e.g. wood, fruits and products from trees) are used for household-level consumption. In Figure 8.2, such areas are shown as "Small scale agriculture on communal land". On the other hand, some communal areas were allocated to private individuals by the previous government during the 1960s and 1980s, and more recently by traditional and government authorities or by claiming or acquiring the land informally. Some of these individuals are really engaged in farming actively and commercially in their large farms while the others just keep the land as ranches and investments¹. In Figure 8.2, such areas are shown as "Large scale agriculture on communal land".
- A growing trend on communal land is the formation of conservancies and community forests, which allow harvesting of resources such as wildlife and wood under principles of sustainable offtake. They are shown as "Conservancy" and "Community forest" in Figure 8.2. Since they are established on communal land, their areas overlap with the areas of "Small scale agriculture on communal land" and "Large scale agriculture on communal land".
- Freehold land predominantly in the central and southern parts of the country. It is owned and controlled by private individuals or companies and used mainly for livestock production, with a growing trend of including wildlife and using the land and facilities for tourism. It makes up 44% of the whole land area. Freehold or private farm land in Namibia is conventionally referred to as 'commercial land' (shown as "Commercial farming area" in Figure 8.2). As on communal land, a growing number of conservancies are being established, where there is collaboration among neighbouring farms and permitted offtake of game species through hunting.
- Urban settlements include the built up area as well as surrounding land that is available for expansion, jointly forming townland. The areas are owned and controlled by local authorities (municipalities, towns and villages) and make up just less than 1% of the total land area. The areas are shown as "Urban" in Figure 8.2.

As mentioned above, Figure 8.2 illustrates land use type of the country. Figure 8.1Figure 8.3 shows landscape of Namibia and logistics corridors. Then, the environmental situations of each section of the corridors are summarized in Table 8.2.

¹ Mendelsohn et al. "Atlas of Namibia" 2002



Source: JICA Study Team

Figure 8.3: Landscape of Namibia and logistics corridors

Table 8.2: Environmental situation of the corridors

No.	Section	Landscape, vegetation and biodiversity	Land use
01	Walvis Bay – Swakopmund – Karibib	<ul style="list-style-type: none"> Namib desert coastal dune strip between Walvis Bay and Swakopmund within Dorob National Park Gravel plain of the central Namib within Dorob NP Open plains with inselbergs Undulating hills with Acacia tree and shrub savannah The National Park hosts low densities of wildlife. The area along the coastal trunk road (B2) between Walvis Bay and Swakopmund is utilized by Damara terns (Endangered and Endemic) for breeding 	<ul style="list-style-type: none"> Dorob National Park. Primary activities are public recreation and tourism Certain areas along the corridor (viz. eastern edge of coastal dune field, Swakop River valley, Rossing Mountain, Khan Valley) are popular film locations for commercials and feature films. Private farms start east of Arandis – primary activities are small stock and game farming with a number of farms providing tourism accommodation; Mining and quarrying activities are located in a number of sites along this route
02	Karibib – (Omaruru) – Otjiwarongo – Otavi	<ul style="list-style-type: none"> Western highlands, thornbush shrubland, and karstveld Vegetation is mostly thornbush savannah but a large proportion is heavily bush encroached. The highest density of large herbivores in Namibia, particularly game species such as springbok, oryx, hartebeest, warthog. 	<ul style="list-style-type: none"> The entire area is commercial farmland, concentrated on livestock (cattle, goats and sheep) as well as game. Concentration of tourism establishments around Omaruru.
03	Otavi – Tsumeb – (Oshivelo – Okashana – Ondangwa) – Oshikango	<p>Otavi to Oshivelo:</p> <ul style="list-style-type: none"> Acacia tree and shrub savannah biome (karstveld vegetation type), <p>Oshivelo to near Ondangwa:</p> <ul style="list-style-type: none"> Broad-leafed tree and shrub savanna biome (North-eastern Kalahari woodland), <p>Ondangwa to Oshikango:</p> <ul style="list-style-type: none"> Cuvelai drainage area <p>Oshivelo to Okashana:</p> <ul style="list-style-type: none"> Since the corridor borders or is close to the north-eastern boundary of Etosha National Park, there is some movement of wildlife such as elephant across the road. <p>Oshivelo to Oshikango</p> <ul style="list-style-type: none"> Livestock on the road are a common problem (especially donkeys and cattle) 	<p>Otavi to Oshivelo:</p> <ul style="list-style-type: none"> Commercial farmland, large stock farming and isolated areas of irrigated agriculture <p>Oshivelo to Oshikango:</p> <ul style="list-style-type: none"> Communal land, no fencing alongside the road, small-holder mixed farming with cattle and goats and rain-fed cropping of mahango, densely settled.

No.	Section	Landscape, vegetation and biodiversity	Land use
04	Otavi – Grootfontein – (Mururani) – Rundu – (Divundu – Kongola) – Katima Mulilo	<p>Otavi to north-east of Grootfontein:</p> <ul style="list-style-type: none"> • Karstveld <p>NE of Grootfontein:</p> <ul style="list-style-type: none"> • Broad-leafed tree and shrub savannah biome, the north-eastern Kalahari woodland habitat type <p>At three points (Okavango, Kwando, Zambezi Rivers):</p> <ul style="list-style-type: none"> • Riverine woodlands and islands (Namibia's smallest and most biodiversity-rich habitat) <p>Extreme east:</p> <ul style="list-style-type: none"> • Caprivi mopane woodland and floodplain habitats <p>NE of Mururani:</p> <ul style="list-style-type: none"> • Livestock and wildlife commonly roam onto the road. • In KAZA (Kavango-Zambezi Transfrontier Conservation Area), wildlife numbers and their ranges are increasing, as are human-wildlife conflicts. 	<p>Otavi to Mururani:</p> <ul style="list-style-type: none"> • Commercial farmland • Large stock farming and isolated areas of irrigated agriculture between Otavi and Grootfontein. Large stock and game farming between Grootfontein and Mururani <p>NE of Mururani:</p> <ul style="list-style-type: none"> • Communal land, no fencing alongside the road: Mururani to Rundu, and on to Divundu <ul style="list-style-type: none"> - Communal land and state protected areas (Mangetti National Park) - Characterized by small-holder mixed farming with cattle and goats and rain-fed cropping of mahango. - Fairly densely settled along the road and river edge, but sparsely populated in the hinterland. <p>Divundu to Kongola</p> <ul style="list-style-type: none"> - The Bwabwata National Park, there are a few small villages in the 'multi-use area' of the Park. <p>Kongola to Katima Mulilo</p> <ul style="list-style-type: none"> - Fairly densely settled along the road, but sparsely populated in the hinterland. - Number of communal area conservancies where wildlife, livestock and rain-fed cropping are the predominant land uses.
05	Okahandja – Otjiwarongo	<ul style="list-style-type: none"> • Acacia tree and shrub savanna biome, notably thornbush shrubland vegetation type. • Heavily bush encroached, only moderate levels of terrestrial diversity. • The highest density of large herbivores in Namibia, particularly game species such as springbok, oryx, hartebeest, warthog. • Probably the highest density of cheetah in the world. 	<ul style="list-style-type: none"> • Only commercial farmland, concentrated on livestock (cattle, goats and sheep) as well as game.
06	Karibib – Okahandja – Windhoek	<ul style="list-style-type: none"> • Western highland and thornbush shrubland • Thornbush savanna • Fairly open but bush encroached in parts. • The highest density of large herbivores in Namibia, particularly game species such as springbok, oryx, hartebeest, warthog. • High terrestrial biodiversity 	<ul style="list-style-type: none"> • The entire area is commercial farmland, concentrated on livestock (cattle, goats and sheep) as well as game. • A number of conservancies amongst private farms • Game farms and tourism lodges are scattered along the route (greater concentration between Okahandja and Windhoek) • In the vicinity of Windhoek, farms are increasingly subdivided into smaller units for low-density residential and light industrial purposes.

No.	Section	Landscape, vegetation and biodiversity	Land use
07	Windhoek – Buitepos/ Mamuno	<ul style="list-style-type: none"> Acacia tree and shrub savanna biomes, divided into highland shrubland in the west and central Kalahari in the east. Thornbush savanna, generally fairly open 	<ul style="list-style-type: none"> The entire area is commercial farmland. Large stock farming. Rangeland condition is generally fairly good A few conservancies. Game farms and tourism lodges are scattered along the route with a higher concentration close to Windhoek. From Windhoek eastwards as far as Hosea Kutako Airport, farms are increasingly subdivided into smaller units for low-density residential purposes
08	Windhoek – (Rehoboth) – Keetmanshoop	<p>Windhoek to Rehoboth:</p> <ul style="list-style-type: none"> Acacia tree and shrub savanna <p>South of Rehoboth:</p> <ul style="list-style-type: none"> The Nama Karoo biome, in particular the dwarf shrub savannah and Karas dwarf shrubland. 	<ul style="list-style-type: none"> Mostly commercial farmland, concentrated on small stock (goats and sheep), and some cattle. Game farms and tourism lodges are scattered along the route, but generally not close to the road or rail line. There are a few communal-area conservancies along the route, which stock low numbers of springbok.
09	Keetmanshoop – (Aus) – Lüderitz	<p>Keetmanshoop to Aus:</p> <ul style="list-style-type: none"> Nama Karoo biome, dwarf shrub savanna, and transition to the southern Namib. <p>West of Aus:</p> <ul style="list-style-type: none"> The open plains of the southern Namib and then a short section of succulent Karoo close to Lüderitz The area forms part of the Sperrgebiet Important Plant Area, noted for its high levels of plant diversity and endemism. <p>Throughout the route:</p> <ul style="list-style-type: none"> Open plains with low hills and undulations. Low density of wild herbivores (e.g. springbok, oryx) and low diversity of fauna. 	<p>Keetmanshoop to Aus:</p> <ul style="list-style-type: none"> Commercial farmland where livestock farming concentrates on goats, sheep and cattle. <p>Throughout the route:</p> <ul style="list-style-type: none"> Scattered tourism farms and lodges. Scenic desert landscapes.
10	Keetmanshoop – Grunau – Noordoewer	<ul style="list-style-type: none"> Nama Karoo biome, particularly the Karas dwarf shrubland. Open undulating grassy plains with sparsely scattered low trees and bushes. Relatively low density of wild herbivores (e.g. springbok, oryx), low biodiversity and biomass 	<ul style="list-style-type: none"> Commercial farmland where livestock farming concentrates on goats, sheep and cattle, often combined with game species such as oryx and springbok. A few tourism farms and lodges are scattered along the route.
11	Grunau – Ariamsvlei/ Nakop	<ul style="list-style-type: none"> Nama Karoo biome, particularly Karas dwarf shrubland Open undulating grassy plains with sparsely scattered low trees and bushes Relatively low density of wild herbivores (e.g. springbok, oryx) and low biodiversity and biomass. 	<ul style="list-style-type: none"> Commercial farmland where livestock farming concentrates on goats, sheep and cattle, often combined with game species such as oryx and springbok. A few scattered tourism farms and lodges.

Source: SAIEA "Baseline Survey Report", July 2014

The impacts of the Master Plan on the corridors are predicted as follows. For most corridors, the potential impacts are quite similar.

- Increase of traffic volumes will escalate traffic accidents and fatalities.
- Increased flow of people due to growth in traffic volume will increase roadside litter and incidence of sexually transmitted diseases (STDs).

- Incidence of road kills of wildlife and livestock will increase. The species vulnerable to accidents vary among the sections of the corridors as shown in Table 8.3.

