Public Disclosure Authorized

SFG1890

TANZANIA PORTS AUTHORITY

P. O. BOX 9184
One Bandari Road, Kurasini
Dar es Salaam, Tanzania
Website: www.tanzaniaports.com

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT: PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DSMGP), TEMEKE MUNICIPALITY, DAR ES SALAAM REGION

Submission date: 25 February 2016

Submitted to

National Environment Management Council
Regent Estate, Plot No. 29/30
P.O. Box 63154, Dar es Salaam, Tanzania
Tel: +255 (022)2134603 Fax: +255 (022)2111579
Email: dg@nemc.or.tz

Prepared by

ENV Consult (T) Ltd
Engineering, Environment & Management Consultants
P.O. Box 31318
Dar es Salaam, Tanzania

Tel: +255 22 2772209; 754 365064
Email: info@envconsult-tanzania.com

वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम - जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय)
(A Government of India Undertaking - Ministry of Water Resources, River Development & Ganga Rejuvenation)

Project Office: House No. 1, Plot No. 66, Regence Apartments,
Urisino/Migombani Street, Mikocheni,
Dar es Salaam, Tanzania
Email: tanzania@wapcos.gov.in
Corporate Address: 76-C, Sector 18, Institutional Area, Gurgaon,
Haryana, India.
Tel: +91-124-2397391 Fax: +91-124-2399224
Email: commercial@wapcos.gov.in

Public Disclosure Authorized

EXECUTIVE SUMMARY

Title and location of the project

The proposed project title is "Improvement of Dar es Salaam Port – Phase 1 of Dar es Salaam Maritime Gateway Program (DSMGP)". Tanzania Ports Authority (TPA) is the proponent and sole operator of the Dar es Salaam Port. The DSMGP is receiving support from various financial institutions, including the World Bank and the Department for International Development (DfID) through the Trade Mark East Africa initiative.

The DSMGP will be implemented in at least two different phases, in partnership between the Government of Tanzania, TPA, other public and private stakeholders, and a coalition of development partners including the Trade Mark East Africa (TMEA), the United Kingdom Department for International Development (DFID) and the World Bank (WB). Phase 1 includes the following four activities:

- Construction of a new multipurpose berth at Gerezani Creek – which shall be used for general cargo operations until Berths 1 to 7 are modernised;
- Deepening and strengthening Berths 1 to 7, with depth increased to 14 m below CD (Chart Datum) (approximately 1,281 m length) and paving of inshore container terminal yards at Berths 5 to 7;
- Improving rail linkages and platform inside the Port; and
- Increasing the capacity of the grain silo, and supporting the installation of a conveyor system, and high speed bulk grab.

Phase 2 also includes four main activities:

- Deepening and widening the entrance channel and turning basin in the port to the end of Berth 11 to 14 m below CD;
- Deepening and strengthening of Berth 8-11;
- Relocation of the Kurasini Oil Jetty (and construction of a new one); and,
- Construction of a substructure and access for a new dedicated container terminal at berth 12-14

Phase 2 activities are at an early stage of development and will be part of a spate stand-alone ESIA that will be prepared and disclosed.

Upon completion of Phase 1, the Dar es Salaam Port will:

- Be able to handle large vessels (thanks to the deepened Berths 1 to 7);
- Provide more efficient unloading of grain;
- Allow the largest vehicle transport Panamax vessels to dock at the new roro Terminal at Gerezani; and
- Benefit from improved use of rail infrastructure to transport goods from the Port to other parts of the country and region, thus contributing to reducing traffic congestion in Dar es Salaam and the wider country.

The bulk of Dar es Salaam Port is located in Kurasini Ward, Temeke Municipality, with a small portion, namely the Malindi and Lighter wharves located in the neighbouring Mchafukoge Ward, in Ilala District.

Name of the proponent and contact

TPA is the proponent, with the main contact:

P. O. BOX 9184, One Bandari Road, Kurasini, Dar es Salaam, Tanzania
Website: www.tanzaniaports.com
Tel: 022 2110 401
Fax: 022 2116 753
Email: amatuntera@tanzaniaports.com
Contact Person: A. Matuntera or Thobias Sonda

Name and address of ESIA expert

WAPCOS Limited were commissioned to undertake this ESIA, with their main contact:

WAPCOS Project Office
House No. 1, Plot No. 66, Regence Apartments
Urisino/Migombani Street, Mikocheni
Dar es Salaam, Tanzania
Email: tanzania@wapcos.gov.in
Contact: Alok Kumar Vidyarthi and K. Chandrasekhar

Brief outline and justification of the proposed project

TPA was established to provide, maintain, promote and operate ports facilities of the country's main ports (Dar es Salaam, Tanga, Mtwara) and secondary ports (e.g. Pangani, Bagamoyo, Kilindoni, Kilwa, etc.) and the inland waterway ports located at Lake Victoria, Lake Tanganyika and Lake Nyasa. Additionally, the TPA performs the role of a landlord, leasing out to private operators the commercial activities of ports.

Tanzanian's main port is Dar es Salaam Port handling approximately 95 % of country's import and export volume. The volumes handled by the Port reached 13.5 million tonnes in 2013. The port has 11 berths, two tanker berths, a multi-product Single Point Mooring (SPM) and lighter quays (KOJ), and handles a vast array of cargo, including containerised volumes increasing even faster. The port handles over half of Tanzania's total Gross Domestic Product (GDP) and represents a strategically important gateway to the central and northern parts of Tanzania and to the landlocked countries of the interior Malawi, Zambia, Democratic Republic of Congo, Rwanda, Burundi and Uganda.

Rapid growth experienced over the last two decades is placing considerable strain on Dar es Salaam. All indicators of port performance and utilization, including inter alia waiting time for ships anchorage, berth occupancy and cargo dwell time were deteriorating. The delay was exacerbated by the limitations in operational efficiency at the quay and lack of storage space, lengthening the time required to unload and load a container ship, and inadequate integration between the key actors. This also impacts on the waiting time for a berth for dry bulk vessels which has reached 4.5 days, as the conventional berths are increasingly congested by container vessels. In addition, despite offering a poorer service resulting in increased charges for cargo, port tariffs (primarily wharfage) in DSM are higher than competing ports.

The constraints were found to be caused by the following:

- Lack of container storage space within the Port area;
- Poor road and rail access to terminals from both the Dar es Salaam and central corridors; and,
- Restricted entrance channel to the Port limiting access to container carriers with capacity up to 2,000 TEUs.

Objectives of the project

This project is among the priorities of the government of Tanzania as outlined in the Big Results Now (BRN) program for maritime sector and hence this is the core of the proposed Dar es Salaam Maritime Gateway Program (hereinafter the DSMGP).

The focus of this ESIA is on the following proposed four main sub-projects within the overall DSMGP:

1 - Deepening and strengthening of Berths 1- 7 (approximately 1,281 m length) and paving of inshore container terminal yards at Berths 5-7.
2 - Construction of a new Ro-Ro Terminal at Gerezani – which shall be used for general cargo operations until Berths 1-7 are modernised.
3 - Improving rail linkages and platform in the Port.
4 - Increasing the capacity of the grain silo and supporting the installation of a conveyor system, and high speed bulk grab.

The project environment

The Port has eleven berths, seven of which are currently dedicated to general cargo (including container, dry bulk, break bulk and Ro-Ro operations) and four to dedicated container operations (Figure 4-1). Other facilities include the Malindi and Lighter wharves (for coastal trades), the Kurasini Oil Jetty (KOJ), and the Single Point Mooring (SPM). The SPM is located on the open side of Kigamboni, at Mjimwema Bay, with delivery pipelines to storage yards at TIPER and other sites. Within the project core area there are three geophysical areas that required specific attention during the EIA. These are Gerezani Creek, which comprises two areas of interest (the Gerezani Creek, within TRL land, and the seaward portion where the future Ro-Ro Terminal is proposed), and the intertidal area at Kurasini that supports mangrove forests (protected reserves under the Forestry Act).

The Dar es Salaam Port is within the metropolitan area characterized by a highly built up environment. The Port is surrounded by the city centre to the north, consisting of business areas and offices and Tanzania Railway; to the west are residential areas (Keko and Kilwa Road areas) and small factory areas (especially garages and BP bulky oil storage areas). The south consists of Kurasini, Mtoni and Mbagala residential areas, public institutions, bulk oils storage tanks and the Mtoni Dumpsite (now closed). To the east, there is Kigamboni residential area, TIPER refinery plant, and a few undeveloped plots. The city centre has a central sewer system that discharges sewage in the harbour mouth through the sea outfall pipe. Many of the areas surrounding the harbour lack sewers and sewage is largely handled by septic tank and soak away systems. Considering the sandy nature of the soils, leaking septic tanks and soak away systems are a source of sewage pollution into the harbour through the groundwater flows.

Generally, the marine ecosystem in the Dar es Salaam harbour is highly exposed to many sources of pollution. The major pollution sources include port operations, harbour activities (maritime), urban drainage (streams, rivers and open channels), uncontrolled solid waste and liquid waste disposal in the city centre and urban periphery areas (directed in the storm water channels). Others include the Kivukoni fish market, the Band beach swimming club, Kigamboni ferry operations, the Sea outfall sewage pipe, leachate from Mtoni dumpsite, drainage from Kurasini bulk oil handling areas, underground seepage of liquid wastes from septic tanks etc. Conceptually Dar es Salaam harbour receives pollutants from within and without the Port environment. The major concerns are drainage channels and natural water courses that bring in the harbour a variety of pollutants including sediments. The Gerezani Creek and Kizinga River are directly impacting on the harbour water quality through incessant ingress of polluted water.

Stakeholders involved in the ESIA Study

The list of parties that may be affected by the proposed project in Kurasini Ward, Temeke Municipality (as well as neighbouring Mchafukoge Ward, in Ilala District) were identified and were consulted during the course of the study, between June 2015 and January 2016. The following thirteen are the main stakeholder groups consulted during the 1st consultative meeting, the 2nd general meeting and subsequent meetings:

1. Ministries
    - Ministry of Lands, Housing and Human Settlement Development (MLHHSD)
    - Ministry of Natural Resources and Tourism (MNRT)
    - Ministry of Agriculture, Livestock and Fisheries (MALF)
    - Ministries of Home Affairs (MOHA)
    - Ministry of Water and Irrigation (MOWI)

2. Government Institutions
    - Tanzania Revenue Authority (TRA)
    - Tanzania National Roads Agency (TANROADS)
    - Marine Parks and Reserved Units (MPRU)
    - Tanzania Social Action Fund (TASAF)
    - Tanzania Railway Limited (TRL)
    - National Health Insurance Fund (NHIF)
    - Energy and Water Utilities Regulatory Authority (EWURA)
    - Reli Assets Holding Company (RAHCO)
    - Shipping Corporation of Zanzibar (SHIPCO)
3. Private Institutions
    - Tanzania International Containers Terminal Services (TICTS)
    - National Microfinance Bank (NMB), Bandari branch
    - CRDB Bank, Bandari branch
4. Donor
    - Trade Mark East Africa (TMEA)
5. Local Government
    - Dar es Salaam City Council
    - Temeke Municipal Council
6. Non-Governmental Organizations (NGOs) along Bandari Road
    - North Star Alliance
    - Wake and Support Other Organisations (WASO)
7. Representatives of Kurasini and Mivinjeni Wards
8. Private shipping companies using Malindi Wharf (Al-Ghubra Marine and Seven Seas)
9. Labour agencies (service providers within the Port)
10. Food vendors (*Mamalishe*) along Bandari Road
11. Fishermen (Kurasini landing site and Vijibweni)
12. Motorcycle taxis (*bodaboda*)
13. Shipping Agents
14. Tanzania Navy (Kigamboni)

Results of the public consultation

The consultations generated valuable contribution to the proposed development. All stakeholders support the idea of the project to be developed in the proposed area taking into consideration the potential for the growing of economic activities in the region and the country at large.

Issues regarding land acquisition are not applicable because the proposed project will be implemented within TPA's own land. Therefore, a Resettlement Action Plan was not necessary in this ESIA. The views and major concerns raised by Stakeholder were collectively categorised into the following ten issues:

1. Movement of construction vehicles will increase traffic and risk of accidents during construction.
2. Influx of people will contribute to an increased rate of HIV/AIDS infections.
3. Increased business opportunities along Bandari Road due to presence of construction labour.
4. Noise generation during construction.
5. Increased dust during construction.
6. Local job creation and increase of income to Temeke residents.
7. Loss of employment after completion of the project.

8. Dredging exercise will disturb the bottom substratum and the potential impact on benthic organisms.
9. Increase in waste generation and improper disposal resulting in land and/or marine pollution.
10. Health, safety and security risks for construction workers, TPA staff and other Port users.
11. Concerns over access to and use of Malindi Wharf during construction (and operation) of the Gerezani Ro-Ro Terminal

Description of the major significant impacts

The ESIA study has identified and addressed all significant impacts of the project. Both positive and negative significant impacts were addressed.

The following were identified as significant positive impacts:

- Increase in income generating activities.
- Creation of temporary employment opportunities of construction workers.
- Increased revenue from imported vehicles.
- Increased income generation opportunities.
- Improved trade with neighbouring countries.
- Increase in efficiency of cargo handling.

Some of the significant negative impacts identified include the following:

- Extraction of raw materials from quarry sites.
- Increased demand on existing infrastructure and utilities in Temeke Municipal.
- Flooding of inner Gerezani Creek area due to accidentally blocking surface water flow into the harbour.
- Reduced berth space at Malindi Wharf impacting existing users.
- Increased vehicle traffic.
- Changes in marine water quality due to potential release of chemicals and heavy metals while dredging or backfilling.
- Marine pollution due to disposal of dredged materials.
- Occupational risks and accidents.
- Increase in invasive species from increased shipping traffic.
- Increased marine pollution from improper disposal of waste from marine vessels.
- Increase in HIV/AIDs infection rate.
- Accidental vessel collisions during dredging.
- Accidental collisions of vehicles and trains within the Port area.
- Accidental spills of oils.
- Accidental vessel collisions leading to oil spills.
- Accidental exposure to hazardous materials.
- Redundancy of casual labourers following mechanisation of the Port.

No land acquisition is required for Phase 1 activities. The area planned to be backfilled at the Gerezani Creek estuary for the new Ro-Ro terminal is within the TPA jurisdiction. In addition, the ESIA recommends that the Contractor(s) employed for the construction phase use existing sites that were identified: one is within the TPA area towards the Ship Yard area; the second is where the current Contractor's camp for the Kigamboni Bridge located on Nelson Mandela Road.

Alternatives considered

The ESIA considered the following location, alignment and technology alternatives:

1. Construction alternatives for deepening and strengthening of Berths 1 – 7: the preferred option was the construction of a suspended deck slab resting on precast concrete piles.
2. Location alternatives for the proposed Ro-Ro terminal: location of the Ro-Ro terminal has no alternative location that was considered during the feasibility study. The proposed location was identified during the development of the Tanzania Ports Master Plan (2009).
3. Construction alternatives for the proposed Ro-Ro terminal: the preferred option is to construct a pile structure with a suspended deck slab consisting of raking and vertical concrete or steel piles and a reverted slope.
4. Alternative backfilling material source for the Ro-Ro terminal: the option to use raw construction material from a land-based quarry and/or borrow pits was included in the assessment.
5. Alternatives of disposing dredging material from construction works at the Ro-Ro terminal and Berths 1 to 7: the preferred alternative is to dispose the material in the ocean, preferably in a depression where sediment would be laterally confined.
6. Technological alternatives for the expansion of the existing grain silo: the preferred alternative was to install high capacity chain conveyors and additional steel silos.
7. Alignment alternatives for railway links at the Port: the preferred alternative is to align the railway tracks along the rear side of the Port area because it offers the most options for modernizing cargo handling and to upgrade to a single track with a standard (triple) gauge track width.

Recommendations and plan for mitigation of the impacts

The ESIA study team recommends the following:

1. The views from different stakeholders should be given due consideration in all stages from planning to the operation of the project
2. The Contractor is primarily responsible for implementing environmental and social control measures recommended in the ESMP. Therefore, this ESMP is to be included in the contractor's bidding documents, as a line item in contracts with Contractors, where the Contractor is expected to develop a more specific ESMP for construction activities, adjusting the bill of quantities and detailed method statements as necessary to mitigate impacts. The Contractor(s) is/are advised to have a Health, Safety and Environment Officer or procure a qualified consultant to oversee the implementation of the ESMP during construction.
3. The overall supervision of the ESMP is the responsibility of the proponent of the ESIA i.e. TPA. To keep within the existing administrative setup in TPA, it is recommended that a Dar es Salaam Port OSHE committee is to be custodian of this ESMP and will be responsible for:
    - Ensuring that recommendations in the ESMP to be implemented during construction are incorporated into the Contractor tendering process;
    - Procuring a supervisory consultant to monitor the Contractor to ensure that the mitigation measures are implemented and revise to improve effectiveness where necessary;
    - Ensuring that respective sections/divisions at Dar es Salaam Port implement mitigation measures during the operation phase;
    - Preparing monthly reports;
    - Strengthening the EMS (Environment Unit) with qualified staff, training and equipment; and
    - Liaising with other institutions with respect to obtaining licenses, complying with standards and reporting on environmental and social issues identified in the ESMP.
4. ESMP and Monitoring plans should begin during pre-construction phase and be carried out through the lifespan of the project as applicable.

<u>Costs of Implementation of the Environmental and Social Management Plan</u>

The EIS presents an outline Environmental and Social Management Plan. The overall estimated cost of the proposed ESMP is TSh 1,610 million (USD 748,837), of which the following are the seven major elements:

- Enhancing overall positive measures associated with all activities TSh 270 million (USD 125,581);
- Construction of the Ro-Ro terminal TSh 567 million (USD 263,721);
- Strengthening and deepening Berths 1 to 7, TSh 213 million (USD 99,069);
- Improvements to the grain delivery and silos TSh 112 million (USD 52,093);
- Improvements to rail links TSh 41,000 (USD 19,069) ;
- Addressing cumulative impacts TSh 312 million (USD 145,116); and
- Addressing accidental events TSh 95 million (USD 44,186).

Costs of Implementation of Environmental and Social Monitoring Programme

Monitoring will concentrate more on aspects such as baseline monitoring namely changes on the baseline conditions following the implementation of the project. Other parameters include impact/effect monitoring, namely the effect of the project; compliance to monitoring which is a periodic sampling and continuous measurement of levels of compliance with standards and thresholds – e.g. for waste discharge and number of vehicles in the project area. Monitoring will also cover checking on the suitability and effectiveness of mitigation measures proposed to address some of the adverse effects. Several parameters including social, economic and environmental ones have been considered in the monitoring and auditing. The main responsibility for monitoring is with the developer, Temeke Municipal Council and NEMC. Time and frequency of data collection are provided in the main report. The EIS presents an outline Environmental and Social Monitoring Programme with an overall estimated costs of TSh 2,866 million (or USD 1.33 million).

Summary of mitigation measures for major impacts

Sn	Impact of Major Significance	Summary of mitigation measures
	Social issues	
1	Increased demand on existing infrastructure and facilities	• Temeke Municipal to be notified on roads to be used; • Additional toilets connected to septic tanks to be constructed (two units proposed to start) for use by construction workers; • TPA to allocate budget for increased costs related to water supply, sewage and solid waste.
2	Increased demand on energy and limited water resources	• Installation of power-saving electrical appliances; • Adoption of a cost effective and technically feasible renewable energy sources e.g. solar power for some port operations; • Limiting the timing of machinery operations in an efficient manner to minimize energy wastage and exhaust outputs; • Use of TPA's boreholes as water sources for construction purposes and allocation of the DAWASCO mains mostly to sanitary facilities stationed for construction labour; • Water-conservation training to construction labour and monitoring water usage; • Frequent maintenance checks on water supply systems
3	Reduced berth space at Malindi Wharf impacting existing users.	• Relocation of banking services to other TPA buildings; • Northern portion of Malindi Wharf (Lighter and Dhow wharfs) to be dredged (maintenance dredging) to allow deeper draught vessels to use these portions. • Vehicle access for Malindi Wharf users improved for Gate 2 to avoid Gerezani RoRo Terminal area during construction and operation • Formation of a dedicate Steerng Committee to address Malindi Wharf issues
4	Increased vehicle traffic.	• Road and safety signs to be positioned along road network; • Speed bumps to be constructed where necessary; • Speed limits to be imposed; • Idling of vehicles to be prohibited;

Sn	Impact of Major Significance	Summary of mitigation measures
	Social issues	
		• Road damage to be attended to promptly. •
5	Occupational risks and accidents.	• Signage, lights around port area; • Audible signals at main railway crossings; • TPA OSHE committee to include safety with staff training and organise annual awareness campaigns • Labourers to be provided with PPE and first aid kits to be available onsite; • Health, safety, security and environment induction course to be conducted for workers; • Controlled access to site with warning signs around perimeter;
6	Increase in HIV/AIDs infection rate.	• Workshops on HIV/AIDS and prevention to be conducted routinely for Port staff; • Conduct sensitisation activities, testing, counselling and promotion of condom use, etc.
7	Managing the redundancy of casual labourers following mechanisation of Port	• Involve casual labourers for those activities that are more labour intensive rather than highly mechanised. For example, during construction workers could be involved in offloading machinery, equipment and other essential services for construction purposes; • The workers have to be prepared for forced retirement; • The skilled workers will find alternative jobs; • Training on using the new technology and system should be provided where possible to casual labourers, relevant to future opportunities should these arise; • Retrenched labourers are to be given first priority for other TPA inland services at ICDs, and other locations should opportunities arise, etc.; • Identify those to be retrenched and inform them about any possible opportunities that will arise during construction. For example , a group of casual labourers could undergo training on how to manage traffic movement in and out the project area especially for large vehicles transporting construction materials such as sands, aggregates and borrow pits entering construction site. This group could be trained on how to use flags and should be equipped with communication equipment's such as radio calls; • Project needs to be in compliance with national labour laws and workers' rights; during redundancy consider severance packages; and • Establish a Labour Steering Committee to oversee the labour needs and loss associated with the specific activities during their operation.
	Environmental issues	
8	Extraction of raw materials from quarry sites.	• Use of only existing licensed quarries in the Coastal Region; • Minimising of dust generation during the collection of raw materials from these quarries by water sprinkling and covering of loose materials; • Further mitigation measures to be employed during drilling operations by licensed quarry owner.
9	Flooding of inner Gerezani Creek area due to accidentally blocking water flow into the harbour.	• Regular inspection and maintenance of culvert outlet.
10	Changes in marine water quality due to potential release of chemicals and heavy metals while dredging or backfilling.	• Remedial dredging to be conducted to remove sediments contaminated above acceptable levels; • Necessary treatment of dredged material to be undertaken prior to disposal.
11	Marine pollution due to disposal of dredged materials.	• Siting disposal at subaquatic depressions where sediment would be more laterally confined;

Sn	Impact of Major Significance	Summary of mitigation measures
	Social issues	
		• Dumping site location confirmed regardless of season, through inspections and expert advice.
12	Increase in invasive species from increased shipping traffic.	• Prevention strategy and detection and rapid response plans to be developed; • Awareness among regular Port users to be increased through workshops; • Ballast water management plan; • Port facilities to conduct cleaning or repair of ballast tanks; • Treatment technologies to be adopted.
13	Increased marine pollution from improper disposal of waste from marine vessels.	• Oil skimmers to be available at the Port as well as chemical dispersants; • Waste generated on vessels to be collected and appropriately disposed of (as per 1973 MARPOL Convention) • Ship waste management plan
14	Accidental vessel collisions during dredging.	• Vessel speed restrictions to be imposed; • Dredging vessel to display required lights and signs for visibility;
15	Accidental collisions of vehicles and trains within the Port area.	• Signage, lights and audible signals at main railway crossings
16	Oil spills from accidental vessel collisions	• Vessels reminded on MARPOL obligations; • Port staff to be trained; • Equipment routinely inspected; • Oil spills drills held regularly
15	Accidental spills of oils and chemicals in the Port	• Port staff to be trained; • Oil skimmers, booms and spill clean-up material for land spills to be available at the Port and equipment to be routinely inspected.

Cost benefit analysis

The Dar es Salaam Port is the biggest port in Tanzania and the second most crucial gateway for regional trade in East and Central Africa after Mombasa. The Port handles approximately 90% of the import and export cargo including transhipment cargo to and from the landlocked countries of Zambia, Malawi, DRC, Burundi, Rwanda, and Uganda. The transit trade counts for as much as 50% of exports and 32% of imports. If the proposed project will be implemented and the envisaged efficiency is attained, Tanzania's economy is expected to gain almost USD 1.8 billion per year (~ 7% of current GDP) and the regional gains (exclusive of Tanzania) would be in the range of USD 800 million per year. Therefore, Tanzania and regional countries could earn as much as USD 2.6 billion per year; and based on average level of consumption, it is estimated that Tanzanian households may be able to save up to 8.5% of total expenditures, or USD 147 per year.

Tentatively, the investment costs for Phase I activities is approximately USD 275 million. After taxation, the Financial Internal Rate of Return (FIRR) of the project is 25.9% with high and 9.6% with low traffic forecast. The Economic Internal Rate of Return (EIRR) of the project is 31.3% with high and 15.4% with low traffic forecast.

Generally, the anticipated socio-economic benefits of the project outweighs the associated repercussions. The proposed project is of great benefit to the country and regional economy at large, and at the same time community members at the local scale will benefit in various ways. The anticipated desirable outcomes will be felt at both the micro- and macro-levels.

Decommissioning

A decommissioning plan will be prepared to specify the undertakings to be implemented in the event that the program operations reach a point of termination. Notwithstanding the project's estimated life span of over a hundred years, continuous advancement in maritime infrastructure technology is likely to phase out the technical deliverables of the program in the long run. The technical, socio-economic and environmental

hurdles associated with the closure of this national facility necessitate the institution of a comprehensive plan to ensure all aspects of decommission works are successfully executed and that negative impacts are adequately abated. When the program approaches the end of its long-established operational phase, a detailed decommissioning plan will be framed by TPA, in collaboration with key stakeholders, and approved by relevant authorities.

Decommissioning works will involve a wide range of closure activities to abolish parts of the harbour facility. The main deliverables associated with this phase of the project include labour demobilization, asset recovery, deconstruction, site rehabilitation and waste management.

Conclusion and recommendations

The results of the study indicate that the project is beneficial to the TPA in terms of income generation. It will also benefit the adjacent communities by ways of employment creation, which is likely to reduce poverty levels. The government will also realise increased revenue from the services offered by the proposed expanded port facility. Further, the envisaged construction of the four project activities under this Phase 1 is to be implemented on TPA-owned land and in an existing area such that no land take is required. This project will not require any resettlement of project affected people, i.e. neither physical nor economic displacement. Therefore, a Resettlement Action Plan (RAP) is unnecessary for this project.

Given the nature and location of the project, the conclusion is that the proposed Phase 1 components of the DSMGP at Dar es Salaam Port will entail no significant impacts provided that the recommended mitigation measures are adequately and timely implemented. The potential impacts associated with the proposed developments are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate mitigation measures. Of note are impacts from employment, Malindi Wharf, supply of backfill materials for the Gerezani Ro-Ro Terminal and dredging (including disposal of spoils).

The consultants from WAPCOS Ltd. are of the opinion that almost all potential environmental and social impacts identified may be mitigated against. There are few impacts that are considered residual in nature. The proposed environmental management plan and environmental monitoring programme, if implemented, will safeguard the integrity of the natural and social environment.

Names and signatures of registered ESIA experts

Name	Role	Signature

Contents

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immuno Deficiency Syndrome
ARI	Acute Respiratory Infections
BOD	Biochemical Oxygen Demand
BP	British Petroleum
BRN	Big Result Now
Cap	Chapter
CD	Chart Datum
CGCLA	Chief Government Chemist Laboratory Agency
CPP	Consultation and Public Participation
Cr	Chromium
CT	Container Terminal
DAWASCO	Dar es Salaam Water Supply Company
dB(A)	Decibels
DFID	Department for International Development
DIA	Direct Area of Influence
DMGP	Dar es Salaam Maritime Gateway Improvement Program
DMRs	Dar es Salaam Marine Reserves
DSM	Dar es Salaam
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIA	Environmental Impact Statement
EIRR	Economic Internal Rate of Return
EMA	Environmental Management Act
EMS	Environmental Management System
ENATA	Environmental Association of Tanzania
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Regulatory Authority
FIRR	Financial Internal Rate of Return
G.N	Government Notice
GCLA	Government Chemist Laboratories Agency
GDP	Gross Domestic Product
Hg	Mercury
HIV	Human Immuno-Deficiency Virus
IIA	Indirect Area of Influence
IMS	Institute of Marine Sciences
IPCC	International Panel on Climate Change
ISO	International Organization for Standardisation
ISPS	International Security for Port Services
JWTZ	Jeshi la Wananchi wa Tanzania
KOJ	Kurasini Oil Jetty
kWH	KiloWatt Hour
m	Meter
m^2	Meter Square
m^3	Meter cubed
MCH	Maternal and Child Health
MDGs	Millennium Development Goals
MKUKUTA	Mkakati wa Taifa wa Kukuza Uchumi na Kupunguza Umasikini
MLHHSD	Ministry of Lands, Housing and Human Settlements Development
MMO	Municipal Medical Officer
MNRT	Ministry of Natural Resources and Tourism
MPRU	Marine Parks and Reserves Unit
MRI	Magnetic Resonance Imaging
NEMC	National Environment Management Council
NGOs	Non – Governmental Organisations
NHP	National Health Policy
No.	Number
NSGRP	National Strategy for Growth and Reduction of Poverty

OP	Operating Procedures
OPD	Out Patient Department
OSHA	Occupational Safety and Health Authority
OSHE	Occupational Safety, Health and Environment
OTC	Organotin Compounds
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Plumbate (Lead)
PCB	Polychlorinated Biphenyls
PID	In-patient Department
PPP	Public Private Partnership
RAHCO	Reli Assets Holding Company
RAP	Resettlement Action Plan
Ro-Ro	Roll on Roll off
RTG	Rubber Tired Gantry
SEA	Strategic Environmental Assessment
SOP	Standard Operating Procedures
SPM	Single Point Mooring
SSF	Social Security Fund
SSGs	Ship to Shore Gantries
SUMATRA	Surface and Marine Transport Regulatory Authority
TAC	Technical Advisory Committee
TANESCO	Tanzania Electricity Supply Company
TANROADS	Tanzania Roads Agency
TASAF	Tanzania Social Action Fund
TAZARA	Tanzania and Zambia Railways Authority
TB	Tuberculosis
TBT	Tributylintin
TEUs	Twenty Equivalent Units
THA	Tanzania Harbours Authority
TIC	Tanzania Investment Centre
TICTS	Tanzania International Container Terminal Services
TIPER	Tanzania Italian Petroleum Refinery Co.
TMC	Temeke Municipal Council
TMEA	TradeMark East Africa
ToR	Terms of Reference
TPA	Tanzania Ports Authority
TRA	Tanzania Revenue Authority
TRL	Tanzania Railways Limited
TTCL	Tanzania Telecommunications Company Limited
TZS	Tanzania Shillings
UDSM	University of Dar es Salaam
URT	United Republic of Tanzania
USD	United States Dollar
UTI	Urinary Tract Infection
WB	World Bank
WHO	World Health Organisation
Zn	Zinc

ACKNOWLEDGEMENTS

Tanzania Ports Authority wishes to affirm its gratitude to WAPCOS, for its consultancy on the Environmental and Social Impact Assessment (ESIA) for the proposed Dar es Salaam Maritime Gateway Program at Dar es Salaam Port.

We would like to thank Mr Chandrasekhar, Mr. Alok Kumar Vidyarthi and Mr. Ankit Patadia of the WAPCOS ESIA team for their contributions to the study. The team from COWI Tanzania are thanked for their contributions to the finalization of this ESIA report, namely Dr. Matthew Richmond, Ms. Navonaelli Kaniki, Ms Kathy Wilfred, Ms. Christina Nsekela, Ms. Lilian Ruther, Dr. Jesper Jonsson, Mr. Edward Ezekiel and Mr. Ignatius Ngamesha. To Mr. Mike Shand for the excellent maps we are very grateful.

We would also like to extend our appreciation to Mr. Thobias Sonda (TPA), Mr. Nelson Nanyaro (TPA), Dr. Simon Ndaro (UDSM), Mr. Mukaka (UDSM), Mr. Kayonko Juma Kayonko, Dar es Salaam City Council and Temeke Municipal Council for the guidance and insights provided in the course of numerous interviews and participatory field visits. To the various reviewers of earlier drafts, from the World Bank, TPA, TMEA, and Sellhorn, we gratefully acknowledge the inputs that have contributed significantly to improving the document.

Lastly, all stakeholders listed in Appendix 5, and various staff within TPA, are acknowledged for their cooperation and valuable inputs.

Chapter 1: GENERAL BACKGROUND TO THE STUDY

1.1 Introduction

Tanzania Ports Authority (TPA) was established on 15th April 2005 following the repeal of Tanzania Harbours Authority (THA) Act No. 17/2004. The TPA's major responsibilities are to provide, maintain, promote and operate ports facilities of the country's main ports (Dar es Salaam, Tanga, Mtwara) and secondary ports (e.g. Pangani, Bagamoyo, Kilindoni (Mafia), Lindi, Kilwa) and the inland waterway ports located at Lake Victoria, Lake Tanganyika and Lake Nyasa. Additionally, TPA performs the role of a landlord, leasing out to private operators the commercial activities of ports.

Tanzania's main port is Dar es Salaam Port (Figure 1-1) handling approximately 95 % of the country's import and export volume. The volumes handled by the Port reached 13.5 million tonnes in 2013/2014 up from 12.1 million tonnes in 2012 and 10.4 million tonnes in 2011. The Port has 11 berths, two tanker berths, a multi-product Single Point Mooring (SPM) and lighter quays (KOJ), and handles a vast array of cargo, including increasing containerised volumes. The Port handles over half of Tanzania's total Gross Domestic Product (GDP). The Port also represents a strategically important gateway to the central and northern parts of Tanzania and to the landlocked countries of the interior Malawi, Zambia, Democratic Republic of Congo, Rwanda, Burundi and Uganda. Transit trade accounted for as much as 33 % of total volume in 2012 or just over 4.4 million tonnes with forecasts suggesting this could increase to 9.7 million tonnes by 2030.

This rapid growth is placing considerable strain on Dar es Salaam. All indicators of port performance and utilization, including *inter alia* waiting time for ships anchorage, berth occupancy and cargo dwell time are deteriorating. The delay is exacerbated by the limitations in operational efficiency at the quay and lack of storage space, increasing the time required to unload and load a container ship, and underpinning inadequate integration between the key actors. This also impacts on the waiting time for a berth for dry bulk vessels, which has reached 4.5 days, as the conventional berths are increasingly congested by container vessels. In addition, despite offering a poorer service resulting in increased charges for cargo, port tariffs (primarily wharfage) in Dar es Salaam are higher than competing ports (e.g. Tanga and Mombasa).

The constraints were found to be caused by lack of container storage space within the Port area, poor road and rail access to the terminal from both the Dar es Salaam and the central corridors, and restricted entrance channel to the Port limiting access to container carriers with capacity up to 2,000 twenty-foot equivalent units (TEUs).

1.2 Dar es Salaam Maritime Gateway Program

This project is among the priorities of the Government of Tanzania as outlined in the Big Results Now (BRN) program for maritime sector and hence this is the core of the proposed Dar es Salaam Maritime Gateway Program (hereinafter the DSMGP).

The major program objective is to improve the effectiveness and efficiency of the Dar es Salaam Port, for the benefit of port users, thereby facilitating the economic development of Tanzania and the landlocked countries of the East African region. This objective will be realised through a sequential improvement in spatial and operating efficiency, institutional capacity and reform, and infrastructure enhancements both in Dar es Salaam Port, and its immediate hinterland.

The DSMGP will be implemented in different phases in partnership between the Government of Tanzania, TPA, other public and private stakeholders, and a coalition of development partners including the Trade Mark East Africa (TMEA), the United Kingdom Department for International Development (DFID) and the World Bank (WB).

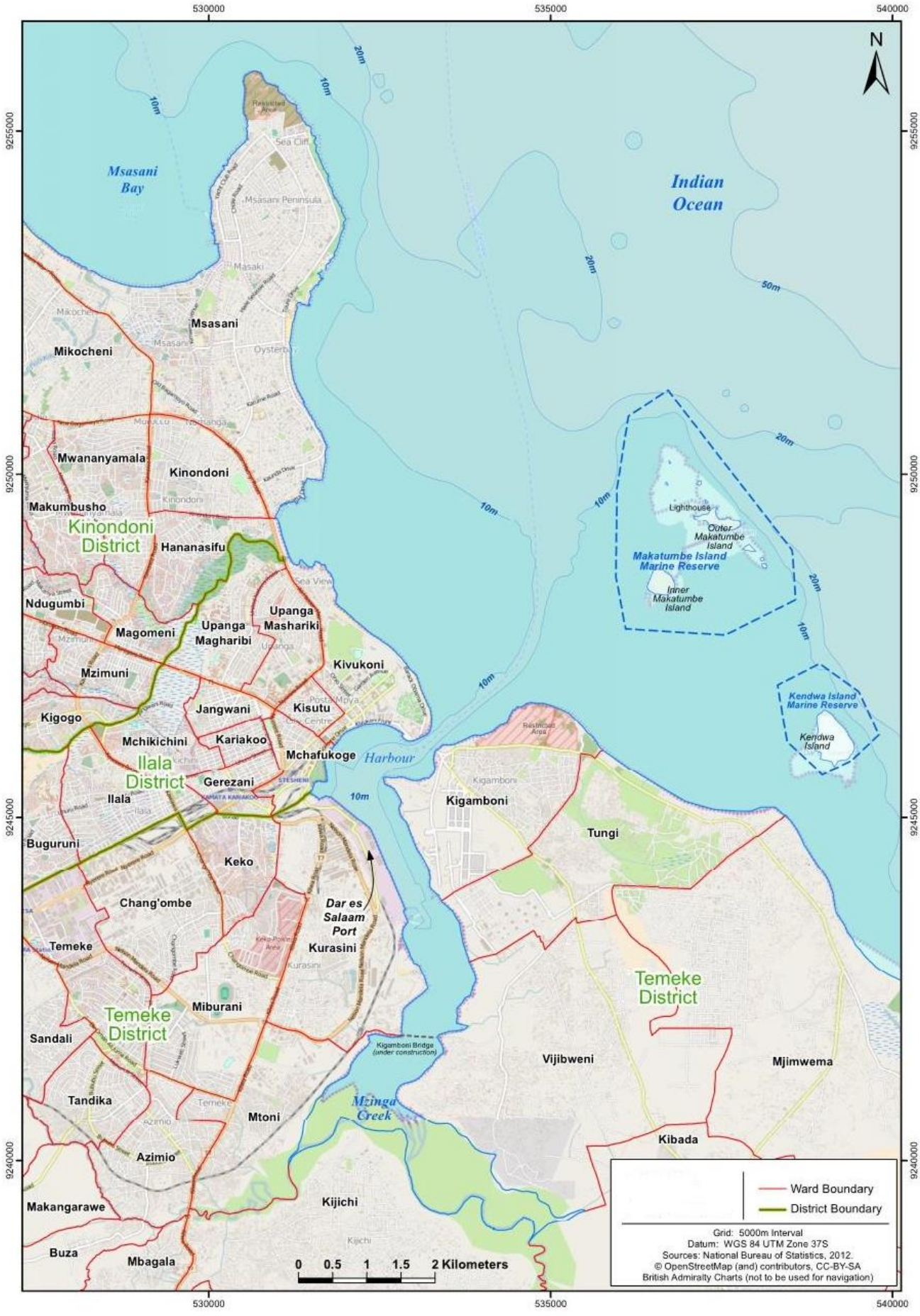


Figure 1-1 Dar es Salaam Port within district and ward administrative boundaries. Sources: COWI Tanzania Ltd. 2016.

In preparation for the proposed port expansion and upgrade, a series of studies were undertaken in 2012 and 2013 as part of the feasibility assessment. The consultants Inros Lackner AG in association with Gauff Ingenieure GmbH & Co. KG–JBG Branch Tanzania undertook the work and produced a Feasibility Study document divided into Parts A and B, plus Appendices. These documents form the basis of the proposed design options referred to in the present assessment and are collectively quoted as "Feasibility Study 2013".

During port expansion under the DSMGP, the following are the activities to be implemented:

(i) Construction of new multipurpose berth at Gerezani Creek;
(ii) Deepening and strengthening Berths 1 and 7 up to 14 m below Chart Datum (CD);
(iii) Deepening and widening the entrance channel and turning basin in the port to the end of Berths 11 to 14 m below CD;
(iv) Deepening and strengthening of Berths 8-11;
(v) Improving rail linkages and platform in the Port;
(vi) Increasing the capacity of the grain silo and supporting the installation of a conveyor system, and high speed bulk grab;
(vii) Relocation of the Kurasini Oil Jetty (and construction of a new one); and,
(viii) Construction of a substructure and access for a new dedicated container terminal at Berths 12-14 (for private operator).

Other project-related activities financed by Trade Mark East Africa (TMEA) include:

(i) Port community/single window to integrate stakeholders system;
(ii) Relocate space and improve layout by demolition and relocation of Shed 2-7;
(iii) Institute single flow of road traffic and single entry/exit points by improving access roads to Gates 4, 5 and 8;
(iv) Install scanners at Gates 4 and 8 to improve security and flow of traffic at gates;
(v) Improve flow of traffic on public roads immediately outside the Port by upgrading, widening Bandari and Mivinjeni roads; and
(vi) Improve Port productivity by establishing new standard operating procedures, Terminal Operating Systems, Tariff review to provide incentive for improved operation.

1.3 Project Objectives

The existing Port layout is shown in Figure 1-2, where specific activities proposed during Phase 1 will take place. These Phase 1 activities, the subject of this Environmental and Social Impact Assessment, are the following:

- Construction of a new multipurpose berth at Gerezani Creek – which shall be used for general cargo operations until Berths 1 to 7 are modernised;
- Deepening and strengthening Berths 1 to 7, with depth increased to 14 m below CD (approximately 1,281 m length) and paving of inshore container terminal yards at Berths 5 to 7;
- Improving rail linkages and platform inside the Port; and
- Increasing the capacity of the grain silo, and supporting the installation of a conveyor system, and high speed bulk grab.

The proposed Port layout of the berths is as indicated in Figure 1-3. To the south there is the existing TICTS, followed by Terminal for other uses, Gain Terminal, Fertilizer and Cement Terminal, Break Bulk Terminal, Ro-Ro parking area and finally Ro-Ro Terminal at the northern end.

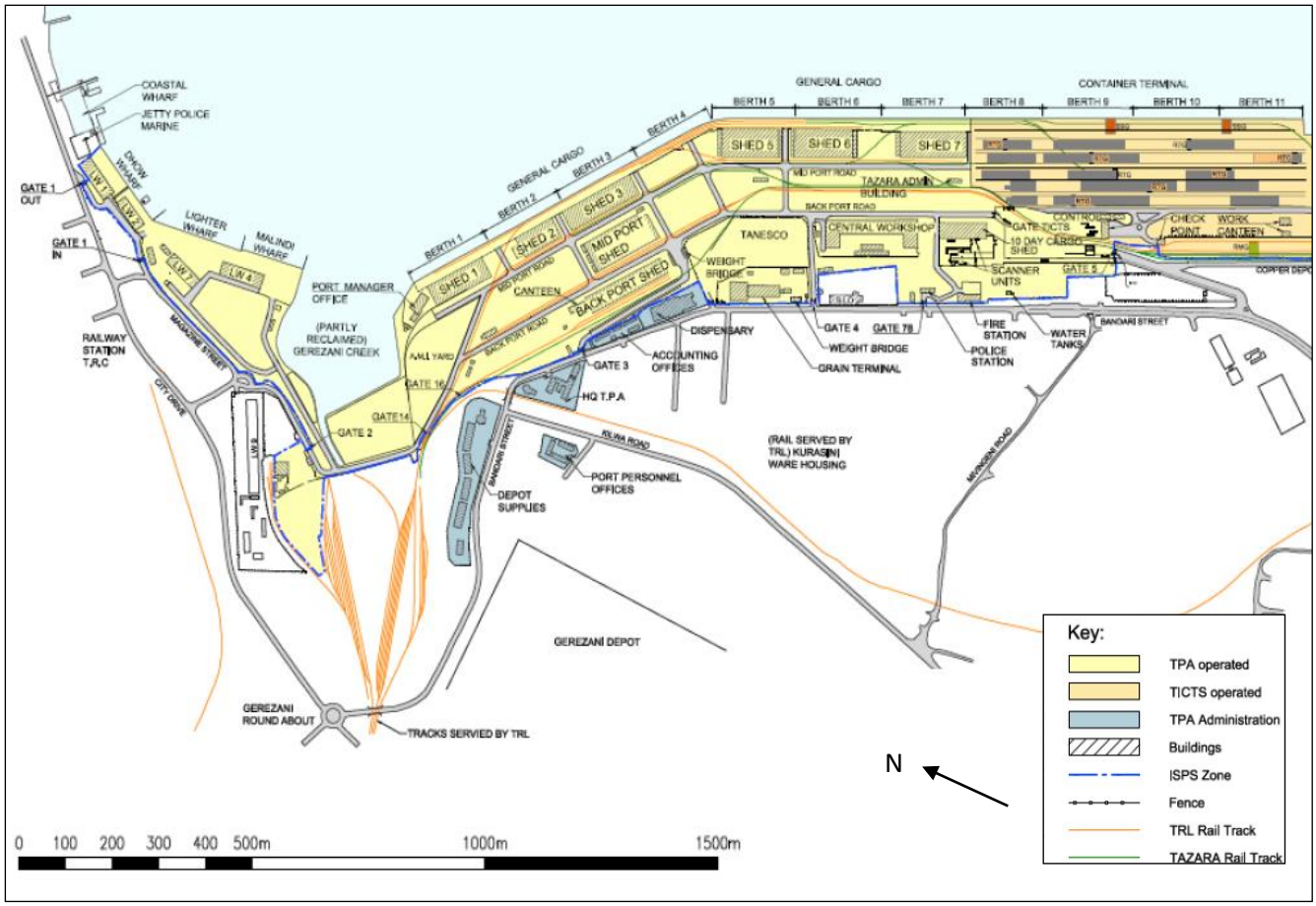


Figure 1-2 Current Port utilization. Source: Feasibility Study 2013.

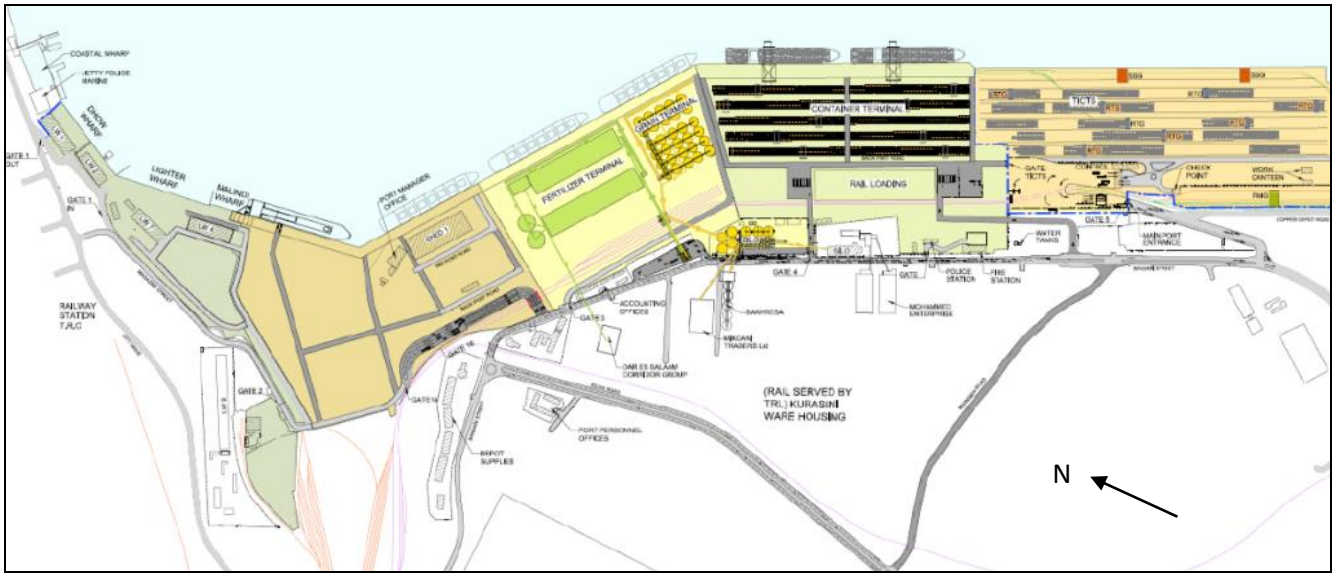


Figure 1-3 Proposed future Port utilization. Source: Feasibility Study 2013.

1.4 Need for Environmental Impact Assessment

Environmental and Social Impact Assessment (ESIA) provides an independent assessment and identification of the potential environmental impacts of a proposed project. It is a formal study, which enables planners to determine the socio-economic and environmental consequences of a proposed development project. The ESIA collects data on biophysical and socio-economic environment and the information is used to predict the potential impacts of the proposed activities, to develop appropriate mitigation and enhancement measures and to plan programs to monitor any changes that may result from the proposed development.

Furthermore, ESIAs concentrate on problems, conflicts, or resource constraints that could affect the viability of a project program or policy. It also examines how the project might cause harm to people, their property, their livelihood, or to other nearby developments. After the potential problems are identified, ESIA identifies measures to minimize the problems and outline ways to improve the sustainability of the project.

According to the Environmental Impact Assessment and Audit Regulations, 2005-G.N. NO.349 of 2005, the project falls under Category `A' for which EIA is mandatory. First schedule list of projects requiring EIA (Mandatory list), under Transport and Infrastructure (item 1V) the proposed project is one of them as harbour facility. In Tanzania, the ESIA is undertaken according to specific procedures, as determined by the Environmental Management Act, Cap. 191. Main steps and actors are stipulated in the Environmental Impact Assessment and Audit Regulations, 2005, while the Environmental (Registration of Environmental Experts) Regulations, 2005 require ESIAs be undertaken by certified and registered EIA experts or firm of experts. In fulfilment of this legal requirement, Tanzania Ports Authority commissioned WAPCOS Limited of India to carry out the ESIA study for the project. The screening letter Ref. NEMC/HQ/EIA/11/0012/Vol. I/2 dated 24/04/2014 advised the proponent (TPA) to undertake a full ESIA study for the proposed project. Subsequently, a scoping exercise was carried out from 11th August to 16th August 2015, and the stakeholders meeting pre-briefing was held on 27th August 2015, the Scoping Report and draft Terms of Reference submitted to the National Environment Management Council (NEMC) for review and approval.

The scoping phase identified the main issues of concern through consulting all the relevant concerned parties. Terms of Reference to guide the impact assessment study (Appendix 1) were approved by NEMC in letter Ref. NEMC/EIA/11/0012/Vol. 1/4 of 10 December 2015 (see Appendix 2).

1.5 Objectives of the ESIA Exercise

The objectives of the ESIA, as stipulated in Part IV of the Environmental Impact Assessment and Audit Regulations, 2005 and EA Regulations of 2005 are to:

- Ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;
- Anticipate and avoid, minimise or offset the adverse significant biophysical, social and relevant effects of developmental proposal;
- Protect the productivity and capacity of natural systems and ecological processes which maintain their functions;
- Promote development that is sustainable and optimises resources use and management opportunities;
- Establish impacts that are likely to affect the environment before a decision is made to authorise the project; and
- Enable information exchange, notification and consultations between stakeholders.

Additional objectives are to ensure the proposed investments implemented through the DSMGP comply with the existing environmental protection laws, regulations and standards in Tanzania as well as the World Bank's Safeguard Policies for Category A projects; and will not have lasting adverse impacts on the country's population, the natural environment or assets of particular cultural heritage value.

TPA publicized the project extensively by posting posters in strategic public places; publishing notices in newspapers on 15 January 2016 (see Appendix 3); and conducting public meetings (as appropriate) with affected parties and communities.

The preparation of the ESIA study report followed approval of the ToR, to identify likely impacts, assess and evaluate their severity and magnitude and proposed mitigation measures to minimize potential negative impacts and enhance positive benefits. This ESIA report has been prepared according to contents and format prescribed by the EIA Regulations and includes an Environmental Management Plan, a Monitoring Plan and a Non-technical Executive Summary in English and Swahili.

1.6 Methods of the Study

The methodology employed in conducting the scoping exercise is in line with the Environment Impact Assessment and Audit Regulations, 2005 GN No.349 of 2005 section 13. Onsite observations of the proposed project site and surrounding habitats were also made. Secondary sources to include literature review were also used, i.e. review of relevant reports, policies and documents. The study adopted the following approach:

1.6.1 Identification of stakeholders

Identification of stakeholders was based on the role and relevance of an organization, group or individual to the proposed project. Stakeholders such as the Tanzania Ports Authority (TPA), Occupational Safety and Health Authority (OSHA), Ministry of Livestock and Fisheries and vendors were pre-determined based on the nature of the project. Others were Tanzania Revenue Authority (TRA), Marine Parks and Reserves, Tanzania Roads Agency (TANROADS), TradeMark East Africa (TMEA), Tanzania Railways Limited (TRL), Tanzania Social Action Fund (TASAF), Ministry and Ministry of Water. Temeke Municipal Council, Kurasini Ward leaders were identified as stakeholders in the area of influence. The selection of stakeholders was done based on categories and levels of stakeholders' i.e. national, municipal, ward and *Mtaa* level. Classification by levels allows the establishment of adequate planning and strategies for the development of the consultation meetings (see Appendices 4 and 5 for comments and signatures of consulted stakeholders respectively).

1.6.2 Involvement of stakeholders

The scoping and impact assessment applied participatory approaches such as meetings, one-to-one interviews and focus group discussions. Other methods included consulting secondary sources from various stakeholders.

1.6.3 Identification of stakeholders' concerns

Through interviews and meetings, consulted stakeholders pointed out a number of issues and concerns. Relevant issues were noted and will be discussed further in the subsequent sections of this report and later fully addressed in the ESIA study in order to mitigate impacts and to provide further information.

1.6.4 Review of literature

Documents reviewed include:

- Project Feasibility Study of 2013
- Relevant National Policies
- Relevant National Acts
- EIA and Audit Regulations of 2005
- World Bank Safeguard Policies for Category A projects.
- Socio-economic Profiles of Dar es Salaam and Temeke Municipality
- Tanzania Port Master Plan of January 2009
- PIANC, IFC and other dredging guidelines
- Relevant scientific literature

1.6.5 Field Data / Information Collection

Field surveys were conducted by the consultants to obtain an overview of the existing situation on the site. Activities included:

- Appraisal of physical and environmental conditions of the project site and areas that might be impacted by the project – oceanographic, soils, air quality, hydrology, flora and fauna;
- Appraisal of land use and assessment of other relevant socio-economic parameters;
- Review of available maps of the project area;
- Field data / information collection – interviews with experts, local community and other stakeholder groups; observations and other technical methods related to the sector under study.

1.7 Outline of the Report

This report is organized in twelve chapters, as described below:

Chapter 1: The chapter gives an overview of the background of the project, overall programme objectives and need for the ESIA study. The methodology adopted for conducting the EIA study for the proposed project is described in this chapter.

Chapter 2: A brief write-up on various project components.

Chapter 3: Gives a brief description and comprehensive review of policies, legal issues and administrative framework applicable to the project, including international treaties and agreements.

Chapter 4: Baseline environmental conditions including physical, biological and socio-economic parameters, the resource base and infrastructure have been described. Before the start of the project, it is essential to ascertain the baseline conditions of appropriate environmental parameters, which could be significantly affected by the implementation of the project. The planning of baseline surveys in the harbour and surrounding areas emanated from shortlisting of impacts prepared during project identification.

Chapter 5: Describes the process for stakeholder consultation and public participation to identify the key issues and impact of the proposed project. Engagement with key stakeholders at national and local levels and collection of baseline information. It involved field visits to areas within Temeke and Ilala districts, which are the nearest coastal land to the Port where all activities will be centred. Analysis of issues through literature and case studies of port renovations from Tanzania and elsewhere was also undertaken.

Chapter 6: Impacts likely to occur as a result of the construction and operation of the proposed project components are assessed in this Chapter. Prediction is essentially a process to forecast the future environmental conditions of the project area that might be expected to occur as a result of the construction and operation of the proposed project. An attempt has been made to predict future environmental conditions quantitatively to the extent possible. However, for certain parameters, which cannot be quantified, a general approach is taken to discuss such intangible impacts in qualitative terms so that planners and decision-makers are aware of their existence as well as their possible implications.

Chapter 7: The chapter presents the mitigation measures proposed for the identified impacts in various phases of the project. The design, construction, operation and decommissioning phases are considered for the mitigation measures. Using expert judgment, mitigation measures were identified that aim at eliminating or at least minimising potential negative impacts and promoting positive ones. These are addressed and detailed in the environmental and social management and monitoring plans and programmes, respectively, which provide ease of reference and follow-ups during project implementation, thereby allowing management of the entire operation.

Chapter 8: Delineates the Environmental Management Plan (EMP) for anticipated adverse impacts likely to occur as a result of the proposed project. The approach for formulation of an EMP is to maximize the positive environmental impacts and minimize the negative ones. After selection of suitable environmental mitigation measures, cost required for implementation of various management measures along with their implementing agencies has been estimated.

Chapter 9: Environmental Monitoring Programme for implementation during project construction and operation phases has been delineated in this Chapter. The objective is to assess the adequacy of various environmental safeguards and to compare the predicted and actual scenario during construction and operation phases to suggest remedial measures not foreseen during the planning stage but arising during these phases and to generate data for further use.

Chapter 10: A cost benefit analysis of the proposed project is provided.

Chapter 11: This chapter describes the decommissioning plan for identified impacts along with their mitigation measures after the expiry of lifespan of the project. This chapter also includes the closure plan and the responsibility of respective implementing agencies during decommissioning phase.

Chapter 12: The summary and conclusion of the ESIA study is described in this chapter. For the sustainability of the project and ecosystem, some measures are recommended in this chapter.

The **Bibliography** includes full details of all sources of published information, and the **Appendices** present additional information, copies of letters, detailed responses from stakeholder, full data sets of baseline surveys, and excerpts of policies and plans relevant to the main text.

Chapter 2: DESCRIPTION OF THE PROJECT

The DSMGP is being implemented in various stages, some of which require independent ESIAs. Other components began some years ago, such as demolition of Sheds 2 and 3 at Berths 2 and 3, improvement and paving of internal roads such as the road to Gate 5 and demolition of informal housing outside of the Port to make space for storage facilities. This chapter provides a brief background to the project with detailed descriptions of the proposed four main sub-projects during Phase 1, which are the subject of this Environmental and Social Impact Assessment:

1 - Deepening and strengthening of Berths 1- 7 (approximately 1,281 m length) and paving of inshore container terminal yards at Berths 5-7.

2 - Construction of a new Ro-Ro Terminal at Gerezani – which shall be used for general cargo operations until Berths 1-7 are modernised.

3 - Improving rail linkages and platform in the Port.

4 - Increasing the capacity of the grain silo and supporting the installation of a conveyor system, and high speed bulk grab.

The proposed future Port layout of the berths under the DSMGP is as indicated in Figure 2-1. To the south, there is the existing Tanzania International Container Terminal Services (TICTS), followed by terminal for other uses, grain terminal, fertilizer and cement terminal, break bulk terminal, Ro-Ro parking area and finally Ro-Ro terminal on the western end. The sections that follow describe the main infrastructure elements and changes related to specific activities and sub-activities therein, in Phase 1 of the DSMGP.

At the time of writing this EIS, there was scant detail of the Bill of Quantities (BoQ), the duration of the construction phase of each sub-activities, or the manpower required for their implementation. The final section of this chapter provides an informed judgement of the labour required in the construction phases and the potential labour requirements in operation of the new facilities.

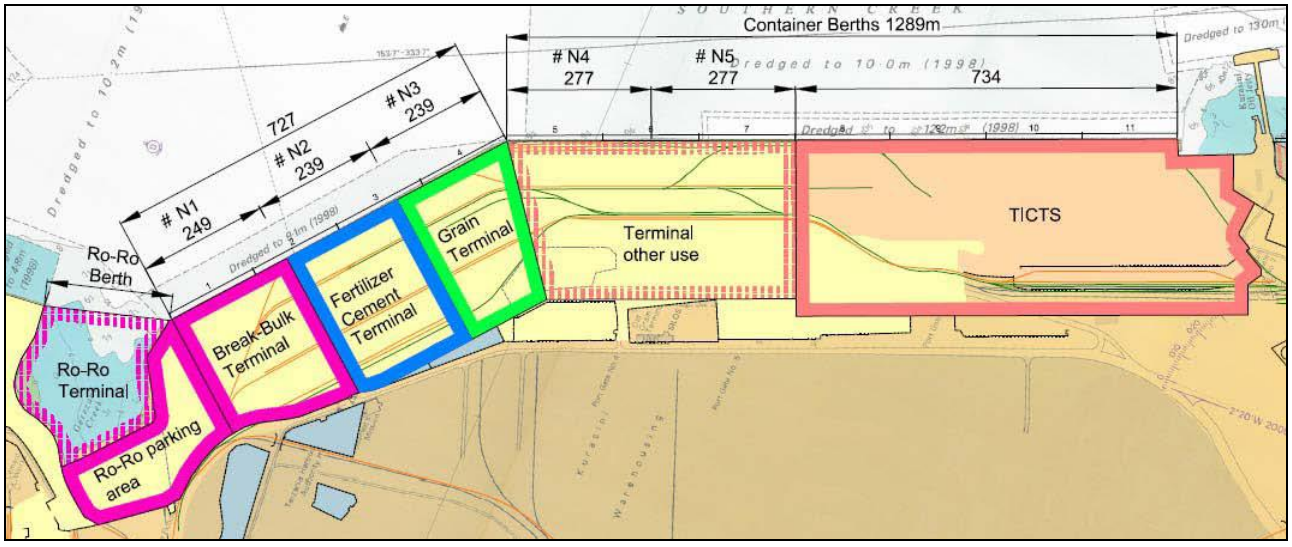


Figure 2-1 Proposed future Port utilization. Source: Feasibility Study, 2013.

2.1 Deepening and Strengthening of Berths 1 to 7

Deepening and strengthening of Berths 1 to 7 from a level of approximately 9 m (Berths 1 to 3) and 10 m (Berths 4 to 7) up to 14 m below Chart Datum (CD). This will include rehabilitation of Berths 1-7 platforms, extension of water depths in front of the quay wall Berths 1 to 7 and horizontal widening of quay apron and extension of quay wall seawards to approximately 11.5 m (or more). The three principle components of this activity are described further below.

2.1.1 Dredging operations at Berths 1 to 7 and Ro-Ro Terminal

Dredging shall be undertaken in berth areas and at the Ro-Ro Terminal (including part of Malindi Wharf). At the latter, dredging shall extend up to five times the beam of the "design vessel" of 30.3. m (see Feasibility Study, 2013) , thus approximately 152 m. Along Berths 1-7, dredging shall extend up to two times the beam of bulk carrier vessels planned, thus equivalent to approximately 65 m. The approximate areas for dredging are indicated in Figure 2-2. This activity also includes removal of sediment below the suspended decks (Berths 4 to 7).

The dredging of Berths 1 to 7 is expected to yield between 270,000 m^3 and 340,000 m^3 of sediment (Feasibility Study, 2013), and of the Ro-Ro Terminal an additional 240,000 m^3, totalling some 0.5 million cubic metres. Ideally, the dredged material would be used to back-fill the Ro-Ro Terminal (see Section 2.2), though this depends on the particle size. Material too fine (silt and clays) retain water and are generally not suitable for in-fill. Failure to use the dredged material in this way requires disposal or other usage, involving transportation away from the site. Alternatives, depending on the presence, type and quality of pollutants in the dredged sediment, may include dumping at sea at pre-determined locations, or at other sites in the vicinity or on land.

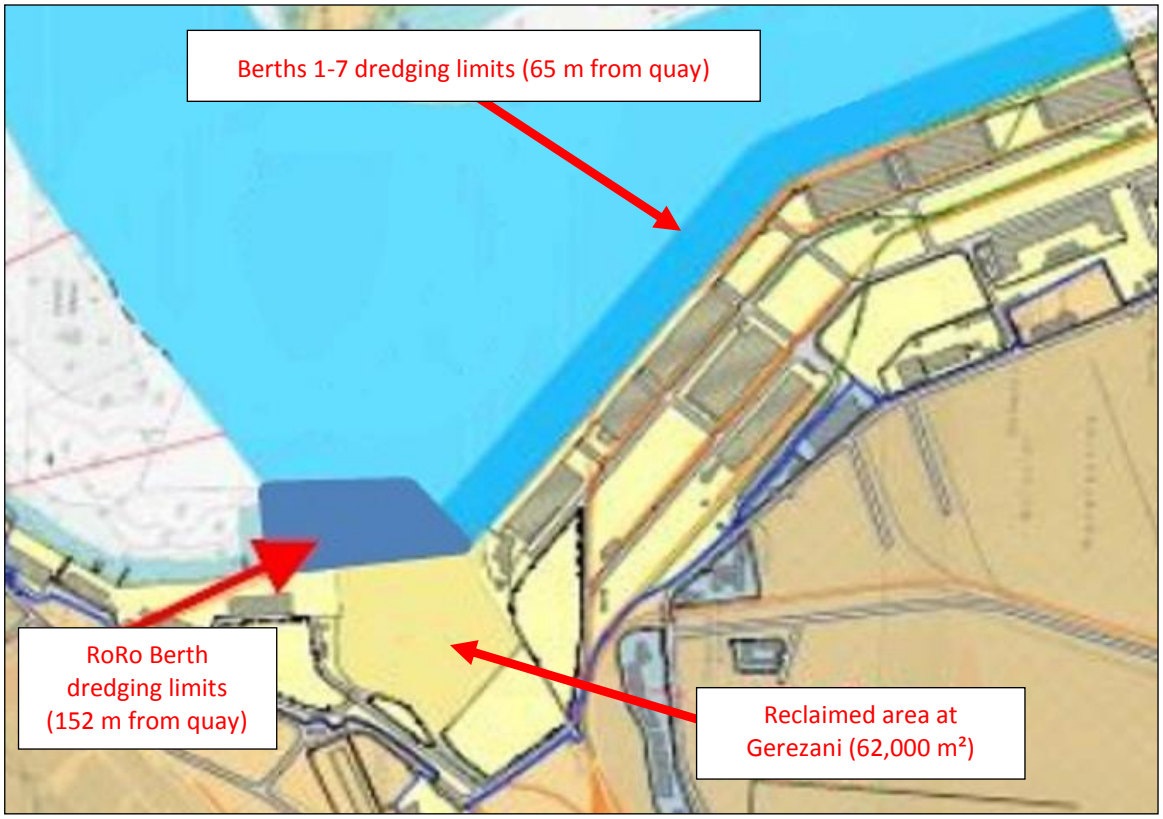


Figure 2-2 Proposed future Port utilization. Source: modified from Feasibility Study, 2013.

2.1.2 Strengthening and widening of Berths 1 to 7

The strengthening and widening of Berths 1 to 7 include construction of a suspended deck slab founded on vertical and raked reinforced concrete piles in front of the existing structures (see Figures 2-3 and 2-4). As described in the Feasibility Study (2013), to maintain the serviceability of the quay wall, the following parts also require rehabilitation:

- Due to cracks of concrete in the pavement, parts of the slab have to be replaced in accordance with best practices. Existing cracks on the walls require attention.
- Where duct covers are missing or where the existing covers are not in an appropriate condition new concrete or steel duct covers need to be installed.
- Some of the fenders and ladders are severely damaged and need to be replaced.

- Damage to the foundation piles at Berth 4 requires rehabilitation, typically removal of concrete affected by chlorides, cleaning and coating of reinforcement and replacement of corroded concrete.

Main materials to be used include concrete, steel reinforcement, reinforced concrete piles, wood, plastic or metal for shuttering and miscellaneous components like duct covers, fenders and ladders. The operations schedule described is one whereby each berth is rehabilitated in turn, thus minimising disturbance and inconvenience to Port users. Installation of dedicated crane rails is described in Section 2.3.

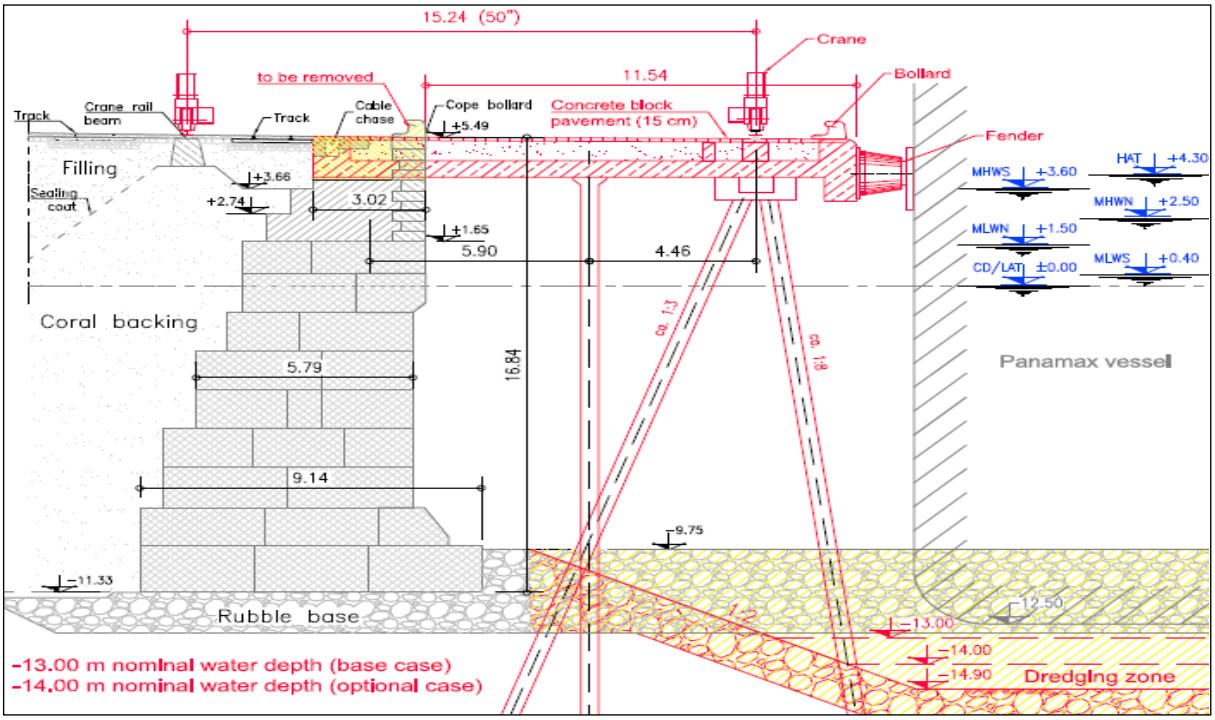


Figure 2-3 Construction arrangement for deepening of Berths 1 to 3. Source: Feasibility Study, 2013.

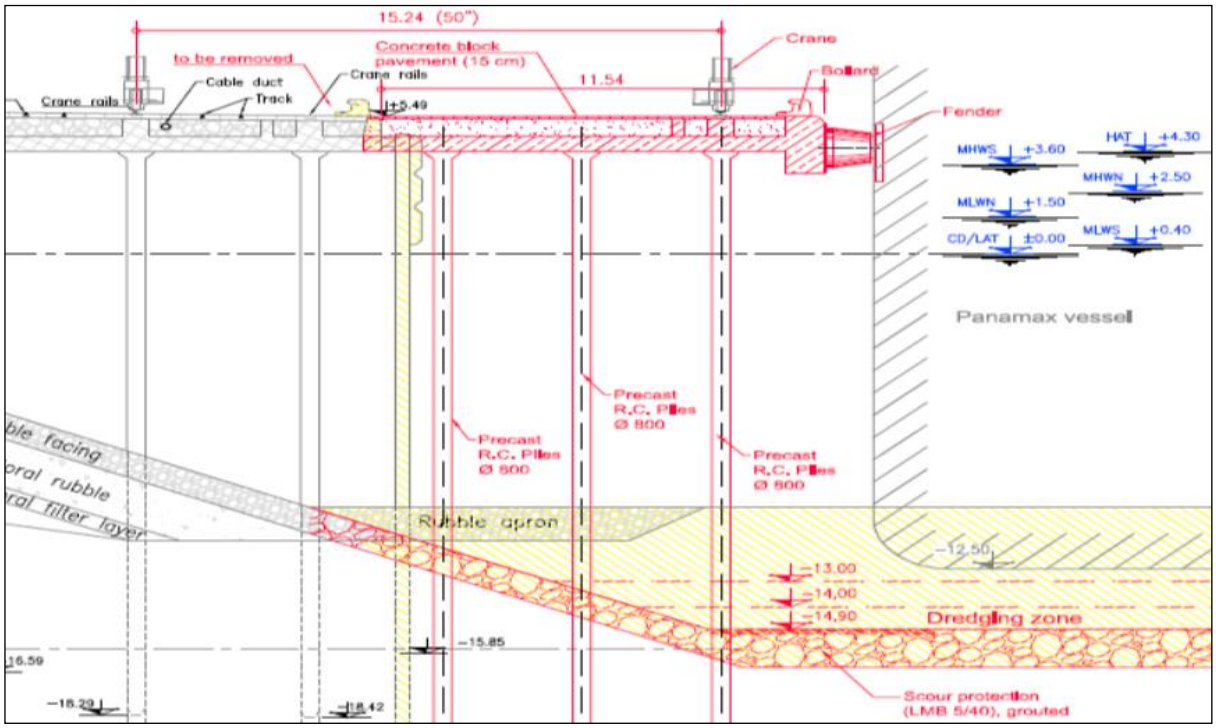


Figure 2-4 Construction arrangement for deepening of Berths 4 to 7. Source: Feasibility Study, 2013.

2.2 Construction of new Ro-Ro Terminal at Gerezani

The new terminal will cover an area of 93,000 m², as a Ro-Ro and Multipurpose Terminal, partly incorporating the south-eastern corner of Malindi Wharf (Figure 2-5), which requires the existing quay wall to be rehabilitated and deepened. An estimated 1,100 m² of the southern corner of the existing Malindi Wharf will be utilised, for loading/unloading vehicles, a space approximately 50 m long (along the quay face) by 22 m width. This will have repercussions for the current users of the wharf.

To create space for the new Ro-Ro Terminal, the seaward portion of Gerezani Creek will have to be completely or partially filled with suitable material. The prospective Ro-Ro Berth will be aligned as a straight extension of Malindi Wharf quay wall towards the quay wall of Berth 1 (near the Port Managers Office).

Dredging of the Ro-Ro Terminal area has been described above, in conjunction with the dredging of Berths 1 to 7 (Section 2.1.1). Below are described the two additional main components of the construction of the Ro-Ro Terminal, namely the back-filling and paving of the seaward side of Gerezani Creek and construction of the new terminal quay.

2.2.1 Back-filling Gerezani Creek estuary and paving

Based on the width of the opening (190 m) and distance from edge of the existing long-vehicle temporary parking area to the future dock (ca. 230 m), and on a cross-sectional depth of 2 m inshore to 6 m at the start of the slope below the suspended deck, the estimated back-fill volume is 160,000 m³. Using a compaction rate of 30 %, the total loose volume of suitable back-fill material needed will be 208,000 m³. The three primary sources of the back-fill materials are:

a) The dredged material from deepening Berths 1 to 7 and the Ro-Ro Terminal (section 2.1.1);
b) Material dredged from other parts of the Port or approaches to the Port, delivered by barge; and
c) Quarried material from land brought to the site by road or rail.

Prior to back-filling, the existing Gerezani Creek stream will have to be protected and a new culvert constructed (shown in Figure 2-5 and Figure 2-6 showing the proposed culvert gate flap). Some form of retainer wall will likely be installed at the seaward boundary after which back-fill material will be added and compacted to the required strength. In addition, mapping of all existing drains will be important before backfilling the seaward portion of Gerezani Creek. The terminal area of 93,000 m² will be paved with concrete to the required standard and thickness. Typical machinery involved will include compactors, diggers, excavators and other landscaping vehicles.

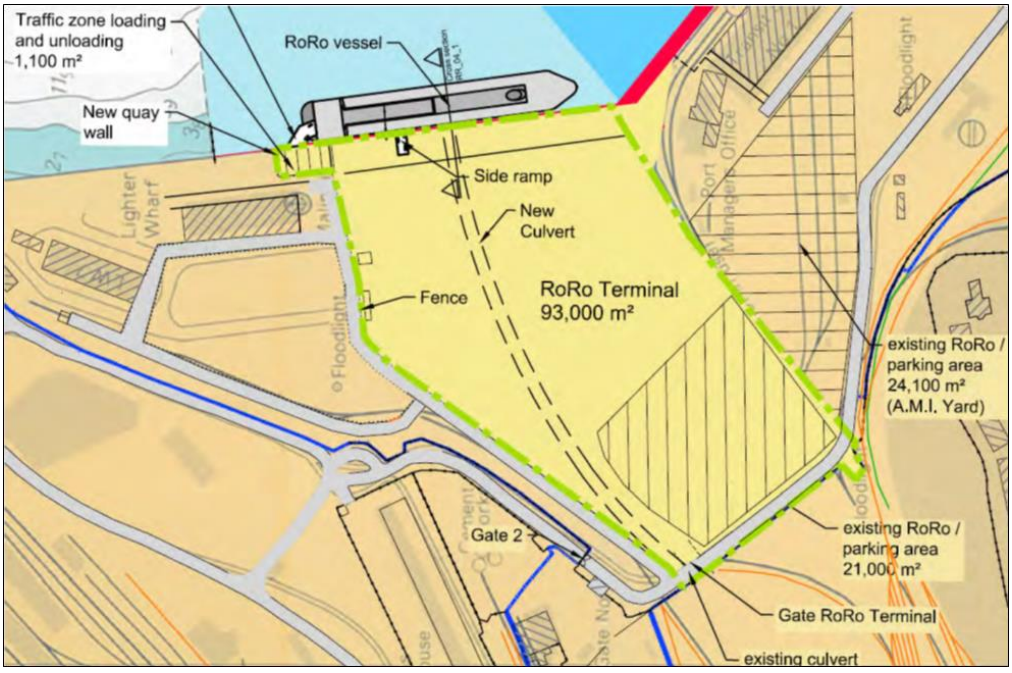


Figure 2-5 Proposed Ro-Ro Terminal layout. Source: Feasibility Study, 2013.

2.2.2 Construction of Ro-Ro Terminal Quay at Gerezani

The Feasibility Study (2013) identified the most appropriate solution for the Ro-Ro Terminal quay wall as comprising a pile structure with a suspended deck slab similar to Berths 4 to 7 (see Figure 2-6). Based on the drawings provided, the suspended section is 40 m wide, and the opening of the Gerezani Creek outflow is situated at the top of the 1:3 slope.

With respect to the flow of the Gerezani Creek stream, as with the existing situation, the creek will be prevented from flowing during high tide, during which time the Gerezani Creek will fill up and then drain as the tide ebbs (see section 4.2.13).

Construction materials and methods will be similar to those described for the strengthening and widening of Berths 1 to 7 (Section 2.1.2 above).

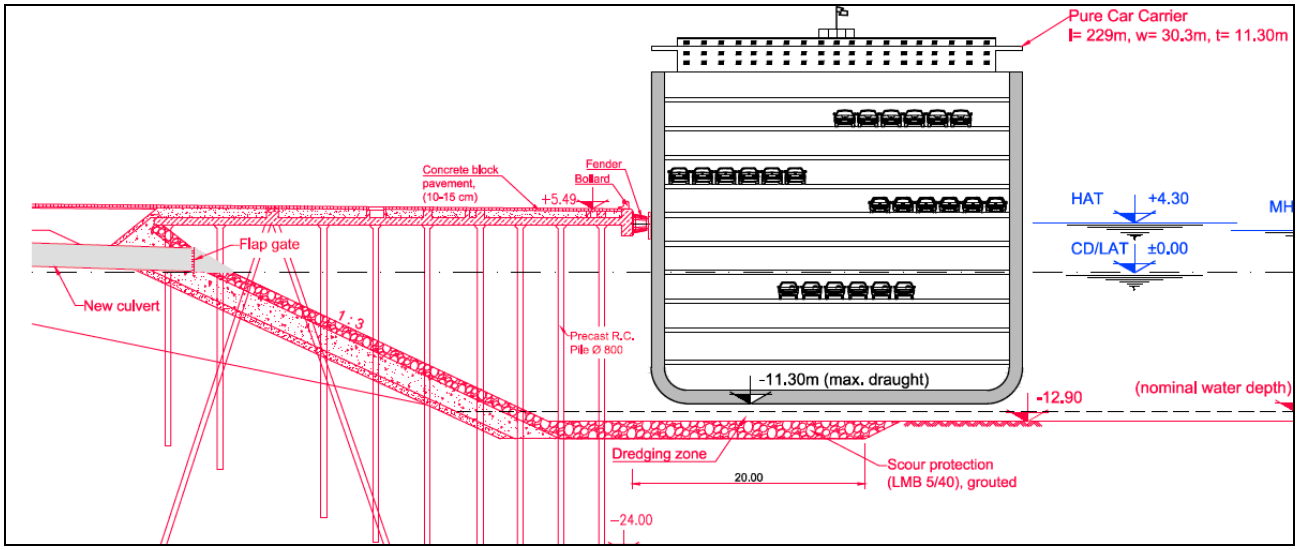


Figure 2-6 Cross section through quay of Ro-Ro Terminal. Source: Feasibility Study, 2013.

2.3 Improving Rail Linkages and Platform in the Port

The Feasibility Study (2013) recommended that TPA liaise with RAHCO to harmonise changes to the railway network in the Port. For new rail tracks, both existing gauges plus the standard gauge track can/should be joined into one single track. In short, all railway tracks should be removed from the quays, mid-port and back port locations and be replaced by maximum two through-going tracks with side tracks for loading where needed. The new wagon rail tracks should be exclusively concentrated at the rear sides of terminals close to the slope against Bandari Road, thus in prolongation of the TICTS Railway Station. Additional tracks are proposed for the cranes servicing the berths. This there are two main components to this activity, as described below.

2.3.1 Removal of Old and Construction of New Rail Tracks at the Rear of the Port

As described in the Feasibility Study (2013), the present three rail tracks will be replaced by combined rail-tracks suitable for 1,000 mm and 1,067 mm gauge. The new system will offer one track for empty wagons, one for loaded wagons and one for other port rail traffic. There two basic elements are:

a) Existing tracks on quays and at mid port sections should be entirely removed.

b) Twin-gauge (1,000 and 1,067 mm) rail tracks with auxiliary parallel sidings for cargo loading operations placed in full length along the rear side of the port area and approaches, close to the slope.

c) Construction of a rail loading platform for containers, between the TICTS gate to the south and the Grain Terminal.

2.3.2 Rail along the Quay Berths 1 to 7

The proposal is to install a heavy duty rail, 15.24 m centre to centre, along the whole length of the quay from Berths 1 to 7 to carter for heavy duty port cranes (rail-mounted ship-to-shore gantry cranes and rail-mounted cranes). The rails are shown in drawing for widening the Berths 1 to 7 (see Figures 2-3 and 2-4) and shown in the plan view of Figure 2-7.

Construction materials associated with both of the above sub-activities include pre-fabricated steel rail tracks, concrete, steel/concrete sleepers. Waste produced include old tracks that need to be removed.

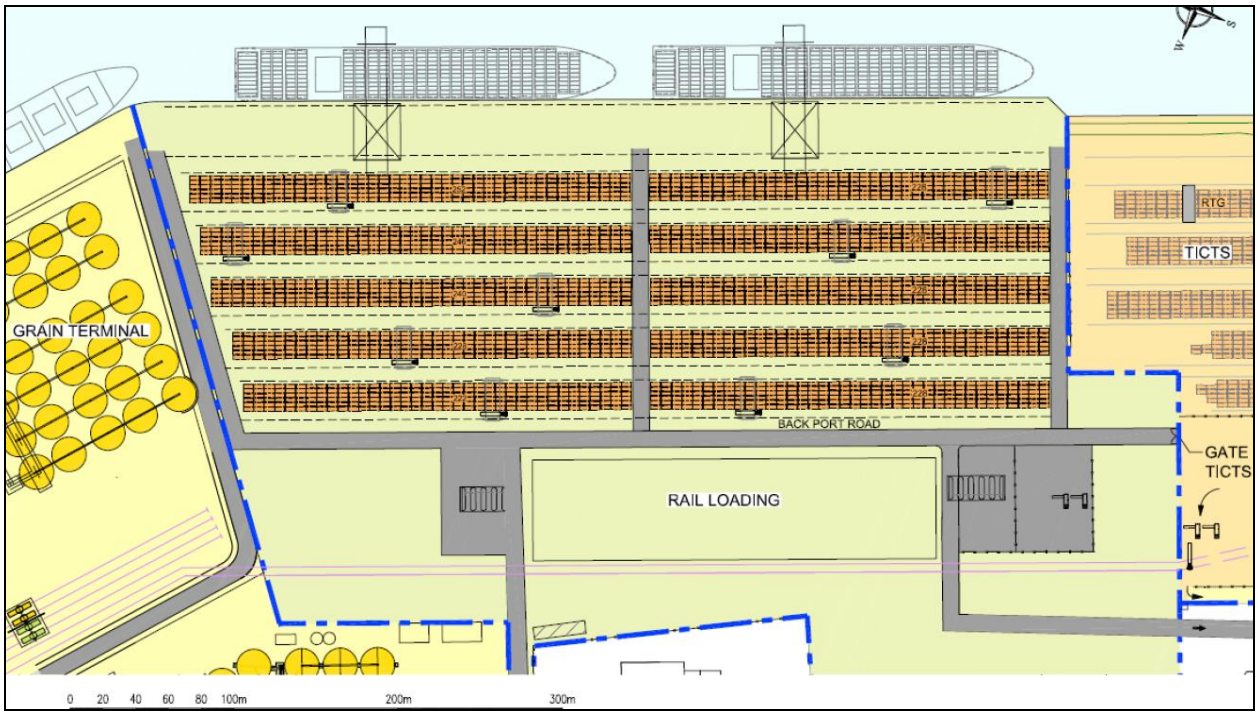


Figure 2-7 Proposed rail layout showing the heavy-duty rail for port cranes along the quayside, and the rail loading platform with rail tracks inshore, linking to TICTS to the south and the grain and fertiliser terminal to the north. Source: Feasibility Study, 2013.

2.4 Increasing Grain Silo, Installation of Conveyor System and High Speed Bulk Grab

Recognising the handling problems of the current grain storage silo, its small holding capacity, even for bulk carriers, and the need for hundreds of truck drive through trips from the ship to the silos, the Feasibility Study (2013) proposed four options for improvements to the system. The preferred option is to increase the capacity of the grain silo, install a conveyor system and a high speed bulk grab. This activity is divided into two main components, the high speed grab, first stage silos and conveyor system with loading stations for rail and trucks, and the renovation and expansion of the TPA grain silo.

2.4.1 High Speed Grab, First Stage Silo Storage and Rail Loading Station

The high speed bulk grab will be installed at the quay, and deliver grain from the ship to the installed conveyor system for transfer into thirty new grain storage silos, each of 6,300 t (Figure 2-7), thereby providing an initial storage capacity for 189,000 t of grain. From these silos, grain will be further transported inland, past two rail loading stations (Figures 2-8 and 2-9). Grain that is not loaded to freight wagons will be transferred by conveyor to the TPA Grain Silo, which will be modernised (see Section 2.4.2).

Construction materials will include prefabricated steel silos and conveyor systems to be assembled on site, plus various concrete footings and platforms.

2.4.2 Modernising and Expanding the TPA Grain Silo

The TPA silos will be completely overhauled and modernised, with installation of additional storage capacity through seven new steel silos (each of 6,300 tonne capacity) plus an integrated conveyor delivery system (Figures 2-9 and 2-10). The activity also includes space of linking the TPA silos with those of the two principle grain importers, Bakhresa Group and Mikoani Traders Limited.

Construction materials associated with this sub-activity are similar to those for the First Stage Silo Storage.