Table 8.3: Wildlife and livestock vulnerable to road kills

Section No.	Section or sub-Section	Species
Wildlife		
01	Walvis Bay – Swakopmund (coastal road)	Damara terns
02	Omaruru - Otavi	Owls, nightjars, warhog, kudu, aardwolf, black-backed jackal (Seasonal) yellow-billed kite
05	Okahandja - Otjuwarongo	
06	Karibib - Windhoek	
07	Windhoek – Hosea Kutako International Airport	Owls, nightjars, aardwolf, black-backed jackal.
08	Windhoek - Keetmanshoop	
09	Keetmanshoop - Lüderitz	Owls, nightjars, aardwolf, bat-eared foxes, black-backed jackal
10	Keetmanshoop – Grunau - Noordoewer	
11	Grunau – Ariamsvlei/Nakop	[In the vicinity of Lüderitz] Brown hyena [In the vicinity of Aus] Wild horse
03	Oshivelo – Okashana	Wildlife from Etosha National Park (e.g. elephant)
04	Divundu – Kongola – Katima Mulilo	Wildlife in Bwabwata National Park and conservancies (e.g. elephant, African wild dog)
Livestock		
03	Oshivelo – Oshikango	Cattle, donkey, goat
04	Mururani – Divundu Kongola – Katima Mulilo	Cattle, donkey, goat

Source: SAIEA "Baseline Survey Report", July 2014

- Incidence of illegal harvesting of natural resources, especially wildlife, plants and wood, will increase. The species to be harvested vary among the sections of the corridors as shown in Table 8.4. Recent experience in road construction projects undertaken by foreign firms has shown worrying trends regarding poaching and illegal trade in wildlife products in Namibia.

Table 8.4: Potential target of illegal natural resources harvesting

Section	Species
01	- Reptiles - Succulent plants
02	- Rhino, common game, pangolin, vultures, parrots - Wood
05	
06	
03	- Rhino, common game, pangolin, vultures - Wood
07	
08	
09	
10	- Reptiles, common game - Succulent plants, wood
11	
04	- Elephant, common game, pangolin, vultures, parrots, bee-eaters - Wood

Source: SAIEA "Baseline Survey Report", July 2014

- The risk of veld fires ignited by burning objects being thrown from cars and trains, and sparks from trains on rail lines will increase.
- Increased traffic with more industrial and heavy vehicles between Walvis Bay and Swakopmund

(a part of section 1) will undermine the tourism appeals of the coastal road and the surrounding areas.

- Since people locate their homesteads and livestock kraals near the road in section 3 (Otavi – Tsumeb – Oshikango) and section 4 (Otavi – Grootfontein – Rundu – Katima Mulilo), ribbon development along the road will be accelerated. Consequently, traffic accidents, road kills, litter, incidence of STDs and deforestation will increase more than in the other sections

8.3 Current environment of major nodes and possible impacts

The analysis of nodes was carried out for 10 municipalities/towns in the baseline survey, that is, Walvis Bay, Swakopmund, Tsumeb, Oshikango, Otavi, Grootfontein, Katima Mulilo, Windhoek, Keetmanshoop, and Lüderitz. Nevertheless, in the process of the Study after the baseline survey, only 5 out of 10 nodes were considered to be strategically important for the Master Plan. They are Walvis Bay, Swakopmund, Oshikango, Katima Mulilo and Lüderitz. In this section, only these 5 major nodes are discussed.

Table 8.5 provides basic information of these 5 major nodes. Some data is not available at Municipality/Town level but Regional level.

Table 8.5: Baseline information of the major nodes

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
Socio-economic					
Administration	<ul style="list-style-type: none"> • Municipality • Region: Erongo 	<ul style="list-style-type: none"> • Municipality • Region: Erongo 	<ul style="list-style-type: none"> • Oshikango falls under the local authority of Helao Nafidi Town Council since 2004 • Region: Ohangwena 	<ul style="list-style-type: none"> • Town • Region: Zambezi 	<ul style="list-style-type: none"> • Municipality • Region: Karas
Social institutions and decision making	<ul style="list-style-type: none"> • The Municipality of Walvis Bay and its Council were established under the Local Authorities Act No. 23 of 1992 delegating power from national level to local authorities to administer municipal areas. • The Municipality is governed by ten municipal councillors on a councillor-committee management model system where an honorary Mayor is the political head serving as the chairperson of council. • The CEO is appointed by the Council for a period of five years and heads the administration as well as advising Council on all aspects of Local Government. He/she is assisted by five heads of departments of i.e. Finance; Roads & Building Control; Water, Waste & Environmental Management; Community & Economic Development, and Human Resources and Corporate Services. 	<ul style="list-style-type: none"> • The Municipality of Swakopmund and its Council were established under the Local Authorities Act No. 23 of 1992 delegating power from national level to local authorities to administer municipal areas. • Swakopmund is the capital of Erongo region and the official seat of the Regional Council. The regional council consist of the Governor and the constituency council. There is only one Constituency that falls under the Municipality. 	<ul style="list-style-type: none"> • Helao Nafidi Town still maintains its Village Council. This is led by the Headman, who reports to the mayor for community needs. The Town Council consists of the town Mayor and Chief Executive Officer. 	<ul style="list-style-type: none"> • Katima Mulilo Town and its Council were established under the Local Authorities Act No. 23 of 1992 delegating power from national level to local authorities to administer town areas. • In Katima Mulilo, only the Local Authority has governing power while the traditional authority has power in the rural area. There is a regional head who is a governor/Major and under the governor there is a councillor for the constituency. This constituency is led by Katima Mulilo Town Council. 	<ul style="list-style-type: none"> • The Municipality of Lüderitz and its Council were established under the Local Authorities Act No. 23 of 1992 delegating power from national level to local authorities to administer municipal areas. • Lüderitz is a constituency in Karas Region and is governed by a municipal Council which comprises of the CEO and Councillor.
	One NGO (Coastal Environmental Trust of Namibia) is active on local environmental issues	<ul style="list-style-type: none"> • An NGO (Coastal Environmental Trust of Namibia) is active on local environmental issues. • An email group called 	--	One NGO (Integrated Rural Development and Nature Conservation) is active in Zambezi Region.	--

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
		'Swakopmund Matters' is active in environmental issues, especially industrialisation of Swakopmund and phosphate mining.			
Local conflicts of interest	<ul style="list-style-type: none"> • Entrepreneurs quickly identify business opportunities and carve a niche for themselves. • Namibia's Gini-Coefficient is very high at 0.59, and at national level, 24% of households live in impoverished housing, having increased in urban areas to 30% from 2004's 27%. <ul style="list-style-type: none"> • Poor communities and low-wage workers commonly protest at their perceived exploitation by the private sector and elites. • [Katima Mulilo] Due to its location, Katima Mulilo is susceptible to in-migration of foreigners, especially from Zambia. 				
Working conditions	<ul style="list-style-type: none"> • Namibia's Labour Law has strict requirements for inter alia, health safety and environment issues (HSE), minimum, wages, etc. Implementation is variable. • Harsh condition on ships at sea (Walvis Bay, Lüderitz), in some mines (Walvis Bay Swakopmund, Lüderitz), and construction projects. • Chinese construction firms are allegedly the worst employers with regards to adherence to the labour law. 				
Unions	<ul style="list-style-type: none"> • Namibia has approximately 30 registered trade unions representing workers, namely the National Union of Namibian Workers (NUNW) - affiliated with the ruling SWAPO party, and the Trade Union Congress of Namibia (TUCNA), which is not affiliated with any party. The National Union of Namibian Workers is affiliated to the International Trade Union Confederation (ITUC). • The unions are active in all nodes. 				
Indigenous or ethnic people	<ul style="list-style-type: none"> • Some 70,000 indigenous Nama, a Khoe-speaking group which includes the Topnaars, inhabit Walvis Bay and parts of the Namib Naukluft Park area. They depend on small-scale livestock production, use of Nama melons (<i>Acanthosicyos horrida</i>), and tourism. 	There are no recognized indigenous or minority groups living in Swakopmund.	There are no recognised minority groups in this area.	The population consists mostly of the Masubia and Mafwe tribes, who displaced the original San inhabitants.	<ul style="list-style-type: none"> • Nama people occupied the area around Lüderitz when German settlers discovered diamonds there in 1908. • There are no recognized indigenous or minority groups living in Lüderitz now.
Gender issues and children's right	<ul style="list-style-type: none"> • Namibian legislation on gender and child welfare is included in <ul style="list-style-type: none"> - Namibia Constitution - Combating of Rape Act (8 of 2000) - Combating of Domestic Violence Act (4 of 2003) <ul style="list-style-type: none"> • Statistics difficult to obtain but rape and gender-based violence regarded as an issue of national concern. • 12,000 cases of GBV reported in 2010. 1,070 of those were rape. • It is estimated that 1/3 of all rape cases are withdrawn (LAC 2006). 				
Cultural heritage	<ul style="list-style-type: none"> • Namibia's rapid rate of urbanisation (3.14%) is resulting in young people losing contact with their rural roots and tribal traditions, norms and values. • A consequence of the loss of traditional heritage is a confused national identity which is rapidly being replaced by a culture of materialism and consumerism. 				

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
	--	Swakopmund is rich in architectural heritage, with many buildings from the German colonial era.	--	Cultural traditions are still widely practiced in and around this node.	--
Social infrastructure	<ul style="list-style-type: none"> 15 schools, numbers of teachers and pupils not available. Erongo Region hospital beds per 1,000 inhabitants = 4.2 Hospital bed occupancy rate Erongo Region = 39% 	<ul style="list-style-type: none"> State schools = 11; private schools = 3 4,617 pupils, teacher: pupil ratio = 1:18.6 Erongo Region hospital beds per 1,000 inhabitants = 4.2 Hospital bed occupancy rate Erongo Region = 39% 	<ul style="list-style-type: none"> School attendance in Ohangwena Region = 86.1% Oshikango has 7 schools, teacher/pupil ratio not available. Ohangwena Region hospital beds per 1,000 inhabitants = 1.9 Engela Hospital (near Oshikango) bed occupancy = 94% 	<ul style="list-style-type: none"> School attendance in Zambezi Region = 86.3% 9 schools in Katima Mulilo, teacher/pupil ratio not available. Zambezi Region hospital beds per 1,000 inhabitants = 2.7 Katima Mulilo hospital bed occupancy = 69% 	<ul style="list-style-type: none"> School attendance in Karas Region = 88.3% 5 schools in Lüderitz. Teacher/pupil ratio = 1:23. Lüderitz Hospital bed occupancy rate = 71%
Property prices	<p>Average prices in 2013</p> <ul style="list-style-type: none"> Undeveloped erf = N\$160,000 Small house = N\$440,000 Medium house = N\$1,069,000 Large house = N\$1,903,000 	<p>Average prices in 2013</p> <ul style="list-style-type: none"> Undeveloped erf = N\$70,000 Small house = N\$502,000 Medium house = N\$1,104,000 Large house = N\$1,782,000 	<ul style="list-style-type: none"> Average price Undeveloped erf = N\$135,000 (2012) Small house = N\$489,000 (2013) Medium house = N\$920,000 (2013) Large house = 2,600,000 (2012) 	<p>Average price in 2013</p> <ul style="list-style-type: none"> Undeveloped erf = N\$168,000 Small house = N\$398,000 Medium house = N\$1,108,000 Large house = N\$1,931,000 	<ul style="list-style-type: none"> Average price in 2013 Undeveloped erf = N\$86,000 Small house = N\$415,000 Medium house = N\$928,000 Large house = no data available
STDs	Namibia's overall HIV/AIDS prevalence rate is 18.8%.				
	HIV/AIDS prevalence rate = 19.6%.	HIV/AIDS prevalence rate = 17.8%	HIV/AIDS prevalence rate is not available for	HIV/AIDS prevalence rate = 35.6%, The highest in the	HIV/AIDS prevalence rate = 18.1%