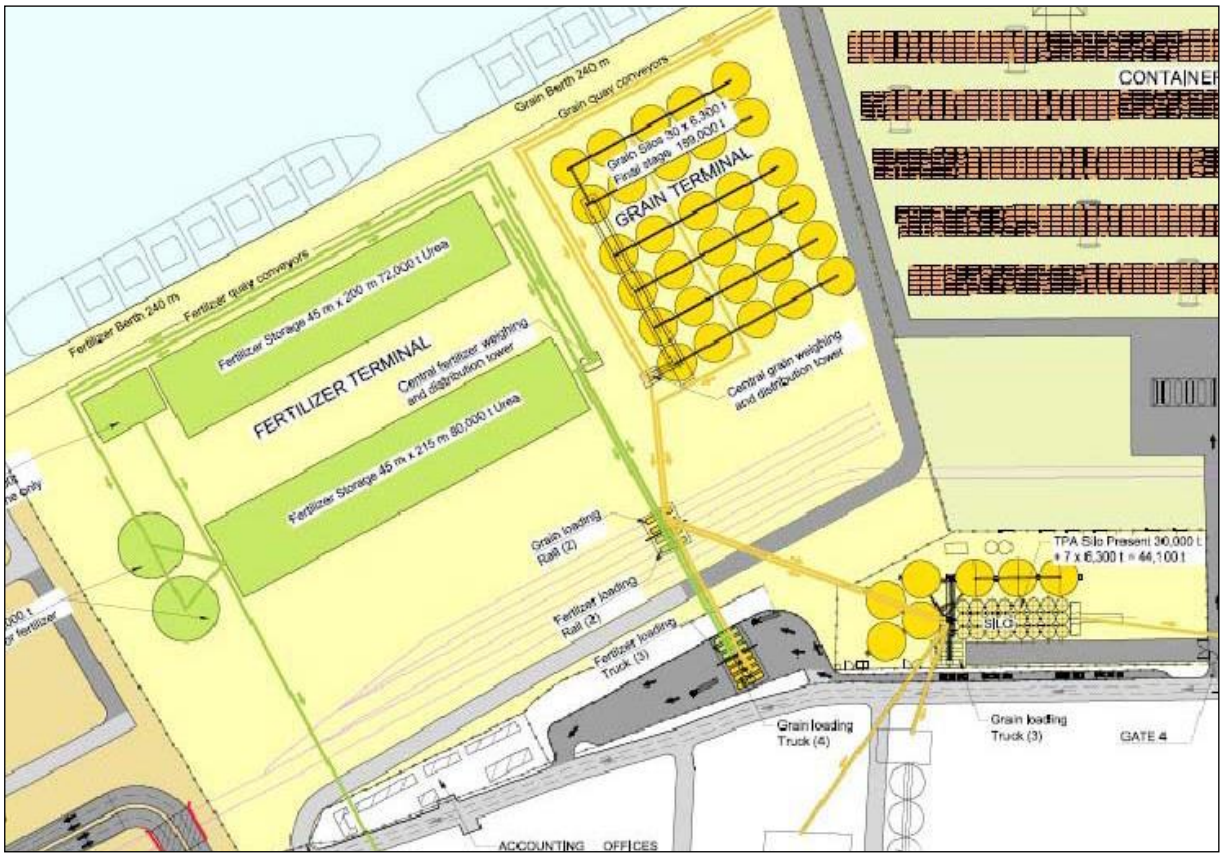


Figure 2-8 Proposed dry bulk terminal layout, including the Grain Terminal at Berth 4, and Fertiliser Terminal at Berth 3. Source: Feasibility Study, 2013.

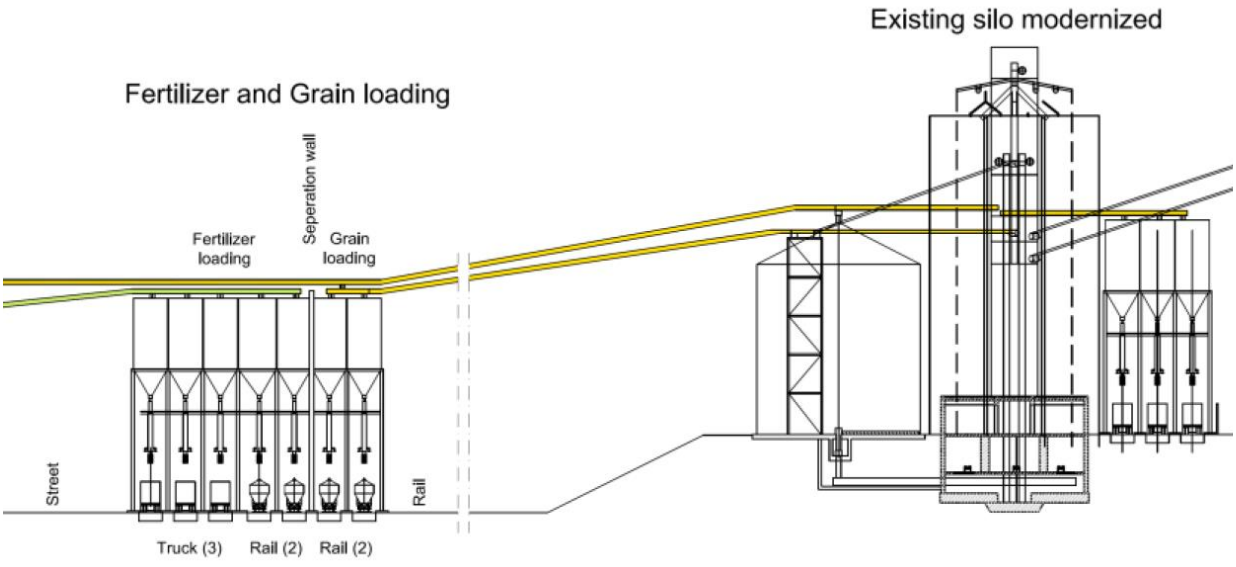


Figure 2-9 Proposed grain terminal layout cross-section. Source: Feasibility Study, 2013.

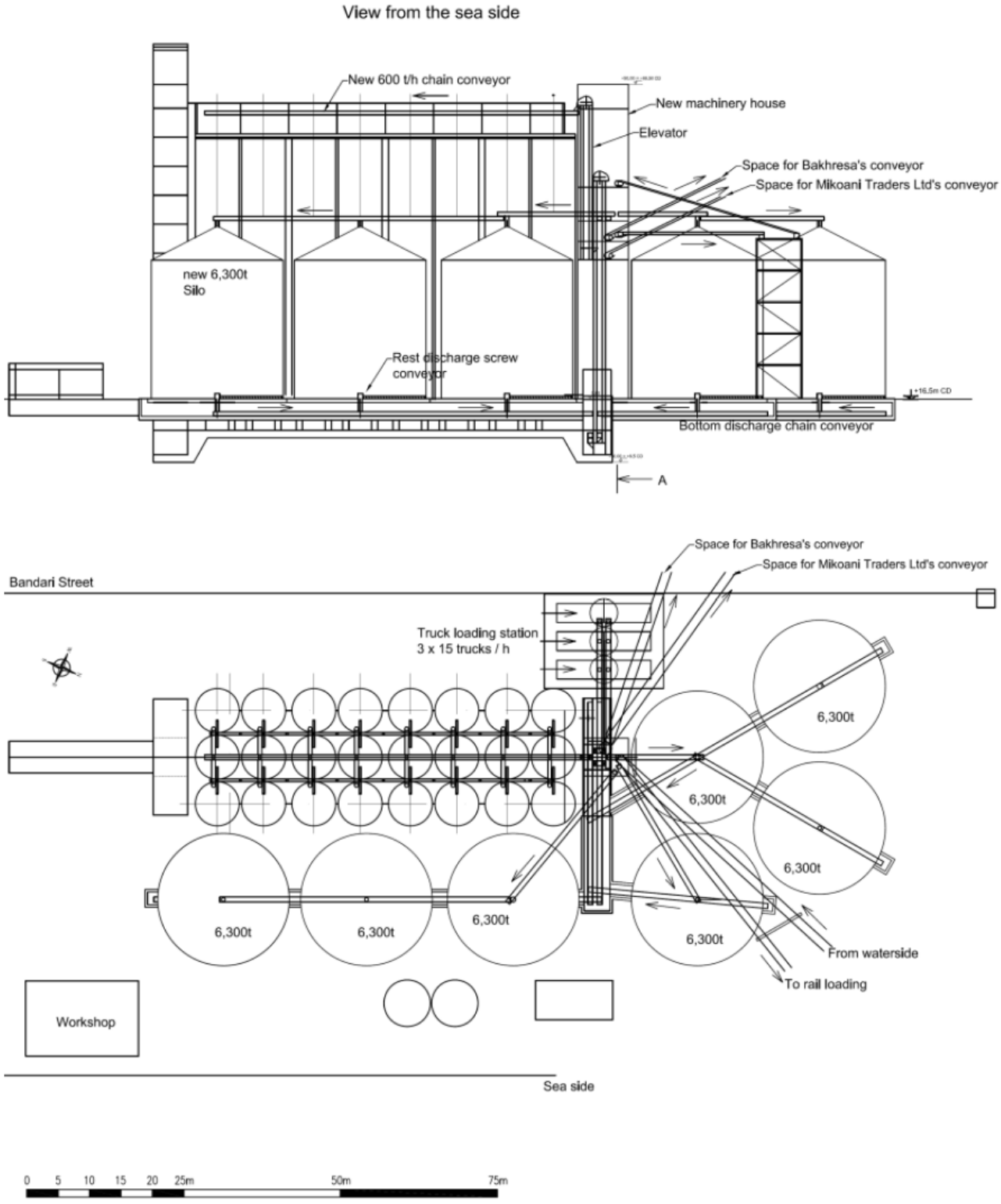


Figure 2-10 Proposed modernisation and expansion of existing TPA silo. Source: Feasibility Study, 2013.

2.5 Labour Requirements during Construction and Operation of New Facilities

The final section attempts to provide an informed judgement of the labour requirements and duration of the construction phases associated with the various sub-activities described above. It also considers the labour requirements for operating the new facilities. Understanding these is important to determine the significance, duration and scale of impacts associated with each activity (identified in Chapter 5) based on an understanding of the baseline conditions (described in Chapter 4).

2.5.1 Overall improvements to Berths 1 to 7

Dredging operations, from the Malindi Wharf to the end of Berth 7, are likely to involve at least one form of dredger, a barge and a tugboat, potentially for several months to a year or more. The present concept is to begin with the Ro-Ro Terminal at Gerezani, and then work on each berth one by one, thus minimising inconvenience to other Port users. Personnel involved will most likely be qualified seamen and engineers, of the order of 20 to 30 to operate the vessels, supported by a shore workforce engaged in construction of the widened berths. That will require a cement plant, delivery vehicles, engineers and most likely a casual labour workforce of 30 to 60 depending on the configuration. The construction will also most likely last a year or more.

Operation of the new berths will allow larger and more frequent vessels to visit and load/unload. The increased traffic will increase the need for services associated with visiting ships (stevedoring, food and water provisions, waste collection, etc.). At this early stage of the project development, it is not possible to estimate precisely whether there will be a need for a greater or reduced workforce to service the increased shipping activity, though an increased workforce is considered likely, at least for break cargo and non-bulk cargo vessels.

2.5.2 Expanded and Improved Delivery of Vehicles

In addition to the personnel involved in construction of the new Ro-Ro Terminal at Gerezani, similar to the configuration described above for the Berths 1 to 7, the increased volume of vehicles that will be unloaded in Dar es Salaam will definitely increase the number of drivers required for their movement to temporary storage parking and beyond.

2.5.3 Improved Rail Linkages with the Port

The removal of the bulk of the existing rail infrastructure and construction of the new rail network and platform will certainly require a number of different personnel, from rail engineers to casual labourers, for a period likely to last several months to over a year. After the system is operational, rail freight should increase substantially with commensurate need for workers in the railway network.

2.5.4 Modernising and Expanding Grain Delivery and Storage

Construction of the various elements in the improvement of grain deliveries and storage will likely engage a number of engineers and supervisors of a casual labour workforce of 20-50, for a period likely to last up to one year. Once the facility is operational, there will be a reduction in the need for drivers operating inside the Port, especially from the main clients (Bakhresa Group and Mikoani Traders Limited) since these will have dedicated conveyor delivery systems direct to their silos. Consequently, there will still be a need for a number of personnel to operate the various elements in the new infrastructure. While the need for sweepers, supervisors, crane operators and other specific tasks are certain to continue, it is likely that there will be a small reduction in the need for casual labourers.

Chapter 3: POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter identifies the administrative framework, policies and legislations that are relevant to the project. In addition to providing a summary of the key Tanzanian national regulations pertaining to the construction, operation and closure of the project, the chapter also highlights the relevant international treaties of which Tanzania is a signatory.

3.1 Policies

The national policies that are relevant to this project are outlined in the sections below.

3.1.1 National Environmental Policy, 1997

The National Environmental Policy provides a framework for environmental protection in Tanzania. The Policy requires that development projects be done in a way that does not compromise environmental integrity.

Relevant provisions of this Policy that are pertinent to the proposed project include:

- Sections 28 and 29, which state that environmentally sound technologies (i.e. those that generate no or low waste or protect the environment) should be used in all projects; and
- Section 56(f), which states that "workers…shall be adequately protected from environmental health [hazards]".

The Client will comply with the above provisions and other related sections of this Policy and associated laws and regulations.

3.1.2 National Energy Policy, 2003

The National Energy Policy objectives are to ensure the availability of reliable and affordable energy supplies and their use in a rational and sustainable manner to support national development goals. The Policy therefore aims to establish efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner.

The role of the Government for the energy sector, according to the Policy, is to facilitate development, provide stimulus for private investment initiatives and promote effective regulation, monitoring and co-ordination of the sector.

The proposed project is in line with the objectives of this Policy, and the Government has provided stimulus in accordance with the Tanzania Investment Act of 1997.

3.1.3 National Women and Gender Policy, 2000

The key objective of the Policy is to provide guidelines that will ensure that gender sensitive plans and strategies in all sectors and institutions are developed. While the Policy aims at establishing strategies to eradicate poverty, it emphasises gender equality and equal opportunity for both men and women to participate in development undertakings and to value the role played by each member of society. Specifically, this Policy advocates for opportunities for both men and women in projects including construction works and related activities, and for women to be involved at all levels of the project from planning to implementation.

On employment strategies for women, Section 30 of the Policy requires presence of equal employment opportunities between men and women depending on required qualifications at all level. In addition, there should be records of exact number of women and men at levels in order to assist monitoring and follow-ups, less bureaucratic special system in the provision of business licences especially to women working in the informal sector. The Client must adopt such an approach during all stages of the implementation of this project that is in line with the aims of this Policy.

3.1.4 National Land Policy, 1997 (revised)

The National Land Policy advocates the protection of land resources from degradation for sustainable development. The Policy requires project development to take due consideration of land capacity, ensure proper management of the land to prevent erosion, contamination and other forms of degradation. Sections of the Policy relevant to the project are Section 2.4 (on use of land to promote socio-economic development, and Section 2.8 (on the protection of land resources from degradation for sustainable development). The project site is located within TPA's designated ports activities area, and thus issues of resettlement and compensation will not be relevant. All project components and activities concerning land development will comply with the relevant aforementioned provisions and other related sections of this Policy.

3.1.5 The National Water Policy, 2002

The National Water Policy concerns both urban and rural settings and builds on the previous 1991 policy. The main objective of the revised policy is to develop a framework for the sustainable development and management of Tanzania's water resources. The Policy addresses cross-sectoral interests in water resource planning, development and management, where the Government's role is one of coordination, regulation and the formulation of policies and guidelines.

An important section of this Policy in relation to the proposed project is Section 3.3, which details the main policy principles in water resource management. The Section specifies that the "polluter-pays" principle applies to water-related projects, and that project activities must aim to cause the least detrimental effects possible on the natural environment. These policy statements are relevant to the project and will be adhered to throughout the construction and operation phases.

Section 4.2 is also applicable to the proposed project because it concerns water conservation, water quality management and pollution control. That is, project activities will ensure that the environment, ecological systems and biodiversity remain protected throughout project implementation in alignment with Policy requirements.

3.1.6 The Sustainable Industries Development Policy (SIDP), 1996-2020

The Sustainable Industries Development Policy was formulated to enhance the sustainable development of Tanzania's industrial sector by improving the country's economic growth through employment, external balance of payments, environmental sustainability and equitable development. The anticipated impact of the proposed project aligns directly with the objectives of this Policy because maintaining sustainable competitive technological progress – one of the major Policy objectives – underlines the major project objective of improving the effectiveness and efficiency of Dar es Salaam's Port.

In line with the National Environmental Policy, Section 3.5.3 of this Policy champions sound environmental management for the promotion of environmentally friendly and ecologically sustainable industrial development. The Policy emphasises that environmental audits and appropriate mitigation measures should be enforced for all projects at pre-implementation stage. Among other responsibilities, the Government pledges to promote the continuous application of an integrated preventive environmental strategy to industrial processes, products and services. This strategy includes propagating the efficient use of raw materials and energy; eliminating the use of toxic or dangerous materials, as well as reduction of emissions and wastes at their source. In this regard, the government will develop the capacity within its institutional machinery and support other initiatives designed to enhance the application of cleaner production as an important complement to end-of-pipe pollution control. TPA will observe this Policy.

3.1.7 National Human Settlements Development Policy, 2000

This Policy provides for the coordination of the Land Policy, land development, human settlements development, surveys, valuation, sites and services, land registration of documents, chattels transfer, formulation and implementation of the National Housing Policy, building research, urban physical structure policy, town planning, master plans, maps and regional physical planning. Although the project is established in an area designated for Port and industrial activities, this Policy is relevant to the operation

phase of the project. Development of the project will attract more investment companies, which may lead to an increase in settlement in Kurasini and Kigamboni Wards within Temeke Municipal as well as in other surrounding areas.

3.1.8 National Health Policy, 2003

The National Health Policy provides guidance for the improvement and sustainability of the population's health status by reducing disability, mortality and morbidity statistics, and improving nutritional status and raising life expectancy. The objectives of the Policy, among others, are to reduce the burden of disease and maternal and infant mortality, and to increase life expectancy through the provisions of adequate and equitable services. Furthermore, the Policy aims to facilitate the promotion of environmental health and sanitation, adequate nutrition, control of communicable diseases and treatment of common conditions.

The Policy is relevant to the project because the project is situated in an industrial and commercial area that many livelihoods depend on, therefore TPA should adhere to environmental standards to safeguard public health.

3.1.9 The National Investment Promotion Policy, 1996

The Policy stresses the need for modernization of equipment and technological upgrading of processes to enable the optimal use of available resources, improve the efficiency of operations and the quality of products and co-products, etc. Another objective is to promote exports by encouraging the domestic production of goods and services to enhance the development of a dynamic and competitive export sector. TPA caters for customers from both local and international markets. Therefore, the Port activities are in line with the provisions of this Policy.

3.1.10 National Policy on HIV/AIDS, 2001

The overall goal of the National Policy on HIV/AIDS is to provide a framework for leadership and coordination of the national multisectoral response to the HIV/AIDS epidemic. This includes formulation, by all sectors, of appropriate interventions that will be effective in preventing the transmission of HIV/AIDS and other sexually transmitted infections, protecting and supporting vulnerable groups, and mitigating the social and economic impacts of HIV/AIDS.

The objectives of the Policy are, among others, to prevent the transmission of HIV/AIDS through the creation and sustenance of an increased awareness of HIV/AIDS through targeted advocacy information, education, and communication for behaviour change at all levels by all sectors. This hinges on effective community involvement and empowerment to develop appropriate approaches in prevention of HIV infection, care and support to those infected and affected by the epidemic including widows and orphans.

The project proponent will, in accordance with Policy provisions, carry out workplace awareness seminars and have counselling sessions for affected or infected employees to counter stigmatisation.

3.1.11 Construction Industry Policy, 2003

The Construction Industry Policy is a deliberate and managed process to improve the capacity and effectiveness of the construction industry to meet the national economic demand for buildings and other physical infrastructure facilities. The Policy is aimed at meeting the goals of the National Development Vision 2025.

The objectives of the Policy include:

a. To improve the capacity and competitiveness of the local construction enterprises (Contractors, consultants and informal sector);
b. To develop an efficient and self-sustaining roads network that is capable of meeting the diverse needs for construction, rehabilitation and maintenance of civil works for trunk, regional, district and feeder roads network;

c. To improve the capacity and performance of the public sector and private sector clients so as to ensure efficient, transparent and effective implementation and management of construction projects; and
d. To ensure application of practices, technologies and products which are not harmful to both the environment and human health.

TPA will adhere to the Construction Industry Policy directives in its Port facilities development activities.

3.1.12 National Transport Policy, 2003

The main objective of this Policy is to enhance transport systems and promote environmental protection. The mission is to develop safe, reliable, effective, efficient and fully integrated transport infrastructure and operations that will best meet the needs of travel and transport by improving levels of services at lower costs. Ultimately, the development of a reliable transport network should drive human development in a manner that is economically and environmentally sustainable.

Section 5.13.2.2 of the Policy is pertinent to the proposed project as it stresses that in order to develop efficient and environmentally sound maritime transport services, increased investment and human capacity are required. Section 7.5 identifies Dar es Salaam Port as one of the country's major seaports that will benefit from improved infrastructure and facilities for maximum exploitation of water transport for coastal waterways. Further, Section 8.2.3 states the policy objective of improving seaport services to effectively cater for international transit traffic, and this aligns directly with the ultimate purpose that the proposed project aims to serve.

3.1.13 National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) - II, 2010

The National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) is a framework that focuses on poverty reduction. The NSGRP is informed by the aspirations of Tanzania's Development Vision (Vision 2025) for high and shared growth, high quality livelihood, peace, stability and unity, good governance, high quality education and international competitiveness. It is committed to the Millennium Development Goals (MDGs), as internationally agreed targets for reducing poverty, hunger, diseases, illiteracy, environmental degradation and discrimination against women. The Strategy promotes the effective participation of civil society, private sector development and local and external partnerships in development and commitment to regional and other international initiatives for social and economic development.

Economic growth is a powerful instrument for reducing poverty. Such growth is measured as the percent rate of increase in real gross domestic product (GDP). The reduction of poverty requires a sustained high growth rate of GDP of at least 6-8 percent per annum over the next decade. The implementation of the proposed project will create employment, improve trade and increase revenue, and in this way contribute to the growth rate of the GDP.

3.1.14 National Employment Policy, 1997

Employment in Tanzania falls under two main categories: wage employment and self-employment. In both categories, employment is defined as any acceptable activity in which a workforce is actively engaged. Such activity yields payment in some form.

The objectives of the National Employment Policy, among others, are:

- To prepare a conducive environment for the unemployed to employ themselves by directing more resources to the self-employment sectors;
- To identify potential areas for employment and to stipulate strategies for utilizing such areas in promoting employment in the country;
- To identify and elaborate on the status and roles of government, private sector, society in general, NGOs, local and foreign donors in promoting and sustaining employment; and
- To initiate a special system whereby employers and job seekers will be made aware of the existing supply of and demand for labour.

The Policy highlights the industrial sector due to its capacity to create additional employment opportunities. The proposed project is expected to increase more chances of employment for both formal and informal (skilled and unskilled) labourers. TPA is advised to adhere to this Policy by advertising vacancies for qualified applicants.

3.1.15 National Tourism Policy, 1998

The National Tourism Policy promotes the economy and livelihoods of the people by championing poverty alleviation through encouraging the development of sustainable and quality tourism that is culturally and socially acceptable, ecologically friendly, environmentally sustainable, and economically viable. It is recognized that the private sector will play a major role in the industry's development, with the government playing the catalytic role of providing and improving infrastructure as well as providing a conducive climate for investment.

The constraints to tourism include low levels of awareness and appreciation of tourism opportunities and the importance of preserving tourist attractions. Furthermore, local communities are often not involved in decision-making, development and sharing of the proceeds from the tourism resources and tourist trade.

The project aims at improving the Port's efficiency in handling its activities through strengthening and widening of the entrance channel for ships. This project may in future attract the development of a waterfront. In the event of this, big cruise ships from around the world would have a berth for anchoring at the Dar es Salaam port.

3.1.16 The Mineral Policy of Tanzania, 2009

The Mineral Policy of 2009 aims to strengthen the integration of the mineral sector with other sectors of the economy; improve the economic environment for investment; maximise benefits from mining; improve the legal environment; strengthen the capacity for administration of the mineral sector; develop small-scale miners; promote and facilitate value addition to minerals; and enhance environmental management. The vision of this Policy is relevant to the proposed project, specifically during the construction phase when various construction materials are expected to be sourced from quarries/mines. The Policy vision aspires to maintaining an effective mineral sector that contributes significantly to the acceleration of sustainable economic development.

3.2 Legislation

3.2.1 Environmental Management Act Cap 191

The Act is a single comprehensive environmental law, which became operational from 1 July 2005. According to Part VI, Section 81-(1), any person, being a proponent or a developer of a project or undertaking of a type specified in the Third Schedule to this Act, for which environmental impact assessment is required, shall undertake or cause to be undertaken, at his own cost, an environmental impact assessment study prior to the commencement or financing of a project or undertaking.

A permit or license for the carrying out of any project or undertaking in accordance with any written law shall not entitle the proponent or developer to undertake or to cause to be undertaken a project or activity without an environmental impact assessment certificate issued under this Act. Preparation of this EIA for the proposed Dar port improvement based on national and international guidelines fulfils the requirements of the Act.

3.2.2 Environmental (Registration of Environmental Experts) Regulations, 2005

The objectives of these Regulations are to:

1. Establish a system for registration of environmental experts;
2. Provide for a system of nurturing competence, knowledge, professional conduct, consistency, integrity and ethics in the carrying out of environmental impact studies and environmental audits;

3. Ensure that the conduct of environmental impact assessments or environmental audits is carried out in an independent, professional, objective and impartial manner; and
4. Provide for a code of conduct, discipline and control of environmental experts. The NEMC maintain a registry of EA and EIA experts.

These Regulations also stipulate the code of practice for Environmental Audit experts. Developers are required to use registered experts under the law. TPA has complied with the directives of these Regulations by commissioning registered EIA experts to carry out an EIA for the proposed project.

3.2.3 The Ports Act No. 17, 2004

This is an Act to establish the Ports Authority and to provide for its functions and powers; to repeal the Tanzania Harbour Authority Act 1977 and to provide for related matters.

Part (III) Section 12 – (i), the functions and powers of the Authority shall be, among other things:

- To administer land and waters within the limits of the ports;
- To promote the use, improvement and development of the ports and their hinterlands;
- To regulate and control navigation and the protection of the environment thereof;
- To negotiate and or enter into lease, concession, operating contract, management contract, service contract or any other form of contractual arrangement with any other person including a body corporate for the purpose of delegating powers of the authority to said person or body corporate to carry out such activities as provided in the contractual document; and
- To regulate control, the transport, handling and storage of dangerous goods within limits of the ports and the approaches to the ports.

Part XI, Section 65 of the Act is of particular relevance to the dredging activities that will be carried out for the deepening and strengthening of Berths 1 to 7. Specifically, TPA has the authority to prescribe the limits and levels within which dredging activities may take place in areas under TPA's jurisdiction.

The development of the project is in the Port Master Plan and will follow all the standards as stipulated in the ports master plan and the Tanzania Ports Authority Act No. 17 of 2004.

3.2.4 The Railways Act No. 4, 2002

One of the proposed project activities includes improving rail linkages and platforms in the Port. Therefore, sections of the Railways Act (2002) are relevant to this project. Specifically, Part III of the Act details the provisions for the regulation of rail transport. Section 29 in Part IV stipulates that it is the railway operator's duty to ensure people's safety during the operation of the railway; and Section 56 in Part VII states that a railway operator is allowed to internally manage and control a railway with the Surface and Marine Transport Regulatory Authority's (SUMATRA) consent. In light of these provisions, the Project Proponent will adhere to the rules in the Act throughout the operation of the internal railway circuit. Further, TPA will liaise with the national Reli Assets Holding Company (RAHCO), the landlord of railway infrastructure in the country, and Tanzania Railways Limited (TRL), the railways operator, during design, construction and operation phases of the project for technical guidance and alignment with other railway networks in the country.

3.2.5 The Energy and Water Utilities Regulatory Authority Act, Cap 414 R.E 2002

The Energy, Water Utilities Regulation Authority (EWURA) was established under the EWURA Act, 2001, and given the responsibility inter alia for regulating the water and sewerage services. Section 28 of the Act confers EWURA with powers to: exercise licensing and regulatory functions in respect of water supply and sanitation services; establish guidelines on tariffs chargeable for provision of water and sanitation services; monitor water quality and standards of performance for provision of water supply and sanitation services. In the case of petroleum and natural gas, the Act authorises the Authority to regulate transmission and natural gas distribution. New facilities at the Port following the implementation of the proposed project need to meet the Act requirements and TPA will comply with the Act directives.

3.2.6 The Local Government (Urban Authorities) Acts Cap 288 of the Revised Edition, 2002

This Act provides for a detailed responsibility for the urban councils on administration of day-to-day activities. Urban authorities have the duty of taking measures to safeguard and promote public health, to maintain the area of the authority in clean and sanitary condition, and to prevent the occurrence of or to remedy any nuisance or condition likely to be injurious or dangerous to health. TPA needs to comply with this Act by ensuring that no direct disposal of haphazard effluent or any waste generated from the new facilities at the Port that can affect natural resources and public health in general.

3.2.7 Occupational Health and Safety Act, 2003

This Act makes provisions for the safety, health and welfare of persons at work in factories and all other places of work. It also provides for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work. Relevant sections of the Act to the proposed project include Part IV section 43 (1) - Safe means of access and safe working place; Prevention of fire; in Part V of the Act emphasis is on provision of adequate clean, safe and wholesome drinking water, sufficient and suitable sanitary conveniences and washing facilities.

TPA will provide safety and working gear to all workers as well as training on first aid and firefighting training. Furthermore, TPA will provide health services through first aid provision to labourers as well as reference to hospitals in case of accidents.

Part VI Section 60 stipulates that in every factory or workplace where activities carried out involve hazardous processes or hazardous equipment or use of hazardous chemicals substances, likely to result in adverse health effects to people or serious damage to property or environment in case of accidents, the employer shall ensure that:

i. A risk assessment is conducted annually or at any other time when the need for the risk assessment deems necessary is done by an approved inspection authority; and
ii. Evidence of the risk assessment is furnished.

During construction, the site will be regularly inspected by OSHA, and after completion TPA will invite OSHA to inspect proposed new facilities and acquire a certificate.

3.2.8 Surface and Marine Transport Regulatory Authority (SUMATRA) Act, 2001

The Surface and Marine Transport Regulatory Authority Act of 2001 establishes a regulatory authority in relation to the surface and marine transport sectors and provides for its operation in place of the former authorities and for related matters.

Part II 6-(i) (b) (iii) of the Act states that the functions of the Authority, among others, are to establish standards for the terms and conditions of supply of the regulated goods and services. TPA adheres to these functional standards accordingly.

Part V 29-(5) of the Act states that the council shall make its own rules for regulating its procedures and matters relating to its functions. This section is applicable to the project and rules are observed in the implementation of the project.

TPA follows the required procedures for transportation, storage and distribution.

3.2.9 Land Use Planning Act No. 10, 2007

The Act established the National Land Use Planning Commission (NLUPC), which is the principal advisory organ of the Government on all matters related to land use. The Act has the function of formulating policy on land use planning, co-ordinating the activities of all bodies concerned with land use planning matters, and evaluating existing and proposed policies and activities of the Government directed to the safeguarding of land against its wrongful, wasteful or premature use or development and, on that basis, recommend policies and programmes which will achieve more effective protection and enhancement of the land quality and encourage better land use planning.

Other functions include recommending measures to ensure Government policies are complied with, including those for the development and conservation of land. This is also an important environmental provision, which introduces the requirements for environmental impact assessment at least in respect of land use matters. The propose project will be implemented in the TPA's own land therefor no need for land acquisition. However, the project design and implementation shall comply with the zonal land use planning of Kurasini and adjacent areas.

3.2.10 Land Act No. 4, 1999

This Act outlines, among other issues, the administration of land, the role of local government in land administration, land allocation and occupation.

Part V of the Act defines the rights to occupy land. There are two different procedures and two categories in granting rights of occupancy.

- For citizen, in a group of two or more will enjoy the right of being granted right of occupancy or derivative of a granted right of occupancy.
- A person or a group who has or are non-citizen may only obtain a right of occupancy or tentative right for purpose of investment presented under the Tanzania Investment Act CAP 38 of 2002.

Since the proposed project site is within the land belonging to TPA, the introduction of new facilities at the Port on this land is in compliance with the provisions of this Act.

3.2.11 The Land Act Cap 113, 2002 (revised)

The Land Act outlines the administration of land, the role of local government in land administration, land allocation and occupation, and contains provisions of critical environmental importance. One of the important fundamental principles of the Act is “to ensure that land is used productively and that any such use complies with the principles of sustainable development”. This project is developed on a plot belonging to the TPA hence there is no breach of any clause of the Act. In addition, the project has proposed measures to minimize water use, and to manage solid and liquid waste. These measures ensure that the project activities will not adversely affect the environment. There are no registered pending compensation issues associated with this project; therefore, issues regarding this legislation are not discussed further.

3.2.12 The Urban Planning Act No. 8, 2007

This Act provides for the orderly and sustainable development of land in urban areas, and the preservation and improvement of amenities. The Act also provides for the grant of consent to develop land and powers of control over the use of land and provides for other related matters. Under Section 3, the Act seeks to improve the level of the provision of infrastructure and social services for sustainable human settlement development. Environmental management is also a matter that the urban planning legislation addresses. This has taken into account the need for planning legislation to address the environment and possible environmental impacts from planned development. All provisions of this Act, particularly those concerning building permits and approvals of building structures, will be handled accordingly by TPA through Temeke Municipal Council. The environmental issues will be covered by this EIA study. The EIA certificate will be appended to the building permit application.

3.2.13 The Roads Act No. 13, 2007

This Act makes provisions for road financing development, maintenance, management and other related matters. Regarding road safety, Part V 33-(2) stipulates that road users and pedestrians in particular shall use public roads in a manner that does not pose safety hazard to the machines, vehicles or any other road users.

Part VII 42-(1) stipulates regulations concerning the maximum weight, speed and dimensions of objects to be carried on any public road. It shall be lawful for the purpose of safeguarding the safety of public or of preserving the condition of a road, for the road authority to fix a limit to the maximum weight, speed or dimensions of vehicles that may lawfully be driven or hauled over any part of a road. The project’s

transportation activities shall observe the standards and conditions to be placed by the road authority at the district and regional levels as per this Act.

3.2.14 Tanzanian Harbours Regulations, 1991

These Regulations make provisions for the control and discharge of pollutants from vessels into the harbours of all Tanzanian ports. Articles 62 and 66-68 establish the standards and procedures for control of garbage, waste and sewage from vessels into harbour waters. Article 164 states that for vessels carrying petroleum, the regulations apply additional to other legislation in force. Articles 14-17 cover oil pollution, and state that it is forbidden to discharge oily ballast or bilge water within the 12 miles harbour limit, this is subject to a penalty of USD 100,000 fine and/or imprisonment. All discharge valves should be secure and in the event of any discharge or leaks from the vessel, the officer in charge should attempt its recovery and avoid it being swept overboard. TPA will comply with the requirements of this Regulations by implementing Ballast Water Management Plan, Local Marine Oil Spill Contingency Plan, and revising the draft Waste Management Plan to be ready for approval and implementation.

3.2.15 Merchant Shipping Act No. 21, 2003

This is an Act to repeal the Merchant Shipping Act of 1976 and Inland waters Transport Ordinance to provide for the registration and licensing of ships, and to regulate proprietary interests in ships and terms of engagement of seafarers and matters ancillary thereto. The Act also provides for the prevention of collisions at sea, the regulation of load lines, the carriage of bulk and dangerous cargoes, inland waterways, passenger ships, wrench and salvage, the liability of ship owners and others and inquires and investigations into Maritime Security.

Unless otherwise expressly provided, this Act shall apply to:

- all Tanzanian ships wherever they may be; and
- all other ships while in a port or place in, or within the territorial sea, lakes, rivers, and cause ways under the jurisdiction of the United Republic of Tanzania.

This Act shall not apply to:

- vessels of the Tanzania Police;
- vessels of the Tanzania Peoples' Defence Forces;
- sea aircraft of the Tanzania Peoples' Defence Force; and
- any other ships belonging to or under the control of and in the service of the Government.

This Act shall apply to the Regulation of shipping in inland water transport. In adherence to this Act, TPA will make sure that handling of all cargo is monitored.

3.2.16 Workers Compensation Act No. 20, 2008

This is an Act for compensation of employees for disablement or death caused by or resulting from injuries or diseases sustained or contracted in the course of employment. The Act establishes the fund for administration and regulation of workers' compensation and to provide for related matters.

This Act shall apply to:

- All employers and employees including those in the Public service of the government of Tanzania in mainland Tanzania;
- Employees while employed in any capacity on a Tanzanian ship or aircraft and, subject to section 2-(1), employees employed outside Tanzania on any other ship or aircraft; and
- Employees who, subject to Section 24, are injured in occupational accidents or contract occupational diseases while employed outside Tanzania.

The objectives of the Act are to:

- Provide for adequate and equitable compensation for employees who suffer occupational injuries or contract occupational diseases arising from and during the course of their employment, and in the case of death, for their dependants;

- Provide for rehabilitation of employees who have suffered occupational injuries or contracted occupational diseases in order to assist in restoring their health, independence and participation in society;
- Provide for a framework for the effective prompt and empathetic consideration, settlement and payment of compensation benefits to employees and their dependants;
- Provide for establishment, control and administration of the Workers Compensation Fund, and the Legal framework for contributions and payments from the Fund;
- Give effect to international obligations with respect to worker's compensation; and
- Promote prevention of accidents and occupational diseases.

TPA shall adhere to the provisions of this Act and make sure that all employees are adequately trained and all danger areas are clearly marked to warn employees. This will help the Port to operate smoothly and avoid the costs that would result from compensation for injuries and fatalities. As such, the Ports Authority will adhere to provisions of the Act and make sure that all injured workers and families of deceased workers are adequately compensated.

3.2.17 Environmental Management Regulations, 2007

These refer specifically to Air, Water, Soil Quality Standards and Control of Ozone Depleting substances G.N.No. 237, 238, 239 and 240 respectively). The objectives of the Air Quality Standards Regulations are to set baseline parameters on air and emissions; enforce minimum air quality standards prescribed by the National Environmental Standards Committee; help developers such as industrialists to keep abreast with environmentally friendly technologies; and ensure protection of human health and the environment from various sources. The ambient air quality baseline data has been collected and it will be used for monitoring air quality during construction and operation phases of the project. The Contractor and TPA shall abide to the maximum permissible levels by implementing suggested mitigation measures for minimising dust, noise and gaseous pollution.

The objectives of the Water Quality Standards Regulations are to protect human health and conserve the environment; enforce minimum water quality standards prescribed by the National Environmental Standards Committee; enable the National Environmental Standards Committee to determine water usage for purposes of establishing environmental quality standards and values for each usage; and ensure all discharges of pollutants take account of the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned. During construction and operation phases, water quality will be continuously monitored. Water samples will be collected and tested periodically in order to detect any possible contamination and implement remedial measures.

The objectives of the Soil Quality Standards Regulations are to set baseline parameters on soil limits for soil contaminations; enforce minimum soil quality standards prescribed by the National Environmental Standards Committee; prescribe measures designed to maintain, restore and enhance the sustainable productivity of the soil; prescribe minimum soil quality standards to maintain, restore and enhance the inherent productivity of the soil in the long term; enforce minimum soil standards prescribed by the National Environmental Standards Committee for such purposes as agricultural practices. In compliance with this Regulation, TPA shall conduct soil quality analysis for monitoring purpose especially at the Gerezani creek.

The objectives of the Regulations for Control of Ozone Depleting Substances are to eliminate the production and consumption of ozone depleting substances in accordance with the phase out schedule of the Montreal Protocol; to regulate the production, import, export, trade, disposal and use of ozone depleting substances and its products; to control and monitor the amount of ozone depleting substances entering or leaving the United Republic of Tanzania; to provide a system of data collection that will facilitate compliance with relevant reporting requirements under the protocol; to promote measures, strategies, programmes, incentives, equipment and technologies in favour of the use of ozone friendly substances, products and equipment in line with national obligation specified by the Montreal Protocol; and to facilitate the link between the National Ozone Unit and the Ozone Secretariat of the Protocol. TPA will strive to observe this Regulation by collaborating with relevant government authorities such as

Tanzania Bureau of Standards, Vice President's Office-Division of Environment and Tanzania Atomic Energy Commission (TAEC) in regulating importation of the equipment containing ozone depleting substances.

3.2.18 The Employment and Labour Relations Act No. 6, 2004

This Act makes provisions for core labour rights, for establishing basic employment standards, and provides a framework for collective bargaining and the prevention and settlement of disputes and other related matters. The Act restricts the employment of children under the age of eighteen in mine, factory or a crew in ship or in any other work place including informal settings and agriculture.

According to Section 7(1), every employer shall ensure that he/she promotes an equal opportunity in employment and strive to eliminate discrimination in an employment policy or practice. The project should not be discriminatory against women and be able to provide equal opportunities for both men and women. Project should avoid forced or compulsory labour including overtime work with the threat of being fired. By extension, Section 7(2) states that an employer shall register with the labour commission a plan to promote equal opportunity and to eliminate discrimination in the workplace. During construction local employment shall be optimised by allocating jobs fairly (consider gender, marginalized groups), involve community leaders/ committees to identify suitable/able people for the jobs, review to avoid bias or favouritism observe national/and international labour standards.

TPA is an equal opportunity employer and shall adhere to the provisions of this Act.

3.2.19 The Water Resource Management Act No. 11, 2009

This Act provides the institutional and legal framework for the sustainable management and development of water resources. This includes principles for water resource management and the control and prevention of water pollution. Section 7 of the Act mandates all entities in Mainland Tanzania with the duty to inform the relevant authority of any activity or factor that may compromise the quality of water resources. As per this directive, the Client must alert authorities concerned with maintaining environmental integrity in the event of potentially threatening circumstances to groundwater resources and the Indian Ocean.

Section 9 stipulates that all proposed developments within water resources areas/a watershed must conduct an EIA in accordance with the provisions of the EMA. By commissioning a consultant to conduct an EIA for the Proposed Project, the Client is already in compliance with this directive.

Section 39 mandates an occupier of land on which any activity is likely to cause the pollution of a water source with the responsibility to take measures to prevent any such pollution from occurring. By implication, the project proponent must ensure that throughout all phases of this project, the environmental state and safety of the Indian Ocean is not compromised as per the directives of this Act.

Additionally, in accordance with Part VII of this Act, TPA must ensure that Groundwater Permits have been secured for each of the boreholes to be used as water sources during the construction phase. In addition, commissioning of this EIA study fulfils the requirements of the Section 9.

3.2.20 The Marine Parks and Reserves Act, 1994

This Act provides for the establishment, management and monitoring of marine parks and reserves to establish a Park and Marine Reserves Unit, and to repeal certain provisions of existing legislation. While there are no marine parks or reserves near the project site, the existence of mangroves is to be investigated.

3.2.21 Industrial and Consumer Chemicals (Management and Control) Act, 2003

This Act provides for the management and control of the production, importation, exportation, transportation storage, dealing and disposal of chemicals. This Act is relevant to the proposed project should certain chemicals for construction need to be stored onsite. The licence to be obtained in the event of this involves the registration and analysis of the chemicals. The Act outlines guidance on the storage, transportation and use of chemicals (Part III of this Act). TPA will comply with the directives of this Act in the importation, storage and handling of various chemicals.

3.2.22 The Mining Act, 2010

This Act includes provisions that regulate the law relating to prospecting for minerals, mining, processing and dealing in minerals, to granting, renewal and termination of mineral rights, payment of royalties, fees and other charges and any other relevant matters. The Act is relevant to the proposed project, specifically during the construction phase when various construction materials are expected to be sourced from quarries/mines. Part IV of the Act concerns mineral rights and is relevant to the project for the purpose of extracting construction materials. Potential locations for such extraction are within Temeke District and/or the Coastal Region. During construction, the Contractor will source materials from existing quarries and borrow areas that are licenced.

3.2.23 The Explosives Act, 1963

The relevance of this Act to the proposed project ties in with that of the Mining Act (2010). Part III of the Act, concerning general responsibilities for the care and security of explosives, and Part VIII, concerning the use of explosives, are pertinent in this respect. Wherever the extraction of construction materials via use of explosives will take place, the project proponent will ensure that the directives in this Act are adhered to and that blasting operations are performed by a certificate holder.

3.2.24 The Contractors Registration Act, No. 17, 1999

This Act requires Contractors at any site to abide by labour laws, and occupational health and safety regulations in construction industries. Furthermore, in the execution of the work, the Contractors are obliged to supply materials necessary for the work, and are authorized to exercise control over the type, quality and material used during Construction. TPA will monitor all Contractors used for the project to ensure that they comply with this Act.

3.3.25 The Tanzania Food, Drugs and Cosmetics Act, 2003

Section 18 of the Act states that the premises on which the products/services are to be located must be registered. In accordance with Section 22 of the Act, TPA will also ensure that: any grains to be stored in the onsite silo are registered in accordance with the provisions of this Act; that all required licences and permits are obtained; and that registration for food importers is completed.

3.2.26 The Tanzania Food, Drugs and Cosmetics (Food Hygiene) Regulations, 2006

According to Section 18 of these Regulations, any premises to be used for the storage of food must be licenced. Therefore, TPA will ensure that the premises where the silo is located is inspected and registered accordingly.

3.2.27 The Cereals and Other Produce Act, 2009

This Act makes provisions for the establishment of the Cereals and Other Produce Board for the promotion and development of cereals and other agricultural produce. One component of the proposed project is to increase the capacity of the grain silo and support the installation of a conveyor system. Given that grains will be imported and stored at the silo, the project proponent acknowledges that the Board's duty is to exercise its powers and functions under this Act for the purpose of promoting the quality and competitiveness of the cereals industry within the country. Therefore, the main functions of the Board shall be to carry out commercial activities and such other activities as are necessary, advantageous or proper for the development of the cereals industry.

3.2.28 The Cereals and Other Produce Regulations, 2011

These Regulations apply to any specified crops grown and processed in Tanzania Mainland as well as those that are imported (raw or processed). According to these Regulations, the Director responsible for Crop Development in the Ministry of Agriculture has the authority to issue directives concerning all cereals in the country, and TPA will adhere to these Regulations for the importation and storage of grains.

3.2.29 The Port Service Charge Act, 2011

This Act imposes a charge upon passengers embarking on ships at ports. During the operation phase, when the upgraded Port is operational, TPA, in accordance with this Act, will ensure that any person liable to pay any port charge pays to verified collection agents (Sections 6 and 7).

3.2.30 The Fertilizers Act, 2009

In accordance with Section 18 of the Fertilizer Act, all premises providing fertilizer storage and supply are to be registered under this Act for that purpose. Furthermore, Section 31 of the Act prohibits the handling, storage or discharge of fertilizer in a manner likely to cause any adverse effect to human health or the environment. Therefore, TPA will enforce measures to ensure that operations at the Fertilizer Terminal conform to the standards and requirements stipulated in this Act.

3.2.31 The Fisheries Act, No. 22 of 2003

This is an Act to repeal and replace the Fisheries Act, 1970 to make provision for sustainable development, protection, conservation, aquaculture development, regulation and control of fish, fish products, aquatic flora and its products, and for related matters. In relation to the proposed development at the Dar es Salaam Port, Section Part X, Sections (51)-1 and 52 are pertinent. Part X, 51 (1) All biological resources and their intangible products whether naturally occurring or naturalized within fisheries including genetic resources belonging to the Government in accordance with Article 27 of the Constitution, shall be conserved and utilized for the people of this country in accordance with the provisions of this Act and any other written law on biological resources. Section 52 states that 'no person shall undertake any development activities in this Act, without undertaking Environmental Impact Assessment in accordance with any other written laws of Tanzania'. This EIA is part of the proposed project at the Port therefore complies with the requirements of the Fisheries Act.

On improved quality of the fisheries resources, Part VI, Section 24 states that the Minister shall by notice published in the Gazette, impose conditions that are necessary for ensuring the right of consumers to safe, wholesome and unadulterated fish and fishery products. The Contractor and TPA will comply the required provisions of this Act during construction and operation phases of the project.

3.2.32 The Environmental Impact Assessment and Audit Regulations, 2005

The EIA and Audit Regulations, 2005 outline guidelines and procedures for carrying out environmental impact assessment studies and environmental audits as provided for under the Environmental Management Act. The regulations prohibit the project proponent from undertaking any construction project without carrying out an environmental impact assessment study required under the Environmental Management Act.

The regulations also define the contents and format of an EIA report to be presented to the authorities for environmental clearance certificate. The Minister shall take the final decision on issuance of environmental certificate based on NEMC's advise. The Regulations also provide for public hearings and appeal against decisions of the Minister. The Regulations (2005) are the legal document which outlines requirements for the consultant to follow during preparation of the EIA report such as the registration process, environmental scoping process, detailed EIA process and report writing. This report is structured in the format that is required by the Regulations 18.

3.3 International Obligations and Treaties

The relevant international treaties that Tanzania has ratified include:

- **Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148)**, concerning the protection of workers against occupational hazards in the working environmental due to air pollution, noise and vibration, came into force in 1979. Tanzania acceded in 1984 to the provisions regulating air pollution and these provisions apply to the project.

- **The International Convention for the Prevention of Pollution from Ships (MARPOL)** is the main global convention concerning the prevention of pollution of the marine environment by ships from operational measures or accidental causes. This includes pollution by oil from operational measures and/or accidental discharges; pollution by noxious liquid substances in bulk; pollution by harmful substances carried by sea in packaged form; and pollution by sewage and garbage from ships. This Convention is relevant to the proposed project because TPA will be responsible for ensuring that the ecology of the Port's marine environment is not compromised once it is operational. Additionally, it was noted during the July 2013 Environmental Scoping Investigation at TPA that TPA is in the process of establishing Port waste reception facilities at the Dar es Salaam Port by 2016 (ship waste management as required by the MARPOL Convention). It will be the first port in East Africa, and among few in Africa, to have such a facility (refer to Section 4.2 (ii) vi of the MARPOL Convention).
- **The 1972 Convention on International Regulations for Preventing Collisions at Sea (COLREGs)** set out, among other things, the navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels. The rules in this Convention are relevant to the dredging activities that will take place to deepen and strengthen berths 1 to 7, and are highlighted in Chapter 7 of this report.
- Tanzania is party to **The Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter** (also known as the 1972 London Convention). As per the purpose of the Convention, the goal of waste management where dredged material is concerned is to identify and control potential sources of contamination from estuarine and marine sediments. To this end, the project proponent must ensure that such identification and control measures are implemented with a view to developing and employing suitable prevention and source control strategies. Where the characteristics of the dredged material render its disposal as failing to meet Convention requirements, other treatment/management options should be considered.
- **The 1991 Bamako Convention** on the ban of the Import in Africa and Control of Trans boundary Movement and Management of Hazardous wastes within Africa was ratified in 1993.
- **1992 Convention on Climate Change** to which Tanzania is a party.
- **The 1989 Basel Convention** on Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal. The project shall adhere to both Bamako and Basel conventions to ensure that the ships do not bring into the country hazardous wastes by strictly abiding to the cargo declaration formalities.
- As Tanzania is party to the **1996 Convention on Biological Diversity**, TPA must cooperate with other related contracting parties for the conservation and sustainable use of biological diversity. Article 14 of the Convention concerns impact assessments and minimising adverse impacts; therefore, in this respect the Client is compliant with this Policy by commissioning the Consultant's completion of this ESIA.
- **The 2009 Hong Kong International Convention for the Safe and Environmentally Sound Recycling Of Ships**. The provisions of this Convention aim to avoid and mitigate adverse effects on human health and the environment caused by ship recycling, and to enhance ship safety throughout a ship's operating life. Parties to the Convention are to cooperate in the detection of violations and the enforcement of the provisions of this Convention. Where activities for the proposed project are concerned, the Convention includes regulations for the safe and environmentally sound recycling of ships that will guide TPA's monitoring of ships, particularly when the upgraded Port is operational.
- **ILO Minimum Age Convention (C138), 1973**. The Convention is concerned with minimum age for admission to employment. The minimum age stated in Article 2 (3) of the Convention is not less than 15 years or 18 years dependent on the nature of the work. The Convention prohibits child labour with a view to achieving the total abolition of child labour worldwide. Members of the Convention are committed to pursuing national policies that have been designed to ensure effective abolition of child labour and to increase progressively the minimum age for admission to

employment or work to a level consistent with the fullest physical and mental development of young persons. During construction the Contractor will abide by the provisions of this Convention.

3.4 World Bank Safeguard Policies

- **OP/BP 4.01 – Environmental Assessment Policy**: The World Bank requires that all projects financed by the Bank undergo an environmental assessment (EA) to inform decision-making and to ensure that the projects are environmentally sound and sustainable. The preparation of this report, and its submission for review to the World Bank, is in accordance with this safeguard policy.

  Of relevance to this Policy are International Finance Corporation (IFC) Environmental, Health and Safety Guidelines for Port and Harbour Facilities. These guidelines are for the design, construction and use of ports, harbours and associated facilities. These guidelines address issues concerning project siting, dredging, construction materials, general environmental requirements, port and harbour safety, hazards protection, training of personnel, and record keeping and reporting.

- **OP/BP 4.04 – Natural Habitats Policy**: This policy concerns the conservation of natural habitats, whereby the World Bank requires that natural habitats are protected, maintained and rehabilitated. Where development projects are concerned, the Bank requires that precautionary measures are taken for natural resource management with a view to ensuring environmentally sustainable development. In light of this, the project proponent will employ considerations for environmental integrity and protection during all phases of the project.

- **OP/BP 4.11 – Physical and Cultural Resources**: Physical cultural resources are of scientific, historical, economic and social value. To avoid or mitigate any potential negative impacts on these resources from World Bank-funded projects, the Bank assists project proponents by following the project cycle processes of screening; developing terms of reference (TORs) for the EA; preparing and reviewing the EA report; and project appraisal, supervision and evaluation. The Client commissioning the Consultant to prepare this ESIA is therefore in line with the World Bank's strategy and policy on protecting physical and cultural resources.

3.5 Administrative Framework

3.5.1 TPA Administrative set up for Environmental Management

TPA has an Environment Management System (EMS) Section that is responsible for environmental management within Dar es Salaam Port. This EMS section is under the Directorate of Management Systems with quality management and organisation design and development (Fig. 3.1).

3.5.2 TPA Environmental Management System (EMS) Section

Structure and responsibilities

The Section is one among the three sections under the Chief of Management Systems. Some of the functions of this Section include:

- Ensuring a high level of environmental management and compliance with Tanzanian and ISO 14001 standards;
- Formulating EMS plans;
- Conducting Environment Management Systems Audits;
- Planning, coordinating and advising on issues concerning solid waste and waste water management; pollution control; hazardous wastes management; and hydrocarbon and spills management (on land and at sea);
- Conducting formal risk assessments; and
- Ensuring operational compliance with environmental legal requirements and other obligations.

The Section is headed by a Principal Management Systems Officer who is supported by a Senior Management Systems Officer (Figure 3-1). Subordinate to the Senior Management Systems Officer are two

Management Systems Officers. The EMS Section is in its fifth year of operations, and was established to serve a supervisory function by overseeing EMS sub-sections assigned to each port under TPA's jurisdiction. Currently, however, where the management of the environment is concerned, the Section's functions are primarily at a policy level. This means that the Section is not involved in the processes entailed in the implementation of Environmental and Social Management Plans (ESMPs). Similarly, while the Section is not responsible for monitoring the implementation of TPA's waste management plan, the Section is drafting a Waste Management Plan (Appendix 6) to guide waste management processes in future. The Sanitation Section within Dar es Salaam Port's Civil Engineering Department is responsible for the daily handling of waste. In addition to the Waste Management Plan, the Section is drafting Standard Operating Procedures to augment the EMS Policy (draft), and is developing a Hazards Register. The responsibilities of the EMS Section staff for implementing, monitoring, auditing and reviewing environmental management issues are shared.

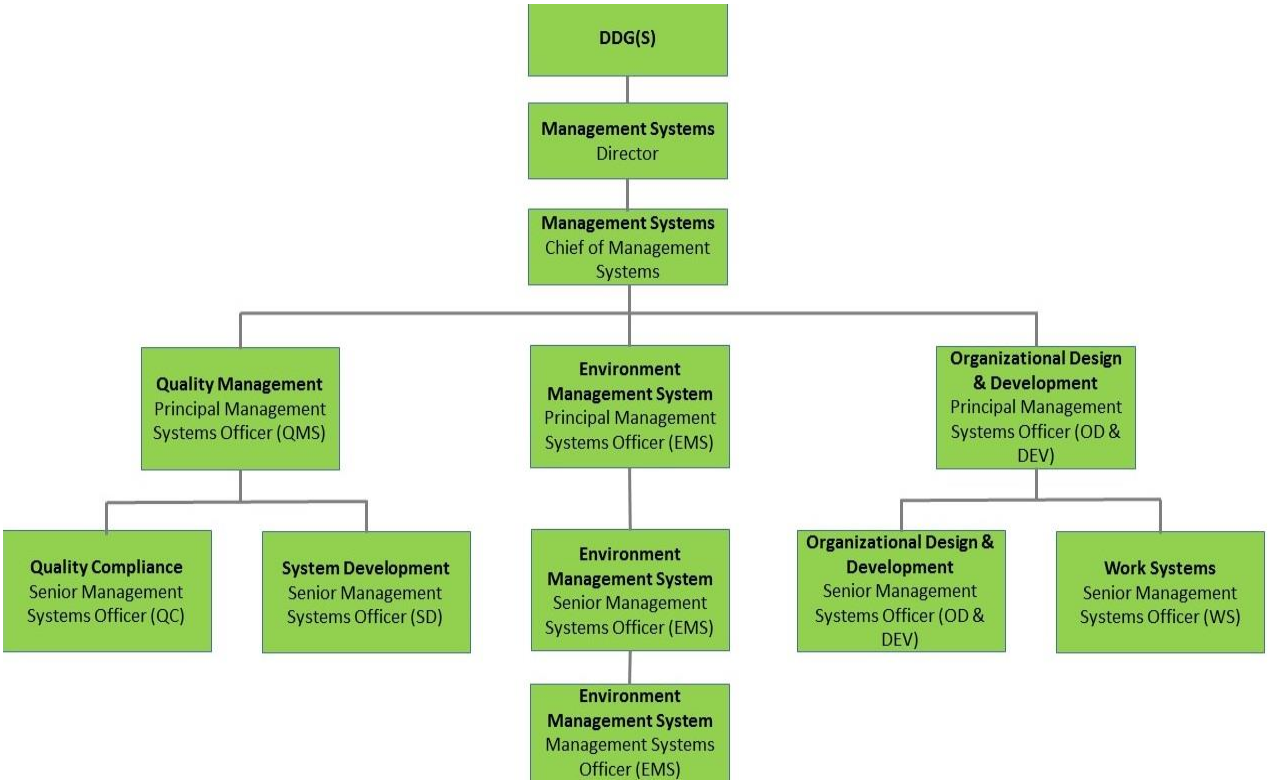


Figure 3-1 Organisational structure of the Directorate of Management Systems.

Challenges

Overall, the structure of the EMS Section could benefit from revision, specifically the introduction of sub-sections assigned to oversee environmental management systems at each port under TPA's jurisdiction. Currently, the Section is understaffed and this is reflected in the division of labour. For example, while the Director of Management Systems initiates the Environmental Impact Assessment (EIA) process for TPA projects, the EMS Senior Management Systems Officer has been assigned to manage the entire process. Currently, the EMS section responsible for monitoring and implementing the ESMP from the EIA, and the Principal Management Systems Officer delegates supervisory functions for different projects to staff in the Section. Furthermore, the EMS section is responsible for developing the EMS system and is currently responsible for implementing it, creating a conflict of interest. Ideally, each port needs an independent structure to be responsible for ESMP implementation, and the EMS Section would benefit from the creation of sub-units that are tasked with implementing, monitoring, auditing and reviewing environmental management issues to allow for specialization. In light of the anticipated increase in port capacity, at least three more staff in the Section are needed to manage a separate sub-section for Dar es Salaam Port.

Sensitizing staff to environmental responsibilities is one of the Section's duties; however, this has thus far proven difficult. The Senior Management Systems Officer explained that while attempts had previously been made, an environmental awareness program has not yet been implemented. Contrastingly, the TPA Medical Department has had more success in conducting HIV/AIDS sensitization workshops for employees. Dar Port's Occupational Safety, Health and Environment (OSHE) Committee allows for the interfacing of health, safety and environmental issues and is a potential avenue through which the EMS Section conducts its environmental sensitization activities. The OSHE Committee has 12 members chaired by the Director General and coordinated by EMS Principal Management Systems Officer

The Section does not have access to certain resources. For example, there are no financial resources available for the implementing and monitoring of ESMPs. The entire Directorate (Quality Management Section; EMS Section; and the Organizational Design & Development Section) is allocated a budget, from which the Director of Management Systems then makes decisions for allocation. There is also currently no equipment available onsite to measure air and water quality. Additionally, there are no vehicles available to the Section for official use, so the officers currently use their personal cars. IT support is limited to only internet access, internal communication systems/cable telephone services (all ports can communicate through internal telephones but not outside TPA) and the Section does not have any radios for communicating with the Dar es Salaam Port. Lastly, according to the Principal Management Systems Officer, if all staff were permanently based in the office, the allocated office space would not be sufficient, which suggests that additional office space will be required in the future. To accompany the proposed development associated with Phase 1, the Unit should be strengthened along the lines above, and include two extra staff (environmental backgrounds), and relevant capacity building with exposure to practical best environmental practices.

Instruments for Environmental Management at TPA

In addition to the aforementioned relevant policies, regulations and legislation, TPA has instruments in place for environmental management in the Port's routine activities. These instruments are listed below with brief descriptions:

1. **TPA Occupational Safety, Health, and Environment (OSHE) Policy, 2008** – This Policy (Appendix 9) outlines guidance for a safe working environment for improved productivity. By addressing a broad range of workplace hazards, the Policy aims to prevent work-related diseases, accidents and environmental degradation. Throughout all phases of the proposed project, TPA will ensure that the Policy's provisions are incorporated in project activities to ensure that all people working at the project site are safe.
2. **TPA OSHE Regulations, 2010** – These Regulations apply to the TPA workplace and concern the occupational safety of staff/workers. Safety, health and environmental provisions and measures detailed in these Regulations will be applied to all activities in the various project phases.
3. **TPA OSHE Guidelines and Procedures, March 2013** – These Guidelines and Procedures (Appendix 10) apply to workplaces under TPA jurisdiction, and includes provisions for the systematic identification, evaluation, and prevention/control of potential workplace hazards. This document details systematic policies, procedures, and practices that are in place to protect TPA employees from occupational safety and health hazards. These guidelines will be followed by TPA throughout all phases of the proposed project.

TPA Emergency Response Plan

TPA also has an Emergency Response Plan for the Dar es Salaam Port (Appendix 8). The purpose of the Plan is to establish a framework for responding to emergencies within the limits of the harbour jurisdiction. This framework includes facilitating an orderly and efficient transition from normal to emergency operations, the assignment of emergency responsibilities to key Port personnel, and the coordination of efforts to respond to the emergency appropriately with a view to resuming regular operations as soon as possible. The Plan covers emergencies such as fires, sinking vessels, collisions, port and vessel security, flooding, medical emergencies, spillage of harmful substances and earthquakes.

TPA Local Marine Oil Spill Contingency Plan

TPA's current capacity to respond to oil spills is indicated in the Local Marine Oil Spill Contingency Plan (Appendix 7). The Plan details the procedures that will be initiated by TPA in the event of an oil spill within the harbour limits. Some equipment is stored in a container, but there are no skimmers. The Contingency Plan covers primarily a Tier 1 response level, which is a response to a spillage that can be dealt with using the resources immediately available. In the event of a casualty spill (i.e. a spill that occurs as a result of equipment or vessel damage such as grounding, stranding, fire or combination of both), which may escalate to Tiers 2 and 3 response levels, SUMATRA and the Permanent Secretary to the Ministry of Transport shall be informed immediately to activate the National Marine Oil Spill Contingency Plan and to seek further assistance nationally and internationally.

External Communications and Grievance Mechanism

TPA has a Customer Care Centre at the Port and suggestion boxes placed in most public places within TPA premises where workers and the general public can log their grievances. The Port has a formal system in place for receiving, acknowledging, assessment and reporting of the complaints and/or grievances.

Chance find procedures during dredging

In the event of a chance find of submerged materials (e.g. shipwreck, or items of archaeological significance) Dar es Salaam Port has a specific procedure. Such chance finds are not anticipated during the dredging of Phase 1 as the near-dock areas have recently been dredged (1993). However, dredging in later phase of the DSMGP, include the turning circle and approaches to the main entrance channel should be cognisant of the possibility of chance finds.

3.5.3 Institutions involved in the project

The Tanzania EIA practice assigns different functions and responsibilities to parties involved in the EIA and environmental audit process of any proposed development to which EIA is obligatory. Table 3-1 depicts key institutions associated with the proposed project. The Environmental Management Act (EMA, Cap 191) mandates NEMC to undertake enforcement, compliance, review and monitoring of environmental impact assessment and has a role of facilitating public participation in environmental decision-making, exercise general supervision and coordinating over all matters relating to the environment. The Act empowers NEMC to determine whether a proposed project should be subjected to an EIA or EA, approves consultants to undertake the EIA and EA studies, invites public comments and has the statutory authority to issue the certificates of approval via the Minister responsible for environment. NEMC is currently the designated authority to carry out the review of EIA and EA including site visit and handling TAC meeting, monitoring and auditing of environmental performance of the project (periodic and independent re-assessment of the undertaking).

Table 3-1 Institutions in the EIA process.

Level	Institution	Role and responsibility
National level	Vice President's Office (Division of Environment)	• Co-ordinate Environmental Management Policy, Environment Management Act and EIA guidelines • Approves, signs and issues Environmental Certificate • Advise Government on all environmental matters • Enforces and ensures compliance with the national environmental quality standards • Provides policy direction and leadership in all matters, particularly those pertaining to hazardous waste management under the Environmental Management Act
	National Environment Management Council (NEMC)	• Project registration, approval of ToR, and review of EIA and EA • Environmental Monitoring and Compliance Auditing • Advises Government on all environmental matters

The project includes various port infrastructure improvements that will involve a broader group of institution, as listed in Table 3-2.

Table 3-2 Other institutions involved in the project.

Institution	Roles
Ministry of Industry, Trade and Investment	• Issuing policy guidance • Providing legal frameworks • Enforcement of laws and regulations • Setting operation standards for energy generation projects • Project monitoring.
EWURA under the Ministry of Energy and Minerals	• Regulation of fuel business as well as water utilities in the country • Issuing of permits to oil companies • Monitoring of petroleum industry operation
Ministry of Lands, Housing and Human Settlements Development	• Land use planning • Issuing of Right of Occupancy; • Valuation and compensation.
Ministry of Health Community Development, Gender, Seniors and Children (Government Chemist Laboratory Agency - GCLA)	• Analysis of chemical content • Designated National Authorities for the Control of Industrial and Consumer Chemicals • Registration of Industrial and Consumer Chemicals • Management and control of the production, importation, transportation, storage, dealing, and disposal of chemicals
Ministry of Water and Irrigation	• Issuing Water extraction permit • Provisions of certificates of compliances • Enforcement of laws and regulations • Project monitoring on water issues.
Occupational Safety and Health Authority (OSHA)	• General understanding and views about the project • Requirements of the project in terms of safety at the workplace • Land use in the area of vicinity in terms of safety
Tanzania Investment Centre (TIC)	• Facilitating investment activities in the country • Overseeing investment activities
Tanzania Port Authority	• Project implementation • Project monitoring and internal auditing
Surface and Marine Transport Regulatory Authority (SUMATRA)	• Established under the Surface & Marine Transport Regulatory Authority (SUMATRA) Act, (2001) • Enforce maritime safety and pollution prevention • Regulate marine transport routes, safety and security. • Regulates and monitors marine vessels in Tanzanian waters including the registration of vessels, issuance of licences and manning and certification of seafarers on vessels.
Dar es Salaam City Council	• Oversee and advice on implementation of national policies at city level • Oversee enforcement of laws and regulations • Advice on implementation of development projects and activities at city level
Temeke District Commissioner office	• Oversee and advice on implementation of national policies at District level • Oversee enforcement of laws and regulations • Advice on implementation of development projects and activities at District level
Temeke Municipal Executive Director Office	• Chief Executive Officer for all development activities in the Municipal level
Temeke Municipal – Environment/ Planning/ Community Development Departments etc.	• Baseline data on social and economic conditions • Extension services • Plan and coordinate activities on community-based natural resource and environment management • Enforcement of laws and regulations • Responsible for waste management within Municipal
Kurasini Ward	• Oversee general development plans for the Ward. • Provide information on local situation and extension services • Technical support & advice • Project Monitoring
Chairman, Communities groups (Members of Mtaa Council)	• Information on local social, economic, environmental situation • View on socio-economic and cultural value of the sites • Rendering assistance and advice on the implementation of the project • Project Monitoring (watchdog for the environment, ensure well-being of residents and participate in project activities

Chapter 4: ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

4.1 Scope

This chapter provides a description of the baseline conditions regarding the Port, the socio-economic Baseline data and information on the biophysical and socio-economic settings at the site, where this project is being implemented. This is essential to provide important benchmarks necessary for future project environmental performance monitoring. Appraisals have been made at three areas of influence. The first is the core area, or Direct Influence Area (DIA), around the Port itself, notably along Berths 1 to 7 and Gerezani Creek; the second comprises the Indirect Influence Area (IIA), namely the areas around the outer anchorage, including the Dar es Salaam Marine Reserve (both north and south areas), and the main Port access roads that are part of Dar es Salaam City. The latter, includes areas that are recipient of liquid discharges, and solid wastes as well as sources of infrastructure services, such as water and energy, and social services such as manpower sources. The third area considered is the Wider Influence Area (WIA), which includes Tanzania and neighbouring, regional countries that presently already do and will benefit further from the improvements to the Port infrastructure and operations.

The level of detail presented in the various sections that follow is proportional to the degree of interaction between the project activities and the particular environmental feature. Information provided in this chapter will be superimposed onto the project concept and components for impact identification, evaluation and development of mitigation measures.

4.2 Project Core Area

The existing Dar es Salaam Port is the main project DIA, centred approximately at 6° 50' 4" S and 39° 17' 57" E. It is within this area, comprising a stretch of dock of less than 2 km in length and adjacent terminal surfaces, that the proposed undertakings of this phase of the DSMGP will be implemented.

4.2.1 Location and accessibility

The Dar es Salaam Port is located in an area called Kurasini in Temeke Municipality of Dar es Salaam City. The Port's operational area is the predominant land use in the eastern side of Kurasini. The Port covers the whole area east of Kilwa Road from the south to the Gerezani roundabout in the north. A very small portion of the Port area, notably the Malindi and Lighters Quays, is within the neighbouring Mchafukoge Ward, in Ilala District (see Figure 1.1, Chapter 1).

4.2.2 Port performance

The rapid growth experienced over the recent decade is placing considerable strain on Dar es Salaam Port. All indicators of port performance and utilization, including inter alia waiting time for ships anchorage, berth occupancy and cargo dwell time were deteriorating. The delay was exacerbated by the limitations in operational efficiency at the quay and lack of storage space, lengthening the time required to unload and load a container ship, and inadequate integration between the key actors. This also impacts on the waiting time for a berth for dry bulk vessels which has reached 4.5 days, as the conventional berths are increasingly congested by container vessels. In addition, despite offering a poorer service resulting in increased charges for cargo, port tariffs (primarily wharfage) in DSM are higher than competing ports, such as Mombasa and those in northern Mozambique.

4.2.3 Port infrastructure

General layout

The Port has eleven berths, seven of which are currently dedicated to general cargo (including container, dry bulk, break bulk and Ro-Ro operations) and four to dedicated container operations (Figure 4-1). Other facilities include the Malindi and Lighter wharves (for coastal trades), the Kurasini Oil Jetty (KOJ), and the Single Point Mooring (SPM). The SMP is located on the open side of Kigamboni, at Mjimwema Bay, with a delivery pipelines to storage yards at the Tanzania Italian Petroleum Refinery (TIPER) and other sites.

Currently, Dar es Salaam Port it is designed to handle Panamax size vessels although length is restricted to 230 m LOA (Length Over All). The KOJ is designed for two tanker berths up-to 45,000 Deadweight Tons (DWT) and the SPM, developed outside the Port at Mjimwema Bay, for tankers up-to 120,000 DWT. The Port entrance channel was deepened and straightened in 1997-98 to a minimum depth of 10.1 metres relative to Chart Datum (CD). The depth within the southern creek (fronting the deep water berths) has been dredged to 10.0 m CD.

Other areas within the general cargo terminal include: land previously occupied by the Port revenue and administration offices; the central workshop; and the ex-TANESCO power station (below the grain terminal and now redeveloped for container storage). Land adjacent to the existing Port Manager's office (by Berth 1) and adjacent to Gerezani Creek is currently used for vehicle storage. Additionally, there is undeveloped land adjacent to Gate 2.

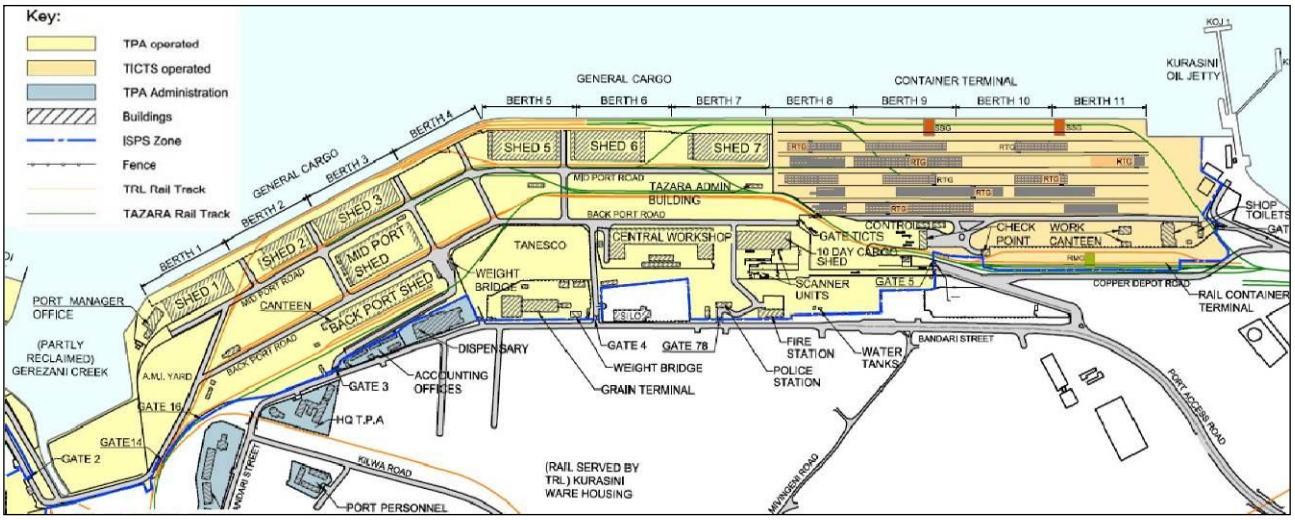


Figure 4-1 Dar es Salaam Port current layout. Source: Feasibility Study, 2013.

Berths 1 to 3 are block wall constructions and provided with an apron with a width of about 30 m, with Berths 4 to 11 open piled with a suspended deck of approximately 33 m width. Berths 8 to 11 are provided with a double row of foundation piles along the cope edge to support ship shore gantry cranes.

The port handles both containerized and un-containerized cargoes. The Port is currently affected by inefficient cargo handling and breakdowns of equipment. Railways capacities of Tanzania Railway Ltd. (TRL) and TAZARA exist, but are weak: their joint modal split of 2011 was just 3.3 %. Most cargo transports run by truck. However, a key problem is also that Port gates are too few and too cumbersome to pass for heavy vehicles, with main access "Bandari Road" as well being too narrow and thus always being heavily congested. The main commodities handled at the Port include:

- Wheat
- Fertilizer
- Clinker
- Other dry bulk
- Bagged break bulk
- Other break bulk
- Vehicle

General cargo handling and storage

Within the sheds of the general cargo terminal (Berths 1-7), open stacking areas exist on the immediate backshore adjacent to the berths. The exception to the above is the grain silo, which is developed adjacent to Bandari Road overlooking the Port. The General Cargo Terminal occupies approximately 50 ha of land with a total of 1,283.5 m of quay (over the seven berths). Paved open storage space behind the quays measures approximately 72,400 m² and is mainly used for the storage of containers and vehicles.

A relatively low amount of break bulk cargo is handled. From 2009 to 2011 break bulk cargo decreased by 10 %. According to the Feasibility Study (2013), the future development of break bulk cargo imports are expected to growth between 65 % (low forecasts) and 126 % (high forecasts) from 2011 to 2018 and between 69 % and 94 % from to 2018 to 2028.

Dry bulk cargo is nearly exclusively related to import (see Figure 4-2, A-D). From 2009 to 2011 dry bulk cargo import decreased from 1,160,000 t to 572,000 t. The actual import data for 2011 is between 60 % (low forecast) and 63 % (high forecast) lower than the dry bulk cargo forecasts. A total increase from dry bulk volume of 13 % (low forecast) and 20 % (high forecast) were forecasted for 2012 to 2015. From 2015 to 2028, the dry bulk cargo volume is expected to increase between 64 % (low forecast) and 126 % (high forecast). Wet weather results in immediate cessation of all bulk cargo unloading, and most shipping agents and/or customers do not arrange for such deliveries during the wet season months of April and May.

Besides the sheds at Malindi Wharf, the Port had seven transit sheds, though Nos. 2 and 3 were recently demolished. The five remaining sheds are located adjacent to the aprons, designed for short term storage and act as general and break-bulk cargo consolidation areas for different loading and unloading requirements and land transport (see Figure 4-3). Long term covered storage space is provided by three additional sheds, including the ten-day cargo shed behind Berth 7, and the Mid Port and Back Port sheds on Berth 3. A grain terminal with a capacity of 30,000 t is located in the back port area, by Bandari Road.

Ro-Ro facilities

Presently, vehicle transporters use any of the main berths (see Figure 4-2 E) with cars and longer vehicles stored temporarily at a number of site within the Port area. Between 2007 and 2011, vehicle imports (units) increased by 23 %. From 2012 to 2018, it is expected that imports of vehicles will increase further between 67 % and 95 % and from 2018 to 2028 imports increase between 216 % and 260 % (Feasibility Study, 2013). Some of these vehicles will be in transit to other destinations in the region.

Container handling

There are two container handling operations. From May 2000, the Tanzania International Container Terminal Services (TICTS) consortium was assigned a 10-year concession (later extended to 2025) to manage the container terminal. Originally, Berths 9 to 11, and later Berth 8, were handed over to TICTS, bringing the total area to over 23.5 ha. The other container handing operation is run by TPA, using the central berths and storage space available within the Port area.

A rough overview of dry cargo handled in 2011 by both TPA and TICTS were 6,353,000 t (about 75 % imports and 25 % exports) or 476,000 TEU (TEU is twenty feet equivalent units).

Liquid bulk terminal

The main liquid bulk terminals in Dar es Salaam Port include the Single Point Mooring (SPM) and the Kurasini Oil Jetty (Figure 4-1). The former is sited outside the Port within Mjimwema Bay. Until recently, the sole use of the SPM was to transfer crude oil to Zambia. However, the facility is now capable of handling multi-products, allowing local discharge of white products (mainly diesel). KOJ is located within the Port adjacent to the container terminal Berth 11 and consists of two petroleum berths, KOJ-1 designed to discharge tankers up-to 45,000 DWT, and KOJ-2 designed to load and discharge coastal tankers up-to approximately 7,000 DWT.

Malindi and Lighter Wharfs

These are the oldest berthing facilities in the Port, built during the German colonial period. The approximately 680 m of wharves are divided into three portions, (with lengths of each) being, from the north, the piled Dhow Wharf (340 m), block wall Lighter Wharf (200 m) and sheet piling Malindi Wharf (140 m) (Figure 4-4). Over recent decades, the Dhow Wharf has been modified significantly. At present, the northern half is used by Zanzibar ferry boats, with a pontoon splitting the wharf in two constructed around 2013. The remaining southern portion (about 90 m) is no longer accessible to any vessels since the construction site of TPA's new office tower block has erected a fence along the dock denying vessel access (see Figure 4-4). The fenced off area extends into the northern portion of the Lighter Wharf by 40 m.

As a result of these changes, current users (see Shipping section below) is restricted to 300 m of dock access. Of this, only the southern portion, the Malindi Wharf, is deep enough for the larger vessels of draft between 2 and 3 m; the remainder having silted up and now deep enough only for small cargo dhows.

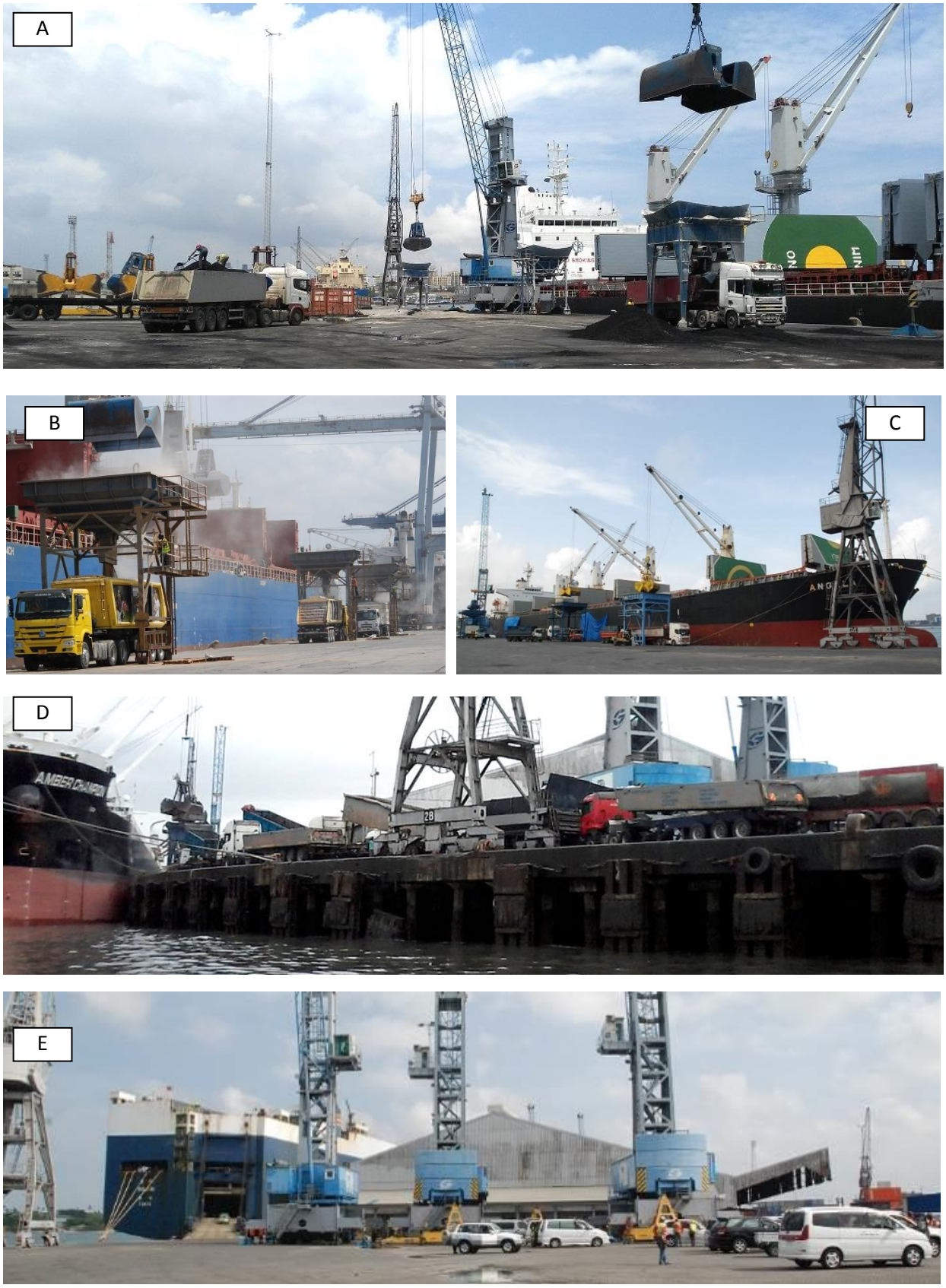
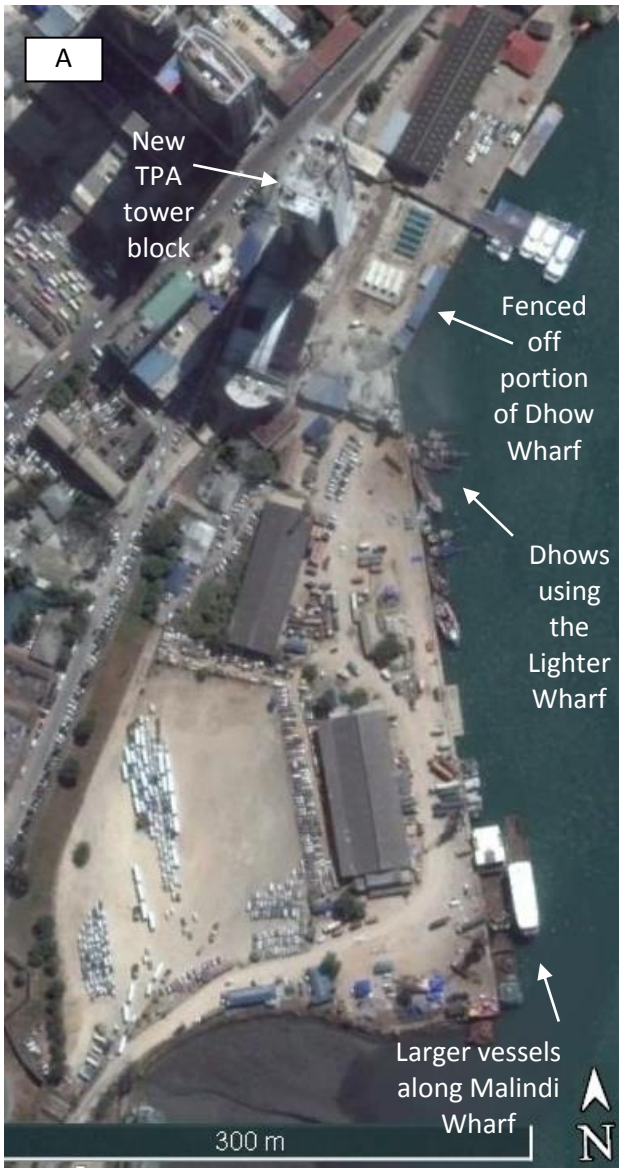


Figure 4-2 Different forms of bulk cargo being unloaded; bulk cargo (January 2016): (A) coal into trucks via three hoppers, (B) wheat grain into trucks via three hoppers, (C) fertiliser into trucks via three hoppers (January 2016), (D) clinker, into hoppers and trucks (December 2015); and (E) vehicles being driven off a Ro-Ro vessel at Berth 5 (January 2016).

Figure 4-3 Storage Shed 1 at Berth 1, with coffee sacks from Burundi waiting to being shipped; and mid port shed with sacks of urea fertiliser, bagged for onward transportation throughout the country.



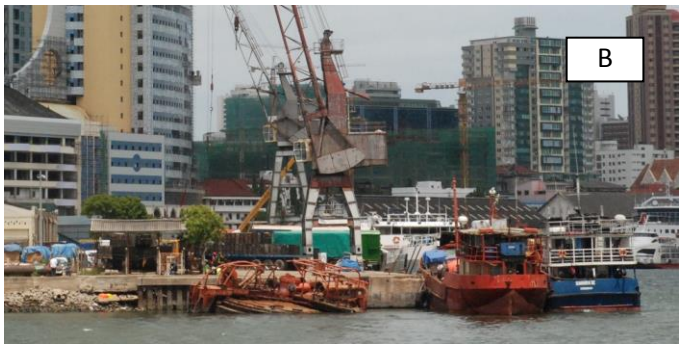


Figure 4-4 Selected images from Malindi and Lighter wharves area: (A) Satellite view (Google Earth) dated July 2015, showing the larger vessels restricted to the southern portion with dhows moored along the shortened central portion, and the northern portion fenced off by the construction of the new TPA tower block; (b) View of the southern corner of Malindi Wharf showing congested larger vessels moored alongside; (C) Fenced off original Dhow Wharf and pontoon for Zanzibar ferries in background; (D) Present situation with dhows using the northern (shortened) section of the Lighter Wharf. [Photos C and D courtesy of Gustav Hueppe].

Marine vessels and traffic in the wider Dar es Salaam Harbour

Data for vessel traffic in 2015 (Table 4-1) shows that in addition to the main dry, container cargo and Ro-Ro shipping fleet that uses the main berths at the Port (856 vessels), there are visits from liquid cargo vessels (146 vessels), plus a few other ships that visit, namely international passenger/cruise liners, Navy, and research boats (146 visits), totalling 1,012 vessel visits to the main Port berths during 2015. There exists also a secondary fleet of smaller "coastal" vessels (mostly <100 m), including freighters carrying cargo and passengers, dhows, transporting break bulk cargo and miscellaneous goods from Dar es Salaam, using the Malindi Wharf area (described above) or dedicated ferry terminals extending from the old Dhow Wharf eastwards (see Figure 4-5), to smaller ports along the coast, particular to Zanzibar and Mafia islands. During 2015, there were 2,786 individual visit from such vessels, though the majority (1,805) were categorised a passenger ferry boats – representing the four to five ferry boat departures per day from Dar es Salaam to Zanzibar, from a fleet of some 6-10 vessels. Annual data of vessel traffic like that in Table 4-1 are available for other years, thus allow a trend analysis to be performed. For virtually all vessel types, traffic has be increasing.

The other category of vessels utilising Dar es Salaam harbour is fishing boats (Figure 4-5). There between 50 and 100 sardine fishing boats as well as numerous smaller canoes and dhows. Adjacent to the Fish Market is the second main fish landing site, used primarily by 50-100 dugout canoes and sailing out-rigger canoes (*ungalawa).* All the vessels use the same entrance to the harbour as the much larger vessel that berth at the main Port facility.

Figure 4-5 Upper: Passenger and cargo ferry boats that travel between Dar es Salaam and Zanzibar (as well as Pemba, Mafia and Mtwara) moored alongside the ferry terminal that presently extends from about half way along the old Dhow Wharf northwards to the City Centre; below: view of the Kigamboni fish landing site on the south side of the harbour entrance, home to a local fleet of sardine fishing boats (as shown here), as well as smaller canoes and dhows.

Table 4-1 Summary of 2015 vessel traffic at Dar es Salaam Port (Source: TPA).