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
			<p>Oshikango.</p> <ul style="list-style-type: none"> Nearby Oshakati = 25.1%, likely to be similar to Oshikango. 	country	
Traffic accidents	<p>(Erongo Region)</p> <ul style="list-style-type: none"> Crashes were 365 (2012), 412 (2013) resulting in fatalities 61 (2012) and 52 (2013) 		<p>(Oshana Region)</p> <ul style="list-style-type: none"> Crashes with injuries in 2013 = 356, with 44 fatalities. Casualties per 1,000 people = 1.5 Vehicle population = 4,231. 	<p>(Zambezi Region)</p> <ul style="list-style-type: none"> Crashes with injuries in 2013 = 147, with 35 fatalities. Casualties per 1,000 people = 1.6 Vehicle population = 3,887. 	<p>(Karas Region)</p> <ul style="list-style-type: none"> Crashes with injuries in 2013 = 115, with 40 fatalities. Casualties per 1,000 people = 3.8 Vehicle population = 13,269.
Urbanisation / demographics	<ul style="list-style-type: none"> Current population – 62,096 (2011), growing at 4.2%/year 64% of population in formal housing, 36% in informal housing. Unemployment in Erongo Region = 25.5% in 2012 	<ul style="list-style-type: none"> Current population – 44,725 (2011), growing at 8.8%/year Unemployment in Erongo Region = 25.5% in 2012 	<ul style="list-style-type: none"> Oshikango population = 5,000 – 8,000 (2010) Unemployment in Oshana Region = 34.6% in 2012 	<ul style="list-style-type: none"> Population = 28,362 (2011). This is 31% of the total population of Zambezi Region = 90,596. Unemployment in Zambezi Region = 28.0% in 2012 	<ul style="list-style-type: none"> Population = 12,537 (2011). Unemployment in Karas Region = 23.9% in 2012
Land use	<ul style="list-style-type: none"> Industrial town around port and fishing. Fast growing residential population. Town surrounded by Dorob National Park, including the Ramsar Site - important for current and future tourism. Coastal tourism bed occupancy rate in 2014 was 36.7%, down from 38.7% in 2013. 	<ul style="list-style-type: none"> Tourist town mainly, but also holiday homes and housing for senior mining staff, as well as people who work in Walvis Bay. Fast growing residential population (8.8% per year). Town surrounded by Dorob 	<p>Oshikango is surrounded by communal land with mixed livestock and crop farming at the small-holder level.</p>	<ul style="list-style-type: none"> Katima is surrounded by communal land with mixed livestock and crop farming at the small-holder level. There are large-scale irrigation schemes 	<ul style="list-style-type: none"> One of only two ports in Namibia. A relatively large proportion of the land is allocated to 'industrial'. This is centred on the fishing industry and harbour.

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
		<p>National Park, and close to many attractions - important for current and future tourism.</p> <ul style="list-style-type: none"> Coastal tourism bed occupancy rate in 2014 was 36.7%, down from 38.7% in 2013. 		<p>along the Zambezi River, but these do not conflict with road and rail infrastructure.</p>	<ul style="list-style-type: none"> Very little room for expansion, as the town is 'wedged' between the ocean and the restricted Diamond Area.
Water usage / users	<ul style="list-style-type: none"> Industry and residents are the main users. Water for domestic use generally regarded as affordable. Water supply generally reliable but disrupted occasionally when Kuiseb River floods, damaging the water infrastructure. 	<ul style="list-style-type: none"> Water supplied to mines in the overall area, plus industry and residential sectors in town. Mines pay a higher tariff (reflecting the price for desalination). 	<ul style="list-style-type: none"> Residents and businesses are the main water users. No known conflicts at present. 	<ul style="list-style-type: none"> Residents, a few small-scale irrigation projects and a small fish farm are current users. No conflicts at present. 	<p>Fresh water is used by residents and a small proportion by diamond mining operations. Industrial-scale water for mining purposes is sea-water.</p>
Employment and local economy	<ul style="list-style-type: none"> Namibia's main port. Primarily industrial town – economy closely linked to the harbour and fishing industry. Mining and quarrying also an important activity in general proximity to Walvis Bay. Salt and guano harvesting well established export businesses. Walvis Bay Airport recently upgraded. Various manufacturing (e.g. granite tiles) and service industries (e.g. ship and rig maintenance) established and growing. Major economic driver is lifestyle investments in the coastal strip between Walvis Bay and Swakopmund. The dunes north of Walvis Bay are increasingly used for adventure tourism, film making, and ecotourism. Marine environment also supports tourism and mariculture. Ramsar wetland increasingly recognised as a prime bird-watching destination. 	<ul style="list-style-type: none"> The residential town of choice for executives and staff of Erongo's mining sector, retirees, and holiday-makers. Services to the mining sector well established and rapidly growing. The most visited tourism attraction in Namibia REFS NBT report. German colonial buildings and culture are particular attractions. Key tourism attractions also include the dunes, beaches and nearby Moon Landscape. 	<ul style="list-style-type: none"> Economy is centred on businesses linked to the border post and road crossing to Angola. Town is characterised by small trading shops and warehouses. 	<ul style="list-style-type: none"> The employment is found mainly in the government, retail and tourism sectors. Wenela Bridge over the Zambezi River and proximity of neighbouring Zambia, Zimbabwe and Botswana make it a commercial trade hub in the overall region. There are a thriving informal market and economy. Waterfront offers some tourism and commercial development potential, but is not yet fully operational. Mpacha Airport, serviced by Air Namibia, located close to Katima. 	<ul style="list-style-type: none"> The employment is found mainly in the harbour with its fishing and trade activities, as well as tourism. It is the centre of the lobster industry, which exports overseas. The local economy is depressed due to the decline of the fishing sector. The railway line from Keetmanshoop to Lüderitz has been out of action since 1995, but is presently being refurbished (2014). Re-opening of this transport route will possibly create more business for this sector in Lüderitz. The town is surrounded by State land, namely the Sperrgebiet and Namib-Naukluft National

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
					<p>Parks.</p> <ul style="list-style-type: none"> A number of new investments have been made or are proposed, including a phosphate plant, seaweed production, mariculture, and a possible new port at Shearwater Bay, for coal exports from Botswana.
Involuntary resettlement	<ul style="list-style-type: none"> No involuntary resettlement currently, but this could change if port/industrial developments require land currently used for residential. 	<ul style="list-style-type: none"> No involuntary resettlement currently. There is adequate space within the townlands, but future expansion such as port/industrial developments might encroach on nearby housing areas. 	<ul style="list-style-type: none"> No involuntary resettlement currently, but the overall area is densely populated and intensively used for rain-fed cropping and livestock grazing. 	<ul style="list-style-type: none"> No involuntary resettlement currently. There is adequate space within the townlands to accommodate future expansion, but if the large-scale irrigation projects are realised subsistence farmers may be negatively affected as regards access to land and water. 	<ul style="list-style-type: none"> No involuntary resettlement currently. Although the townland area is limited, there is adequate space for future expansion into the National Park.
Ecological					
Habitat loss, fragmentation, wildlife barriers	<ul style="list-style-type: none"> Town expansion options limited by ocean, dunes, wetland and Dorob National Park. Most important ecological feature is the Walvis Bay Ramsar site: regularly over 100,000 wetland birds, including 7,000 chestnut banded plovers, 33,000 lesser and 23,000 greater flamingos. Site supports 11 Namibian Red Data species, vital stopover for Palaearctic migrants. Bird island (guano platform) important breeding area for seabirds. Shoreline between Walvis Bay and Swakopmund is an Important Bird Area, 	<ul style="list-style-type: none"> Town expansion options limited by ocean, dunes, and Dorob National Park. Most important ecological feature is the shoreline between Walvis Bay and Swakopmund is an Important Bird Area, supporting highest density (770 birds/km of beach) of shorebirds on entire south-western coast of Africa. Barriers exist in the Swakop 	<ul style="list-style-type: none"> There is intensive settlement and mixed crop-and-livestock farming in western Ohangwena, with zero or very little indigenous wildlife in the area. Therefore habitat loss and fragmentation, 	<ul style="list-style-type: none"> Riverine forest along the Zambezi (the Maningimanzi area) is well preserved in the Nature Reserve close to Katima Mulilo. There are accidents with wildlife (e.g. elephants) and livestock along the Trans-Caprivi 	<ul style="list-style-type: none"> Lüderitz occupies a small area of rocky land but is immediately surrounded by sand dunes of the southern Namib. The rocky peninsula that protects the bay is noted as an area of high plant value, with over 400 species recorded, and there are lichen fields. The area is vulnerable to

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
	<p>supporting highest density (770 birds/km of beach) of shorebirds on entire south-western coast of Africa.</p> <ul style="list-style-type: none"> • Main barrier is that the Walvis Bay lagoon no longer has flushing ability because of urban encroachment in north-west, and the salt works in the south. Consequently, it is silting up. • Barriers have been established to protect Walvis Bay from Kuiseb River flooding, thus restricting river functioning. • Tar road between Walvis Bay and Swakopmund is a barrier for bird fledglings (e.g. Damara tern – Red Data Species), chicks walk to the beach after hatching inland (thus crossing the road) – 150 nests between Walvis Bay and Swakopmund in 2010. 	<p>River because of upstream dams and sand mining in the lower reached - thus restricting river functioning.</p> <ul style="list-style-type: none"> • Tar road between Walvis Bay and Swakopmund is a barrier for bird fledglings (e.g. Damara tern – Red Data Species), chicks walk to the beach after hatching inland (thus crossing the road) – 150 nests between WB and Swakopmund in 2010. 	<p>and barriers to wildlife are not a concern.</p>	<p>highway (No statistics available). Vehicles travel at higher speed since it was upgraded to tarmac in 1996.</p>	<p>illegal collecting of succulents and destruction of range-restricted endemic species.</p> <ul style="list-style-type: none"> • Rail- and roadways currently do not pose a barrier to local fauna or ecosystem processes. • Power lines kill many Red Data birds from collisions, especially endangered bustards. Southern Namibia has a number of high capacity power lines from South Africa.
Pollution	<ul style="list-style-type: none"> • At Walvis Bay airport, highest dust fallout of 368 mg/m²/day recorded in November 2009. • PM10 concentrations were 16 µg/m³ in 2009. • SO₂ concentrations in 2008 were 0.1-27µg/m³ in various suburbs. • Air and water quality baseline – no data available. • In 2009, Walvis Bay domestic waste site had a total volume of 4,500 m³. By that date it was about 25% full. • Not measured, but odours from fish factories a regular feature, as are smells from naturally-occurring sulphur eruptions. • Light pollution an increasing problem along the coast – no data available. • Noise and vibration baseline – no data available. 	<ul style="list-style-type: none"> • PM10 concentrations averaged 21 µg/m³ in 2010, but the air quality objective of 75 µg/m³ was exceeded 28% of the time. Sporadic poor air quality is due largely to high wind conditions. • SO₂ concentrations in 2010 were 0.1-27µg/m³ in various suburbs. • Swakopmund domestic waste landfill site is well managed, but there is not a facility for hazardous waste. • Light pollution an increasing problem along the coast – no data available. • Noise and vibration baseline – no data available. 	<p>No data available</p>	<ul style="list-style-type: none"> • No significant water pollution issues. • The landfill site is poorly managed. There are no facilities for hazardous waste. Domestic waste is collected and dumped in a landfill, and burned to reduce its volume. Informal dumping of waste within the town is common. 	<ul style="list-style-type: none"> • Lüderitz obtains its water from the Koichab Aquifer located about 50 km northeast of the town. There is no threat to water quality, but the quantity may be limiting. • Lüderitz landfill is very poorly managed, many people scavenge opportunistically for food and recyclables, and strong winds disperse litter and rubbish over a wide area. The town has no facilities for hazardous waste. Domestic waste is burned to reduce the

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
					<p>volume.</p> <ul style="list-style-type: none"> No available data on ambient noise and vibration levels. These are probably insignificant over most of the town, possibly a nuisance factor close to the railway line.
Deforestation and poaching	No reliable data on levels of legal or illegal wood-cutting in Namibia.				
	N/A	N/A	<ul style="list-style-type: none"> Excessive wood cutting is a significant environmental problem in north-central Namibia. No statistics available on rate of deforestation. Poaching of wildlife not an issue since very little wildlife present in the area. Harvesting of natural food animals, such as fish and frogs, probably exceeds the limits for sustainability. 	<p>Poaching problems are experienced in the region, with a sudden increase in elephant poaching in 2012 that coincided with a Chinese road construction event.</p>	<p>Lüderitz offers almost no natural firewood so paraffin and gas are the predominant cooking and heating fuels in the low-income, informal housing sector.</p>
Water resources	<ul style="list-style-type: none"> Current water use (2012) was 5.7 Mm³/year. Comes from Omdel and Kuiseb aquifers. Aquifers able to supply current demands, but 	<ul style="list-style-type: none"> Current water use (2012) was 4.46 Mm³/year (2013). Comes from Omdel aquifer and 	<ul style="list-style-type: none"> No data on consumption. Water supplied by 	<ul style="list-style-type: none"> All water abstraction for Katima town is from the Zambezi 	<ul style="list-style-type: none"> All water abstracted from Koichab Pan fossil groundwater – a finite

	Walvis Bay	Swakopmund	Oshikango	Katima Mulilo	Lüderitz
	<p>desalination of seawater will be needed in near future.</p> <ul style="list-style-type: none"> No surface water sources available. 	<p>Wlotskasbaken desalination plant. Aquifer able to supply current demands, but more desalination of seawater will be needed in near future.</p> <ul style="list-style-type: none"> No surface water sources available. 	<p>NamWater via a piped scheme, using water derived from Calueque Dam on the Kunene River.</p> <ul style="list-style-type: none"> Water shortages occasionally arise due to inefficient distribution service by the Local Authority. 	<p>River.</p> <ul style="list-style-type: none"> Settlements further away from the town use groundwater. Average annual consumption = 48 m³ per person 	<p>resource with adequate supply till 2022.</p> <ul style="list-style-type: none"> Average annual consumption = 80 m³ per person
Other					
Aesthetic and sense of place deterioration	<ul style="list-style-type: none"> Currently regarded as an industrial town, with less sensitivity to aesthetics and sense of place than nearby Swakopmund. Town expects to grow tourism, therefore wishes to maintain/improve aesthetics. 	<ul style="list-style-type: none"> Currently regarded as a tourist town, with very high sensitivity to aesthetics and sense of place Town expects to grow tourism, therefore wishes to maintain/improve aesthetics. 	--	<p>Katima Mulilo serves as a transit centre, offering retail and fuel facilities for tourists travelling to Victoria Falls, Okavango Delta and other KAZA attractions. The Zambezi river frontage is pleasant and well preserved.</p>	<p>Lüderitz has significant historical value as the site in Namibia where German colonialism began. Historical buildings are the main attraction, especially at Kolmanskop (~10 km E of town). The railway line and road go directly past Kolmanskop.</p>

Source: SAIEA "Baseline Survey Report", July 2014

The possible impacts of the Master Plan on the major nodes are predicted as follows.

- Due to increased volumes of traffic, noise and air pollution may increase, especially in the areas close to the port, railway yards, and border posts.
- STD infection rate may increase if there is greater rail, truck and sea traffic, especially if cargo clearing time is slow.
- Especially in Walvis Bay and Swakopmund, increased night lighting at the harbour facilities and other urban developments will cause greater light pollution at night. This is a concern for two reasons: (i) it disrupts biological functioning in a number of taxa, particularly insects, arachnids, reptiles and birds, resulting in species composition changes at local level; (ii) the Namib Desert is known for its wilderness qualities and clear night skies, which are important aspects of the country's tourism attractions.
- Population is increasing in all nodes except for Lüderitz. The Master Plan may accelerate this upward trend and, consequently, lead to greater stress on social infrastructure such as schools and health facilities. Demand for housing may also increase.
- Property prices are currently more or less on a rising trend in all nodes except for Lüderitz. The Master Plan may accelerate the growth in the demand for land and housing and push up the property prices.
- Water consumption is stable or in slight increase in all nodes and current water resources still can cope with the demand. The Master Plan will possibly increase the water demand in future. If the water demand greatly increases in Walvis Bay and Swakopmund, desalination will become inevitable. Desalination plants can have significant environmental impacts on marine life and push up the water price considerably.
- Further industrial and residential development may be induced by the Master Plan. It may threaten the Ramsar Site in Walvis Bay.
- Increasing housing development along the coastline between Walvis Bay and Swakopmund is reducing bird habitat at present. The Master Plan may accelerate this trend.

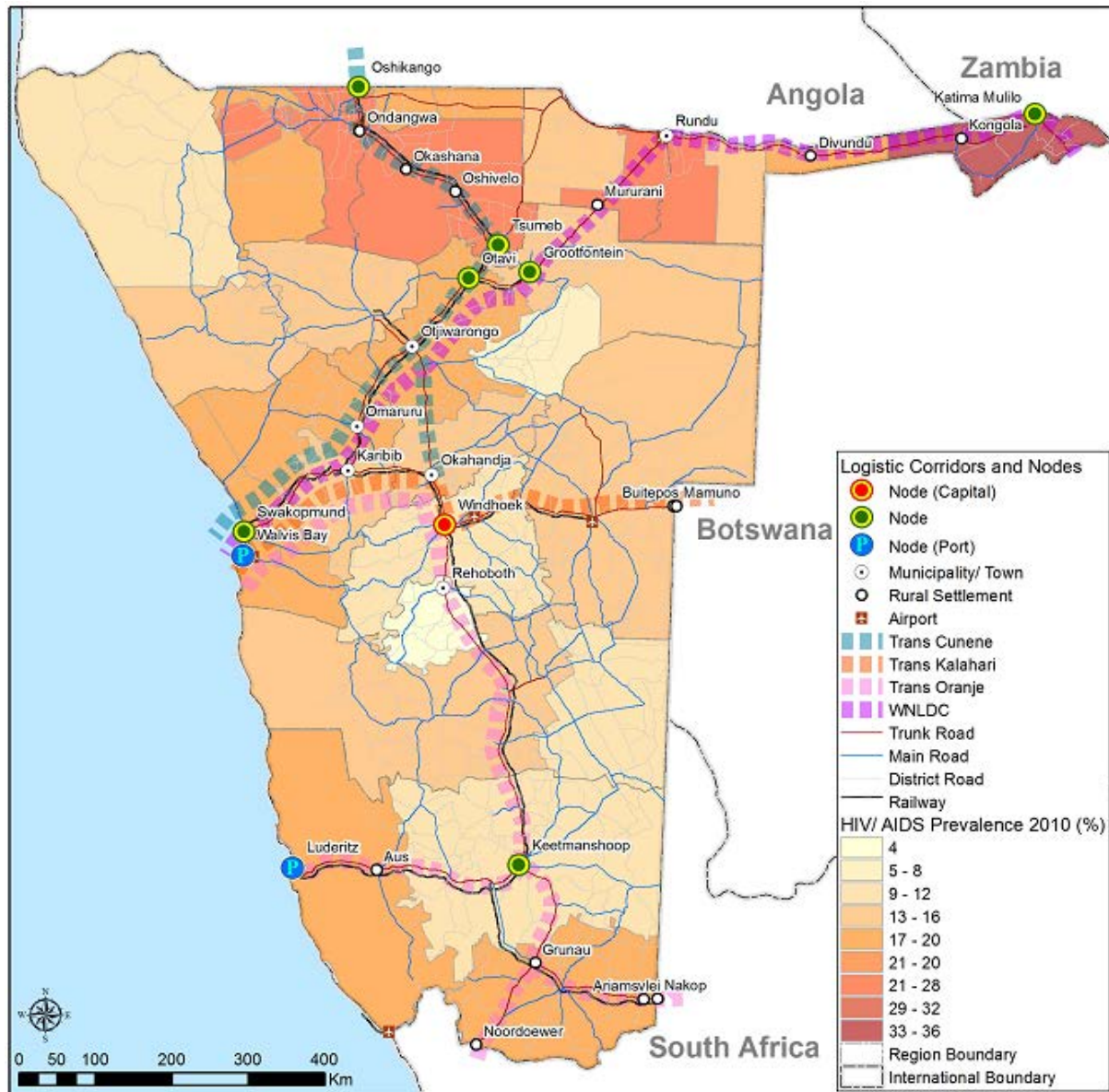
8.4 Preliminary conclusion of the assessment

8.4.1 Overall conclusion

The Logistics Master Plan will not change the nature of the potential nodes (municipalities/towns) significantly, but the implementation of the Plan will exacerbate some issues which are already a cause for concern in various areas. Similarly, the corridors have been in existence for many decades, so upgrading road and rail infrastructure is unlikely to cause any land use changes or major environmental or social impacts. Nonetheless, it should be addressed that crimes such as illegal hunting, wood collecting, littering and inappropriate interactions with local communities, may take place especially during the upgrading/construction phase of infrastructure.

From a social perspective, the greatest concern is increasing levels of HIV/AIDS. The spread of this disease correlates closely with transport infrastructure and trade hubs. The areas of greatest concern

in this regard are the north-eastern part of WNLDC and north-central part of Trans-Cunene corridors, and the Walvis Bay municipality. These areas are densely populated and already prone to high HIV/AIDS prevalence (Figure 8.4). Moreover, border crossings and other areas where transport bottlenecks occur, may be hotbeds with regards to the spread of STDs.