TYPE OF SHIP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
(1) DEEP SEA VESSELS													
(a) Dry Cargo Vessels													
(i) Break bulk vessels	12	14	14	11	8	9	8	7	6	7	11	6	113
(ii) Dry bulk vessels	6	3	6	6	6	9	3	4	5	9	11	8	76
(iii) RO-RO Vessels													0
Container carrier	3	3	3	1	3	2	3	2	3	2	4	4	33
Car carrier	12	10	15	13	12	16	17	15	17	15	16	17	175
Sub-total	15	13	18	14	15	18	20	17	20	17	20	21	208
(iv) Container vessels													0
TICTS	32	27	27	32	27	27	28	30	27	34	30	36	357
TPA	13	10	7	10	7	10	11	6	10	6	4	8	102
Sub-total	45	37	34	42	34	37	39	36	37	40	34	44	459
Sub-total	78	67	72	73	63	73	70	64	68	73	76	79	856
(b) Liquid Cargo Vessels:													0
(i) Crude oil (SPM-TAZAMA)	1		1		1	0	0		1		0	1	5
(ii) Refined oil (SPM)	2	2	2	2	2	3	3	2	3	2	2	2	27
(ii) LPP (KOJ)	5	8	13	8	8	6	9	8	6	10	12	9	102
(iii) Edible oil (KOJ)	2	1	1	2	1	1	1	1	1	0	0	1	12
Sub-total	10	11	17	12	12	10	13	11	11	12	14	13	146
(c) Other Vessels (International passenger, Navy, research, etc.)			0	1	5	0	0			0	0	4	10
Total (a + b + c)	88	78	89	86	80	83	83	75	79	85	90	96	1,012
(2) COASTAL VESSELS:													
(a) Dry Cargo Vessels													
(i) Break bulk	25	37	37	25	29	40	29	43	41	43	52	43	444
(ii) Passenger/Cargo	12	12	15	14	8	19	12	14	17	11	17	15	166
Sub-total	37	49	52	39	37	59	41	57	58	54	69	58	552
(b) Liquid Vessels (LPPC)	8	3	5	5	3	3	4	4	5	5	2	6	53
(c) Passenger ferry boats	187	159	140	136	133	141	159	158	149	136	145	162	1,805
(d) Other Vessels													
(i) Schooners & Dhows	26	21	27	19	20	36	42	31	30	33	32	41	358
(ii) Fishing, yachts, tugs, etc	10				1	2			1	0	4		18
Sub-total	36	21	27	19	21	38	42	31	31	33	36	41	376
Total (a + b + c + d)	268	232	224	199	194	241	246	250	243	228	252	267	2,786
Grand total	**356**	**310**	**313**	**285**	**274**	**324**	**329**	**325**	**322**	**313**	**342**	**363**	**3,798**

Rail links

As described in the Feasibility Study (2013), all rail infrastructure in the Port is owned and maintained by the TPA and consists of a combination of 1.000 m gauge (TRL and RAHCO network) and 1.067 m gauge (TAZARA network) rail infrastructure. Except for the rail transfer terminal at the container terminal, there are no dedicated areas for rail cargo handling within the Port. The rail network was designed to allow railway wagons to be shunted along the quay when the slow rate and small scale of general cargo operations allowed a high percentage of direct delivery to rail transport. Additional lines running on the landward side of the transit sheds allowed loading/unloading of longer stay or seasonal cargo stored under cover in break-bulk form. The performance of the railway in transportation of goods is very low due to lack of wagons, locomotives and the poor condition of the rail system caused in most cases by frequent washouts during heavy rains and lack of maintenance. Overall freight transported by train has declined over the years (Figure 4-6), though details of numbers of wagons was not obtained.

The TAZARA line runs from Dar es Salaam through the South West Corridor to Zambia. TAZARA enters the Port near Gate 8 and runs to the TICTS container terminal. Another line runs to the break bulk terminal. TRL enters DSM from south-west and is connected to Gate 14 and Gate 16. Its main marshalling yard is a few kilometers from the Port in Ilala; a second yard is next to the imported cars parking lot close to Berth 1, thus mainly used for Port traffic (Figure 4-7). The TRL rail network serves the transportation of all cargos, including containers through Central Corridor and Northern Corridor. Rails also exist for the dock cranes, many in need of service (Figure 4-7).

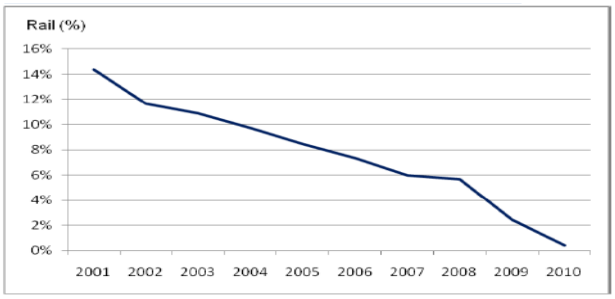


Figure 4-6 Rail volumes (as percentage of total port throughput). Source: TPA Presentation 2011.

Figure 4-7 Freight train pulling loaded wagons in front of the Port Operations Office with the rear of the storage shed No. 5 in the background (January 2016) and part of the existing railway track network in the Port, close to dock edge at Berth1, that will be removed under the rail link improvements of Phase 1 DSMGP (January 2016).

Truck traffic in and around the Port

The is a noticeable number of trucks entering and leaving the Dar es Salaam Port, especially through Gates 3, 4 and 6 (at the TICTS). Cargo include bulk (typically wheat grain, fertiliser, coal and clinker), loose cargo (in sacks or packaged) and containers (via the TICTS and the main berths). Obtaining data on the number of trucks that enter and leave the port over a year has been a challenge, but data from the TICTS part of the Port is available and indicates that between January and October 2015, averaged 21,740 truck visits per months, totalling 217,398 truck visits over the period that entered the facility and spent on average between 1 and 3 hours inside (TPA data).

These data provide at least one baseline against which future changes can be monitored, though they are not directly related to the parts of the Dar es Salaam Port that will change as a result of Phase 1

improvements. The unloading of a single large grain bulk carrier may require over a thousand trucks visits, which will no longer use the berth apron areas but take on grain at the silos close to Bandari Road. Data are thus missing for this component of the baseline.

4.2.4 Bulk wheat handling

Unloading of this specific type of cargo is one of the focus activities of Phase 1 Port modifications under the DSMGP. Data on bulk wheat grain provided by TPA deliveries and workforce associated with the discharge of the cargo for the years 2010 to 2015 (see Appendix 11), reveal a general increase in the volume of wheat and average number of personnel involved, as summarised in Table 4-2.

Table 4-2 Summary of bulk wheat grain deliveries from 2010 to 2015. Source TPA 2016.

Year	No. of vessels	Total no. days in port	Average vessel tonnage	Total tonnage delivered	Total no. man days	Average no. workforce per day during unloading	Range of no. of workforce involved in unloading
2010	26	131	25,732	669,048	14,176	104	42 - 167
2011	32	178	19,914	637,269	15,565	87	35 – 170
2012	40	220	24,596	938,847	22,282	100	22 – 226
2013	35	202	28,722	1,005,273	22,410	117	57 – 168
2014	26	116	28,171	734,456	15,383	136	72 – 240
2015	35	212	27,547	964,153	25,296	121	47 – 225

The workforce associated with the unloading of bulk wheat grain is divided between at least eight categories, the main ones being forklift operators, labourers, foremen, supervisors, operations officers, tally checkers, sweepers and mooring rope handlers. The average workforce figures shown in Table 4-2 cover three work shifts, thus there are usually between 30 and 45 workers involved on any single eight-hour shift. Of these, 60 % are labourers and sweepers combined, a casual labour manpower supplied by the labour agencies associated with the Dar es Salaam Port (see Section 4.2.5).

In order to verify manpower associated with unloading bulk grain, an observer was positioned at Berth 7 to periodically count the number of personnel seen associated with the unloaded of bulk grain from the bulk carrier Tiger Shanghai with a cargo of 44,000 t of bulk wheat grain (on 11 and 13 January 2016). Three hoppers were in use (see Figure 4-2B) and the operation lasted several days, with the vessel having to be re-located to Berth 3 after five days. The number of personnel observed during a day-time shift was 31 on one day (during which time 14 truckloads were filled), and 20 personnel on the second day (during which six truckloads were filled). It was clear that some of the personnel provided were not visible, being inside the cargo hold, operating the cranes, or on standby but out of sight (such as mooring rope assistants). Nevertheless, these observations corroborate the data provided by TPA. The entire consignment was purchased by Bakhresa Group, with none being delivered to the TPA grain silo (Figure 4-8) which is not operational.

Figure 4-8 TPA grain silos close to Bandari Road. Not in use due to poor condition of the installations.

4.2.5 Employment and services in and around the Port

There are two main forms of employment within the Dar es Salaam Port, those employed by TPA and those provided by labour agencies. In addition, a number of service providers utilise the Port, such a cleaning and waste collection services, food and provision suppliers (ship chandlers), health and medical services, banking and financial institutions, the TRA offices and offices of the shipping agents. Some of the main ones are described in more detail below.

TPA employment

Dar es Salaam Port has 2,594 permanent employees of whom, 2,011 employees are male and 583 employees are female. Contracted employees are 26 of whom 15 are male and 11 are female. In total, Dar es Salaam Port has 2,620 employees (Source: Director of Management Systems, TPA 2015).

Casual labour

Additional employment opportunities exist in the cleaning and stevedoring sectors, where an estimated 2,000 personnel are engaged (see Table 4-3). These are provided by the labour agencies (see below) and monthly details of casual labour employed by TPA are recorded (see Appendix 12). Greater numbers of labourers are needed with loose cargo that needs to be physically handled, such as bagged goods, compared to containerised or bulk cargo. These are casual labourers mostly, engaged through three main employment agencies. Conditions of employment is based on health and skills set. The daily wages meet the legal minimum wage, though benefits such as pension funds and health insurance are not provided to casual labourers.

In case of injury to workers, laws related to workers' compensations and insurance packages exclude casual labourers, and they are not entitled to any form of compensation (pension, insurance etc.). Unless TPA has, set requirements, which need to be incorporated in contractual agreement with third parties that all workers contracted with third parties regardless of their contractual status, will be entitled to medical treatment/pension funds etc.

Section 9.-(1) of National Health Insurance Fund (NHIF) states that; each employer shall make a monthly contribution to the Fund of an equivalency of 3% of his employee's salary. This applies to workers with contracts and not casual labourers

The Act also states that any private company wanting to register its employees with the National Health Insurance Fund should consider the following:

- Minimum salary for the lowest paid employee should not be less than the minimum wage set by the Government.
- Only permanently employed workers will be able to be registered. Employees on contract will be registered if they have a contract lasting a period of one or more years;

Any employer registered by the National Health Insurance Fund is required to implement all rules, regulations and laws of the National Health Insurance Fund.

Labour agencies

The principle ones are Portable Enterprises Limited, HESU Investment Limited, CHIKASA General Traders, TAN drivers HAI-SUB Investment Limited and Baga Investment Company.

Food Vendors (*Mamalishes*)

There are about 100-200 food vendors grouped in side streets off Bandari Road that provide mostly food services, serving between 30-50 customers per day. Potential customers are the long distance truck drivers, oil tank drivers and their assistants, of all nationalities. Countries of destinations are Rwanda, Zambia, Burundi, Democratic Republic of Congo, Malawi and Zimbabwe. Some of the female employees among the food vendors also provide sexual services to the drivers and other port users.

Shipping Agents

There are at least twenty agencies responsible for assisting vessels with port procedures. Notable ones for general cargo are SEAFORTH (wheat in bulk) and WOSAC (vehicles). Other shipping agents assist in with container shipping and handling valuable items. One ship can load maximum 20,000-40,000 t of wheat and has a length of 210 m. There are draft restrictions for some of the berths such as Berth 7 where draft restrictions is 10.5 m. Therefore, most unloading of wheat is restricted to vessels using Berth 7. Berth 7 is also prioritized for container vessels because unloading/loading a container can take a maximum of two days unlike wheat in bulk, which may take seven days or more to unload. Berthing delays is one of the factors, which causes in efficiency in the Port.

Table 4-3 Summary of categories and employment condition of the casual workers provide by labour agents.

Name of the agency	Portable Enterprises Limited	HAI- SUB Supplier	Baga Investment Company
Contract period with TPA	Two years	Two years	Two years
No. of labourers deployed/day	Approx. 200	200-500	Approx. 1,000
Gender	Nearly all Male	Nearly all Male	Approximately 70 % Female 30 % Male
Works performed	Lashing and unlashing	Freight and general cargo handlers, drivers at ro-ro terminal, drivers for fork lifters, crane operators	Cleaners
Nodal Officer at TPA	Container Manager	Operations Manager	PHI Manager
Peak seasons	October – December During this time, up to 800 persons are deployed	NIL	NIL
Source of labourers	Dar	Dar as well as outside Dar	Dar
Shift duration	Eight hours	Eight hours	Eight hours
Daily wages (weekdays)	Unskilled labourers: TZS 9,000/ Shift	Unskilled labourers: TZS 9,000 / Shift Skilled labourers: TZS 10,000 / Shift Drivers: TZS 1,500 / Unit Machine handlers : TZS 2,000/unit	Unskilled labourers: TZS 9,000/ Shift
Daily wages (weekends/holidays)	Unskilled labourers: TZS 18,000/ Shift	Unskilled labourers: TZS 18,000/ Shift Skilled labourers : TZS 20,000/ Shift	Unskilled labourers: TZS 18,000/ Shift
Method of recruitment	Health and skill wise assessment	Health and skill wise assessment	Health and skill wise assessment

4.2.6 Health facilities

The TPA provides medical services to the employees and families. TPA has one medical facility, a health centre at Dar es Salaam Port. The centre has six sections: clinical i.e. outpatient and inpatient (observation), laboratory, theatre, reproductive children health, x-ray and special clinics (TB and leprosy, diabetic clinic, hypertensive clinic and care and treatment centre).

The facility has 44 rooms that are being used for different purposes. Information sourced from the Principal Medical Officer at the Port confirms that the facility has 12 beds for observation, consultation rooms, injection rooms, stores etc. The dispensary has a total of 50 staff, divided as follows: eight clinicians (comprising 1 medical specialist, 1 anaesthesia, 2 general practitioners, 4 clinical officers, 14 nursing, 1 senior nurse officer, 3 nurse officers, 6 nurse midwives and 4 nurse assistants). The laboratory comprises one Laboratory technician and an Assistant Laboratory Technician, while the Pharmacy includes two Pharmaceutical Technicians.

The most common diseases treated or attended to are malaria, diarrhoea, ear/eye infections, urinary tract infection, upper respiratory tract infection, HIV and trauma. The Dispensary is attending about 1,500 to 1,555 patients per month. Almost all drugs are available, including different types of antibiotics and

analgesia. All drugs are being bought from suppliers through tender procedures, following Public Procurement Regulations.

As the dispensary is meant for staff and their families only, all payments are covered by TPA. As the need for referral arises, the dispensary refers patients directly to either Muhimbili National Hospital or Muhimbili Orthopaedics Institute, or if only special investigation are required e.g. CT scan or MRI then the patients are being referred to either Aga Khan or Regency Hospital. All members in the project area including residents of Kurasini Ward and general public can access at own medical services offered at the Port.

4.2.7 Water supply

The Port requires water for different purposes mainly used for supply to the ships and tugs, fire hydrants and fire tender, equipment and machinery cleaning, domestic purposes (drinking, cooking, sanitary), cleaning of compounds, watering of gardens, construction activities etc. The main sources of the water supply at the Port are from DAWASCO mains, 18 boreholes located around the Port area and supply by water bowsers to the designated areas. According to TPA, the quality of water from all sources comply with the Tanzanian national standards.

The average monthly water consumption at the Port is estimated to be 23,369.1 m³. This amount is insufficient for Port activities since the estimated quantity needed for full operation is twice as much, amounting to 46,738.2 m³. The expected water demand after project implementation is estimated to be 50,000 m^3 per month. Table 4-4 summarizes monthly water consumption from January – May 2015 (DAWASCO and water bowsers supplies).

Table 4-4 Water consumption at the Port Jan – May 2015. **Source**: Engineering Department, September 2015.

Months (2015)	Amount DAWASCO (m^3)	Amount Bowsers (m^3)	Total (m^3)
January	26,225	N/A	26,225
February	11,694	N/A	11,694
March	16,738	460	17,198
April	25,721	710	26,431
May	33,701	490	34,191
Total	114,079	1660	115,739
Average	22,815.8	553.3	

4.2.8 Solid waste management

The Civil Engineering Department handles solid waste management at the Port. Data recorded at Pugu Kinyamwezi landfill, for the random months sampled, shows that the daily average solid waste generation from the Port per was 8.9 t (Table 4-5). The Operations Department is the major waste generator. Wastes from construction and demolition activities represent approximately 10 % of the total waste, but this is not transported to the city's landfill. The types of solid wastes generated at the Port includes:

- Expired waste cargo such as maize, rice, cans, food etc. These wastes are destroyed under supervision and disposed at the dumping site;
- Office wastes such as newspapers, papers, boxes, empty bottles, empty food package;
- Bulk cargo such as wheat, toxin materials, fertilizers, clinker, copper lobe;
- General wastes such as broken tarpaulins, broken pallets, irons, packing materials (e.g. Wire, ropes, boxes, empty bottles), garbage, plastic bags, grass, leftovers, garden wastes etc.;
- Medical and infectious wastes: mainly generated by the Port's health centre is managed by the private Contractor. The wastes are collected and transported to Muhimbili national hospital (MNH) for incineration. Medical waste records are non-existent; and
- Wastes brought ashore by the visiting vessel and handled by private Contractors coordinated by the shipping agents engaging the particular vessel (though no data were found on volumes).

Table 4-5 Solid waste disposal at Pugu Kinyamwezi dump site from Dar es Salaam Port.

Months	Amount (t)	Number of Days/month	Average
February 2014	403	28	14.4
June 2014	376	30	12.5
January 2015	98	31	3.4
May 2015	168	31	5.4
July 2015	330.23	31	10.4
Aug 2015	229	31	7.4
Total	**1604**		**53.6**
Average	**267**		**8.9**

Source: Engineering department Dar Port.

The domestic and general wastes are collected from the source and temporarily stored at the transfer stations located adjacent to the Equipment Yard towards Gate No. 3 and at Kitopeni nearby KOJ (Figure 4-9). These two designated transfer stations aide collection of the solid wastes before the final disposal. From the transfer station, wastes are transported daily by using the Port's waste trucks to Pugu Kinyamwezi landfill site. The Port owns seven trucks and a wheel loader for waste management. Out of all trucks, only one is a compactor truck. Collection and transportation is done on a daily basis and TPA is charged 15,000TZS/tonne disposal fee at the landfill. The Kitopeni transfer station is located away from public gathering offices and it is mainly used to store wastes for a slightly longer time when the Port's trucks have mechanical problems (refer Figure 4-22, Section 4.3, addressing land use within the wider project area of influence).

An informal waste sorting is performed at the transfer stations, not at the source, whereby recyclables such as metals and plastics are sorted; and materials such as wooden pallets are re-used for storing bagged fertilizers at the fertilizer godown. This is an effort towards reducing the amounts of wastes disposed at the landfill and an additional income-generating activity for the workers.

Figure 4-9 First waste transfer station adjacent to the Equipment Yard (left) and Kitopeni transfer station nearby Kurasini Oil Jetty (KOJ) (right).

Further, it is common to find fertilizer and grains spillage at the fertilizer godown and grain terminal respectively. This is due to unloading, bagging and loading operations. Normally, the spilled fertilizer is re-collected and re-bagged by using bagging machines available at the Port.

In case of hazardous consignments, the Port has a direct delivery arrangement whereby the Port does not keep any hazardous consignment; it has to be delivered to the intended client/destination immediately. The consignment's paper work is done ahead of time and haulage trucks are prepared before the ship's arrival. Upon docking, the cargo is unloaded from the ship and loaded directly to the trucks ready for transportation.

The liquid and solid wastes that comes with the ships are handled by ship agents who provide various services to the ships. Different waste dealers are commissioned by the agent to collect and dispose wastes

as directed by authorities. TPA monitors the agents and conducts capacity building to the agents annually on the best industry practices for managing wastes.

The Port has developed a Waste Management Plan that is still at draft stage (see Appendix 6). The overriding long-term goal of the plan is to provide an environmental procedure that will serve as a guiding document on how to minimize, handle, contain, control, re-use, recycle and dispose of the waste generated at the Port. The Plan describes effort underway to "currently working to establish the ports waste reception facilities to handle and manage ship waste" (page 2).

4.2.9 Liquid waste management

There are two forms of liquid waste handled at the Port: that generated through usage of supplied water, resulting in liquid waste "brown" water entering sewage connections and cesspits around the Port, and the wastewater created during deck wash and from rain "grey water" that enters deck drains and in most cases are emptied into the sea.

Sewage and Brown Wastewater

Some parts of the Port are connected directly to the main sewer located along Bandari Road. These areas are civil engineering department, baggage room, marine police, harbour master, motor vehicle, Port manager, container terminal, operation manager, Sheds no. 5, 6, 7; ex-TANESCO, TAZARA office, TPA headquarter, Kurasini Oil Jetty (KOJ) and dockyard. The main sewer discharges wastewater directly to the sea. The existing network of stormwater drains at the Port discharges wastewater to the sea as well. However, the stormwater drain located at the Central Workshop is fitted with an underground oil-water separation chamber for skimming oil from water in order to avoid surface and groundwater contamination. The skimmed oil is re-tanked and either re-used or stored.

The remaining areas of the Port are served by cesspits, located at the Port's Human Resource Manager Office, Port supply depot, lighter quay wharf, Shed no. 5, NASACO, grain terminal, finance office, Port health centre, fire department, security department, and TPA headquarters. However, the cesspit at the TPA headquarter is connected to the main public sewer that discharges to the sea. Wastewaters from the cesspits around the Port are emptied by using trucks and disposed at Kurasini oxidation ponds located at Shimo la Udongo (Figure 4-10). The 5-set ponds is owned and operated by DAWASCO and used by both public and private institutions, commercial and residential establishments from around the city. DAWASCO charges disposal fee for each truck disposing off waste at the ponds.

Figure 4-10 Part of the Kurasini oxidation ponds used by TPA for disposal of liquid waste.

On average during dry season, the Port collects three to four trips of 9,000 litres of liquid waste per day; and 5 to 6 trips during rainy season mainly due to rainwater discharge. Thus, on average there are 4.5 trips/day. That is to say, average daily liquid waste generation is 4.5 x 9,000 = 40,500 litres that is being disposed at the oxidation ponds. From this existing situation, it is clear that, the proposed project activities will trigger more liquid waste generation. Therefore, the existing waste handling system will need to be upgraded and expanded to cope with the increased waste quantities.

Deck Wash and Storm Water Drainage

Storm waters drain directly into the Port at several culvert and drain openings along the berths and within Gerezani Creek (Figure 4-11). An updated map of the locations of the drains could not be obtained during the study, but historic drawings were found that provide some indication of the locations of some "outfalls" and drains (see Figures 4-12 and 4-13) taken from 1964 and 1975 drawings, respectively. The presence of some of these is obvious (see Figure 4-11) while other smaller drains and sewers are not so visible. Precise mapping all d rains and sewers will be an important task prior to back-filling the seaward portion of Gerezani Creek.

Additionally, the Port has developed and implements a Local Marine Oil Spill Contingency Plan (see Appendix 7). The objectives includes "b) To establish prompt response to either prevent pollution or restrict the spread of contaminants", implying both on land and in the sea. The plan outlines procedures that will be initiated by the TPA in the event of an oil spill within harbour limits. The plan also ensures the existence of an appropriate system for rapid detection and reporting of spillage or other noxious substances or of incidences related to the operation of shipping that may result in a spillage.

Figure 4-11 Portion of Berth 3 (left) showing gravity block structure and one of several storm water drains discharging dirty water into the Port, on a day of heavy rainfall (15 December 2015). There is concern that on days of heavy rainfall, spilt fertiliser from around the mid port shed also gets swept into the drains and discharged to sea. One of six drain discharging into the channel of the lower Gerezani Creek (on a non-rainy day), close to Malindi Wharf (right).

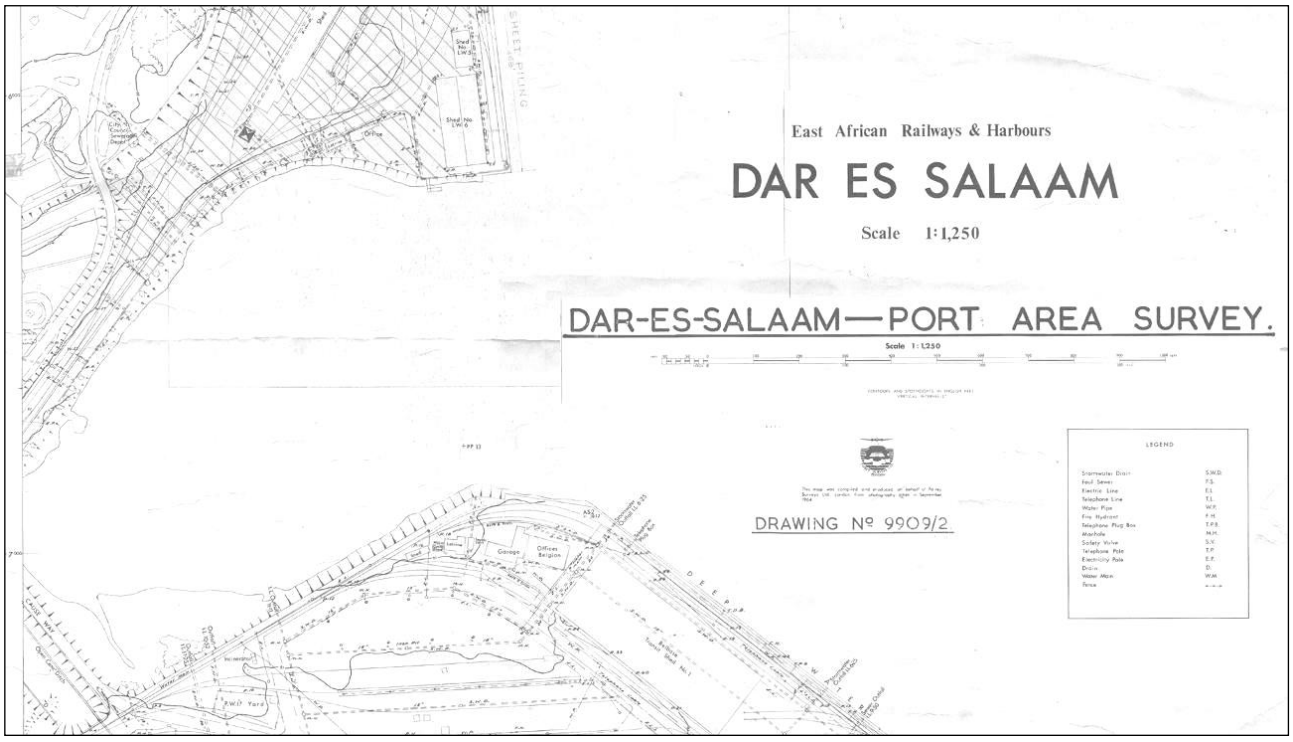


Figure 4-12 Excerpt from a 1964 map of the Dar es Salaam Port, extending from the Malindi Wharf to Berth 2, showing the locations of at least three outfalls (drains) along the southern shores of the seaward portion of Gerezani Creek.

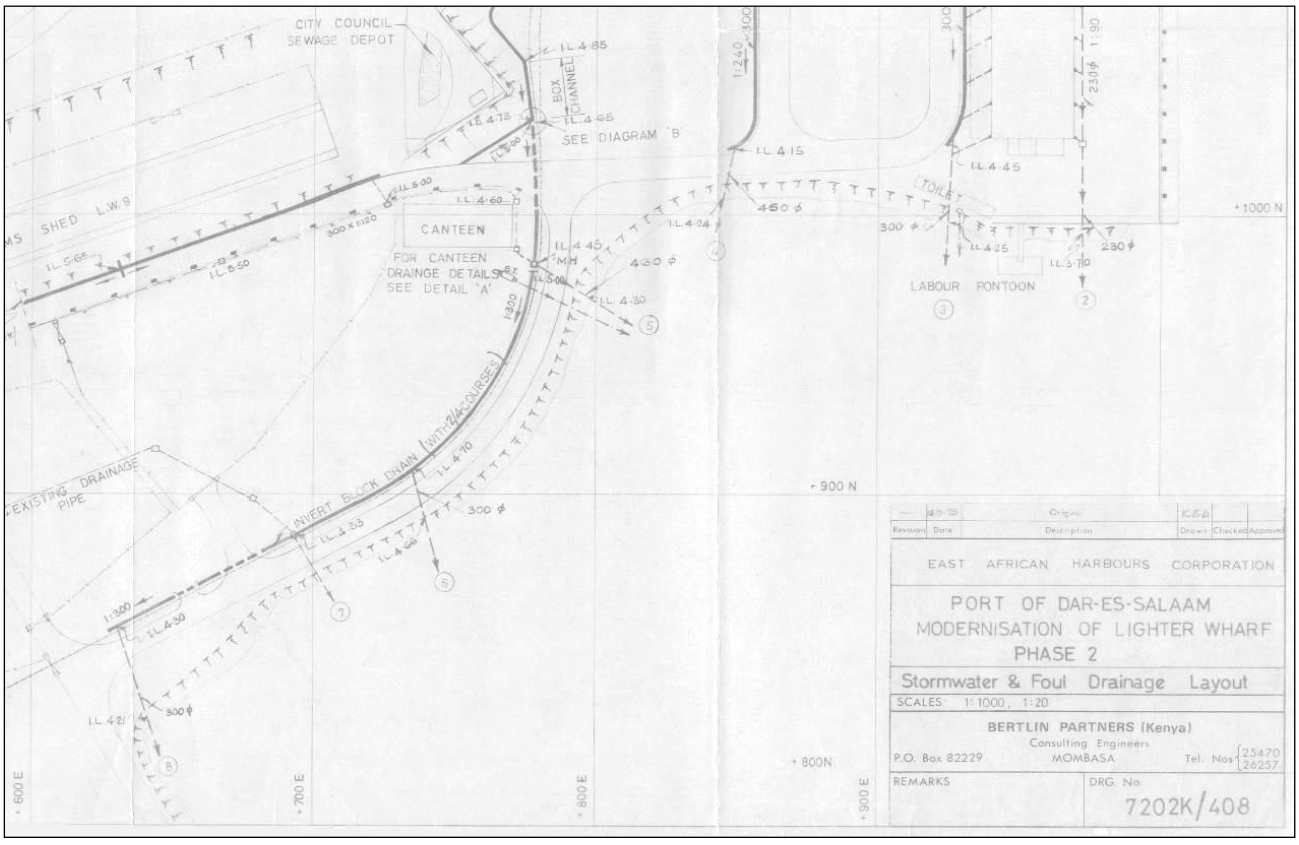


Figure 4-13 Excerpt from a 1975 map of the Dar es Salaam Port, showing six drains entering the northern side of the seaward portion of Gerezani Creek.

4.2.10 Energy

The Port utilizes two major sources of energy in its daily operations, TANESCO's national grid and back-up generators. From July 2014 to June 2015, the Port's electricity consumption was 5,068,371 KWH (23,648 KVA). Table 4-6 summarizes the TANESCO-supplied monthly electricity consumption from July 2014 to June 2015. With increased automated delivery of bulk goods proposed, the consumption and reliability of electricity supplied to the Port will need to be increased.

Table 4-6 Electricity use at the Port from July 2014 to June 2015 Source: TPA, September 2015

S/N	Month	KWH (Unit)	KVA (Unit)	Costs (TSHS)
1	July 2014	515,894	2,013	136,615,168.15
2	August 2024	345,616	1,634	96,916,067.98
3	September 2014	518,248	1,886	135,429,062.12
4	October 2014	428,353	1,882	113,963,896.82
5	November 2014	462,850	2,182	129,341,328.04
6	December 2014	224,929	1,065	154,513,242.76
7	January 2015	633,447	2,531	171,832,357.09
8	February 2015	503,684	2,749	146,448,312.00
9	March 2015	453,151	2,077	125,351,358.30
10	April 2015	446,392	2,185	123,491,320.68
11	May 2015	352,884	2,422	109,045,974.12
12	June 2015	182,923	1,022	111,698,344.40
Total		**5,068,371**	**23,648**	**1,554,646,432.46**

4.2.11 Revenue

The Dar es Salaam Port generates revenue and as per records obtained from the revenue department, there is an increasing trend from 2011 to June 2015 (Table 4-7).

Table 4-7 Dar Port Revenue collection (2011 – June 2015). Source: Director of Management Systems.

Category/Period	2014/2015	2013/2104	2012/2103	2011/2012
Operating Revenue	502,473,653,761.16	466,026,132,876.82	377,563,485,522.97	339,506,824,265.48
Non-operating revenue	42,966,562,172.83	21,940,706,877.87	4,311,304,383.17	2,529,848,525.14
Total	**545,440,215,933.99**	**487,966,839,754.69**	**381,874,789,906.14**	**342,036,672,790.62**

4.2.12 Ecological features of the port area

Within the project core area, there are three geophysical areas that required specific attention during the EIA, these are Gerezani Creek, which comprises two zones of interest (i) the inner Gerezani farmland and tidal mud flat (that is entirely within TRL land), and the (ii) seaward portion, where the future Ro-Ro Terminal is proposed, and a third area, the intertidal area south of Kurasini that supports the only intact mangrove forests on this shoreline (protected Forest Reserves under Tanzania Forestry legislation). Each of these are described in more detail below.

Other than the south Kurasini mangrove area (and some small fragments of mangrove forest on the eastern shoreline of the harbour), there are no other legally protected and/or internationally recognised areas within the DIA or even in the wider IIA. Note: for the assessments that follow, all geo-location reference data from survey points are plotted on a map (Figure 4-14), with details compiled in Appendix 13.

Gerezani Creek

The Gerezani Creek area can be divided into two main portions, the inland Gerezani farmland and reed bed area (of 8,285 m²) and adjacent tidal mud flat area (of 9,304 m²) - with area data derived from a July 2015 Google Earth image (see Figure 4-15) - and the seaward Gerezani estuary that is planned for backfilling to form the Gerezani Ro-Ro Terminal main car parking area, at least to begin with. The farmland and tidal mud

flat area is located entirely on land that belongs to the Tanzania Railways Limited (TRL), and separated from the Port area by a tall (2-3 m) wall along the inner port road between Gate 14 and Gate 2, inshore of the existing lorry/truck parking area (see Figure 4-15). The mud expanse visible during the Consultant's visit was a feeding ground for Sacred Ibis (15 birds seen) and smaller waders, with the inland and border areas cultivated with small mixed areas of sugar cane, bananas, cassava, ground nuts and other seasonal crops. All other vegetation, representing a minor coverage compared to cultivated plants was grasses and sedges, typical of a freshwater flood-prone landscape. A single mangrove tree (*Avicennia marina*) was seen on the southern bank, possibly 5-10 years old, suggesting that seawater may at times have penetrated the farmland and tidal mud flat bringing propagules with it.

The exposed area of the tidal mud flat has increased in size over the last eight years, to an area with a larger exposed mud expanse (see Figure 4-15). The change possibly results from changes to land use in surrounding areas with increases in flash floods and volumes of surface water drained into the farmland and tidal mud flat during heavy rain. Also, the principle stream feeding the farmland and tidal mud flat (Figure 4-16) emanates from beyond the PUMA fuel depot direction and may be carrying increased vehicle and equipment wash and other wastewaters.

During the low tide visit to the upper Gerezani farmland and tidal mud flat (13 January 2016), TPA staff explained that seawater did not enter the mud flats and farmland thanks to the efficient flap gate installed at seaward culvert (Figure 4-17 E). However, inspection of time series of satellite images revealed that during high tide, water levels inshore of the flap gate rise (see Figure 4-15). A second visit was made during high tide (16 January 2016), which confirmed a fully flooded area (see Figure 4-17 A). Salinity readings taken using a hand-held field probe (HACH SenSION5), with station locations shown in Figure 4-14, confirmed higher salinity towards the flap gate (7.0 ppt) inside the Gerezani mud flat area (station 54), and 1.1 ppt located 200 m inland, among banana trees and sugar cane (Station 51). Salinity measured outside the flap gate, during low tide, recorded 4.0 ppt. Based on these observations, it is obvious that seawater does penetrate into the inner Gerezani tidal mud flat area during high tides, but the flow rate is probably restricted by the culvert flap gate. Slight increases in sea level and/or compaction and lowering of the land within the farmland and tidal mud flat may have also contributed to the increase in the flooded area over time. The overall conclusion is that water from the sea penetrates the inner tidal mud flat, and that waters are at times restricted from flowing seaward during high tide. At times of heavy rainfall coinciding with high tide the flooded area within the inner mud flat is likely to expand. The Feasibility Study (2013) estimated that the rain catchment of Gerezani Creek covered an estimated 6,420,000 m^2 and that during a six hour tropical storm, the flow rate could reach 32.6 m^3/sec. The proposed new culvert, extending from the road and existing culvert (see Figure 4-17 E) must consider these flow rates so that the design allows flows to be maintained and to avoid water backing up inside the farmland and tidal mud flat area and potentially flooding nearby roads.

Gerezani Creek is not seen as such a "highly fragile ecosystem" as the Feasibility Study (2013) suggest, though it is likely to a minor extent to naturally filter some pollutants from the main stream as it meanders through the farmed land and small reed beds before it eventually discharges into the harbour. Likewise, the existing culvert flap gate probably delays the speed of water ebb out of the flooded area thus aiding sedimentation within the inner tidal mud flat, potentially inadvertently trapping sediment and pollutants brought by the main stream that appears to be heavily polluted. No particularly sensitive or endangered plant or animal life was seen in the area – most of the land is farmed with a small reed bed to the west – and it is unlikely that this small area contributes to marine productivity in the adjacent harbour waters.

Impact on the Gerezani Creek (farmland and tidal mud flat area) from the construction of the proposed Ro-Ro Terminal is unlikely, so long as the culvert is designed to accommodate the required flows (see above) and provided that access to any new culvert and flap gates is maintained for servicing to ensure free flows in and out of the Creek (shown in Figure 2-6). Any existing threat to the area comes not from the port operations (present or future) but from the drainage emanating from the surrounding built up areas and roads. The exception to this is only an accidental significant spill of oil or other noxious substance that enters the Creek during a flooding tide.

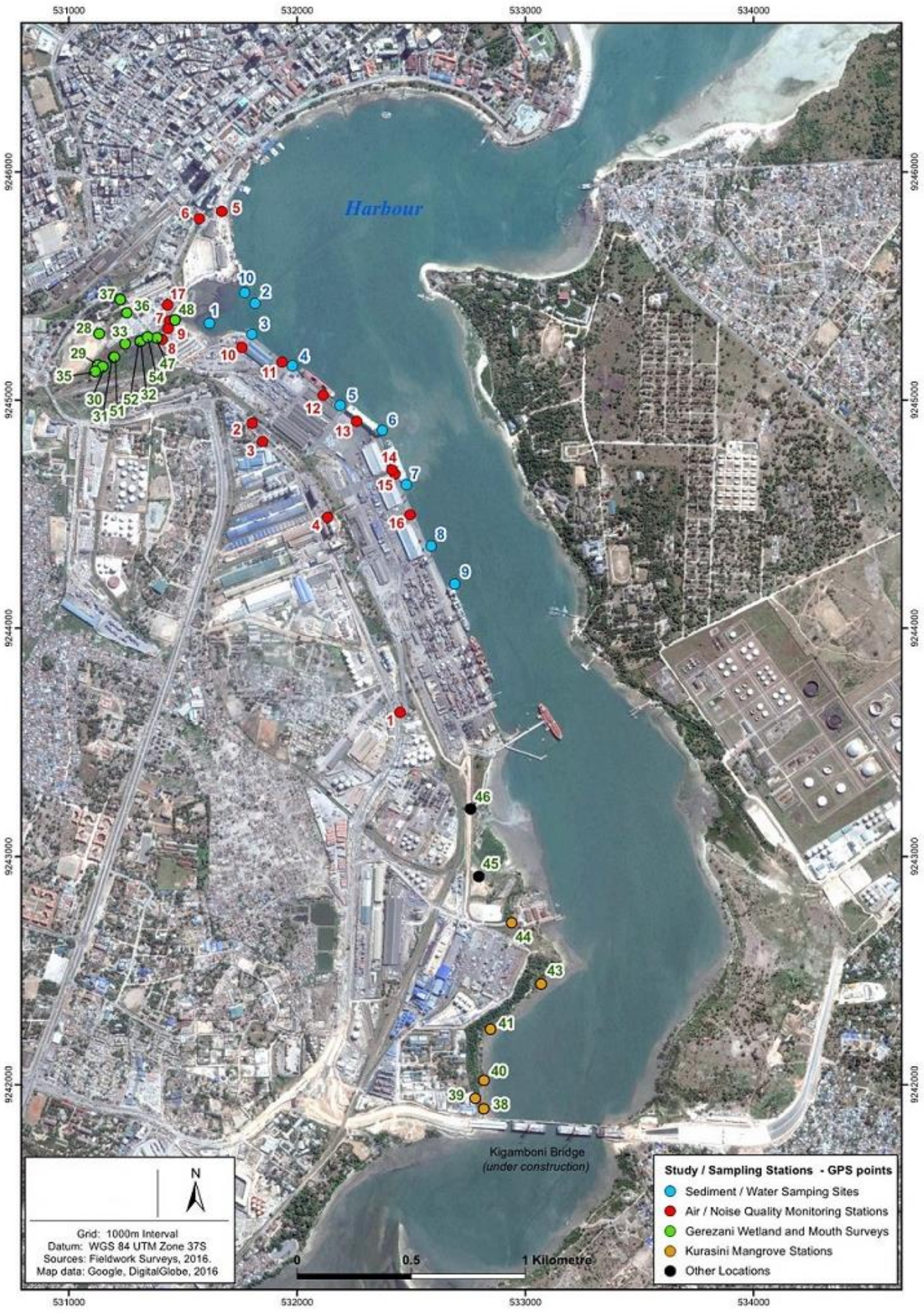


Figure 4-14 Locations of study and sampling stations shown on a satellite image of the Dar es Salaam Port area. Sources: COWI Tanzania Ltd. 2016.

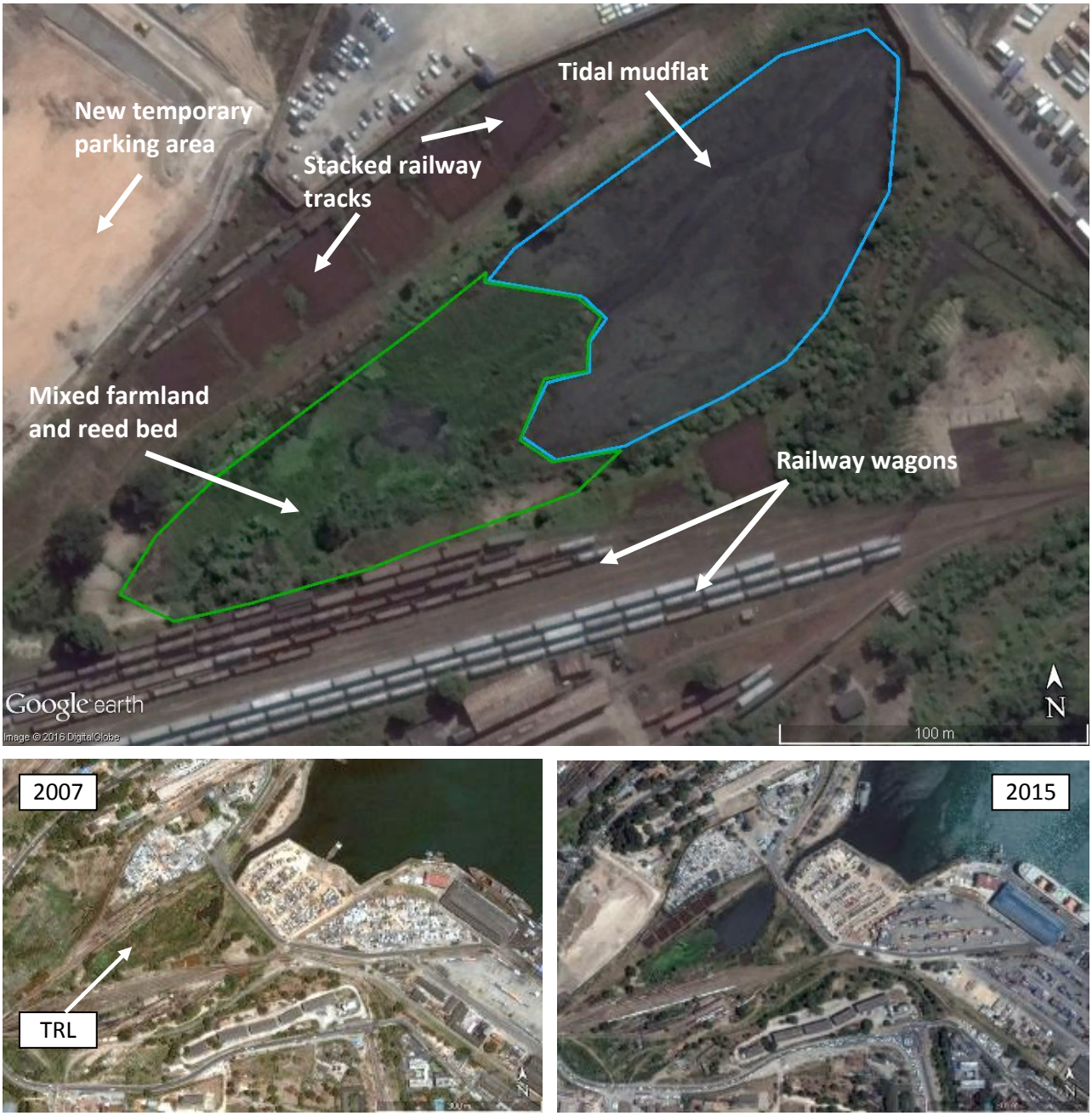


Figure 4-15 Satellite views of inner Gerezani Creek (owned by Tanzania Railways Limited) and the outer Creek area (site of the proposed Ro-Ro terminal). Upper: July 2015 image showing the inner Creek portion comprising farmland and reeds (8,285 m²) and tidal mud flat (9,304 m²); bottom left: February 2007 and (bottom right) March 2015, both during high tide, showing the significant increase in the tidal mud flat flooded area (all within TRL land), and changes in land use in the upper left portion of the image, from agricultural to bare surface (future TPA temporary vehicle parking area, as indicated in the upper image). Source: Google Earth.