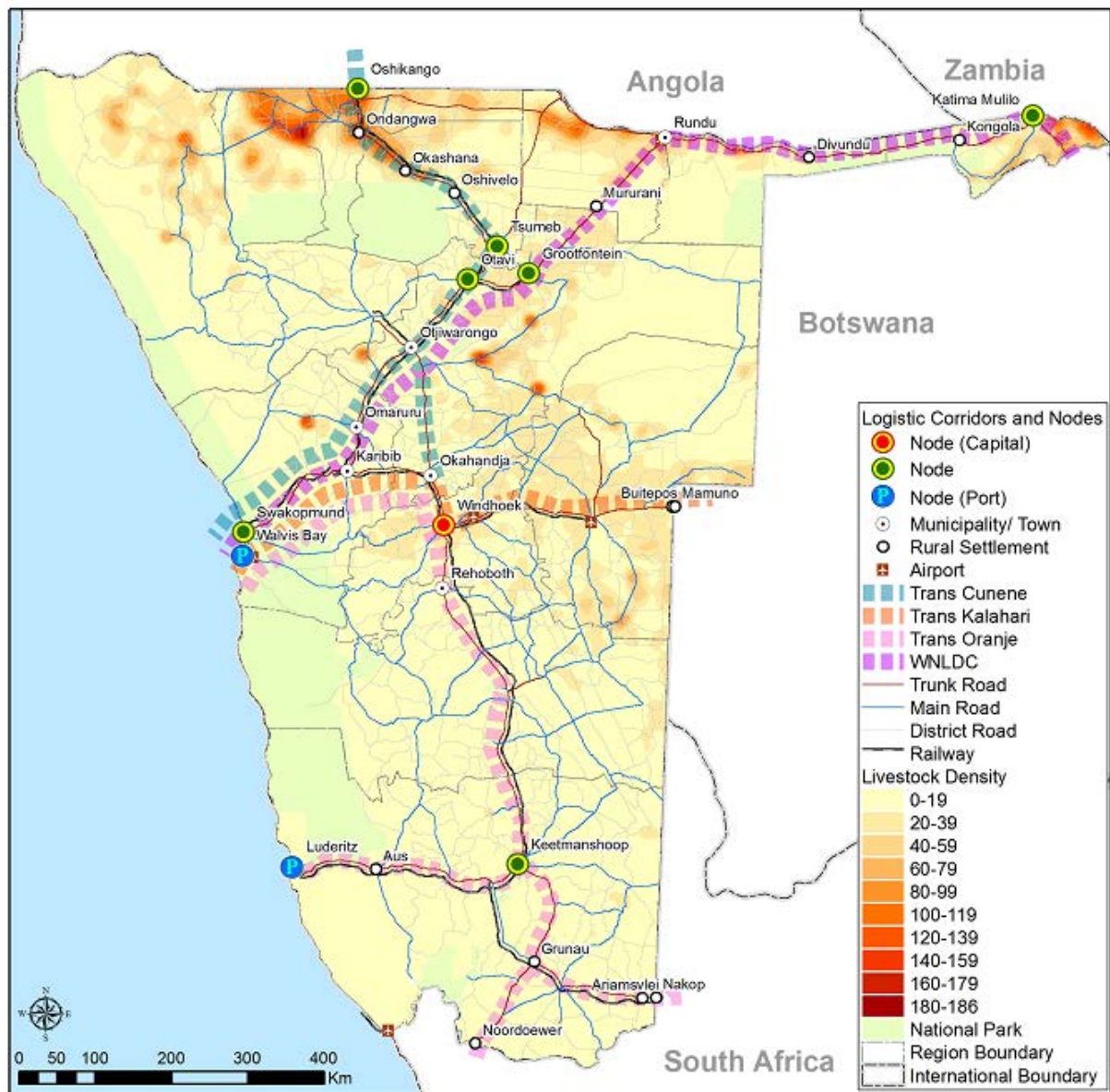


Source: SAIEA "Baseline Survey Report", July 2014

Figure 8.4: HIV/AIDS prevalence by health district 2010

Although the agriculture sector is not sensitive to the development of the Logistics Master Plan, logistics corridors will likely improve marketing opportunities for livestock and other agricultural products, while negative impacts of the Master Plan on this sector are thought to be insignificant. Since livestock density (Figure 8.5) in Namibia correlates closely with human population density, the

areas most likely to be positively affected by the Master Plan in this regard are the north central (Trans-Cunene Corridor) and north-eastern (WNLDC) parts of the country.



Source: SAIEA “Baseline Survey Report”, July 2014

Figure 8.5: Livestock density

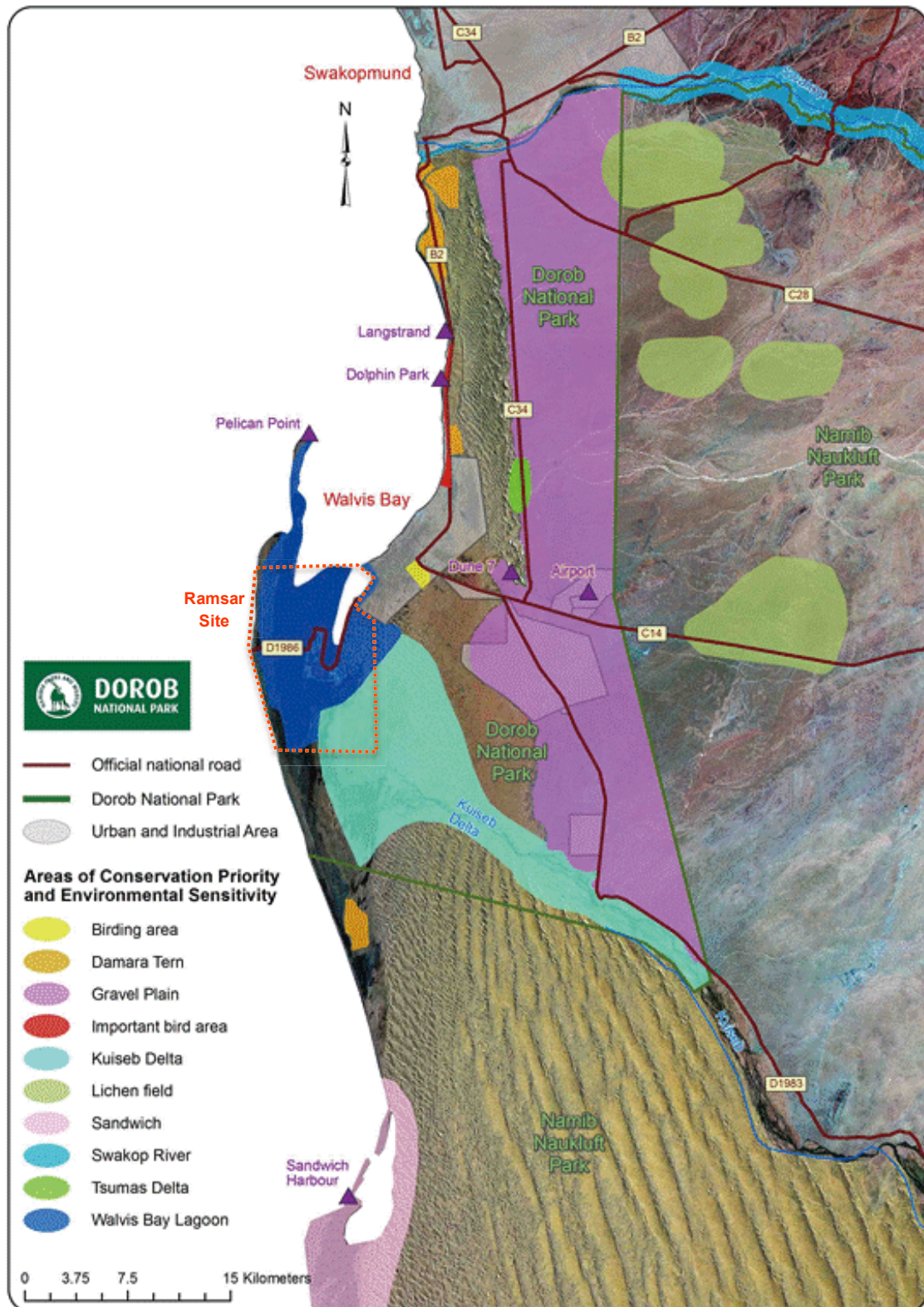
Namibia’s most important tourism assets are not likely to be affected by the Logistics Master Plan as they are mostly located in more remote areas such as the Namib, Erongo, Kunene and central areas. However, increasing industrialisation in the central Namib coast and escalating traffic in the north-east may result in conflicts with Namibia’s important and fast-growing tourism industry. Nevertheless, there is no doubt that tourism relies on efficient, safe and sound transport infrastructure, so the upgrading of roads will ultimately benefit tourism in the country.

The two areas of concern regarding cumulative impacts as a result of the implementation of the Logistics Hub Master Plan are the central coast (Walvis Bay – Swakopmund) and the north-eastern area (especially Zambezi Region). These two areas are much more sensitive compared to the other nodes and corridors.

8.4.2 Areas of concern (1): The central coast

The key concerns for the central coast are as follow.

- Further industrialisation of the area may alter the area's sense of place. If industry can be confined to the Walvis Bay area, this will have lower impacts. However, accelerated growth is likely to cause urban sprawl, which will negatively affect tourism. The attractions in the area are based on natural desert assets and the German colonial character of Swakopmund.
- From a social point of view, an escalation of HIV/AIDS infection rates is a big concern.
- There is already concern about the rising costs of land and housing and strain on social infrastructure such as schools, clinics and other public amenities at the coastal towns. Rapid economic development, if it is not supported by the required urban planning and provision of services, will likely exacerbate this situation.
- From a biodiversity point of view, there are two main concerns. Firstly, vulnerability of the Walvis Bay Ramsar site, a wetland of international importance located in close proximity to the harbour, may increase. Increase in harbour development and shipping will raise the risks of pollution and reduced ecological functioning. The second concern is increasing pressure on the coastal strip between Walvis Bay and Swakopmund, which is a designated Important Bird Area. Also within this area, there are a number of breeding sites for the endangered and endemic Damara Tern (Figure 8.6).
- On the positive side, there is no doubt that economic stimulation in this area is sorely needed due to the vagaries of the mining sector, particularly uranium. Namibia desperately needs sustainable development that will provide jobs, opportunities for entrepreneurs, and alleviation of poverty.



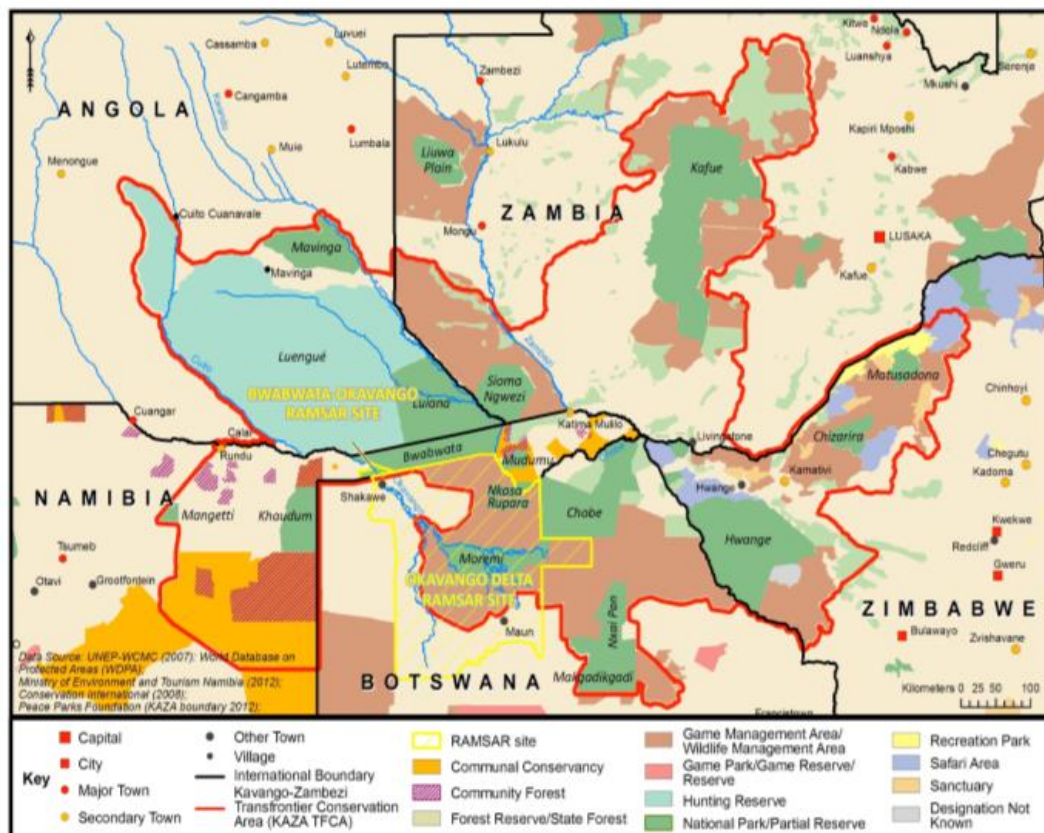
Source: SAIEA "Baseline Survey Report", July 2014 (Originally from NACOMA 2014)

Figure 8.6: Areas of conservation priority and environmental sensitivity between Walvis Bay and Swakopmund

8.4.3 Areas of concern (2): North-eastern area (especially Zambezi Region)

The key concerns for this area are as follow.

- This area may have more impacts on the corridor than on a specific node. For most of its length, the Trans-Caprivi highway passes through rural landscapes, densely populated in parts by people, livestock and wildlife because construction of the Trans-Caprivi highway has resulted in ribbon development along much of its course, with villages and homesteads located alongside the road. Given that the road reserve is not fenced, there is escalating danger of people and livestock being killed by traffic.
- The Zambezi Region already has the highest incidence of HIV/AIDS in Namibia, and the escalating use of the Trans-Caprivi highway for bulk transportation will very likely exacerbate an already serious situation.
- From a biodiversity perspective, this area is unique in that it crosses regionally and globally important wildlife corridors, especially near the Okavango and Kwando wetland systems. The area is a part of the Kavango-Zambezi Transfrontier Conservation Area (KAZA) (Figure 8.7). Wildlife numbers have increased markedly in the Bwabwata National Park and adjacent conservancies, and road kills from increasing traffic will undoubtedly escalate. Of particular concern are impacts on rare and endangered species such as wild dog and other predators, elephant, buffalo and other wildlife. As a result of the landscapes and biodiversity in the north-east, this area has become a well-established and highly valued tourism destination that links in with world-renowned attractions such as the Victoria Falls, Okavango Delta, and Chobe National Park.



Source: SAIEA "Baseline Survey Report", July 2014

Figure 8.7: The Kavango-Zambezi Transfrontier Conservation Area (KAZA)

8.4.4 Other corridors and nodes

The remaining corridors pass through mostly fenced farmland and utilise well established development routes. While many parts of Namibia host important biodiversity and archaeological sites, as noted earlier, the roads and railway lines are already in existence and it is unlikely that the upgrading and escalating use of these corridors for bulk transportation will change the status quo significantly, and negatively affect the environment or existing land use activities. By contrast, improved infrastructure will, on balance, be highly positive for Namibia’s economy and social development. Similarly, the other nodes in most cases should be able to absorb additional development activities.

8.5 Preliminary review and assessment of the purpose and contents of the Master Plan

8.5.1 Review of NDP4

8.5.1.1 Position of logistics sector in NDP4

NDP4 has set the three overarching goals.

- High and sustained economic growth
- Employment creation
- Increased income equality

Three priority areas to achieve these goals have been identified in Table 8.6. Basic enablers are defined as essential albeit not sufficient conditions for economic development. They may not necessarily translate into rapid development, but development cannot be sustained without them.

Table 8.6: Priority Areas of NDP4

Priority 1:	Basic enablers	1. To create an institutional environment 2. To improve education and skills 3. To establish a quality health system 4. To address extreme poverty 5. To upgrade the public infrastructure
Priority 2:	Economic priorities	1. Logistics 2. Tourism 3. Manufacturing 4. Agriculture
Priority 3:	Execution, monitoring and evaluation, and progress reporting	

Source: “Namibia’s Fourth National Development Plan 2012/13 to2016/17” (Office of the President, National Planning Commission)

Logistics is one of the priority sectors and high-level strategies to reach the enhancements desired in logistics during NDP4 are to:

- Upgrade and develop infrastructure,
- Establish a PPP funding framework,
- Attract, retain and transfer skills,
- Market Namibia as a logistics hub of choice,
- Develop a National Logistics Master Plan,
- Develop a Master Plan on the Development of Regional Urban Centres,
- Development of storage facilities,
- Promotion of the Trans-Kalahari Railway, and
- Provide serviced land in towns along Corridors to support logistics activities.

Among these 9 strategies, the first one is closely involved with the basic enabler 5 in which the following high-level strategies are proposed:

- Expand the port
- Upgrade the rail network
- Maintain the road network
- Secure base load energy
- Ensure water security
- Ensure air traffic safety and airport development and maintenance
- Provide low-cost housing and review National Housing Policy
- Enhance ICT infrastructure

8.5.1.2 Impact assessment in rapid SEA

After NDP4 was published in July 2012, a key question, whether environmental and associated social concerns are adequately addressed in NDP4, was raised. Thus, the Department of Environmental Affairs, MET commissioned the International Institute for Environment and Development (IIED) and the Southern Africa Institute for Environmental Assessment (SAIEA) to conduct a rapid SEA. Funding was provided by the German Federal Ministry for Economic Cooperation and Development (BMZ) through the MET/GIZ Biodiversity Management and Climate Change Project.

Specific objectives of the rapid SEA were to:

- Review NDP4 in the context of sustainability to identify the likely environmental and social impacts of its implementation, and critical environmental and social issues not addressed in

NDP4; in order to provide a basis for sectors to consider adjustments to policies, plans and programmes during NDP4 implementation

- Provide a simple guideline and check-list for use during NDP5 preparation to help in addressing environmental and sustainability considerations.

Ideally, SEA execution should be fully integrated into the planning process of the policy/plan/programme itself. Since SEA of NDP4 was only an ex-post process in a very short implementation period (just 4 weeks), this SEA is regarded as a “rapid” or trial one illustrating only the key environmental and social issues and concerns.

In the rapid SEA report, policies addressing the logistics sector and public infrastructure (enabler 5) are jointly analysed. The results of analysis are shown in Table 8.7.

Table 8.7: Key cumulative impacts, oppositions and synergy options for selected policy components

Policy component	Key cumulative impacts	Key oppositions	Key synergy options
New power generation & transmission infrastructure	<p><u>Positive</u></p> <ul style="list-style-type: none"> - Affordable power will enable industrialisation & sustained economic growth. - If power generation options include household and village level solar capture (off-grid), there should be reduced deforestation for fuel wood. <p><u>Negative</u></p> <ul style="list-style-type: none"> - Most industrial-scale power generating facilities have significant environmental impacts. These will be cumulative if, for example, multiple hydropower schemes are located on a single river (e.g. altered ecological functioning of the river), or coal/diesel stations are sited in close proximity to each other (e.g. pollution & health impacts). - Expansion of grid transmission lines poses increasing threats to birds, particularly bustards & flamingos. 	<ul style="list-style-type: none"> - Power generation & transmission vs biodiversity: As noted in the impacts column, cumulative biophysical impacts are a cause for concern. - Power transmission vs tourism: In Namibia’s open landscapes, power lines are highly visible and easily reduce sense of place. A proliferation of power lines in important tourism areas may present opportunity costs, e.g. Central Namib, Kunene. 	Power and households: If incentives are provided for investment in household panels, energy surplus to domestic requirements could be fed into the grid, supporting national demand whilst reducing household energy bills.
Port expansion	<p><u>Positive</u></p> <ul style="list-style-type: none"> - Benefit to national economy through multipliers. - Provides jobs, income opportunities and skills training. - Attracts expatriate expertise. <p><u>Negative</u></p> <ul style="list-style-type: none"> - Habitat destruction, resulting in biodiversity loss. - Pollution (land, water & air) and associated health hazards and biodiversity loss. - Intrusion onto residential and other urban areas. - Increase in maritime traffic – with accidents, pollution and spread of alien invasive organisms and increased transmission of STDs in port areas. 	<ul style="list-style-type: none"> - Ports vs conservation: Namibia’s ports are close to important coastal & wetland habitats. Routine port activities pose on-going pollution threats to nearby biodiversity whilst port expansions (e.g. dredging and land reclamation) increase the distribution of toxic substances (e.g. heavy metals in mud) - Ports vs mariculture: The most suitable areas for shell-fish mariculture in Namibia are the clam waters & sheltered bays close to Walvis Bay & Lüderitz ports. Ambient pollution levels, spiked by intermittent dredging & accidents, threaten the viability of small but increasing mariculture industry, and may contaminate shell-fish. 	Ports and tourism: Both Walvis Bay & Lüderitz already provide facilities and opportunities for tourism. But there is substantial potential for expansion – with social and economic benefits.

Policy component	Key cumulative impacts	Key oppositions	Key synergy options
Improvement of existing road & rail infrastructure	<p><u>Positive</u></p> <ul style="list-style-type: none"> - Overall benefit to national economy through enabling marketing, improving efficiency, mobility, and attracting investment. - Provides jobs, income opportunities and skills training. <p><u>Negative</u></p> <ul style="list-style-type: none"> - Habitat destruction, resulting in biodiversity loss. - Wildlife road kills, especially birds, reptiles & nocturnal mammals. - Increased accidents - Vector for STD transmission. 	<ul style="list-style-type: none"> - Roads/rail vs conservation: Whilst essential for a modern economy, the development of new all-weather roads & rail in remote wilderness areas (e.g. northern Kunene) will undermine wilderness and sense of place attributes, biodiversity, and ecotourism potential. 	<p>Roads/rail and power transmission: the impacts of roads/rail and power lines could be reduced by establishing such infrastructure along existing or the same corridors.</p>

Source: "Rapid Strategic Environmental Assessment of the Fourth National Development Plan and Associated Policies and Strategies in Namibia: Final Report", 14 January 2014 (IIED, SAIEA)

From Table 8.7, it is recognized that the natural environment will be threatened by physical infrastructure development which, on the other hand, will contribute to an increase in employment opportunities and income, and economic growth. Considerable negative impact on the social environment is not elaborated.

8.5.2 Review of the purpose of the Master Plan

Overall goals of the Master Plan are defined as follows.

- Accelerated economic growth by development of Namibia as "A Logistics Nation", which will contribute to making SADC as a region more competitive in the global market
- Accelerated growth of other sectors in the Namibian economy spearheaded by the logistics industry, and
- Increased employment and improved income equality in Namibia

As far as the purpose of Master Plan concerned, economic benefit for the people will be the most significant positive impact of Master Plan utilization from the viewpoint of social considerations. It should also be noted that the goals of the Master Plan comply with overarching goals of NDP4.

As mentioned in the rapid SEA of NDP4, it is easily predictable that a major conflict of interest could arise between conservation of the natural environment and infrastructure development. An infrastructure-driven scenario should be the most cautionary alternative from the viewpoint of natural environmental considerations at the stage of Master Plan formulation.

9. Utilization of GIS

9.1 General

GIS (Geographic Information System) provides a means of integrating information/data to understand issues and problems Namibia is facing today. GIS helps to organize data regarding identified issues, and to understand their spatial relationships quantitatively and visually. This knowledge will lead to more sensitive and intelligent decision-making.

Chapter 9 of Appendix presents utilization of GIS in this Logistics Hub Master Plan project, including usage of GIS techniques and results of data collection and gives the outline of GIS database.

9.2 Introduction of GIS: Concept of GIS techniques

There are a lot of definitions for GIS. The following sentence is a typical definition by ESRI, a major GIS software developer.

“An integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analysed”.

GIS is a tool to understand things, events or phenomena quantitatively, and mapping is only one of the functions in GIS. In addition, the characteristics of GIS are layer-based geographic information models for characterizing and describing our real world as shown in Figure 9.1.