Figure 4-16 Views of the upper Gerezani farmland area (January 2016). (a) Main stream that feeds the Gerezani farmland area, with cloudy, milky water; (B) view of the stream extending from the Bandari Road area, with PUMA fuel depot in background; (C) Gerezani inner mudflat 2 ½ hours after spring high tide; (D) inner mudflat during spring low tide; (E) single drainage gate, exposed during low tide; (F) Same drainage gate immersed 2 ½ hours after spring high tide; (G) Seaward view of the culvert showing flap gate; (H) Close-up of flap gate showing slight opening (ca. 2 cm) (I) Outer Gerezani drainage channel; (J) Partly exposed mudlfats of Gerezani estuary during half tide.

Harbour Mangroves

There are two areas of mangrove within the Harbour: the intact fringe at Kurasini and the highly degraded and fragmented remnants of a fringing mangrove strip on the eastern shoreline. Neither area is likely to be impacted by the activities in Phase 1. Any temporary elevated turbidity associated with dredging is unlikely to affect mangroves that are accustomed to mud and silt environments.

A visit to the Kurasini fringing mangrove stretch was conducted in January 2016 to establish the condition and extent of the forest. A standard rapid assessment survey was undertaken, recording the width from the upper shore to the lowest shore mangrove root or seedlings, general observations on the number of seedling and species present, and a sample of tree girth, taken a breast height (Figure 4-17).

Mangroves are a protected Forest Reserves in Tanzania, in recognition of their role as nursery for fish and crustacean, in protecting the shoreline from erosion, trapping sediment and a source of numerous products. A survey of the mangroves was conducted on 13 January 2016 that involved walking the entire length of the shore, from the base of Kigamboni Bridge on the Kurasini side, to the TPA Workshop (approximately 900 m). Along the stretch, four survey stations were selected where the width of the mangrove fringe was measured, notes taken on species composition and the girth of the largest tree at the station was measured at breast height. The survey revealed that the fringe is narrow throughout its length, rarely exceeding 100 m in width, backed inshore by a steep vegetated slope, dominated by ornamental and exotic trees and shrubs plus some coconut and Indian Almond trees. Mangrove assemblages was dominated by *Sonneratia alba* and *Avicennia marina*, with scattered smaller *Rhyzophora mucronata*. There were numerous seedling, and evidence of cutting.

Figure 4-17 South-west Kurasini fringing mangrove forest viewed from the Kigamboni Bridge (left) and Consultants measuring the width of the narrow forest fringe during low tide.

4.2.13 Marine and coastal physical features

Ocean Currents

The Dar es Salaam coastal waters are influenced by the East African Coastal Current (EACC), which is also referred to as a western boundary current. This current is in turn influenced by the southern and northern monsoons. During the strong southern monsoon (Kusi, April - October), winds accelerate the East African coastal current which become much stronger during this period with velocities of up to 2 m/s occasionally reaching 3.5 m/s. Tidal currents however, have the strongest influence inside the harbour. The average speed obtained measured in port channel drogues over the tidal cycle is 0.25 m/s whereas the maximum speed is 0.5 m/s. The results agree very well with direct current meter measures with daily maximum speed of 0.3 m/s during the neap tide and 0.75 m/s during spring tide (Lwiza, 1994). The slight deepening of Berths 1 to 7 and construction of the Gerezani Ro-Ro Terminal is not likely to affect the local currents.

Tides

Semi-diurnal characterized by two occurrences of both high and low waters within a day. Mean tidal range is 3.2 meters at spring tides and the mean neap tide range is about 1.0 meter. Spring tidal range is approximately 4.5 m.

Tidal currents

Tidal current measurements taken at the entrance channel to the harbour (Sanga and Dubi, 2004) indicate that the ebb currents are significantly higher than the corresponding flood currents. Maximum current speeds at the entrance channel were about 55 cm/s while maximum flood currents were about 20 cm/s. Further upstream at the confluence of the creek with the Kizinga and Mzinga Rivers, maximum ebb currents were about 55 cm/s (Figure 4-18) against the maximum flood currents of 35 cm/s (Mgaya et al., 2004). The tidal current speeds in the vicinity of the proposed terminal site are therefore weaker than the tidal current speeds measured at the harbour entrance (Sanga and Dubi, 2004) as well as those measured at the creek head further south (Mgaya et al., 2004). The slight deepening of Berths 1 to 7 and construction of the Gerezani Ro-Ro Terminal is not likely to affect the local currents.

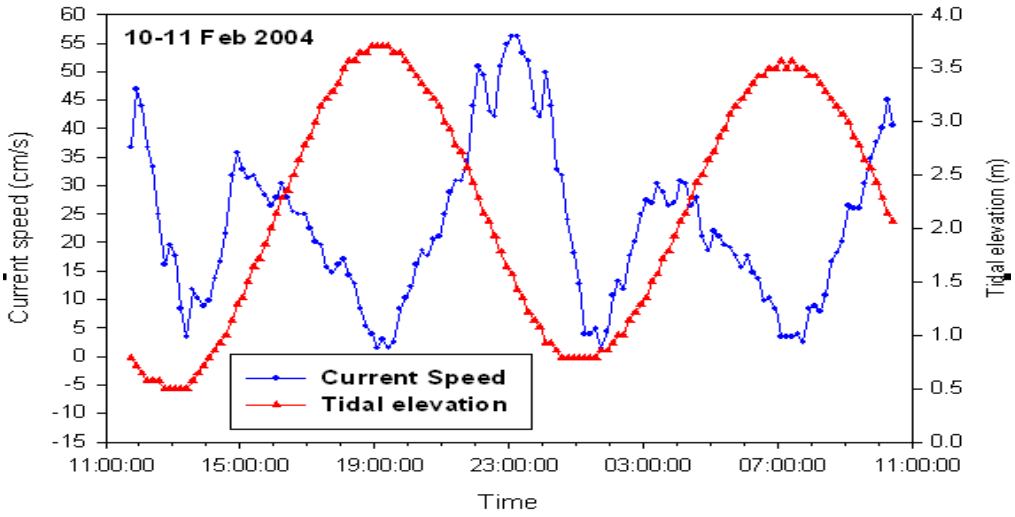


Figure 4-18 Tidal current speed at the confluence of the tidal channel of the Dar es Salaam harbour with the Kizinga River. Source: Mgaya et al. (2004).

Waves

Wave action is very low in the area; with an average wave height of 0.2 m, likely attributed to the bay characteristics, the surrounding island of Dar es Salaam Marine Reserves, which play an important role in refracting and diffracting the waves. During the southeast monsoons, waves are entirely aligned to the wind direction; they are sometimes from southeast and sometimes from southwest.

Figure 4-19 Recording position, depth data and water clarity data, and labelling sample containers (left), collection of water samples (centre) and extraction of sediment from Van Ven Grab (right), aboard the TPA Mooring Boat (15 December 2015).

Marine sediment grain size analysis

Under the present study, ten sediment samples were collected from the area designated for dredging. A Van ven Grab was used, sampling the surface of the sediment (see Figure 4-19). After wet-sieving through a set of six sieves (from 2.0 mm to 0.063 mm) grain size distribution was determined (Table 4-8). The results reveal a wide spectrum of grain size fractions, with some comprising mostly coarser sand, and others dominated by fine sand and silt. Based on these results, no firm recommendation can be made that the material be used for backfilling at Gerezani. A much more comprehensive sampling (including deeper cores) has to be undertaken prior to dredging in order to assess the suitability of the dredge material for backfilling.

Table 4-8 Grain size results (percentage fractions) from ten sediment samples collected between Malindi Wharf and Berth 8 (15 December 2015). Percentage fractions greater than 20 % are bolded. Station locations are shown in Figure 4-14 with GPS data provided in Appendix 13.

Type of sediment	Grain size	Stations									
		1	2	3	4	5	6	7	8	9	10
		Gerezani bay	Gerezani mouth	Berth 1	Berth 2	Berth 3	Berth 4	Berth 5	Berth 6	Berth 7	Gerezani mouth (N)
Granule	> 2 mm	4.0	3.9	**22.9**	5.7	17.5	3.2	2.4	2.7	1.9	4.3
Very coarse sand	1 - 2 mm	4.5	4.6	6.2	12.9	**32.8**	14.1	6.2	**44.9**	7.7	**31.2**
Coarse sand	0.5 - 1.0 mm	10.0	1.7	7.3	**34.6**	**21.4**	**28.5**	5.4	4.0	3.0	**21.2**
Medium sand	0.25 - 0.5 mm	16.8	**20.4**	15.7	**23.1**	14.1	**25.2**	12.1	4.7	9.2	**23.2**
Fine sand	0.125 - 0.25 mm	19.7	17.0	10.1	8.7	5.2	10.5	16.4	7.0	17.4	12.7
Very fine sand	0.063 - 0.125 mm	**29.4**	19.5	6.2	2.9	1.9	2.0	10.8	4.1	8.4	6.1
Silt and clay	< 0.063 mm	15.7	**32.8**	**31.6**	12.1	6.9	16.5	**46.7**	**32.5**	**52.3**	1.2

Sediments Analysis

Metals in seawater and sediments are often bound to organic particulate matter. As seabed sediments often consist of quartz and calcium carbonate (remains of seashells, etc.), the metal levels in such sediments are often low (as the levels of organic matter is low = low LOI = Loss of Ignition). The results of the analysis of sediment samples in the present survey (undertaken by SGS Laboratories, see Appendix 14) show low levels, even below the detection limits for some of the most important metals (Cd, Hg, Pb, Cu), see Table 4-9. Zinc levels at Berth 1 sediment were 1.1 mg/kg.

The Swedish EPA environmental quality criteria for seabed sediments, has the following guideline concentrations for metals in contaminated sediments (SNV 2006):

Metal	*As*	*Pb*	*Cd*	*Cu*	*Cr*	*Hg*	*Ni*	*Zn*
Concentration (mg/kg)	*45*	*110*	*3*	*80*	*70*	*1*	*100*	*360*

Concentrations less than these are considered “safe”, while concentrations between these and less than a factor 3 higher are considered “moderately serious”, a factor 3 to 10 higher “serious”, and >10 “very serious”. Compared with these concentrations, the levels found in the sediments in the area studied were all classified as ‘safe’. Hence, from the data obtained (Table 4-9), it is safe to assume that heavy metals do not pose a threat to marine life in the areas sampled.

Total petroleum hydrocarbons in sediments from Berth 1 and Gerezani Bay exceed 100 mg/kg (Table 4-10). The results of studies of hydrocarbon in sediment, summarized for example by the National Research Council in the USA (NRC 2002), show that sediment concentrations of petroleum hydrocarbons in areas far from urbanized coastal areas often range from 20 – 50 mg/kg. Concentrations in the range of 50 to several hundred mg/kg are often found in coastal sediments where anthropogenic activities are intensive. Hence,

in densely trafficked ship channels, near marinas and ports, levels often show concentrations of several hundred mg/kg. Near water-cooled oil refineries and oil terminals, the concentrations may be 1,000 to several thousand mg/kg. From a toxicological standpoint, it is generally considered that biological effects of oil in sediments start to occur among the more sensitive organisms at levels in the 50 – 100 mg/kg range. More resistant organisms can tolerate concentrations in the range of 1,000 to a few thousand mg/kg. The sediment at the mouth of Gerezani Creek is thus polluted by oil at levels that will affect sensitive marine life. The samples from the other sites showed levels half or significantly less, suggesting much less oil pollution.

Table 4-9 Sediment heavy metal results from ten sediment samples collected between Malindi Wharf and Berth 8 (15 December 2015). Station locations are shown in Figure 4-14 with GPS data provide in Appendix 13.

Stn No.	Location	Hg mg/Kg	Cd mg/Kg	Cr mg/Kg	Co mg/Kg	Cu mg/Kg	Pb mg/Kg	Ni mg/Kg	Zn mg/Kg
10	Gerezani-Malindi Wharf	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.012
1	Gerezani Bay	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.20
2	Gerezani Mouth	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.004
3	Berth 1	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	1.1
4	Berth 2-3	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	<0.001
5	Berth 3-4	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	<0.001
6	Berth 4-5	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.020
7	Berth 6	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.062
8	Berth 7	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.12
9	Berth 8	<0.001	<0.001	<0.001	<0.003	<0.001	<0.005	<0.004	0.067

Table 4-10 Sediment oil, organic matter and TBT results from ten sediment samples collected between Malindi Wharf and Berth 8 (15 December 2015). Station locations are shown in Figure 4-14 with GPS data provide in Appendix 13.

Stn No.	Location	PHC mg/Kg	OM mg/Kg	PAH mg/Kg	BTEX# mg/Kg	OCPs# mg/Kg	TBT mg/Kg
10	Gerezani-Malindi Wharf	14.5	124	<0.00002	0.004	<0.00001	<0.005
1	Gerezani Bay	185	368	<0.00002	<0.001	<0.00001	<0.005
2	Gerezani Mouth	59.5	132	<0.00002	<0.001	<0.00001	<0.005
3	Berth 1	105	68	<0.00002	<0.001	<0.00001	<0.005
4	Berth 2-3	2.0	68	<0.00002	<0.001	<0.00001	<0.005
5	Berth 3-4	26.0	48	<0.00002	<0.001	<0.00001	<0.005
6	Berth 4-5	<1.0	52	<0.00002	<0.001	<0.00001	<0.005
7	Berth 6	37.0	288	<0.00002	<0.001	<0.00001	<0.005
8	Berth 7	65.0	352	<0.00002	0.004	<0.00001	<0.005
9	Berth 8	59.5	224	<0.00002	0.004	<0.00001	<0.005
PHC Petroleum hydrocarbons; OM Organic matter; PAH polycyclic-aromatic hydrocarbons; BTEX Benzene/Toluene/Ethylbenzene/Xylenes; OCP Organo-chloride pesticide; TBT Tributyltin.							

Results for organic matter testing revealed the highest levels (368 mg/kg) from station 1 at Gerezani Bay, which is not surprising, and from Berth 7 (352 mg/kg), with sediment from other stations ranging between 48 and 288 mg/kg (Table 4-10). Sewage discharges and spilt grain or other organic material will influence these nearshore sediments and no conclusions can be gained from the single sampling event. The more toxic compounds, represented by polycyclic-aromatic hydrocarbons, organochloride pesticide and tributyltin were recorded at extremely low levels, usually below minimum detection levels (Table 4-10) and thus cannot be posing a problem to the area. Nevertheless, high levels of PCBs and organochlorine pesticide residues and heavy metals have been detected in Dar es Salaam harbour sediments, not from areas other than close inshore to the berths sampled in the present study (Machiwa, 1992; Mwevura et al. 2002).

Based on these results, the material from future Ro-Ro Terminal and Berths 1 to 7 can be dumped at sea because, on the whole, it is not heavily polluted. This is somewhat to be expected, as the samples were collected from areas previously dredged in 1998. However, since the samples were collected only from the

surface sediments, a more comprehensive study of material from greater depth in the sediment is required which should be conducted as part of the ESIA for the dredging of entrance channel and turning basin. The study shall be used to inform decisions on dumping of dredged material at sea.

Water Sampling

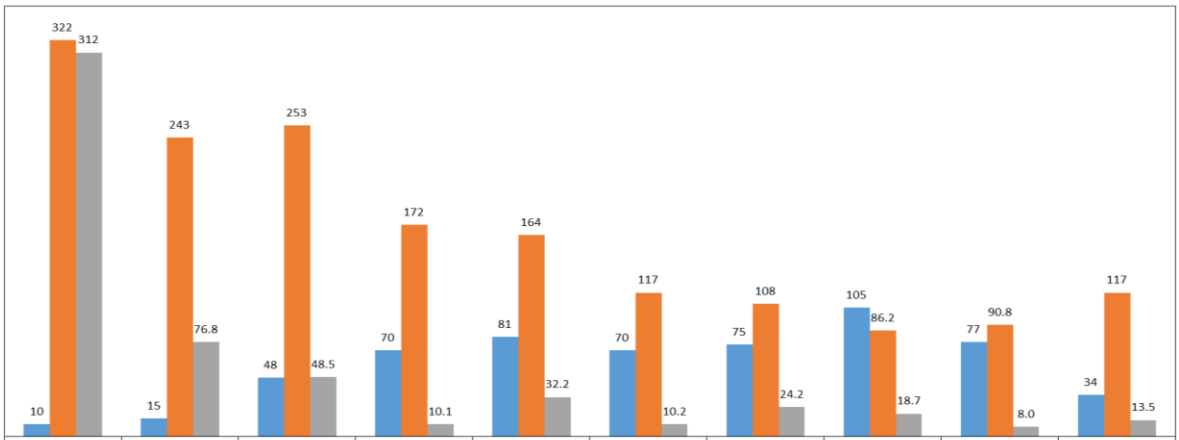
Under the present study, ten water samples were collected from the area designated for dredging. Four litres of water samples were taken from the same sampling stations from which sediment was sampled, as delivered to SGS Laboratories (see Appendix 15 for full results). On the date of sampling, there had been heavy rainfall, which persisted during the sampling. Storm water discharges from the various gutters and drains entering along the docks between Berths 1 and 8 were providing a steady flow of turbid water (see Figure 4-11).

Physical properties of water

The results of the water quality study confirmed the generally turbid waters along the Port at that time, with low transparency, ranging from the highest of only 105 cm (at Berth 6) to the lowest of 10 cm (within the Gerezani estuary area) (see Figure 4-20). As expected, especially on a day with heavy rain, total suspended solid levels were highest at the Gerezani-Malindi end of the Port, and lowest between Berths 4 and 8. Turbidity, measured in nephelometric turbidity units (NTU), can be caused by the presence of silt, sand and mud, bacteria and other germs or chemical precipitates. In the case of the Dar es Salaam Port, any of these agents may be present. NTU levels at the Gerezani-Malindi Wharf end of the Port, levels exceeded 300 NTU, while from Berths 1 to 7, ranged from approximately 8 to 32 (Figure 4-20) .

Seawater Conditions

From the brief analysis of water properties and chemistry, the waters with the Port area, between the Malindi Wharf and Berth 8 are turbid and slightly polluted with nutrients. The Tanzania Bureau of Standard (TBS) municipal wastewater discharge standard does not include nitrite concentration, dissolved oxygen, salinity and transparency parameters, but TSS is included and nearly all samples from the Port exceeded the tolerance limits. Municipal wastewater discharge standards for turbidity were exceeded only in the Gerezani mouth. The values of all other parameters were found to be within the permissible limits. The high value recorded for nitrate



	Gerezani- Malindi Wharf	Gerezani estuary	Gerezani mouth	Berth 1	Berth 2-3	Berth 4	Berth 4-5	Berth 6	Berth 7	Berth 8
Secchi depth (cm)	10	15	48	70	81	70	75	105	77	34
TSS (mg/l)	322	243	253	172	164	117	108	86.2	90.8	117
Turbidity (NTU)	312	76.8	48.5	10.1	32.2	10.2	24.2	18.7	8.0	13.5

Figure 4-20 Relative values for water transparency (Secchi disk depth), Total Suspended Solids (TSS) and Turbidity (nephelometric turbidity units - NTU), for the ten stations samples between the corner of Malindi Wharf with Gerezani and Berth 8 (15 December 2015).

Marine pollution in the Harbour

Dar es Salaam harbour receives pollutants from within and outside the Port environment. Generally, the marine ecosystem in the harbour is highly exposed to many sources of pollution. The major pollution sources include Port operations, harbour activities (maritime), urban drainage (streams, rivers and open channels), uncontrolled solid waste and liquid waste disposal in the city centre and urban periphery areas (directed in the storm water channels), the Kivukoni fish market, Kigamboni ferry operations, the sea outfall sewage pipe, leachate from Mtoni dumpsite, drainage from Kurasini bulk oil handling areas, underground seepage of liquid wastes from septic tanks, and from the Port operations themselves. The major concerns are drainage channels and natural water courses that bring in the harbour a variety of pollutants including sediments. The Gerezani Creek and Kizinga River are directly impacting on the harbour water quality through incessant ingress of polluted water. In the Kurasini area, a major drain emanating from the many fuel depots and container storage yards in the vicinity flows milky into the sea, close to the TPA (Figure 4-14, station 46). Other sources of pollution are the many small ships that lack waste receptacles (discharging directly into the sea), some of which is adds to the wind-driven solid wastes that accumulate in the Port area, especially the lower Gerezani Creek.

Municipal wastewater discharge standards for BOD were exceeded in nearly all samples, and nitrate concentration was exceeded at Berth 2-3 and Gerezani Bay (Table 4-11). Nitrites were also highest in surface waters from these two locations. The surprisingly high value recorded for nitrate at Berth 2-3 is possibly linked to the nearby fertiliser storage and bagging operations in the mid-port shed where spilled urea was noticed, and from around the docks where bulk fertiliser is discharged through hopers ad trucks, and likely to have been washed into surface drains during the heavy rain experienced on the sampling day. High nitrite levels associated with samples taken at Gerezani Bay are possibly linked to drains that discharge into this area as well as from the Gerezani main stream.

Table 4-11 Water quality results from ten water samples collected between Malindi Wharf and Berth 8 (15 December 2015). Station locations are shown in Figure 4-14 with GPS data provide in Appendix 13.

Stn No.	Location	Water depth (m)	Salinity ‰	pH SU	Phosphate mg/l	Nitrate mg/l	Nitrite mg/l	DO mg/l	BOD mg/l
10	Gerezani-Malindi Wharf	5.50	3.9	7.9	1.37	<0.01	<0.01	5.5	70.0
1	Gerezani Bay	2.17	28.0	8.0	1.29	8.2	0.71	<0.10	210
2	Gerezani Mouth	8.68	35.8	7.9	0.41	0.87	0.06	<0.10	120
3	Berth 1	9.67	40.0	7.9	0.02	0.15	0.02	5.3	27.0
4	Berth 2-3	9.13	33.7	7.7	4.96	28.1	0.65	3.9	100
5	Berth 3-4	11.00	39.4	8.0	0.19	0.60	0.06	5.1	90.0
6	Berth 4-5	10.47	38.2	8.0	0.12	2.1	0.15	4.5	110
7	Berth 6	10.63	36.1	8.0	0.26	1.5	0.22	4.7	100
8	Berth 7	12.83	37.8	8.0	0.01	<0.01	<0.01	4.3	90.0
9	Berth 8	11.60	36.6	8.1	0.08	<0.01	<0.01	5.7	80.0

4.2.14 Air quality

Over three days, air quality, noise and vibration was recorded hourly during the daytime and at night-time at predetermined locations (see Figure 4-14).

Suspended Particulate Matter (Dust levels)

Dust levels from the sampling points were determined by using the Casella Microdust Pro particulate monitor model 176000A. The MicroDust Pro complies with the EMC Directive 89/336/EEC of the European Union. It has been tested according to the standard delivery schedule and complies with the following standards: EN 50081-1:1992, EN 50081-2:1993. The equipment is capable of sampling dust in the range from 0.01 to 2500 mg/m^3 with a resolution of 0.001 mg/m^3 (1µg/m^3). The Microdust Pro measures

particulate concentrations using a near forward angle light scattering technique. Infrared light of 880 nm wavelength is projected through the sampling volume where contact with particles causes the light to scatter. The amount of scatter is proportional to the mass concentration and is measured by the photo detector. Samples were collected at a breathing height of approximately 1.5 meters above the ground for a period of at least six hours and a maximum of eight hours. A total of three readings were recorded in each sampling point, the average of which was the measured dust particulate level.

As summarized in Table 4-12, the daytime mean value of suspended particulate matter was 0.063 mg/m^3 for TSP and 0.032 mg/m^3 for PM_{10}. The night time mean value of suspended particulate matter was 0.054 mg/m^3 for TSP and 0.025 mg/m^3 for PM_{10}. The mean dust levels in both day and night hours are below the threshold limit value set by the TBS (TZS 845:2005), IFC (2007) and WHO-AQG (2006).

Compared to night hours, the day-time mean dust levels were higher for both TSP and PM_{10}. The high dust values recorded in few locations mainly Berth 7 and Gate no. 5 along Bandari Road were mainly contributed by the offloading of bulk wheat from the cargo ship and movement of trucks respectively. Detailed recordings of the dust levels in the project area are presented in Appendix 16.

Ambient gases

The ambient air quality (gas emissions) was assessed by using a portable desktop gas analyzer type KANE900 Plus and portable gas detector type GMI VISA model 66369BENX. The GMI VISA gas detector meets the European standard EN 61779, EN 50104 and EN 45544 with certification to ATEXII 1 G EEx ia IIB T3/UL913 Class I Group CD/EC. The gas detector undergoes automatic calibration once switched ON by pumping in fresh air into the sensors to allow toxic sensors to be set to zero and the Oxygen sensor to be set to 20.9 %. The gas detectors established the air composition characteristics by recording the proportions of oxygen (O_2) [%], carbon monoxide (CO) [mg/nm^3], hydrogen sulphide (H_2S) [mg/m^3], nitrogen oxides (NO_x) [mg/nm^3], sulphur dioxide (SO_2) [mg/nm^3], and carbon dioxide (CO_2) [%]. The CH_4 was measured using a methane meter. A total of five readings were recorded at each point and the mean value was used to represent the gaseous concentration at that particular point.

It was observed that all the surveyed points had enough ambient oxygen (O_2) to a mean value of 20.88 % and 20.84 % for day and night hours respectively (see summary in Tables 4-13 and 4-14). Scanty nitrogen oxides and sulphur dioxides (SO_2) below the TBS (TZS 845:2005) emissions limit were observed at some sampling locations. The gaseous contaminants of Carbon monoxide (CO), Carbon dioxide (CO_2) and Methane (CH_4) were not detected. That is, the undetected gases are present but in minimal concentration levels below the detection limit of the used methodologies as described above. Detailed findings of the ambient gases assessment are presented in Appendix 16.

Table 4-12 Summary of particulate matter (dust) emissions.

Point	Location	TSP (mg/m^3)		PM10(mg/m^3)	
		Day	Night	Day	Night
1	Gate no. 5 (along Bandari Road)	0.239	0.217	0.119	0.108
2	Grain Silos area	0.072	0.059	0.036	0.029
3	Lighter Quay Wharf (Upward Wind Direction)	0.032	0.034	0.016	0.017
4	Lighter Quay Wharf (Downward Wind Direction)	0.026	0.022	0.013	0.011
5	Gerezani creek (LHS)	0.003	0.003	0.002	0.001
6	Gerezani creek (Front Side)	0.068	0.044	0.034	0.022
7	Gerezani creek (RHS)	0.007	0.006	0.004	0.003
8	Between Berths 1 and 2	0.003	0.003	0.002	0.001
9	Between Berths 3 and 4	0.003	0.002	0.001	0.001
10	TASAF Office (control point)	0.005	0.003	0.002	0.002
11	Berth 7	0.234	0.214	0.117	0.107
12	Berth 5	0.070	0.046	0.035	0.023
	Minimum Value	0.003	0.002	0.001	0.001
	Mean Value	0.063	0.054	0.032	0.025
	Maximum Value	0.239	0.217	0.119	0.108
	TBS LIMITS [TZS845:2005]	**n.m**		**0.06 - 0.09**	
	IFC (2007) and WHO AQG 2006	**0.23**		**0.05**	

Source: Field measurement, January 2016. n.m = not mentioned.

Table 4-13 Summary of ambient gaseous emissions - day time gases emissions.

Point	Location	O_2 [%]	CO mg/m³	CO_2 [%]	Ambt Temp. [°C]	SO_2 mg/m³	NO mg/m³	NO_x mg/m³	CH4 [%]
1	Gate No. 5 (along Bandari Rd)	20.90	n.d	n.d	31.55	0.02	0.02	0.02	n.d
2	Grain Silos Area	20.90	n.d	n.d	31.95	0.02	0.01	0.01	n.d
3	Lighter Wharf (upwind)	20.90	n.d	n.d	38.23	0.01	0.01	0.02	n.d
4	Lighter Wharf (downwind)	20.90	n.d	n.d	35.35	0.02	0.03	0.03	n.d
5	Gerezani creek (LHS)	20.85	n.d	n.d	32.08	n.d	n.d	n.d	n.d
6	Gerezani creek (Front Side)	20.90	n.d	n.d	30.03	n.d	n.d	n.d	n.d
7	Gerezani creek (RHS)	20.93	n.d	n.d	36.55	0.02	0.04	0.04	n.d
8	Between Berths 1 and 2	20.88	n.d	n.d	37.90	0.02	0.05	0.05	n.d
9	Berth 3	20.88	n.d	n.d	36.13	n.d	n.d	n.d	n.d
10	Berth 4	20.80	n.d	n.d	35.45	0.01	n.d	n.d	n.d
11	Berth 6	20.75	n.d	n.d	36.60	n.d	n.d	n.d	n.d
12	TASAF Office (control point)	20.90	n.d	n.d	31.95	0.02	n.d	n.d	n.d
13	Berth 7	20.90	n.d	n.d	37.60	n.d	n.d	n.d	n.d
14	Berth 5	20.90	n.d	n.d	37.48	0.02	0.02	0.03	n.d
15	Gate no.3 (along Bandari Rd)	20.90	n.d	n.d	35.63	n.d	n.d	n.d	n.d
16	Port Manager office	20.90	n.d	n.d	36.13	n.d	0.02	0.01	n.d
17	NHIF HQ, (along Bandari Rd)	20.90	n.d	n.d	37.20	n.d	0.02	0.03	n.d
	Minimum Value	20.75	n.d	n.d	30.03	0.01	0.01	0.01	n.d
	Mean Value	20.88	n.d	n.d	35.16	0.02	0.02	0.02	n.d
	Maximum Value	20.93	n.d	n.d	38.23	0.02	0.05	0.05	n.d
	TBS LIMITS [TZS 845:2005]	**n.m**	**10**	**n.m**	**n.m**	**0.1**	**n.m**	**0.12**	**n.m**

Source: Field measurement, January, 2016. n.m = not mentioned, n.d = not detected.

Table 4-14 Summary of ambient gaseous emissions - night time gases emissions.

Point	Location	O_2 [%]	CO mg/m3	CO_2 [%]	Ambt Temp [°C]	SO_2 mg/ m3	NO mg/m3	NOx mg/m3	CH_4 [%]
1	Gate No. 5 (along Bandari Road)	20.8	n.d	n.d	31.1	n.d	0.02	0.02	n.d
2	Grain Silos Area	20.85	n.d	n.d	31.7	n.d	n.d	n.d	n.d
3	Lighter Wharf (upwind)	20.83	n.d	n.d	37.6	n.d	n.d	n.d	n.d
4	Lighter wharf (downwind)	20.83	n.d	n.d	35.2	0.01	n.d	n.d	n.d
5	Gerezani creek (LHS)	20.8	n.d	n.d	29.5	0.01	n.d	n.d	n.d
6	Gerezani creek (Front Side)	20.8	n.d	n.d	30	n.d	n.d	n.d	n.d
7	Gerezani creek (RHS)	20.81	n.d	n.d	33.6	n.d	n.d	n.d	n.d
8	Between Berths 1 and 2	20.88	n.d	n.d	35.2	n.d	0.02	0.02	n.d
9	Berth 3	20.9	n.d	n.d	34.2	n.d	n.d	n.d	n.d
10	Berth 4	20.9	n.d	n.d	32.1	n.d	n.d	n.d	n.d
11	Berth 6	20.7	n.d	n.d	33.3	n.d	n.d	n.d	n.d
12	TASAF Office (control point)	20.8	n.d	n.d	30.5	n.d	n.d	n.d	n.d
13	Berth 7	20.9	n.d	n.d	31.3	n.d	n.d	n.d	n.d
14	Berth 5	20.9	n.d	n.d	34	0.02	0.03	0.03	n.d
15	Gate no.3 (along Bandari Road)	20.8	n.d	n.d	32.2	n.d	0.03	0.01	n.d
16	Port Manager office	20.9	n.d	n.d	32.6	n.d	n.d	n.d	n.d
17	NHIF HQ, (along Bandari Road)	20.86	n.d	n.d	33.2	n.d	n.d	n.d	n.d
	Minimum Value	20.70	n.d	n.d	29.5	0.01	0.02	0.01	n.d
	Mean Value	20.84	n.d	n.d	32.78	0.01	0.03	0.02	n.d
	Maximum Value	20.90	n.d	n.d	37.6	0.02	0.03	0.03	n.d
	TBS LIMITS [TZS 845:2005]	**n.m**	**10**	**n.m**	**n.m**	**0.1**	**n.m**	**0.12**	**n.m**

Source: Field measurement, January, 2016. n.m = not mentioned, n.d = not detected

4.2.15 Noise levels

Noise level assessment was done at the seventeen selected sampling locations (refer Figure 4-14 – locations of study and sampling locations). The noise assessment was performed by using a Clas Ohlson digital sound level meter type 36-1604, model ST-805 with measurement range of 30 to 130 dB(A). The meter meets ANSI S1.4 type 2 standards and conforms to IEC 651 type 2. Accuracy of the meter is ±1.5 dB of reading. The meter is calibrated using electrical calibration with built in oscillator (1 kHz sine wave). In recording measurements, the meter was set to the "A" weighed measurement scale, which enables the meter to respond in the same manner as the human ear. The "A" scale is applicable for workplace compliance testing, environmental measurement, and workplace design and law enforcement. The meter was held approximately 1.5 m above the floor and at least 0.5 m away from hard reflecting surfaces such as walls. A set of four readings were recorded and averaged in each sampled location.

As summarized in Table 4-15 below, the mean noise level to the seventeen assessed points was 69.2 dBA during day time and 59.77 dBA during night time, which are below the TBS-EMDC 6 (1733) P2 threshold limit of 85 dBA. The maximum noise levels were observed at Berths 5 and 7 and Gate no. 5 along Bandari road. The noise at Berths 5 and 7 was mainly contributed by the movement of cranes during offloading of cargoes from the ship and loading into trucks. The noise at Gate no. 5 is mainly due to movement of trucks transporting cargoes. Detailed measurements and recordings of the noise level emissions are presented in Appendix 16.

Table 4-15 Summary of noise levels at the project area.

Point	Location	Day time (06:00am – 10:00 pm Noise (dBA)	Night time 10:00pm – 06:00am Noise (dBA)
1	Gate No. 5 (along Bandari Road)	81.8	66.18
2	Grain Silos Area	78.5	57.70
3	Lighter quay wharf (Upward Wind Direction)	78.5	59.53
4	Lighter quay wharf (Downward Wind Direction)	62.4	56.75
5	Gerezani creek (LHS)	65.8	54.80
6	Gerezani creek (Front Side)	63.5	56.13
7	Gerezani creek (RHS)	56.1	55.63
8	Between Berths 1 and 2	65.2	57.20
9	Berth 3	66.7	58.40
10	Berth 4	58.5	57.68
11	Berth 6	60.6	59.85
12	TASAF Office (control point)	57.7	49.18
13	Berth 7	83.4	64.78
14	Berth 5	78.0	64.33
15	Gate no.3 (along Bandari Road)	81.1	68.75
16	Port Manager office	61.9	60.65
17	NHIF HQ (along Bandari Road)	75.9	68.55
Minimum Value		56.1	49.18
Mean Value		69.2	59.77
Maximum Value		83.4	68.75
TBS LIMIT- EMDC 6(1733) P2		**85**	**60**

Source: Field measurement, January 2016.

Ground Vibrations Levels

Ground vibrations were measured at seventeen stations that represented onsite and offsite receptors (Figure 4-21). The XTECH SDL-800 vibration meter data logger was utilized to quantify the ground vibration at the study area. The meter has an accuracy of ±5 %, acceleration of 200 m/s^2, a wide frequency range of 10 Hz to 1 kHz for capturing almost all possible vibrations for workplace assessments. The XTECH vibration meter data logger is designed to measure vibration at the workplace according to European standard EN 14253:2003. At each identified station, at least two hours vibration readings were recorded after every 30 minutes and their mean value was used to represent the vibration level at that particular station.

Figure 4-21 Recording noise, air quality and vibrations, during fertiliser unloading via hoppers into trucks. January 2016.

After capturing the ground vibration level to the individual substation locations, the Exposure Action Value (EAV) and Exposure Limit Value (ELV) were computed based on the two hours duration of exposure to the vibration per day. The ground vibration findings as summarized in Tables 4-16 and 4-17 below shows that all the assessed seventeen points had vibrations levels below the threshold EAV and ELV values of 0.5 m/s^2 and 1.15 m/s^2 respectively. The mean value vibrations levels were 0.0049 m/s^2 and 0.045 m/s^2 during day and night hours respectively. The maximum vibration level was 0.0208 m/s^2 recorded at Berth 3 with the lowest value being averaged to 0.0000 m/s^2 recorded at Berth 4. The vibrations seemed to originate from the trucks, motor vehicles and other mechanical equipment that were moving near the monitoring stations during the study. Appendix 16 details the ground vibration levels at the project area.

Table 4-16 Summary of the day-time ground vibration levels.

Point	Location	Vibration (m/s^2)	Daily exposure*	Over EAV**	Over ELV**
1	Grain Silos	0.0201	0.0101	no	no
2	Berth 3	0.0208	0.0104	no	no
3	Berth 4	0.0000	0.0000	no	no
4	Berth 5V	0.0002	0.0001	no	no
5	Berth 6	0.0001	0.0000	no	no
6	Between Berths 1 and 2	0.0033	0.0017	no	no
7	Berth 7	0.0040	0.0020	no	no
8	TASAF office (control point)	0.0094	0.0047	no	no
9	Gate no. 3 (along Bandari Road)	0.0092	0.0046	no	no
10	Gate no.5 (along Bandari road)	0.0001	0.0001	no	no
11	Gerezani creek (LHS)	0.0027	0.0014	no	no
12	Gerezani creek (Front side)	0.0002	0.0001	no	no
13	Gerezani creek (RHS)	0.0001	0.0000	no	no
14	Lighter Quay wharf (Downward wind direction)	0.0004	0.0002	no	no
15	Lighter Quay wharf (Upward wind direction)	0.0055	0.0027	no	no
16	Port Manger office	0.0060	0.0030	no	no
17	NHIF HQ (Bandari Road)	0.0054	0.0027	no	no
Minimum Value		0.0000	0.0000	no	no
Mean Value		0.0049	0.0024	no	no
Maximum Value		0.0208	0.0104	no	no

Source: Field measurement, January 2016.

Table 4-17 Summary of the day-time ground vibration levels.

Point	Location	Vibration (m/s^2)	Daily exposure*	Over EAV**	Over ELV**
1	Grain Silos	0.0215	0.0107	no	no
2	Berth 3	0.0014	0.0007	no	no
3	Berth 4	0.0001	0.0000	no	no
4	Berth 5	0.0002	0.0001	no	no
5	Berth 6	0.0001	0.0000	no	no
6	Between Berths 1 and 2	0.0028	0.0014	no	no
7	Berth 7	0.0038	0.0019	no	no
8	TASAF office (control point)	0.0072	0.0036	no	no
9	Gate no. 3 (along Bandari Road)	0.0099	0.0049	no	no
10	Gate no.5 (along Bandari road)	0.0098	0.0049	no	no
11	Gerezani creek (LHS)	0.0046	0.0023	no	no
12	Gerezani creek (Front side)	0.0002	0.0001	no	no
13	Gerezani creek (RHS)	0.0002	0.0001	no	no
14	Lighter Quay wharf (Downward wind direction)	0.0004	0.0002	no	no
15	Lighter Quay wharf (Upward wind direction)	0.0041	0.0021	no	no
16	Port Manger office	0.0055	0.0027	no	no
17	NHIF HQ (along Bandari Road)	0.0051	0.0026	no	no
Minimum Value		0.0001	0.0000	no	no
Mean Value		0.0045	0.0021	no	no
Maximum Value		0.0215	0.0107	no	no

Source: Field measurement, January 2016.

4.3 Wider Project Area

The wider impact area (WII) in the case of the proposed project includes the rest of the Dar es Salaam city Temeke Municipality in particular, from where most of the labour force, some building materials, food and goods are likely to be obtained. The Municipality may also benefit from revenues and from businesses to be stimulated by the project. Administratively, Temeke Municipality is divided into 30 wards but Kurasini, Kigamboni, Tungi, Vijibweni and Mchafukoge wards will be the most related to this project (see Figure 1-1). However, the Mchafukoge Ward is in Ilala Municipality where part of the Port (Malindi Wharf) is located.

4.3.1 Surrounding urban areas

The Dar es Salaam Port is within the metropolitan area characterized by highly built up environment (see Figure 4-22). The Port is surrounded by the City Center on the north (Mchafukoge Ward), consisting of the central business district; in the west are residential areas (Keko and Kilwa Road areas) and small factory areas (especially garages and PUMA bulk oil storage areas). The south consists of Mtoni and Kijichi residential areas, public institutions, Bulk Oil Storage Tanks and the Mtoni Dumpsite (now closed). In the east, there is Kigamboni commercial and residential areas, TIPER storage depot, and very limited undeveloped plots. The city centre has a central sewer system that discharges sewage in the harbour mouth through the Sea Outfall. Many of the areas surrounding the harbour are unsewered and sewage handling is largely by septic tank system.

4.3.2 Demographic characteristics

According to 2012 National Population and Housing Census, Temeke Municipality is the second most populous municipality in Dar es Salaam City after Kinondoni. In 2012, the Municipality had a population of 1,368,881 persons, an average household size of 3.9, which is the lowest in Dar es Salaam City. With an annual average growth rate of 4.6 %, the population of the municipality is estimated to increase in density from 83 persons/km^2 in 2012 to 109 persons/km^2 in 2018. Kurasini Ward where this project will be implemented has a population of 26,193. Population of the other wards related to the project are Kigamboni (30,496), Vijibweni (29,010), Tungi (23,380) and Mchufukoge (10,688).

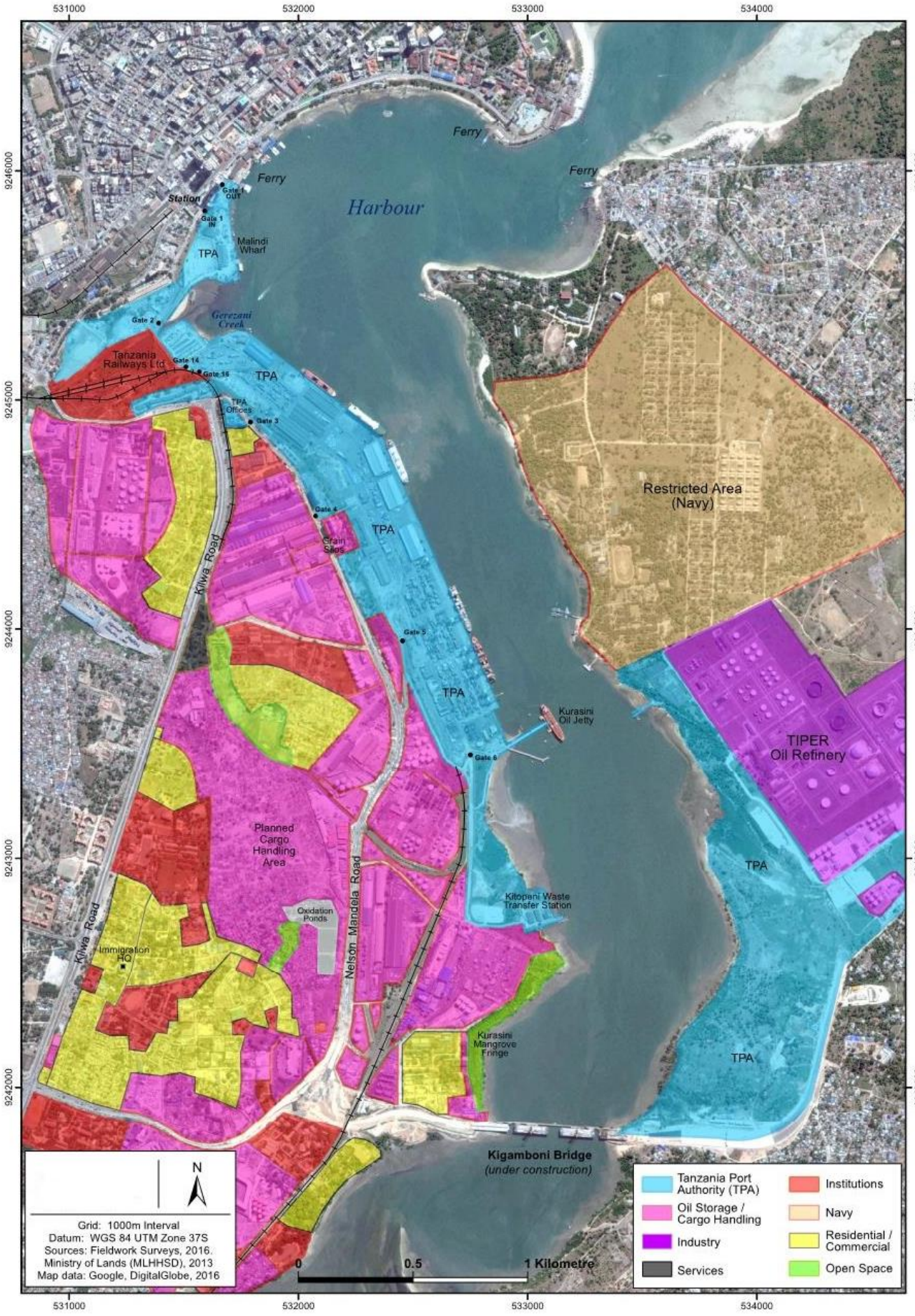


Figure 4-22 Land use within the wider project area of influence. Sources: COWI Tanzania Ltd. 2016.