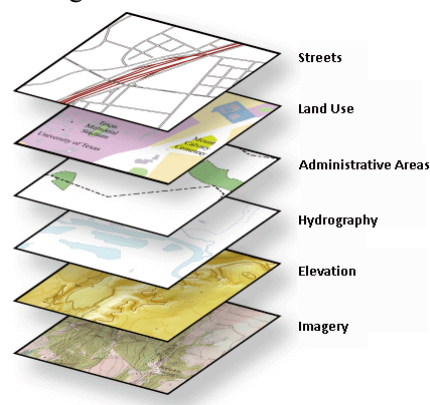


Figure 9.1: Image of GIS data layers

Basic features of GIS are as follows:

- Digitized geospatial data
- Data overlay
- Linkage to tabular data (attribute data)
- Data share
- Easy to update data

Basic features mentioned above allow users to develop GIS data, overlay a wide range of data layers and label or symbolize data using attributes from linked data tables. Multiple users can work with the same dataset independently of each other to browse and analyse data, or to create maps of nearly any size or level of quality. In addition, updates posted to a centralized GIS database can be immediately available to all users.

In this Study, these GIS techniques are used not only for mapping/visualization tools, but also planning tools to identify existing conditions and issues. In addition, it is planned to use the GIS technique to monitor the implementation process of the master plan after completion of the master plan project.

9.3 GIS basic data and GIS data

9.3.1 GIS basic data

GIS basic data are the fundamentals of the GIS database, which normally includes administrative boundaries, water bodies, transportation networks, coastline and so forth. Typical contents of GIS basic data are as follows:

- Roads
- Railways
- Water bodies such as lakes, ponds, rivers and sea
- Coastline
- Vegetation
- Contour lines and spot heights
- Administrative boundaries
- Name of administrative units, etc.

GIS basic data can be defined as GIS structured digital topographic data or GIS formatted digital topographic data which would be commonly used for any kind of GIS data and commonly used for various purposes in various sectors.

It is very important to share this GIS basic data among all related Agencies/ Ministries to avoid

duplication of work and to save costs.

9.3.2 GIS data

GIS data is not equal to GIS basic data. GIS data is added supplemental data or information from other data sources to make data suitable for a particular purpose by a user. In other words, GIS data is value added GIS basic data to fit to the user's purpose. For example, road network data of GIS basic data might only have "X, Y coordination", "length" and "road name" as attributes, however GIS data of a road network for traffic demand forecast normally needs to include much more attributes such as road type, pavement type, speed and number of lanes etc. to calculate traffic demand. Thus, GIS data needs to be prepared so as to fulfil user purpose.

The difference between "GIS basic data" and "GIS data" is depicted in the Figure 9.2.

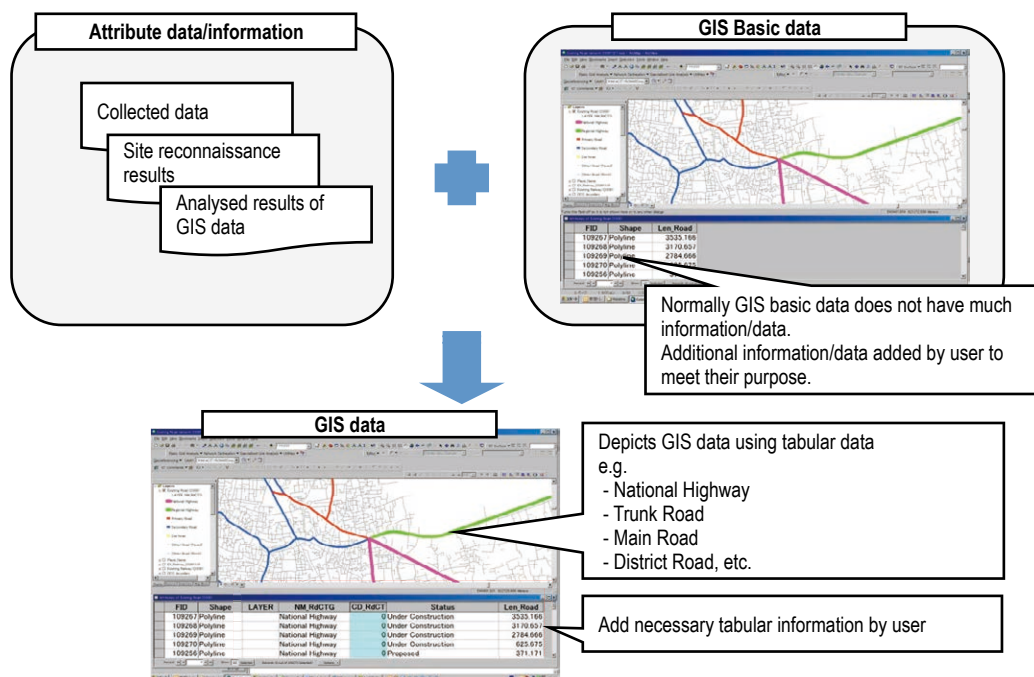


Figure 9.2: Example of the difference between GIS basic data and GIS data

9.3.3 Attribute data

There are many types of attribute data for GIS data. Some of them are from relevant Ministries, agencies and organizations; some of them through site reconnaissance and some of them might be collected from the Internet in various formats, such as Microsoft Excel, statistical books, and print out maps. In the case that the data format is Microsoft Excel or Microsoft Access, the data is relatively easy to integrate with GIS data. However, if the collected data is in hard copy format, it is required

to input/digitize it to digital format to integrate it with existing GIS data.

Thus, preparing GIS data is quite time consuming work. To reduce the total time of preparation of GIS data, identification and collection of suitable data for the purpose is inevitable and important to meet the ultimate purpose of development of GIS data. Otherwise, final data products might be difficult to handle, such as huge data size because of lots of unnecessary attribute data.

9.4 Application of GIS in this Study

A variety of data/information has been collected in the master plan study from relevant ministries, agencies and other data sources. This collected data was also compiled/integrated in numerical or GIS format for further analysis to support the formulation of the Logistic Hub Master Plan.

The primary objective of this GIS data development exercise is for logistics master planning and for supporting the SEA process in this project through sharing issues and information visually among various stakeholders.

The following are typical usage of GIS in the master plan study:

- For tabulation: There are various kinds of data collected through this Project such as population data, road network, railway network, administrative boundaries and so on. This collected data is evaluated and gives updates/modifications for quantitative analysis.
- For map preparation: A strong point of GIS technology is visualization of the results of data analysis. In this Logistics Hub Master Plan study, GIS was used for preparing various maps by using the analytical and map production functions of GIS system.
- For Database development: Through this master plan study, many kinds of GIS data were collected and prepared. Those data were integrated in GIS database. This database will be handed over to the Namibian side for future planning activities and monitoring activities of this Logistic Hub Master Plan implementation process. The contents of GIS database are explained in section 9.3.
- For a supporting tool of Logistics Hub Master Plan and SEA: In the master planning phase, GIS technology was utilized as analysing and evaluation tools with collected and newly developed GIS data. In the SEA process, GIS technology was utilized to share information and data among various stakeholders to identify issues spatially. Thus, GIS technology was utilized in various ways in this Project.

The objective of utilizing GIS in this Project is to prepare base data for identifying the present condition and issues to support formulation of the Logistics Hub Master Plan

9.5 GIS database and data collection

9.5.1 General concept of GIS database

All of the collected/developed data for this Study were compiled and integrated in a user-friendly manner and finalized as a GIS database. This GIS database was utilized to formulate the Logistics Hub Master Plan and expects to support future planning work in Namibia.

9.5.2 GIS data producers in Namibia (Governmental Agencies)

There are many GIS data producers in Namibia among Governmental agencies and produced GIS data are submitted to NSA to consolidate management of GIS data. Table 9.1 shows GIS data that was submitted to NSA from various Ministries and Agencies.

Table 9.1: Major GIS data producers in Namibia

Ministry/agency (data producer)	Contents of data
Ministry of Agriculture and Water Affairs	Aquifers, Catchment areas, Dams, Ground water basins, Rivers, Pans, Productivity of aquifers, treatment plants, Water supply points, Storage dams, Supply schemes, Water bodies, Biomes, Bush Density, Vegetation
Ministry of Education	Education circuits, Education Clusters
Ministry of Health and Social Services	Health Districts, Health Regions
Ministry of Lands and Resettlement	Constituency boundaries, Regional boundaries, National boundaries, DEM, Communal land, Farms, Household fences, Locality boundaries, Magistrate boundaries, National parks, Town land boundaries
Ministry of Mines and Energy	Mining, Geology, Mineral Deposits
Ministry of Environment and Tourism	Communal conservancies, Conservancy boundaries
MTC	Telecom network MTC coverage, Telecom network MTC sites
NSA	Satellite imagery, Aerial photos, Geographic names, Enumeration areas
Nampost	Post office locations
Nampower and NamWater	Nampower network distribution stations, Grid network, Power stations, water network (pipelines)
Road Authority	Road network
Telecom	Telecom fibre optic network, Primary exchange, remote line units, Satellite links, Transmitters, Telecommunication towers.

Source: Information from National Statistical Agency

Much of the data produced by various ministries and agencies are submitted to NSA, and utilized and shared through NSA at present; however, periodical update and management system does not function fully yet. It is recommended that periodical data is updated by responsible Ministries or Agencies, and the updated version of data submitted to NSA. This is highly important to become a more useful GIS database for users.

In 2013, NPC prepared a draft final National Spatial Data Infrastructure (NSDI) policy to improve collection, production, integration, storing, exchange, dissemination, and accessibility of spatial information including ICT infrastructure development as a means to achieve national development goals.

The goals of NSDI in Namibia are “to achieve Vision 2030, Namibia needs to improve the quality, use and access of spatial data”. The overall goals of this NSDI Policy are:

- To update Namibia’s metadata directory

- To make the metadata directory freely available and accessible to the public and private sectors and civil society
- To provide all fundamental datasets free of charge to all users
- To strengthen the capacity of the responsible role players
- To build awareness about the use and benefits of the NSDI
- To establish Public Private Partnerships for the value addition of datasets pertinent to the development of Namibia.¹

9.5.3 Summary of collected GIS data

Throughout of this Logistics Hub Master Plan study, the following GIS data was collected from relevant organizations.

9.5.3.1 NSA data

As mentioned in the previous section, many of ministries and agencies submit their GIS data to NSA for information sharing and consolidated data management. In this maser plan study, various GIS data sets provided from NSA and the collected data is fully examined and updated.

9.5.3.2 Digital Atlas of Namibia

Digital Atlas of Namibia was published by the Directorate of Environmental Affairs, Ministry of Environment and Tourism in 2002, and a web portal were produced as well as publication of a book. Some of the GIS data required was downloaded from this web portal.

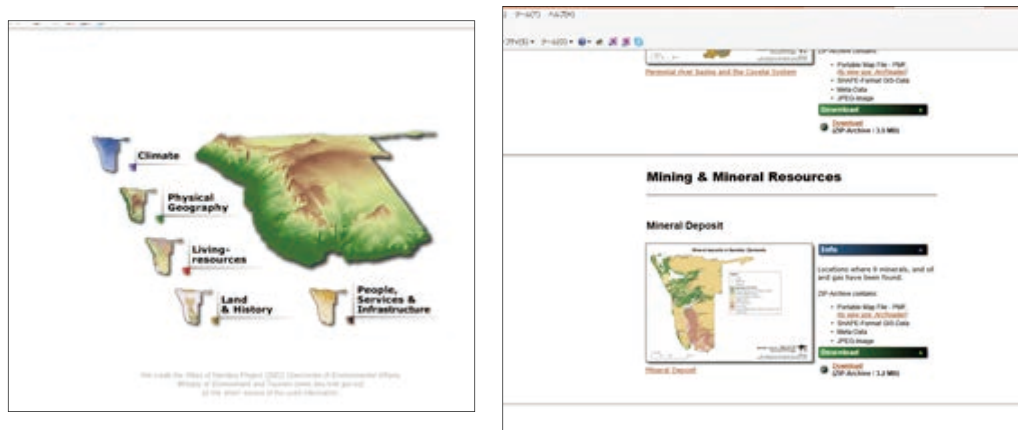


Figure 9.3: Screenshot of Digital Atlas of Namibia

¹ Source of information is a presentation material titled “NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI) – NAMIBIA BY Ms OTTILIE MWAZI, Head of Surveys, Cartography and GIS, NSA”. (http://web.up.ac.za/sitefiles/file/48/16053/NSDI%20at%20NSA%20_19%20Nov%202012.pdf)

9.5.3.3 Transport Master Plan data

“Technical Assistance for the Namibia Integrated Transport Master Plan²” also provided important data for the Logistics Hub Master Plan study in terms of transport analyses such as traffic analysis zones for traffic demand forecast. The data obtained was mainly utilized for the traffic demand forecast.