4.3.3 Economic activities

Major economic activities in Temeke Municipality include industries, both at primary and secondary level, subsistence and commercial farming small-scale enterprises, formal employment, trade and commercial activities encompassing wholesale and retail trade, petty trade, fisheries, animal husbandry and building materials and mining activities.

Agriculture

Agriculture constitutes only 13 % of the total employment in Temeke Municipal Council (Temeke Socio-Economic Profile). Food crops cultivated include rice, maize and beans. The cash crops include cashew nuts, coconuts, fruits, vegetables (tomatoes, chillies, Chinese cabbages etc.). The commonly grown crops in the periphery of the municipality including Kurasini Ward are cassava, sweet potatoes, coconuts, cashewnuts paddy, maize, vegetables, tomatoes and fruits. Food crops production in Temeke accounts for only 20 % of the demand while the remaining portion comes from outside the municipality.

Further, the municipality has a potential of 492 ha for irrigation that has not been fully utilised as only 4 % of the land is under irrigation (Temeke socio-economic profile). This underutilisation of the irrigation scheme is partly due to high costs of the irrigation infrastructures, shortage of extension staff as well as unavailability of high quality seeds.

Livestock keeping

Livestock keeping is based on "Zero grazing", but an important component of agriculture that contributes about 20 - 30 % of milk supply in the Municipality. It is estimated that there are about 4,144 dairy cattle, 5,706 indigenous cattle, 103 dairy goats, 2,912 indigenous goats, 32,000 broiler chickens; 53,000 layers, over 78,000 indigenous chicken, 1,560 ducks, 572 rabbits and 3,015 pigs (Temeke Socio-Economic Profile).

Industry and Markets

It is estimated that the Municipality has about 40 medium scale industries, clustered in Chang'ombe industrial area situated in the Northern part of the Municipality. It is estimated that the municipal has more than 158 small-scale industries located in Mbagala, Kurasini and others are due to be established in the newly designated industrial area at Vijibweni (Temeke Socio-economic Profile). While the industry sector is flourishing in the municipality, the market sector does not perform well. Currently, there are about 17 formal markets with the capacity of 4,500 small traders. However, it is only Temeke stereo market that is in good standard, the remaining markets need renovation to make them meet the set government standards.

Fishing and small ferries

Temeke Municipality has an estimated coastline of 70 km that stretches from Kigamboni to Tundwi (Pemba Mnazi). This coastline supports fishing and ferry boat activities (south of bridge) (Figure 4-23). There are 1,450 registered fishermen and about 2,000 unregistered. There are 1,230 registered fishing vessels and about 800 unregistered. Common fish landing villages include Kigamboni, Magogoni, Vijibweni, Mjimwema, Kibugumo, Dege, Gezaulole, Amani Gomvu, Buyuni, Pembamnazi and Mtoni Kijichi. Fishing is carried out using drag nets (Figure 4-24) and other nets, traps, long lines and baskets.

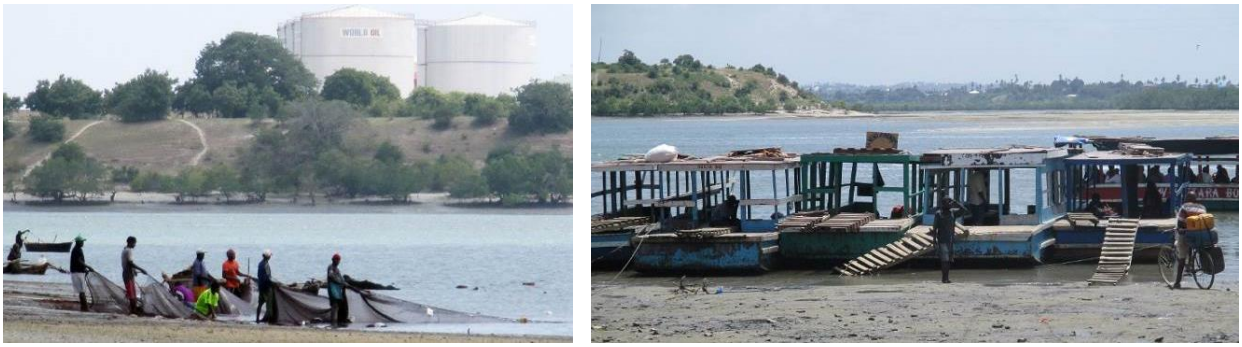


Figure 4-23. Beach-seining for fish and prawns in Kurasini (left) and ferry that transport passengers and small cargos from Kurasini to the south side of the Mzinga Creek in Vijibweni.

Employment

There is currently (according to the 2012 National population and Housing Census) a total labour force of 666,075 people in Temeke Municipality (i.e. both employed and unemployed persons) of whom 284,358 persons (42.7 %) are employed. In addition, out of the total labour force, the unemployed persons stand at 381,717 people or 57.3 % out of which, 24.8 % are fulltime students. The main contributor to employment is informal sector that accounts for about 49 %, agriculture 13 % with 18 % being other types of employment-otherwise known as elementary occupations.

Forestry

Temeke Municipality has 2,041 hectares of natural forest reserve area, out of which the mangrove area covers 27 ha. The forest contain various species of commercial, ecological and medicine values such as teak, ebony and mangrove. These trees are used as source of fuel (fired wood and charcoal) and construction. Due to high demand for firewood and charcoal, the sustainability of the remaining forest reserve remains a big challenge to the municipal administration. Other threats to the forest reserve stem from urbanisation, lime and charcoal production as well as salt production that take place in coastal wards of Mjimwema, Kimbiji, Somangila and Pemba Mnazi.

Mining

Temeke Municipality is endowed with a lot of gravel, sand, limestone and good murram soil. These minerals constitute important components for building construction such as housing, roads and drainage. Sand extraction is carried out in quaternary sand deposits, in several rivers and streambeds, and around built-up areas in the municipality. These areas include Vijibweni and Charambe, Mbagala and Yombo Vituka, which are formal and the informal areas include Yombo, Kizinga and Mzinga rivers and their tributaries.

According to stakeholder consultations in Temeke Municipality, there are three existing borrow pits within Temeke municipality where the Port is located. These are Mji Mwema, Lingato and Gezaulole. However, according to Temeke municipal officials, the use of these sites is strictly prohibited. For large construction projects in Dar es Salaam, Contractors have to source materials from existing approved quarries and borrows in Coast Region. These potential sites are Kisarawe, Lugoba and Msolwa (see Figure 4-24 below). Lugoba is found along the Chalinze-Segera highway approximately 146 km from the Port, Msolwa site is located along the Dar es Salaam - Morogoro highway approximately 135 km from the Port; while Kisarawe is found about 27 km south of Dar es Salaam City.

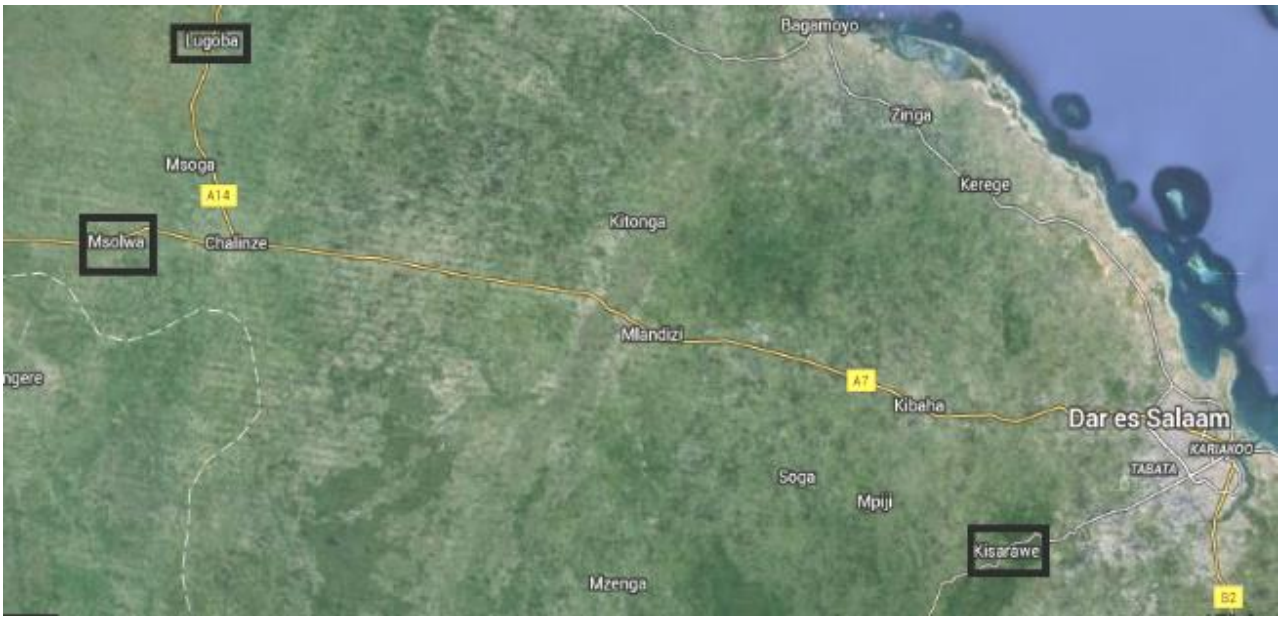


Figure 4-24 Three major potential sources of construction materials for Dar es Salaam within the Coast Region: Lugoba (NW), Msolwa (W) and Kisarawe (SW).

Trade

Trade comprises both formal and informal forms that encompass wholesale and retail trade, hotels, guest houses and financial institutions. The sector employs about 49 % of Temeke residents and is very important to the municipal economy, providing job opportunities and facilitating generation of income and revenue.

Informal sector activities are present in several locations in the Municipality mainly along main roads, open spaces, around markets, public institutions such as schools, hospital, public and private offices. In short, petty traders seem to operate in areas that attract people or have traffic concentrations. Major activities associated with the informal sector include: second hand cloth (*Mitumba*) sellers, fishermen, miners, masonry, food vendors, vegetable growers, carpenters, car washers, street vendors, shoe shiners, etc.

Tourism and Recreation

A number of tourist hotels are available in the municipality and most of these are situated along the Indian Ocean beach stretching from Kigamboni to Pemba Mnazi.

South East of Temeke is the Dar es Salaam Marine Reserves System, Ranked as IUCN Category II, comprising four units (Inner and Outer Mwakatobe Islands, Kendwa Island and Inner and Outer Sinda Islands), gazetted in 2007. Though very unlikely to be impacted by the Phase 1 activities, the coral life is very sensitive to sediment. If dredged sediment is to be dumped at sea, monitoring of turbidity levels and sediment trapping at selected sites is recommended.

4.3.4 Road infrastructure

The Dar es Salaam Port is surrounded by tarmac roads connecting the Port to different areas of the country. The Bandari Road connects the Port to Mandela and Kilwa roads which links the Port to the major exits roads from the main Port. In general the road network around the port is congested and subject to delays resulting from the truck volume and poor condition of the road, many of which are being upgraded as part of the wider DSMGP. Parking space for fuel tankers is a particular problem at present, notably around the southern approaches to the Port. Any activity that results in addition of traffic to the Port area will worsen the already poor traffic slow situation. The on-going development of the Kigamboni Bridge (Figure 4-25 below) and the envisaged Kigamboni New City will to some extent impact on the harbour water quality.

Figure 4-25 Kigamboni Bridge under construction (January 2016).

4.3.5 Communications network

The Municipality is served by cable telephone services provided by the Tanzania Telecommunications Company Limited (TTCL). Moreover, residents enjoy mobile telephone services that are provided by Tigo, Airtel, Sasatel, Zantel and Vodacom companies. Radio and television services are also available in the Municipality and residents can tune in on various stations situated in and outside Dar es Salaam.

4.3.6 Atmospheric conditions

Climate

The climatic conditions of Temeke are tropical with high temperatures, low wind speed, high humidity and absence of a cold season. The climate is influenced by the monsoons. Dar es Salaam receives annual rainfall averages just over 1,000 mm in two seasons, the short rains with storms of limited duration during November and December providing an average rainfall of 75-100 mm per month and the long rains between March and May where a monthly average rainfall of 150-300 mm can be expected. The period between June and October is dry. The mean annual temperature is 26 ^{o}C with a mean daily range of ± 4 ^{o}C. Seasonal variations are slight with the mean seasonal range being ± 4 ^{o}C. The humidity of air is related to the rainfall pattern and is highest during the long rains. Daily maximum humidity occurs at dawn, averaging 96 % while minimum humidity is experienced in the afternoons, averaging 67 %.

Winds

The wind system of the area is typical of the wind regime of the Western Indian Ocean, which is characterized by the south-easterly winds (SE monsoons) during the months of June to October, and the north-easterly winds (NE monsoons) from November to March. Winds in the region are quite weak, generally of F3-F4 (Beaufort scale). The SE monsoons are usually strong, the peak speeds occur in April and July. The northern monsoons are lighter and peek speed occurs in February. This wind system is coupled with an almost complete clockwise current system that changes character with the changing wind.

According to the survey done in the area, it was found that during northeast monsoons, wind speed varies between 1.5 to 8 m/s. During the southeast monsoons, the wind speed is 8 m/s. The predominant wind direction in both the seasons is from south, which is typical of this East African Region (Lwiza 1994).

Climate Change

Climate change has already brought many changes to general living on the planet. Specifically in oceans, there are changes which have been experienced and will continue to be experienced. Sea level rise is possibly the most obvious and certain impact from climate change, particularly relevant to ports and harbours. The average global sea level is predicted to increase as much as 60-70 cm over the next century (IPCC 2007). Sea level rise increases risks coastal communities face from coastal hazards such as floods, storm surges, and erosion. Such impacts are relevant to Temeke Municipality and Dar es Salaam Port.

Sea level rise can also lead to saltwater intrusion—salt water moving further up rivers and seeping into groundwater—making the water unfit for drinking or irrigation. This could affect TPA boreholes that supply freshwater at present. Scientists also predict shifts in weather patterns as a result of climate change. Hurricane intensity may increase, and some regions will receive more rainfall while others will experience drought conditions (IPCC 2007). More rain, combined with increased coastal development, would lead to increased storm water runoff, which could transport pollutants to coastal waters, impairing water quality.

Climate change is and will continue to be a pressing issue in Tanzania's coastal areas. Ocean and coastal managers have an important role in planning for, adapting to, and reducing the impacts of climate change. Their challenges could involve planning for sea level rise, encouraging “smart growth” to reduce greenhouse gas emissions from vehicles, and monitoring changes in coastal and marine ecosystems caused by climate change. TPA should be aware of the above potential threat from climate changes and ensure all plans in this project take precautions to mitigate impacts from climate change.

4.3.7 Land Conditions

According to the geological map, Dar es Salaam Region consists of mainly tertiary soils, the chief constituent being alluvial sand deposits and in some areas clays silt sand (Quarter Degree sheet No. 186).

4.3.8 Hydrology

Temeke Municipality is penetrated by two major coastal river systems, the Mtoni River with a catchment that extends inland over 60 km, into the higher grounds of Kisarawe District, and the northern of two main lower reaches that also forms portions of the border with the northern sister district of Ilala (in which a small part of Dar es Salaam Port is located) and four smaller independent catchments in the southern portion of the district.

The main river (Mtoni) that discharge onto the coast between Ilala and Temeke, at the entrance to Dar es Salaam Port, contributes large amounts of sediment, freshwater, nutrients (and pollutants), especially during periods of heavy rainfall, with peak outflow from the rivers from March to May.

4.3.9 Dar es Salaam Marine Reserves

There are legally protected coral reef and associated marine habitats within the expected IIA in the form of the South Dar es Salaam Marine Reserves (islands of Sinda, Kendwa and Makatumbe) and the North Dar es Salaam Marine Reserves (islands of Bongoyo and Mbudya), shown on Figure 6-2. These six islands and associated coral reefs are important tourism and conservation areas. Due to the forecast increased volume of shipping from improvements to the Port, meaning greater frequency of visits of vessels to the outer anchorage and on passage in and out of the entrance to the Port area, there are potential impacts from oil spills (resulting from collision and accidental spills) and from waste discarded at sea. In the Port area itself there are numerous other small vessels and shipping (e.g. Zanzibar ferries, fishing boats) hence there is an increased risk of vessel collision and potential spoil of oil at sea that could impact the marine reserves.

Figure 4-26 Idyllic setting on Sinda Island, with clear coral reef waters and white sand, the eastern-most of the four islands within the South Dar es Salaam Marine Reserves.

4.4 Wider Influence Area

The Wider Influence Area (WIA) includes the rest of Tanzania, including Zanzibar and neighbouring, regional countries that presently benefit from the Port infrastructure and its operations. Dar es Salaam Port represents a strategically important gateway to the western-central and northern parts of Tanzania and to the landlocked countries of the interior Malawi, Zambia, Democratic Republic of Congo, Rwanda, Burundi and Uganda. Transit traffic to these land-locked countries makes up a growing proportion of Dar es Salaam's traffic, increasing from 10 % to 41 % of liquid bulks, and from 25 % to 39 % of containers between 2001 and 2007. In 2012 transit trade accounted for as much as 33 % of total volume, or just over 4.4 million tonnes with forecasts suggesting this could increase by at least double, to 9.7 million tonnes, by 2030. Any development that improves the volume and turnover of shipping through Dar es Salaam Port will positively contribute to the economy and development of these neighbouring countries.

4.5 Gaps and Limitations

The data gaps identified thus far are related to the following subjects, all of which can be determined and should be considered as part of the requirements of the Contractors (and design engineers) prior to commencement of the works:

a) Employment and staffing needs within the improved facilities, namely the grain unloading infrastructure including silos, the Ro-Ro Terminal at Gerezani, and the rail linkages within the Port. This is needed for future analysis of changes in labour opportunities that will allow targeting of work skills to maximise employment and reduce lost opportunities.

b) Condition of the seabed to be dredged, sampled at a range of depths to the maximum dredge depth, with respect to the grain size and chemical pollutants therein. This is important to determine whether it can be used as backfill for the Ro-Ro terminal and the appropriate disposal required.

c) Truck and train wagon numbers entering-exiting the Port to load materials at Berths 1 to 7, for comparison with future operations once the berths have been improved. This is important to gauge the difference in traffic and congestion outside the Port as well as within the Port area,

d) Traffic volume at selected locations around the Dar es Salam Port, including Bandari Road. These data are required in order to determine whether the Phase 1 improvements are increasing or decreasing congestion.

e) Waste from vessels visiting the port, ideally by vessel category. These data are reported to be with the various individual waste operators linked to the shipping agents. Such data may exist but was not found and is needed for comparison with the expected increase in traffic resulting from Phase 1 improvements.

Chapter 5: STAKEHOLDER CONSULTATION AND PUBLIC PARTICIPATION

5.1 Introduction and background

This Chapter presents all the stakeholders identified and consulted, and elaborates on the main issues and concerns raised by these stakeholders during the scoping exercise and the detailed EIA. Stakeholders were identified during the scoping stage and throughout the ESIA study.

Views from the general public, local leaders, surrounding institutions, communities and development partners who are interested in and/or would be potentially affected by the proposed project were consulted through interviews and public meetings as mandated by the Environment Management Act, Cap 191.

The stakeholder consultations were held to ensure that interested and affected parties were informed of the project. The consultations allowed stakeholders to present their views concerning the proposed project. Recording stakeholders' views and preferences was essential to inform the identification of impacts and drawing effective mitigation measures that are presented in this report.

5.2 Objective of the consultation and public participation

The overall objective of the consultation process was to disseminate project information and to incorporate the views of stakeholders in the design of the environmental and social mitigation measures, management plan and monitoring plan.

The specific objectives of the consultation process were to:

- Improve project design and, thereby, minimize conflicts and delays in implementation;
- Increase long term project sustainability and ownership;
- Reduce problems of institutional coordination; and
- Consult stakeholders to gather the information needed to complete the assessment.

5.3 Public involvement and disclosure

Public participation is a process through which different stakeholders influence and share their views regarding development initiatives and the decisions and resources that affect them. Comprehensive planning is required to ensure that local government, institutions, NGOs, project staff and affected men and women interact regularly and purposefully during all stages of the project. Engagement with stakeholders and the public in general was mainly through consultations and meetings. These were held throughout the entire ESIA study period in the core impact area and project area of influence within Dar es Salaam. Information about the project was publicised through a media advertisement published in the local newspapers *Daily News* and *Nipashe* (15 January 2016). Consultations were carried out between August and October 2015 and completed in January 2016.

5.3.1 Identified and consulted interested and affected parties

Over the course of the ESIA, the consultants identified and consulted the interested and affected parties of this project through consultations. Three types of consultation were considered. These were:

- First round of stakeholders meetings (27th August 2015);
- Second round of stakeholders meeting to disclose draft to Public (21th October 2015);
- Individual meetings – one-on-one interviews and group interviews with interested and affected parties (January 2016); and
- Final disclosure stakeholders meeting (15th February 2016), held at TPA Board Room.

A list of attendees (with signatures) at these consultations is enclosed in Appendix 5. The minutes of the consultative meetings are in Appendix 4. The list of interested and affected parties that were identified and consulted is presented below:

1. Ministries
   - Ministry of Lands, Housing and Human Settlement Development (MLHHSD)
   - Ministry of Natural Resources and Tourism (MNRT)
   - Ministry of Agriculture, Livestock and Fisheries (MALF)
   - Ministries of Home Affairs (MOHA)
   - Ministry of Water and Irrigation (MOWI)
2. Government Institutions
   - Tanzania Revenue Authority (TRA)
   - Tanzania National Roads Agency (TANROADS)
   - Marine Parks and Reserves Units (MPRU)
   - Tanzania Social Action Fund (TASAF)
   - Tanzania Railway Limited (TRL)
   - National Health Insurance Fund (NHIF)
   - Energy and Water Utilities Regulatory Authority (EWURA)
   - Reli Assets Holding Company (RAHCO)
   - Shipping Corporation of Zanzibar (SHIPCO)
3. Private Institutions
   - Tanzania International Containers Terminal Services (TICTS)
   - National Microfinance Bank (NMB), Bandari branch
   - CRDB Bank, Bandari branch
4. Donor
   - Trade Mark East Africa (TMEA)
5. Local Government
   - Dar es Salaam City Council
   - Temeke Municipal Council
6. Non-Governmental Organizations (NGOs) along Bandari Road
   - North Star Alliance
   - Wake and Support Other Organisations (WASO)
7. Ward Executive Officers and *Mitaa* (street)
   - Kurasini Ward
   - Mivinjeni Ward
   - Mivinjeni Street
   - Kiungani Street
   - Kurasini Street
   - Kiungani Street
   - Mchafukoge street
8. Malindi Wharf users (Zanzibar Shipping Corporation, Al Ghubra Marine and Seven Seas).
9. Labour agencies (service providers within the Port)
10. Food vendors along Bandari Road
11. Fishermen (Kurasini landing site and Vijibweni)
12. Motorcycle taxis (*bodaboda*)
13. Shipping Agents
14. Navy (Kigamboni)

5.4 Stakeholders' Views

This sub-section highlights both positive and negative socio-economic and environmental impacts anticipated by consulted stakeholders during the mobilisation, construction and operational phases of the project. This is followed by suggested mitigation measures that the developer should incorporate to minimize anticipated environmental and social impacts. The stakeholders' views presented in the sections below are a result of the two rounds of consultative meetings and the individual interviews with interested and affected parties.

5.4.1 Views from the first stakeholders meeting

Table 5-1 presents a summary of the views from the stakeholders that were identified and consulted as part of the first stakeholders meeting, held at the TPA Fire Station offices. The consultation took place at the Fire Station Hall at the TPA Headquarters. Representatives from Government ministries, institutions, local government and ward offices, labour agencies and *Mtaa* leaders participated in the consultation.

Table 5-1 Views and concerns from the first stakeholders meeting held at Fire Station Hall

Date	Stakeholder	Participants	Venue	Issues of concern/suggestions
27.08.2015	Ministry of Livestock Development and Fisheries (Fisheries Sector)	Bulongo Fharah	Fire Station Hall TPA	- How will the project affect the fishermen around the Port? - Suppose the fish market is affected, how will the fishermen be compensated? - The Consultant should provide more detailed information on the extent of the project undertaking and, if possible, information should be made available to the ministry detailing, if at all, how people will be affected.
	Ministry of Natural Resources and Tourism (Forest Division)		Fire Station Hall TPA	- The project Contractor will need to identify proper disposal technology for the dredged material. - The proposed project is economically viable for improvement in taxes, revenue and employment opportunities. - The project may also lead to increase in the spread of HIV/AIDS.
	Ministry of Lands, Housing and Human Settlement	Anna Misigaro	Fire Station Hall TPA	- The project does not interfere with other projects in the area. - The project allows for the continuation of existing harbour activities. - The proposed project should prevent pollution through oil discharge and soil clearing during ships and boat anchoring.
	Ministry of Energy and Minerals	Eng. Ephraim Mushi	Fire Station Hall TPA	- The project may lead to employment creation. - The project may disturb nearby communities, lead to increased congestion of trucks on the roads and therefore increased frequency of accidents. - TPA should also consider modern technologies in handling wastes (solid and liquid) to reduce environmental pollution. - Dredged material is to be tested for re-use potential to reduce solid waste generation. - Employees to be updated on the safety issues regularly to reduce occupational accidents.
	Tanzania National Road Agencies	Eng. Sanjo Mngeta	Fire Station Hall TPA	- Stakeholders should be kept well informed of project developments. - The Consultant should abide by NEMC

Date	Stakeholder	Participants	Venue	Issues of concern/suggestions
	(TANROADS)			legislation and regulations by first registering the project with NEMC. The firm consultancy firm must also to be registered.
	Tanzania Revenue Authority (TRA)		Fire Station Hall TPA	- The proposed project will improve tax collection (import and corporate taxes). - The project will reduce waiting charges. - With proposed project all imports will be received by TPA, hence, TRA worries are on receiving charges that will go directly to oil companies and the arrangement could cause tax complications. - The security plan of the proposed project should be enhanced.
	Dar es Salaam City Council	Christopher Japhet Grace Mbena	Fire Station Hall TPA	- The proposed project should clear all land matters in a proper and official way. - The project should put all possible measures in place to avoid spillage of oils or toxins and hence pollution to the environment. - Existing system of delivering product at Port and city plan on industry.
	Marine Parks and Reserved Units	Jairos Mahenge	Fire Station Hall TPA	- Most important issue is the development without land reclamation to avoid erosion, which can take place to the nearby Dar es Salaam Marine Protected Islands (DMRs). - Dredging wastes should be disposed in deep sea, at a distance of more than 10 km from the shoreline. - Land filling will impact coral and other marine ecosystems of DMRs.
	Temeke Municipal Council	Said Mkumba	Fire Station Hall TPA	- The proposed project should set effective firefighting in the event of an emergency - The project will encourage the emergence of more oil companies and hence increase taxes and fees collection.
	Vijibweni Ward and street meeting with villagers and fishermen	Ward Executive Officers and street leaders	Vijibweni Ward office	- The project is outside our area therefore no impacts anticipated. - Appreciated the efforts of TPA to involve the community to raise awareness about what is going to happen. - Expect the trade will grow as many and big vessels will come to Dar es Salaam Port.
	Kurasini Ward	Ward Executive Officer and street leaders	Kurasini Ward office	- The government has acquired land for Port activities expansion in Kurasini area so our community accepts the project. - Mechanized operations for conveyor system might affect casual labourers. These casual labourers are potential customers for motorcyclists and food vendors.

5.4.2 Views and concerns from the second stakeholders meeting

The ESIA consultants, with support from TPA, organised a meeting to share the information gathered from the field and discuss the draft ESIA report. The invitees to the meeting were government institutions (ministries and departments), labour agents, TPA representatives, Trade Mark East Africa, municipalities and representatives from the communities around the Port.

The ESIA Consultants presented the draft report in a Power Point presentation and subsequently invited stakeholders to give their views as a way to add value to the report by including all important issues concerning environment and welfare of workers and surrounding communities. Table 5-2 presents a summary of the views of the stakeholders.

Table 5-2 Views and concerns from the second stakeholders meeting held at Fire Station Hall

Date	Stakeholder	Participants	Venue/location	Issues of concern/suggestions
21.10.2015	Ministry of Livestock Development and Fisheries (Fisheries Sector)	Bulongo Fharah	Fire Station Hall TPA	- The report should follow NEMC regulations and standards.
	Ministry of Lands, Housing and Human Settlement Development	Anna Misigaro	Fire Station Hall TPA	- A cost-benefit analysis should be done to identify the most appropriate options for development because this is a national project that requires a huge investment. - Special training should be provided to workers to cope with the growing technology.
	Ministry of Water	Eng. Melania Sengeu	Fire Station Hall TPA	- The construction materials, sources and quantities should be presented in the report. - The baseline information should include the characteristics of the dredged materials. - The impacts of noise and vibration should be included.
	Ministry of Energy and Minerals	Eng. Ephraim Mushi	Fire Station Hall TPA	- The report should present the phases of the project for easy identification of impacts. - The ESMP should summarized.
	Ministry of Home Affairs	Gerad Remmy	Fire Station Hall TPA	- Issues concerning fire and safety, especially in buildings should be discussed at the design stage. - Fire inspector should advise the Contractor right from the design of the project and all drawings should include fire safety structures.
	Tanzania National Road Agencies (TANROADS)	Eng. Sanjo Mngeta	Fire Station Hall TPA	- The mechanism for disposing of dredged material should be identified and documented. - Document all hazardous wastes and their disposal mechanism.
	Dar es Salaam City Council	Christopher Japhet Grace Mbena	Fire Station Hall TPA	- The issue of soil erosion should be enriched by adding the effects of climate change and variability and not only the land reclamation/dredging. - The area planned for the Ro-Ro

Date	Stakeholder	Participants	Venue/location	Issues of concern/suggestions
				terminal may lead to the removal of species. This should be investigated.
	MPRU	Jairos Mahenge	Fire Station Hall TPA	- The report states that the disposal area in the sea is to be 3 km away with a depth exceeding 50m. Are there any studies to be conducted before this exercise? - Local currents of the area should also be known and considered
	Temeke Municipal council	Said Mkumba	Fire Station Hall TPA	- The project should avoid any source of pollution. - The project encourages the emergence of more oil and gas companies and hence will increase tax and fee collection.
	Agencies providing casual labours -Portable enterprises -Hai Sub Supplier -Baga Investment Company	Mr Gorge Michael Mr Khamis Whamdoi Mr Ammu Selemanu	Fire Station Hall TPA	- Provide casual labourers at TPA with employment opportunities such as cleaning services, lashing and unlashing and freight handling, general cargo handling, drivers at the Ro-Ro terminal. - All workers are unskilled and criteria for recruitment is being of good health. - Labourers are not entitled to any benefits i.e. health insurance, pension fund. - Overall, Port improvement will enable labour agencies to get more work within the Port.

5.4.3 Views and concerns from individual consultations

Table 5-3 presents a summary of the views and concerns from individual stakeholders who were consulted in December 2016 and January 2016, and Table 5-4 indicates the sections of this report where stakeholders' comments are addressed.

Table 5-3 Summary of the views and concerns from individual stakeholders consulted

Date	Stakeholder	Participants	Venue	Issues of concern/Suggestions
29.12.2015	Ministry of Agriculture, Livestock and Fisheries	Magreth Dominic, Senior Fisheries Officer	Ministry of Agriculture, Livestock and Fisheries premises	- The dredging exercise will disturb the bottom substratum and therefore some benthos living organisms will also be affected/lost. - The disposal of the dredged material will have ecological effects on the disposal site, therefore careful study is needed to find out what species of fish and other organisms will be affected and propose appropriate mitigation measures.
08.01.2016	Dar es Salaam City Council	Eng. Chionda Kawawa- City Engineer Benedict Mukasa, Quantity surveyor	Engineers Office	- Economic gains – In the past there was a public outcry on the efficiency of the Dar es Salaam Port and some of businesses avoided using the Port due to inefficiency and theft of the valuable goods/items. Improvements to the Port, especially for Berths 1-7, will attract more big ships with more goods entering

Date	Stakeholder	Participants	Venue	Issues of concern/Suggestions
				Dar es Salaam Port, hence increases more revenues to the country. - Disruption of traffic flow – Dar es Salaam Port is adjacent to the Central Business District (CBD) area therefore construction activities will disrupt traffic flow especially when heavy equipment and construction materials are brought to the construction area during day light. - The project will need to comply with the OSHA requirement, especially on issues of health, safety, security and environment.
11.01.2016	Temeke Municipality	Technical staff at Temeke Municipal -Environmental Management Officer -Community Development officer -Counsel HIV/AIDS Coordinator -Municipal Economist	Temeke Municipal Council Hall	- Employment opportunities – During the construction phase for both skilled and unskilled labour. - Stimulation of economic activities such as construction of more Inland Container Depots (ICD) to cater for increasing containers, more storage facilities will be constructed. - Dust during construction – The Contractor should sprinkle water during construction to avoid dust generation. - Spread of HIV/AIDS – Port expansions with associated activities will attract many people in the project area, hence interactions will be high. - Those working at the Port (truck drivers, food vendors etc.) are aware of the HIV/AIDS pandemic since there have been interventions taking place in the area by local NGOs. These interventions are condom provisions, education to commercial sex workers and counselling.
11.01.2016	National Microfinance Bank-Bandari area	Mr Richard Pembe Team Leader-NMB	NMB office Within Port premises	- Port expansion will grow the customer base and will accommodate more customers. Might consider to extend working hours until night. - This is a positive move, as it will increase revenue collection to the government. Most of their customers are clearing and forwarding companies. - Dust generation, noise from construction work should be dealt with.
13.01.2016	CRDB Bank	Mr Juma B.Ng'oko, In charge-CRDB	CRDB office within Port premises	- Increase of tax base because more goods will be imported. - Respiratory diseases caused by dust, air pollution could be a negative impact from construction.
13.01.2016	Tanzania Social Action Fund (TASAF)	Mr Paul Kijazi Environmentalist	TASAF Headquarter offices	- Increase efficiency at the Port – Port expansion might attract more countries to use Dar es Salaam Port as final destinations for the cargos/goods. This will also increase competitions with neighbouring ports such as Mombasa. - Cars movement especially at gate no. 2

Date	Stakeholder	Participants	Venue	Issues of concern/Suggestions
				might disrupt TASAF activities. Most of the in-transit cars use gate no. 2, which borders with TASAF. A fleet of cars from the Port uses this road as an outlet to final destinations, which sometimes restricts other users of this road.
13.01.2016	Malindi Wharf	Mr Hafidh Mohamed-Ship owner (Seven Seas) Mr Hadad Sheha,- Chief Officer (Jitihada)	Malindi Wharf area within the Port	- Project to consider deepening and expanding Malindi Wharf to accommodate more ships. Currently, the area can accommodate only 2 or 3 ships. - Any land take onshore of the Malindi Wharf would affect shipping activities in the area especially for domestic cargo transported to Zanzibar from the mainland. This will consequently affect Zanzibar's economy.
13.01.2016	Labour companies - HESU Investment limited and TAN DRIVERS	Ahmad Ng'itu-Driver Salehe Mhando-Driver	Port premises	- The Port will have more space for the storage of cargo, especially for the Ro-Ro terminal hence more security and safety for the imported goods. Goods stored in ICD are at higher risk of being stolen and most of the countries such as Rwanda, Burundi and the Democratic Republic of Congo prefer goods to be stored within the Port area to avoid theft.
14.01.2016	Tanzania Railway Limited	Eng. Vincent Assey Assistant Chief Civil Engineer	TRL office	- TRL does not oppose Port expansion, but any rail improvement within the Port should align with existing rail lines which are connected to the Port. Consider challenges in crossings, etc.
14.01.2016	Fishermen-Kurasini Landing site and Vijibweni	Group of fishermen, fish traders	Kurasini landing site	- Dredging activities, if not handled carefully, might affect the fishing hatching area due to underground disturbances, and hence reduce the availability of fish. To them the project area is far from fishing grounds, thus they will not be affected. - The fishing communities accept the project, as they will get more customers during construction, and hence increase their income.
15.01.2016	North Star Alliance-NGO under TACAIDS Umbrella	-Mariam Mlimira, Site coordinator -Raphael Mwangu, Clinician -Magreth Lucas, HIV/Testing &Counselling	North Star Alliance Office-Along Bandari Road	- They will increase level of coverage hence meet their target level-at the moment they serve between 20-30 people per day and with Port expansions the number will likely increase - HIV/AIDS increase – Despite the interventions offered by NGOs, it is likely that HIV/AIDS will increase due to social and interactions, which will affect the work force.
15.01.2016	Wake And Support other Organization (WASO) funded	Dr Lussumo Samson, Programme Manager	WASO office-Along Bandari Road	- HIV/AIDS increase – The spread of HIV/AIDS and other sexually transmitted diseases. During construction, workers and other users of the Port are at higher risk of being infected with venereal

Date	Stakeholder	Participants	Venue	Issues of concern/Suggestions
	under USAID			diseases, especially HIV/AIDS. The Contractor is required to conduct relevant awareness seminars and campaigns on HIV/AIDS for both workers and communities, distribute condoms, posters etc. The Contractor needs to liaise with local NGOs working along Bandari Road for further assistance.
15.01.2016	Members from; Kurasini Ward Vijibweni Ward Kurasini *Mtaa* Kiungani *Mtaa* Minazini *Mtaa* Mivinjeni *Mtaa*	Ward executive officer-Kurasini Ward and Mtaa leaders	Kurasini Ward office	- Considerations for local employment – During mobilisation, construction and operations – especially on those activities which do not require skills such as cleaning masonry, digging trenches, etc. – casual labourers should preferably be sourced at Kurasini Ward and *Mitaa*. - Early pregnancies for school girls – School girls who engage in relations with project workers may end up with unwanted pregnancies. There are many parking lots for trucks around Kurasini area and some of the drivers can stay in the area for about a week waiting to load cargos. - Loss of employment and income – This is anticipated after completion of the project as many unskilled labours will lose their job. It is anticipated that this will be minimal or temporary. Contrastingly, other businesses are expected to grow, e.g. food vendors.
15.01.2016	Food vendors	Food vendors (estimated no 20-30)	Along Bandari Road	- Most of the food vendors are not aware of the Port improvement and it is good news for them, as they will get more customers. - HIV/AIDS is growing at an alarming rate and some food vendors are also sex workers as a means of diversifying livelihood. Some do accompany long distance drivers for upcountry trips.
15.01.2016	Motorcyclist	Motorcyclist (estimated number 15)	Along Bandari Road and Kurasini Landing site	- They were not aware of the Port expansion. It is a positive move for motorcyclists since they will have more customers, hence increased income. At the moment, their customers are food vendors and other port users.
22.01.2016	National Health Insurance Fund (NHIF)	Eng. Simon Seleman-Civil Engineer	NHIF office	- Construction activities will cause traffic congestion especially along Bandari Road. - Vibrations due to heavy equipment brought on site.
22.01.2016	Shipping Agents	Said Nzlamo - Chief operator(WASAC LTD) Kassim Ngonyani-Agent (Seaforth LTD)	Along Bandari Road	- Berthing delay for other goods (such as wheat in bulk); Port prefers container vessels to be offloaded first because they stay in short time (2-3 days). - Positive move for the project as it will relieve congestion for the ships.

5.4.4 Views from final stakeholders disclosure meeting

The ESIA consultants, with support from TPA, organised a meeting as a required by IFC standards, to disclose the overall findings of the consultations and impact assessment and in particular to share the proposed mitigation measures to address the impacts. The meeting was held in the TPA offices, and invitees included 33 participants in total (see participants list, Appendix 5). Important participants included representatives of government institutions (ministries, departments and local government), labour agents, TPA, NGOs, Tanzania Navy, wheat grain importers, railways, shipping companies using Malindi Wharf, and representatives from the motorcycle taxis, local fisher groups and food vendors from around the Port.

The ESIA Consultants presented the draft Executive Summary from the EIS in a Power Point presentation and invited stakeholders to share views and opinions. In general there was agreement as to the need and value of the Port development proposed in Phase 1. There were however four important issues raised:

- Reducing space for Malindi Wharf users from Ro-Ro construction and operation. The accepted suggestion was to consider alternatives so as to reduce inconveniences to current and future users, and to meet at the Wharf to discuss (see 5.4.5).
- Increase traffic jams on public roads during construction, especially from delivery of back-fill material for the Ro-Ro Terminal. One suggestion was to consider using marine vessels to transport construction materials from Bagamoyo to Dar es salaam.
- Publicising ship scheduling during construction was deemed to be a useful mitigation measure to avoid collisions at sea.

5.4.5 Focus group consultation on Malindi Wharf options

Following the important issue raised in the disclosure meeting (see section 5.4.4), a special focus groups meeting was organised by the EIA consultants to take place at Malindi Wharf on 18th February 2016 (Figure 5-1), specifically to learn from three vessel operators (Zanzibar Shipping Corporation, Al Ghubra Marine and Seven Seas), as well as the Tanzania Navy. Participants also included TPA representatives and the Contract Management consultant from Sellhorn.

The vessel operators provided useful background to the usage of the area, from the northern bend of the original Dhow Wharf to the southern end of the Malindi Wharf. The two major restrictions that affects the present operations are:

- Shortage of dock length for small ships and dhows due to shallow water depth except for the Malindi Wharf section;
- Shortage of dock length even for dhows, due to reduction in the length of the Dhow Wharf (from the Zanzibar ferry pontoon half way along the original section), and from the recent fencing erected by the construction of the new TPA tower block;

Figure 5-1 Meeting on 18th February 2016 with representatives of local shipping companies that use Malindi Wharf, at the southern end of the wharf - the only portion where waters are deep enough for coastal lighters (upper); in focused group consultation with three coastal lighters that use the Malindi Wharf (Zanzibar Shipping Corporation, Al Ghubra Marine and Seven Seas), as well as the Tanzania Navy, to discuss the potential impacts of the construction and operation of the Ro-Ro Terminal at Gerezani, with the preferred design option proposed to occupy the southern corner of the existing, heavily used facility, and to consider alternatives and mitigation measures.