9.5.3.4 Data provider on the Internet

Recently, various public domain GIS datasets have become available on the Internet DEM (digital elevation model)³. The SRTM DEM is one of the public domain GIS datasets, and well known for providing elevation for almost the entire world except the Polar Regions. This data provides land elevation information by almost 90 m grid (3 arc second data) all over the world. This data also assisted the project team to understand land elevation and slope conditions in Namibia and surrounding areas. In addition to SRTM DEM, port locations, airport locations, road networks and railway networks for Southern Africa area are also collected from the Internet. Figure 9.4 shows an example of a map developed from data collected from various sources.

² The technical assistance operation is financed under the EU Africa Infrastructure Trust Fund

³ SRTM stands for “The Shuttle Radar Topography Mission”, and it is managed by NASA.

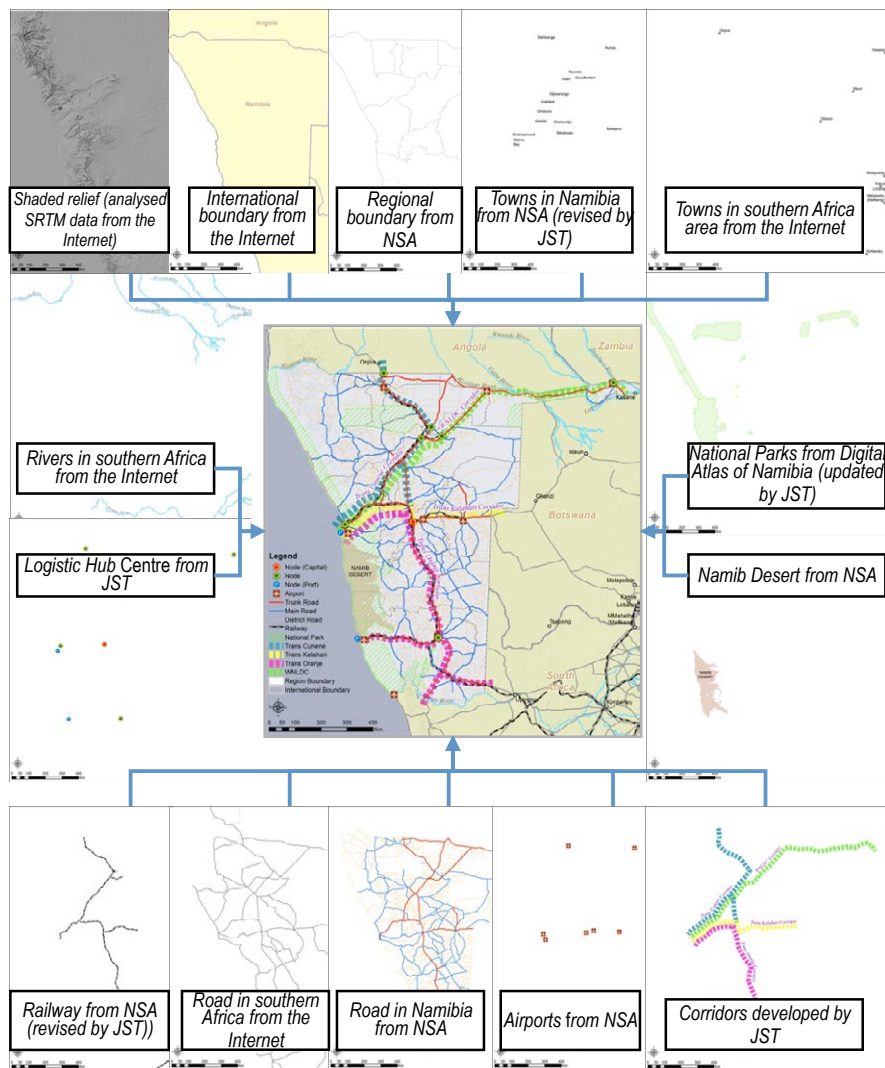
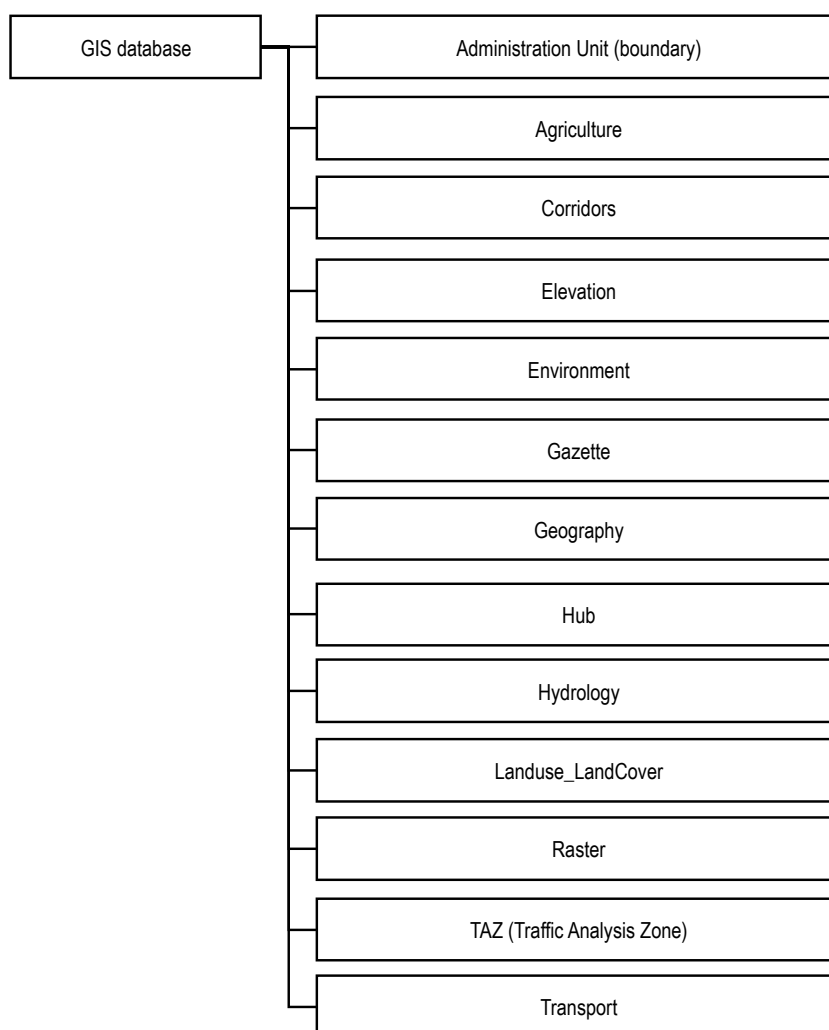


Figure 9.4: Example of a map developed from various GIS datasets

9.5.4 Composition of GIS database system

The overall structure of the GIS database is indicated in Figure 9.5. The database is composed of GIS files containing graphic and attribute data. Table 9.2 indicates a list of major datasets stored in the GIS database.



Source: JICA Study Team

Figure 9.5: Outline of structure of the GIS database

Table 9.2: List of major datasets stored in the GIS database

Category	Feature	Data Source	Coverage Area
Administrative Unit	EA (Enumeration Areas) 1991, 2001, 2011	NSA	Namibia
	Constituencies in 2001	NSA	Namibia
	Constituencies in 2014	NSA, revised by JICA Study Team	Namibia
	Regions in 2014	NSA, revised by JICA Study Team	Namibia
	International Boundaries	JICA Study Team	Southern Africa
	Health Districts	Ministry of Health and Social Affairs	Namibia
Agriculture	Town lands	Ministry of Land and Resettlement	Namibia
	Irrigated areas	Ministry of Agriculture, Water and Forestry	Namibia
Corridors	Corridors in Namibia	JICA Study Team	Namibia
	Corridors in South Africa region	JICA Study Team	Southern Africa
Elevation	Elevation	Digital Atlas of Namibia	Namibia
Environment	Community Forests	Ministry of Environment and Tourism	Namibia
	Conservancies	Ministry of Environment and Tourism	Namibia
	National Parks	JICA Study Team based on map from Ministry of Environment and Tourism.	Namibia
Gazette	Tourist Accommodation	Ministry of Environment and Tourism	Namibia

Category	Feature	Data Source	Coverage Area
	Customs Offices	JICA Study Team	Namibia
	Livestock density	Digital Atlas of Namibia	Namibia
	Towns in Namibia	NSA updated by JICA Study Team	Border towns in Namibia
	Towns in Southern Africa area	JICA Study Team	Southern Africa
Geography	Dune Namib	NSA	Dune Namib
	Landscape	Ministry of Mines and Energy	Namibia
	Mining sites	Ministry of Mines and Energy	Namibia
	Water bodies	Ministry Agriculture and Water affairs	Namibia
Hub	Logistic Hubs	JICA Study Team	Namibia
Hydrology	Dams	Ministry Agriculture and Water affairs	Namibia
	Rivers	Ministry Agriculture and Water affairs	Namibia
	Aquifers	Ministry Agriculture and Water affairs	Namibia
	Rivers	Ministry Agriculture and Water affairs	Namibia
Land use - land cover	Land use	Digital Atlas of Namibia	Namibia
	Control Over Land	Digital Atlas of Namibia	Namibia
Raster	Satellite Imagery by Town	NSA	Namibia
TAZ	Traffic Analysis Zones	Transport Master Plan	Namibia
Transport	Airports	NSA	Namibia
	Airports	Internet	Southern Africa
	Ports	JICA Study Team	Namibia
	Ports	Internet	Southern Africa
	Rail	Road Authority revised by JICA Study Team	Namibia
	Rail	Internet, revised by JICA Study Team	Southern Africa
	Roads	Road Authority, revised by JICA Study Team	Namibia
	Roads	Internet	Southern Africa

Source: JICA Study Team

9.5.5 Specifications of GIS data

The specification of GIS data in the GIS database is indicated in Table 9.3. The study team adopted ESRI shapefile (.shp) format for GIS vector data, developed by ESRI⁴ because many government agencies in Namibia use ESRI's GIS software such as ArcGIS, and shapefile has a high compatibility with other software, not only GIS but also transport planning and traffic demand forecast software such as CUBE or JICA STRADA.

Table 9.3: Specification of GIS data

Category	Specification of GIS data
Vector File Format	ESRI shapefile (.shp)
Raster File Format	JPEG file (.jpg), or Geo tiff (.tif)
GIS Map File Format	ESRI ArcMap GIS Project File (.mxd)
Projection System	WGS84 UTM 33S

Source: JICA Study Team

Currently, a lot of GIS data produced by Ministries and Agencies in Namibia use geographic coordinate system and Datum is WGS 84⁵; however, in the master plan study, UTM coordinate system is selected for the projection system of GIS data instead of Geographic coordinate system, and the selection of UTM projection system was done on NSA's advice⁶.

⁴ ESRI: Environmental Systems Research Institute, Inc

⁵ WGS: World Geodetic System

⁶ According to hearing from NSA, Namibian government plan to apply UTM projection system as national standard.