Table 5-4 Responses to issues raised by stakeholders

No	Issue/Impact	Response	Section addressed in the EIS
1	Increase of traffic jam and accidents during construction	• Consider transporting construction materials at night or consider alternative routes such as Mivinjeni-Taffico Road at night.	7.2.1.2 7.2.3 7.3.1 7.3.2
2	Increases of HIV/AIDS	• The Contractor is required to conduct relevant awareness seminars and campaigns on HIV/AIDS to both workers and communities, proper usage of condoms, posters, use video displays to show the impact of HIV/AIDS. This can be done with local NGOs namely North Star Alliance and WASO Organisation working along the Bandari Road for further assistance. • Give camp-workers some few days off every few weeks to go to their homes specially the married to reduce their levels of temptation to search for new partners. • Advice truck and oil tank drivers in some cases to travel with their partners to reduce their levels of temptations to search for new partners.	7.3.2
3	Increase of business opportunities along Bandari Road due to presence of workforce during construction	• These will include food vendors, motorcyclist, kiosks and small general stores.	7.1.1
4	Noise during dredging and Dust during construction	• Use proper equipment to monitor noise levels, proper maintenance of construction equipment. • Contractor is obliged to sprinkle water during construction to avoid dust.	7.2.2 7.2.4 7.3.1
5	Local job creation and increase of income to locals	• Involvement of locals in the construction activities will increase income to locals. • Locals will acquire skills, which will be utilized elsewhere when opportunities arise. • Involve community leaders/ committees to	7.1.1
6	Loss of employment after completion of the project	• This is anticipated after completion of the project as many unskilled labours will lose job. • It is anticipated that this will be minimal or temporary and on the contrast, business will grow especially for food vendors, petty traders and motorcycle.	7.2.3.3
7	Dredging exercise will disturb the bottom substratum and therefor some benthic living organism will be affected as well	• The design to consider best option and best practises during dredging such as suspension of sediment, disruption of ecology, etc.	7.2.1 7.2.2

No	Issue/Impact	Response	Section addressed in the EIS
8	Waste generations	• Collect all generated waste in designated places, segregate recyclables (plastic, metal, cans, timber and glass for recycling). • All biodegradable materials need to be collected and dumped to designated open landfill site at Pugu Kinyamwezi. • Project proponent need to consider disposable toilets during constructions.	7.3.1 7.3.2
9	Health, safety and security	• Provision of personal protective equipment (PPE) e.g. safety boots, reflective jacket, gloves to avoid body harm/injuries • Design to incorporate fire safety structures. • Sensitize all employees working on the project to use PPE to avoid occupational diseases. • Occupational risks (hard hats, ear plugs/muffs, dust coats, safety harness for those working above ground, gloves, dust masks, goggles for eye protection, hard toed boots	7.3.1 7.3.2
10	Inadequate or lack of awareness amongst stakeholders about the proposed project	• The Client will conduct public awareness campaign before the project begins, as well as construction and operation phases	12.2
11	Interference with Malindi Wharf operations	• Deepen existing wharf, from south of Malindi Wharf to northern end of the Dhow Warf, through maintenance dredging to - 5.0 m CD (380 m length x 30 m width x 5 m depth = 57,000 m³). • Improve road access through Gate 2 for vessel users (trucks and cars) so as to avoid the Gerezani area, especially during the construction (and operation) period. • Establish a "Phase 1 Malindi Wharf Users Steering Committee" or equivalent entity that represents the TPA and the users of that small portion of the Dar es Salaam Port, to serve for communication, updates and information exchange between the various users.	7.21 12.2

Chapter 6: CONSIDERATION OF ALTERNATIVES AND IDENTIFICATION OF IMPACTS

This chapter presents the various project alternatives and analysis of anticipated environmental and social impacts or issues that are expected throughout the project cycle i.e. mobilization phase, construction, demobilization and operation for the preferred alternative. The valued receptors affected by the planned and unplanned project activities have been identified and the nature and extent of potential negative and positive impacts are described and assessed.

6.1 Identification and Analysis of Alternatives

6.1.1 Construction alternatives for deepening and strengthening of Berths 1 – 7

Construction alternatives for strengthening and deepening Berths 1 to 7 during the Feasibility Study looked at the option of using either a harbour mobile crane or a rail mounted crane for cargo handling. The options involve a combination of:

1. The construction of a deck slab resting on sheet piles and the installation of raked steel anchor pile;
2. Different lengths of the suspended deck slab;
3. Backfilling the area of the suspended deck versus leaving it open; or
4. The construction of a suspended deck slab resting on concrete piles.

These options are summarised in Table 6-1 (Feasibility Study, 2013). The technical feasibility recommended Option 2 as the preferred option for all berths based on: least cost, availability of construction materials to be fabricated locally, least risk during construction, the use of both a mobile and rail mounted crane during operation and low maintenance requirements. From an environmental perspective, all options require dredging; therefore, the impacts due to dredging are unavoidable for all options. However, Option 2 is an open structure, reducing the demand of backfilling material. Option 2 will also most likely cause the most noise during construction.

From a social perspective, Option 2 presents the least execution risk determined during the Feasibility Study (2013) due to the utilisation of existing precast concrete piles. Therefore, the impacts for option 2 as the preferred option have been assessed.

6.1.2 Location alternatives for the proposed Ro-Ro terminal

From an environmental perspective, the location of the Ro-Ro terminal will have negative impacts on the existing Gerezani Creek. Gerezani Creek is not a pristine and fragile environment due to existing use of the area by TRL and pollution due to solid and liquid waste washed into the creek and bay area. However, it is a sensitive area because it collects surface runoff from the surrounding urban area and discharges to the sea.

From a social perspective, the location of the Ro-Ro terminal will not require the acquisition of land because it is within the TPA area and will not affect social services. The location will affect existing economic activities on the lighter quay (Malindi Wharf). Based on the project description (sections 2.1.1 and 2.2.2) part of the corner of the new Ro-Ro terminal will be located on Malindi Wharf. Currently, that area is used by Zanzibar cargo ferries, and has a building with banking services (see Chapter 4 baseline conditions in core area).

However, the location of the Ro-Ro terminal has no alternative location that considered during the feasibility study. The proposed location was identified during the development of the Tanzania Ports Master Plan (2009). Presenting a new location alternative will involve identifying a site outside of the current Dar es Salaam Port that is deep enough and wide enough to accommodate a Panamax vessel. This will have more environmental and social impacts related to land acquisition, land use change and dredging a larger area and possibly an entry channel. Therefore, impacts related to the proposed location of the Ro-Ro terminal at Gerezani creek are assessed.

Table 6-1 Summary of construction alternatives for Berths 1 to 7.

Berth No.	Option 1 – use of harbour mobile crane				Option 2 – use of rail mounted crane
	A	**B**	**C**	**D**	
1 to 3	Construction of a deck slab resting on sheet piles, installation of raked steel anchor piles, minor extension of 3.75 m, using backfilling material (closed structure)	Construction of a deck slab resting on sheet piles and intermediate sheet pile sections at the toe, installation of raked steel, anchor piles, minor extension of 3.75 m, no backfilling (open structure)	Construction of a deck slab resting on sheet piles, installation of raked steel anchor piles, extension of 7.85 m, using backfilling material (closed structure)	Construction of a deck slab resting on sheet piles and intermediate sheet pile sections at the toe, installation of raked steel, anchor piles, minor extension of 3.75 m, no backfilling (open structure)	Construction of a suspended deck slab resting on concrete piles, extension up to 11.30 m, no backfilling (open structure)
Berth 4	Construction of a suspended deck slab resting on a precast concrete pile, installation of an underwater retaining wall, minor extension of 3.75 m, no backfilling	Construction of a suspended deck slab resting on two precast concrete piles, extension of 7.85 m, no backfilling	-	-	Construction of a suspended deck slab resting on two precast concrete, extension of up to 11.30 m, no backfilling
5 to 7	Construction of an underwater retaining wall, with no extension of the quay and no backfilling	-	-	-	Construction of a suspended deck slab resting on precast concrete piles, with extension up to 10.47 m, no backfilling

Source: Feasibility Study, Modernising of Berths 1 to 7 - Part A, 2013

6.1.3 Construction alternatives for the proposed Ro-Ro terminal

Three construction alternatives for the deck and quay wall were considered during the Feasibility Study:

1. A pile structure with a suspended deck slab consisting of raking and vertical concrete or steel piles and a reverted slope;
2. A sheet pile wall consisting of single steel sheet piles which are locked together and anchored to an anchor pile, hard rock or an anchor wall; or
3. A block wall berth similar to Berths 1 to 3 consists of large single massive or hollow concrete blocks or natural stones placed underwater.

All options include a 12.2 m^2 diameter culvert for draining surface water received from the Gerezani Creek catchment area into the sea. The technical feasibility recommended Option 1 using the pile structure based on cost, availability of construction materials to be fabricated locally and the ability to dampen wave action on the revetment slope. From an environmental perspective, the construction of the piles will cause the most noise during construction. However, this alternative will most likely pose the least obstruction to the drainage of Gerezani creek during construction and operation.

From a socio-economic perspective, the pile structure is more vulnerable to damage from ships and has higher maintenance requirements. Therefore, adequate financial resources need to be allocated for maintenance. This ESIA has therefore only considered impacts related to Option 1 of using the pile structure.

6.1.4 Alternative backfilling material source for the Ro-Ro terminal

There are three approaches to sourcing material for backfilling the Gerezani Creek estuary for the Ro-Ro terminal. A rough estimate of 65% of total 90,000 m² between the existing parking platform and the planned new berth needs to be backfilled. Considering an average depth of 14 m, an estimated 208,000 m³ of material is required, (refer Section 2.2). The type of material suitable for landfilling is coarse sand and rock aggregate that can drain water easily and compacted.

The first alternative is to use dredged material. This can be either retrieved from the estuary and along Berths 1 to 7 during construction or from another, more offshore location. Backfill material from Berth 1 to 7 is only suitable if the type of material dredged is coarse (rock or sand). Sediment surface samples taken in December 2015 indicate that the composition is more silt and clay, which does not drain very well. Thus before dredged material from the Phase 1 activities is considered, sediment composition studies of material dredged from greater depths (between 1 and 2 metres) is needed, from a detailed geotechnical investigation. Concurrently, this deeper dredged sediment will need to be analysed for potential contaminants (heavy metals etc.), as elaborated on in section 6.1.5.

The second approach is to use material from a land-based quarry and/or borrow pits and bring it by road or rail into the Port. There are existing licenced sites to source these materials; therefore, a new quarry does not need to be established for this project. However, all these potential sites are far in-land and the preferred source locations are in Coast Region (Kisarawe, Lugoba and Msolwa quarries). Road transport of the least favourable as it will require over 10,000 truck deliveries, into an area with existing congestion problems, this approach is not recommended.

The third approach is to source material from land sources but deliver it to another port (such as Bagamoyo) and deliver the material by sea to the Gerezani Creek.

This ESIA has considered the second option of sourcing materials from an existing quarry/borrow pit from Coast Region and relevant impacts associated with this are assessed. Bringing suitable backfill material by sea would not involve any special considerations since normal shipping and navigation procedures would apply.

6.1.5 Alternative disposing of dredging material from Ro-Ro terminal and Berths 1 to 7

A chosen method of disposal dredging material (Bortone et. al., 2004) depends on:

1. The technological alternatives available: various in-situ and ex-situ treatment technologies are available. Table 6-2 below presents a wide variety of treatment and disposal methods and associated technologies for dredged material.
2. The chemical-physical characteristics of the sediment: silty/sandy/coarse granular size, presence of organic or inorganic contaminants and level of contamination.
3. Public acceptance of using products from recycled sediment or disposal of dredged material in a particular location.
4. The use of the most natural process for treatment and disposal.
5. The cost of treatment and disposal, which depends on the final objective on whether, the dredged material is to be recycled into a useable product and the type of technology required. The more rigorous separation and treatment required the higher the cost compared to straight relocation and disposal of the dredged material (Figure 6-1).

In this ESIA, the Consultant has considered three alternatives: relocation by using the material for backfilling an area within the Port (lower Gerezani Creek), disposal at sea (sub-aquatic disposal) and disposal on land (up-land disposal).

Table 6-2 Treatment and disposal methods for dredged material.

Method of treatment/disposal	Technology
1. Open water disposal	1. Relocation; 2. Injection dredging
2. Mechanical separation	1. Classification; 2. Sorting
3. Dewatering	1. Evaporation; 2. Mechanical dewatering
4. Contaminant separation	1. Chemical extraction; 2. Thermal desorption
5. Contaminant destruction	1. Biological reduction; 2. Chemical oxidation; 3. Thermal oxidation
6. Contaminant immobilisation	1. Chemical immobilisation; 2. Thermal immobilisation
7. Disposal	1. Sub-aquatic confined disposal; 2. Upland disposal

Source: Bortone et. al., 2004

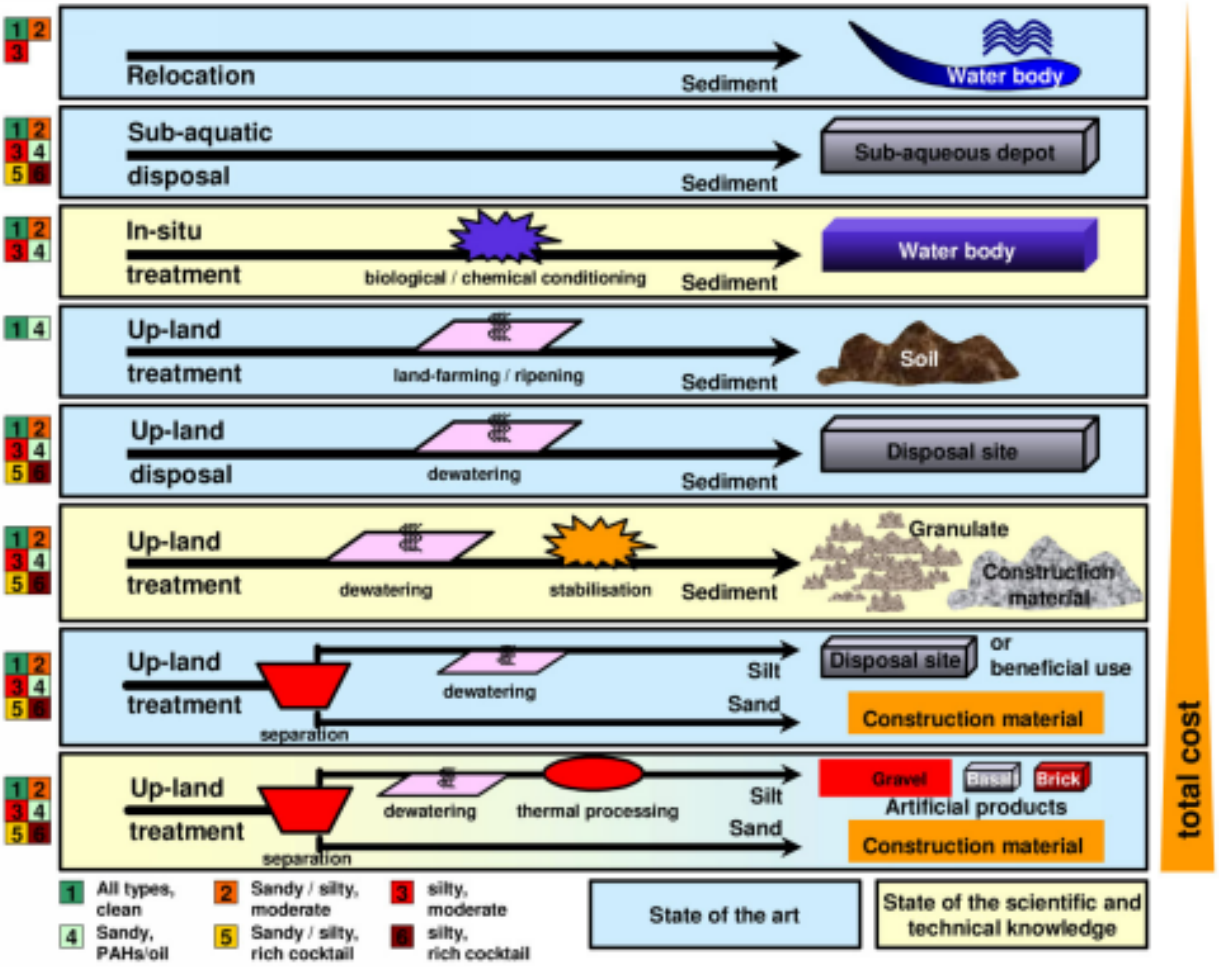


Figure 6-1 Overview of treatment chains for dredged material with relative cost. Source: Bortone et al., 2004.

Relocation for use as backfilling alternative

If the dredged material is found to be of appropriate engineering properties, the best practicable disposal option is its utilization as structural fill for construction on-site. Coarse, sandy sediment can serve as filling material for the Gerezani Creek, upon which the Ro-Ro Terminal will be constructed. This cost-effective disposal alternative is recommended on condition that the dredged material is suitable and/or undergoes treatment prior to construction. Since the contamination of the surface sediments sampled was determined as mainly organic, treatment processes should involve dewatering by evaporation as well as aeration, in order for the removal of volatile and biodegradable contaminants. Nearshore pathway controls include closing off openings in the dikes and managing the area as a confined disposable facility is advised if tidal transport of dredged material is likely to occur.

A suggestion made by the Ministry of Livestock and Fisheries during consultation was to use dredged material to backfill an eroded beach area along Ras Mkwavi (near Mwalimu Nyerere College) on the eastern, Kigamboni shore. This is not a preferred option because the dredged material will most likely be fine silt and/or sand that will be easily washed away by moderate tidal currents.

Sub-aquatic disposal alternative

Another alternative is to sequester the dredged material in the marine environment through confined disposal in submerged pits or by level bottom capping. The dredged volumes can be dumped underwater, ideally into depressions, or onto flat terrain, and capped with a layer of uncontaminated material. The cap should consist of a clayey 1-foot layer, as a chemical seal to prevent the diffusion of contaminants, and a sandy 2-foot cover to avoid bioturbation. It is highly important that subaquatic disposal be sited at a depositional (low hydrodynamic) zone where erosion of the capping material would be minimal, and away from any ecologically or economically important ecosystems. Benthic Pathway Controls include:

- Siting disposal at subaquatic depressions where sediment would be more laterally confined; and
- Depositing the sediment over a wider disposal area to alleviate burial effects on benthos.

Based on the previous studies conducted by Scott Bertlin (revised 1993), a suitable site for disposal at sea off the coast of Dar es Salaam was identified. This is the preferred option because previous dredged materials were disposed in this site. However, the site needs to be re-confirmed.

Upland confined disposal alternative

The least recommendable alternative is to dispose the dredged material in a confined inland facility. This option is quite costly in terms of facility establishment and transportation to the disposal site. It can be deemed as economically feasible if treated sediment can be re-used (commercialized) or if the facility can serve as a long-term repository for dredge waste. However, this is associated with a greater number of contaminant pathways and must therefore include effective effluent, leachate and surface water management systems, as well as containment structures (impermeable liners, weirs or slurry walls etc.). Treatment processes recommendable for this method of disposal are dewatering, ripening and/ or land farming to allow for the volatilization and biological conditioning of organic contaminants. Upland Pathway Controls include:

- Managing settling time and discharge rates to improve return water quality;
- Controlling dust by installing water sprays; and
- Avoid locating the upland disposal facility near land uses sensitive to odours.

Therefore, this ESIA has considered disposal of dredged material at sea as the preferred option and impacts related to this option are assessed in Section 6.4.1.2.

6.1.6 Technological alternatives for the expansion of the existing Grain Silo

The Feasibility Study considered three different options:

Option 1: Rehabilitate existing Silo Conveyors without Modifications. This is not a recommended alternative because it does not meet the current demand and forecasted demand of more than 1,000 t/hour in year 2028.

Option 2: Install high capacity conveyors and maintain existing storage. This option would meet the forecasted demand for offloading but would not meet the minimal storage capacity forecasted at 15,600 m^2 in year 2028.

Option 3: Installation of High Capacity Conveyors (600 t/hr) and seven additional Silos (total storage capacity of 44,000 t). This option meets both the forecasted offloading demand and storage capacity demand.

Technological alternatives in Option 3. This includes the type of conveyor system to be installed and the type of silos to be constructed. Three alternative conveyor types include Belt conveyors versus Chain conveyors and Bucket conveyors described in Table 6-3 (Bern, 2006). The Feasibility Study presents all

three options. The preferred alternative is a combination of the chain conveyor from the ship to the distribution tower and to the silos because of the high capacity and closed system to prevent dust and protect from weather; and a bucket conveyor to lift grain up vertical distances. Type of Silos can be either steel or concrete; steel is the preferred option because of relatively low construction cost, the larger storage capacity compared to concrete and the fact that it is the least demanding on sand and cement required for construction.

Table 6-3 Description of alternative types of conveyors.

Characteristic	Belt Conveyor	Chain conveyor	Bucket conveyor
Description	A belt conveyor consists of an endless moving belt which supports and moves material The belt is usually fabric-reinforced rubber. It is carried on idlers fitted with anti-friction bearings	Flight conveyors consist of one or two endless flexible drive lines (chains, belts, cables) to which flights are attached. Flights drag along material as the drive line is pulled in a circuit. The en masse flight conveyor is most appropriate for many high capacity applications	Bucket conveyors are vertical belt conveyors with buckets bolted on to carry the load. Buckets are made of fabricated metal (usually steel), cast metal, or of a non-metallic material. The three common belt conveyor types vary in the way material is discharged. Most grain conveyors are centrifugal action for discharge the material
Speed	Speed is limited by the tendency of material to blow off the belt	Flight conveyors travel at drive line speeds from 25 to 300 ft/min (common range is from 100 to 200 ft/min). Higher speeds accelerate wear and may increase product damage	High speed options of 450 to 1000 ft/min and low speed options under 450 ft/min
Power demand	Power requirement is comparatively low since the load is carried on anti-friction bearings. Power is independent of product moisture content because there is no sliding of material during movement	Power requirement is relatively higher than belt conveyor because the drive line, flights and material are all dragged along a surface Power demand also varies from one grain to another and usually increases with moisture content	Low power requirements since load is carried in buckets supported by antifriction bearings. Power and capacity are not affected by grain moisture content
Incline	Incline is limited by the repose characteristics of the material being moved. Recommended maximums for grain are in the range from 8-18 degrees	Some are designed for horizontal use only. Others may operate at extreme slopes or even vertically	Vertical incline, most commonly applied in elevator conveyor systems
Capacity	A very wide range of capacities is possible with belt conveyors, theoretically up to 300,000 bu of corn per hour. There is practically no damage to material while being conveyed on a belt conveyor since there is little relative motion between the material and the belt. There may be product damage occurring during loading and unloading	This type of flight conveyor is very versatile and, with little or no modification, can be used for grain, feed, ear corn, forage, and even bundles of shingles. The en masse flight conveyor can carry nearly 100,000 bu/h	Bucket conveyor capacity depends on belt speed, bucket volume, bucket spacing, and the percent of fill attained by the bucket loads of up to 60,000 bu/h are attainable

Characteristic	Belt Conveyor	Chain conveyor	Bucket conveyor
Noise	Noise level comparatively is low since a belt conveyor has none of the usual sources of high conveyor noise (scraping of surfaces, high-speed fans, impact of particles).	Noise level comparatively high due to the dragging	Their noise level is relatively low
Distance	Conveying distance is unlimited	The en masse flight conveyor can be installed distances up to 400 ft	
Cost	Belt conveyors are comparatively high in cost and designed for long life and heavy service	Conventional flight conveyors are inexpensive simple machines	High investment cost, low operating cost
Open or closed system	Belt conveyors are not inherently enclosed and unless there is a reason to add the expense of enclosure (dust containment, weather protection) they are usually left open	The en masse flight conveyor is designed as an enclosed box design retains dust, protects grain from weather, and allows long spans without additional support	Buckets are typically designed open

Source: Bern, 2006.

Location alternatives for Option 3. The Feasibility Study did not consider location alternatives of the additional silos due to availability of space using the current Port zoning. The proposed location is nearest to the designated grain terminal zone that requires minimal demolition of existing structures to create space to seven additional silos. In addition, the proposed location is adjacent to the existing silo therefore the existing discharge conveyors and silo can be incorporated into the design.

6.1.7 Alignment alternatives for railway links at the port

The first alternative is to leave the existing tracks in the mid port and quay areas. The Feasibility Study identified that this option would limit the ability to increase the Port's capacities on the berths and will minimize options for modernizing Port operations particularly at the container terminal. The preferred alternative is to align the railway tracks along the rear side of the Port area because it offers the most options for modernizing cargo handling.

The second alternative was considering the use of multiple tracks with different gauges versus a single track with existing gauges. The Feasibility Study identified the option to upgrade to a single track with a standard (triple) gauge track width as the preferred option to avoid multiple tracks crossing the port area. From a socio-economic perspective, the single track is the preferred option because a single track will decrease occupational risks and accidents by minimising railway crossing locations within the Port, reduce amount of ballast material needed if multiple tracks are used, and reduce maintenance cost.

6.2 Impact Identification and Assessment of Significance

6.2.1 Project boundaries

Determining the boundaries within which the EIA will be undertaken is an important step in the identification of impacts since this will also determine the extent to which the impacts will be experienced. Three types of boundaries that are considered in this EIA, institutional, temporal and spatial boundaries, are presented below.

Institutional boundary

Institutional boundaries refer to those institutions and sectoral boundaries, which the project interacts with. These can be determined from political boundaries, Acts, regulations and institutional mandates. The

proposed development is about modernization of Dar es Salaam POrt to include deepening and strengthening of berths 1-7 plus improvement of cargo handling processes at the Port. This proposed development touches the interest of many institutions and administrative structures in relation to several policies, laws and plans in Tanzania. Administrative institutions such as Temeke Municipal Council form part of the institutional boundaries for this development. Other institutions that will be interested in the proposed development include the Vice President's Office – Division of Environment, Ministry of Land, Housing and Human Settlements Development (MLHHSD), Ministry of Natural Resources and Tourism and several other public and private institutions. For a complete list of key institutions that will be involved in this ESIA, see Section 3.5.

Temporal boundary

Temporal boundaries refer to the lifespan and reversibility of impacts. For example, the impact of construction work for the berths, container yard, silos and the related facilities may be short-lived, but the presence of the Port in the area may have implications that stretch far into the future. In addition, consideration needs to be given to what happens when the project ends, where there is need for site restoration and decommissioning of the structures or when a major rehabilitation like the envisaged happens. Therefore, some of the impacts may occur during construction, e.g., noise caused by bulldozers will disappear as soon as construction is finished. Congestion in the area and along the roads leading to the Port will continue to be a problem during construction and operation phases.

Spatial boundary

Spatial boundaries are difficult to determine accurately but it is crucial to decide whether impacts are likely to occur at local, regional, national or international level. The modernization of the Port facilities will have far-reaching implications that are likely to be felt locally, regionally and outside Tanzania, thus causing impacts to as far as those areas. For example, the deepening and widening of the entrance channel and the berths may create demand for big ships from other places of the world that have never anchored at the f Dar es Salaam Port. In this EIA, spatial impacts were determined in the **Direct Influence Area (DIA)** (the area where the project is located and which would bear the most impacts); the surrounding **Indirect Impact Area (IIA)**, and the **Wider Impact Area (WIA)**.

1. DIA: these are locations where the construction and related port infrastructure improvements, i.e. the Dar es Salaam Port and Kurasini Ward.
2. IIA: these will include the rest of Temeke Municipality and Dar es Salaam City, where most of the labour force, food, goods and social services are likely to be obtained from, supporting infrastructure, and potential locations for sources of building materials in Coast Region (Lugoba, Msolwa and Kisarawe).
3. Wider Influence Area (WIA): these are other regions in Tanzania and neighbouring countries that depends on the Dar es Salaam Port for trade. WIA can be divided into Tanzanian and international influence area as in Table 6-4.

6.2.2 Impact Identification and assessment methodology

Based on the project components, the baseline environmental status and the defined influence areas, the potential impacts were identified in the following main steps:

1. Identification of project activities / aspects causing impacts (see Chapter 2);
2. Establishing affected environmental and human components (valued receptors). These were determined to include: vegetation, marine water quality, marine life, soil, land, surface water flow, ambient air quality, employment and livelihoods (including port users and suppliers), infrastructure (roads, rail) , utilities (water supply, electricity, waste), public safety (including ships and humans that use Port) and occupational health and safety (construction workers and TPA staff);
3. Review of issues and concerns raised by stakeholders;
4. Categorising impacts by preconstruction/mobilisation, construction as well as operation phases for each of the project components;

5. Describing the nature, extension, duration and magnitude of impacts using criteria described in Table 6-4; and
6. Evaluating the significance of impacts using assessment criteria indicated in Table 6-5.

Table 6-4 Criteria for assessment of nature, extension, duration and magnitude of impacts.

Criterion	Description
Nature	***Nature of the environmental change***
Positive	Beneficial environmental change
Negative	Adverse environmental change
Extension	***The geographical area that may be affected by the impact***
DIA	Only the place where the activities directly related to Port improvements may occur, located within the boundaries of TPA Dar Port area
IIA	Effects in Kurasini Ward and Temeke District where the project is located, along transportation corridors and at potential sources for construction materials in the neighbouring Coastal region
National WIA	Effects may occur within Tanzania
Regional or International WIA	Tanzania and neighbouring countries
Duration	***Period along which the impact is expected to occur***
Short-term	Within the construction period or less than six months
Medium-term	Between six months and five years
Long-term	More than five years
Magnitude	***Effect on environmental and social processes***
High	Natural functions and processes/existing conditions are severely altered. Sensitive/protected species or habitats are severely affected
Medium	Natural functions and processes/existing conditions are notably altered. Sensitive/protected species or habitats affected
Low	Natural functions and processes/existing conditions are slightly altered. Sensitive/protected species or habitats not affected
Very low	Natural functions and processes/existing conditions are negligibly altered
Zero	Natural functions and processes remain unaltered

Table 6-5 Criteria for assessment of significance of potential impacts of the project.

Significance category		Description
Major negative impact	Major positive impact	High magnitude with a local extent and medium term duration
		High magnitude with a regional extent and short-term period or a site specific extent and long term duration
		High magnitude with either a local extent and short-term period duration or a site specific extent and medium-term duration
		Medium magnitude with any combination of extent and duration except site-specific and construction period or national/international and long-term
Moderate negative impact	Moderate positive impact	Low magnitude with regional extent and long-term duration
		High magnitude with a site-specific extent and short-term period duration
		Medium magnitude with a site-specific extent and short-term period duration
		Low magnitude with any combination of extent and duration except site-specific and short-term period or regional and long-term
		Very low magnitude with a regional extent and long-term duration
Minor negative impact	Minor positive impact	Low magnitude with a site-specific extent and short-term period duration
		Very low magnitude with any combination of extent and duration except regional and long-term
No impact		Zero magnitude with any combination of extent and duration

6.3 Impacts from Construction of Ro-Ro Terminal

6.3.1 Types of impacts

6.3.1.1 Pre-construction Phase

1. *Loss of road-side vegetation due to site preparation activities*

As part of site preparation activities to prepare the outer Gerezani Creek estuary area for backfilling, the ground may have to be excavated and levelled. Therefore, although vegetation clearance is a negative, direct, site-specific and long-term impact, the magnitude of this impact is low.

2. *Resuspension of sediment*

Excavation works in the Gerezani creek estuary will result in the resuspension of sediment (mud) that will be washed in to the harbour areas. Impacts as a result of the resuspension of sediments is discussed in section 6.4.1.2 as this will continue during construction phase.

3. *Acquisition of land*

The Contractor(s) employed for the construction of the Ro-Ro terminal will require land for the site office and for storage. During site visits, two potential sites were identified: one is within the TPA area towards the Ship Yard area; the second is where the current Contractor's camp for the Kigamboni Bridge is located on Nelson Mandela Road. The ESIA does not recommend the establishment of a new Contractor site. In addition, the proposed car park for the Ro-Ro terminal may need more land than what is currently

available. The design anticipates to backfill part of the Gerezani creek estuary and construct a suspended deck. The expanded car park will therefore be located within the TPA area. Therefore, impacts related to land acquisition are not anticipated and not discussed further.

4. *Disruption of livelihoods due to the demolition of existing structures on Malindi Wharf*

The construction of the Ro-Ro terminal will include an estimated 1,100 m² of the corner of the existing Malindi Wharf for loading/unloading vehicles (a space approximately 50 m long along the quay face by 22 m width. At present there is a building with banking services and a public toilet situated in that area that will have to be demolished in preparation of construction. During stakeholder consultations, the banking services indicated that they are planning to move to the new TPA high-rise building adjacent to Malindi Wharf. In addition, there is a docking area for medium sized vessels transporting goods from Dar es Salaam to Zanzibar, Mafia and other small ports, that significantly overlaps the area planned as the offloading ramp. Therefore, the platform for the vessels to dock will have to be moved further north. The demolition of these structures resulting in the relocation of existing activities will have a negative, short term and site-specific impact on existing livelihood activities. However, this is expected to be a temporary disruption and alternative locations have already been identified, therefore moderate in magnitude.

6.3.1.2 Construction Phase

1. *Changes in marine water quality due to released chemicals/heavy metals while dredging/backfilling*

Redox potential (eH) and pH are two variables that control the characteristics of chemicals and heavy metals in water and sediment. As long as the pH remains around 8 and eH < 150 mV, most of the chemicals and metals will remain bound to the solid phase without being released into the surrounding water. Only anoxic conditions reduce the eH below this level and hence if dissolved oxygen level is normal, no leaching of chemicals and heavy metals will occur. The proposed project is not expected to develop anoxic conditions in marine water in the project area. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water.

This impact is negative, site-specific, medium term, and of medium magnitude.

2. *Fishing activities affected by suspended sediment*

The suspension of sediments during dredging can result in the localised removal of oxygen from the surrounding water. Depending on the location and timing of dredging, this may lead to the suffocation of marine animals and plants within the localised area or may deter migratory fish or mammals from passing through. However, removal of oxygen from the water is only temporary, as tidal exchange would quickly replenish the oxygen supply. Therefore, in most cases where dredging is taking place in open coastal waters, this localised removal of oxygen has little, if any, effect on marine life. Additionally, fishing activities do not directly take place in the Port area. This is a negative, site specific, short-term impact of low magnitude.

3. *Marine pollution from the disposal of dredged material*

The construction of the Ro-Ro terminal will include dredging, which will generate dredged waste that has to be disposed. Dredging will also take place during construction works at Berths 1 to 7, therefore this impact is discussed in Section 6.4.1.2.

4. *Restricted access of other Port users*

The construction and dredging activities may require for access to some sections of the Port to be restricted as a precautionary (occupational health and safety) measure. This will impact vessels docking, TPA staff operations, private company operations, and vessels that use the Malindi Wharf and Berth 1. This will have an indirect impact on the livelihoods of those who have work responsibilities concerning the affected areas. This is a negative, site-specific, short-term impact of medium magnitude.

5. *Flooding of upper Gerezani Creek area*

Backfilling activities in the new Ro-Ro Terminal area may temporarily block the stream and therefore affect the drainage of surface water into the harbour (where the Ro-Ro terminal and berth are 'obstructions'). In

addition to the 'natural' Gerezani stream, the man-made surface water drains/sewers may be temporarily demolished or blocked. If coupled with a heavy rain event, the obstructed drainage will increase the risk of flooding within the Port area and in some parts of Gerezani Creek's catchment area. This is a negative, local, medium-term impact of high magnitude.

6.3.1.3 Operation Phase

1. *Occupational accidents from offloading vehicles*

The day-to-day operation of the Ro-Ro terminal will involve latching and unlatching of the vessels, offloading of vehicles and driving the vehicles to the car park before leaving the Port. During these operational activities, workers in the Ro-Ro terminal area are exposed to the risk of accidents. This impact is negative, long-term, site-specific and of high magnitude.

2. *Reduced berth space at Malindi Wharf*

A section of Malindi Wharf will be claimed for the construction of the new Ro-Ro terminal. This means that private company operations and vessels that currently use the Malindi Wharf area will experience a reduction of approximately 1,100 m^2 of space available for docking. The decreased space may affect number of vessels that can dock at the same time. This will can result in changes in delays, changes in the shipping schedule or reduction of vessels transporting goods to Zanzibar using Malindi Wharf. This will have a long-term, indirect, negative impact on livelihoods, which is regional as it impacts trade with Zanzibar and is of high magnitude.

3. *Increased vehicle traffic*

Due to the increased vehicle importation capacity at the new Ro-Ro terminal, traffic and congestion is expected to increase within the Port, the roads immediately outside the Port and within Dar es Salaam City. The Feasibility Study (2013) forecast indicates an estimated 112,000 units in 2018, which is an average of 390 vehicles per day. Other planned projects within TPA include the upgrading of access roads and the construction of a southern bypass to the Port. These projects will mitigate the magnitude of the increased vehicle traffic. This is a negative, local, long-term impact of moderate magnitude.

4. *Increase in CO_2 emissions from increased vehicular traffic*

In addition to noise pollution, increased traffic around the Port will involve increased vehicle emissions. These emissions add to the heat-trapping gases in the atmosphere and thereby contribute to climate change. If the basis that one 2012 and 2016 model passenger vehicle on average produces 411 grams CO_2/mile is used (EPA, 2014), this is equivalent to about 257 grams CO_2/kilometre. The Feasibility Study (2013) predicts a low forecast demand of 242,000 vehicles annually by 2028; which would produce an equivalent of 62 t/km annually. This is a moderately negative, long-term, regional impact.

6.3.2 Significance of impacts

The significance rating for impacts specific to the new Ro-Ro terminal is presented in Table 6-6. The significance of other impacts similar in other sub-projects are described as cumulative impacts in Section 6.7.

Table 6-6 *Significance of impacts- Ro-Ro Terminal.*

Impact			Impact evaluation criteria			Significance rating
Phase	**Description**	**Nature**	**Extent**	**Magnitude**	**Duration**	
Pre-construction	Loss of road-side vegetation due to clearing around outer Gerezani Creek	Direct	Site-specific	Low	Long term	-ve Moderate
	Acquisition of land	Direct	Local	Zero	Long term	No impact
	Disruption of livelihoods at Malindi Wharf	Direct	Site-specific	High	Long term	-ve Major
Construction	Changes in marine water quality due to released chemicals and heavy metals while dredging or backfilling	Indirect	Site-specific	Medium	Medium term	-ve Major
	Fishing activities affected due to suspended sediment	Indirect	Site Specific	Low	Short term	-ve Minor
	Pollution from disposal of dredged material	Indirect	Local	Medium	Medium term	-ve Major
	Restricted access of other port users	Indirect	Site-specific	Medium	Short term	-ve Moderate
	Flooding of upper Gerezani Creek area due to accidentally blocking surface water flow into the harbour	Indirect	Local	High	Medium term	-ve Major
Operation	Occupational risks and accidents offloading vehicles	Direct	Site-specific	High	Long term	-ve Major
	Deposition of waste from upper Gerezani at the Ro-Ro terminal	Indirect	Site-specific	Low	Medium term	-ve Moderate
	Reduced berth space at Malindi Wharf	Direct	National	High	Long term	-ve Major
	Increased vehicle traffic	Indirect	Local	Medium	Long term	-ve Major
	Increase in vehicle CO_2 emissions	Indirect	Regional	Medium	Long term	-ve Major

6.4 Impact from the Deepening and Strengthening of Berths 1 – 7

6.4.1 Type of impacts

6.4.1.1 Pre-construction Phase

1. *Disruption of services due to the demolition of existing structures on Berths 1 to 7*

The planned works on Berths 1 to 7 will require some of the existing infrastructure to be removed/demolished i.e. fenders, ladders and part of the existing quay walls. Therefore, there will be temporary disruptions for vessels docking. The demolition of these structures will have a negative, short term and site-specific and moderate impact on existing services.

6.4.1.2 Construction Phase

1. *Increased suspended sediment from dredging activities impacting marine life*

Planned dredging of the channel adjacent to the proposed terminal site would lead to increased sediment agitation and in turn lead to increased sedimentation rates at some parts of the harbour. Furthermore, if the planned dredging will change the creek morphology at the banks, the hydrodynamics of the system will significantly change and some of the banks that are currently stable may start to erode.

When dredging and disposing of non-contaminated sediments, the key impacts are the increase in suspended sediments and turbidity levels. Any dredging method releases suspended sediments into the water column, during the excavation itself and during the flow of sediments from hoppers and barges.

Increase in suspended sediments and turbidity levels from dredging and disposal operations may, under certain conditions, have adverse effects on marine animals and plants by reducing light penetration into the water column and by physical disturbance. Suspended sediments can affect filter-feeding organisms, such as shellfish, through clogging and damaging feeding and breathing process. Similarly, young fish may be harmed if suspended sediments become trapped in their gills. Increased fatalities of young fish have been observed in heavily turbid water. Adult fish are likely to move away from or avoid areas of high suspended solids, such as dredging sites, unless food supplies are increased as a result of increases in organic material.

The increase in turbidity results in a decrease in the depth that light is able to penetrate the water column, which may affect submerged seaweeds and plants by temporarily reducing productivity and growth rates. The degree of resuspension of sediments and turbidity during dredging and disposal depends on:

- Sediments being dredged (size, density and quality of the material);
- Method of dredging (and disposal);
- Hydrodynamic regime in the dredging and disposal area (current direction and speed, mixing rate, tidal state); and
- The existing water quality and characteristics (background suspended sediment and turbidity levels).

In most cases, sediment resuspension is only likely to present a potential problem if it is moved out of the immediate dredging location by tidal processes. In general, the effects of suspended sediments and turbidity are generally short term (<1 week after activity) and near-field (<1 km from activity). These are of concern only if sensitive species are located in the vicinity of the maintained channel. Since no sensitive species were observed or likely to exist in the areas to be dredged (between the Malindi Wharf and Berth 7) as this is an existing or operational port area, impacts that are ramifications from suspended sediment are negative, site-specific, short-term and of low magnitude.

2. *Fishing activities affected by suspended sediment*

Depending on the location and timing of dredging, this may lead to the suffocation of marine animals and plants due to localised removal of oxygen from the surrounding water or may deter fish. However, removal of oxygen from the water is only temporary, as tidal exchange would replenish the oxygen supply. Therefore, in most cases where dumping of dredged material is taking place in open coastal waters, this localised removal of oxygen has little, if any, effect on fish. In the case of Dar es Salaam Port, fishing does not take place in the Port area to be dredged. The proposed dredging material dumping site is an "open water" location where the possibility of temporary impact on fish and fishing cannot be entirely avoided. This is therefore a negative, site specific, short-term impact of low magnitude.

3. *Changes in marine water quality due to released chemicals and heavy metals while dredging*

Redox potential (eH) and pH are two variables that control the characteristics of chemicals and heavy metals in water and sediment. As long as the pH remains around 8 and eH < 150 mV, most of the chemicals and metals will remain bound to the solid phase without being released into the surrounding water. Only anoxic conditions reduce the eH below this level and hence if dissolved oxygen level is normal no leaching of chemicals and heavy metals will occur. The proposed project is not expected to develop anoxic conditions in marine water in the project area. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water. This impact is negative, site-specific, medium term, and of medium magnitude.

4. *Marine pollution due to disposal of dredged material*

The material to be disposed of from the construction site after dredging will be required to be disposed of under confined type of disposal so that the fine materials cannot be brought back by current. Scott Bertlin's study conducted in 1981 proposed disposal sites for material to be about 5 km offshore.

However, a revision was done in 1993 after a further observation of the direction of drift. It is therefore proposed that disposal of material dredged from Berths 1 to 7 be disposed of at position given by Scott Bertlin revised study of 1993 (see Figure 6-2). This site is located in deep sea waters (over 5 km from the

nearest land (Outer Makatumbe Island, with the Dar es Salaam Marine Reserve), and 6.5 km from the nearest mainland shore (at Msasani Peninsula) and in waters more than 50 m in depth). From this location, the likelihood of movement of disposed material back to the harbour is considered to be negligible. The direction of the drift was observed during the Scott Bertlin study to be away from the harbour, northerly. However, current direction is known to change depending on the season, and prior to dumping, current studies are needed to confirm direction.

Though very unlikely to be impacted by dumping of dredged material, coral life is very sensitive to sediment, therefore monitoring of turbidity levels and sediment trapping at selected sites is recommended. This is a negative, site-specific and long-term impact of high magnitude.

5. *Restricted access of other port users*

The construction and dredging activities may require for access to some sections of the Port to be restricted as a precautionary (occupational health and safety) measure. This will impact vessels docking, TPA staff operations, and private company operations, which use Berths 1 to 7 for importation of goods. This will have an indirect impact on the livelihoods of those who have work responsibilities concerning the affected areas. This is a negative, site-specific, short-term impact of moderate magnitude.

6. *Damage/disruption of surface water drainage channels on existing berths*

Construction works on Berths 1 to 7 may damage or disrupt existing surface water drainage channels on berths. This may create pools of stagnant water on the quays during construction after heavy rains and flooding the upper areas of Bandari Road. This will result in a general slowing down of construction and other on-going Port operations. This is a negative, short-term, site-specific impact of low magnitude.

7. *Increased noise during construction works*

The major operation of various construction equipment is a major source of noise during the construction phase. The baseline noise levels were taken at various points along the TPA compound and results are detailed in Section 4.2.14. Noise levels were found to be well below the threshold levels of 85 dBA. Different types of construction equipment have different noise levels. Depending on the type of equipment, the Contractor will need to provide the most appropriate protective gear to the workers. The movement of machinery and equipment, dredging and other construction activities at the project site will also generate noise and vibrations at the site, and will likely affect establishments within the vicinity of the project site. This is a negative, short-term, site-specific impact of low magnitude.

6.4.1.3 Operation Phase

1. *Resuspension of sediment during maintenance dredging*

The release of organic rich sediments during dredging can result in the localised removal of oxygen from the surrounding water. Depending on the location and timing of dredging, this may lead to the suffocation of marine animals and plants within the localised area or may deter migratory fish or mammals from passing through. However, removal of oxygen from the water is only temporary, as tidal exchange would quickly replenish the oxygen supply. Therefore, in most cases where dredging and disposal is taking place in open coastal waters, this localised removal of oxygen has little, if any, effect on marine life.

Increase in suspended sediments and turbidity levels from dredging and disposal operations may have adverse effects on marine animals and plants by reducing light penetration into the water column and by physical disturbance. The increase in turbidity level in major portion of the domain of mathematical model shall be up to 0.012 g/l or 12 mg/l, which is not significant, as it is likely to last for a period of 10-15 days after the cessation of dredging activities. This trend is noticeable under flood as well as ebb conditions.

Increased suspended sediments can effect filter-feeding organisms, such as shellfish, through clogging and damaging feeding and breathing process. Similarly, young fish may potentially be harmed if suspended sediments become trapped in their gills and increased fatalities of young fish have been observed in heavily turbid water. Adult fish are likely to move away from or avoid areas of high suspended solids, such as dredging sites, unless food supplies are increased as a result of increases in organic material. Suspended sediment can have negative, long-term, site-specific impacts of low magnitude.

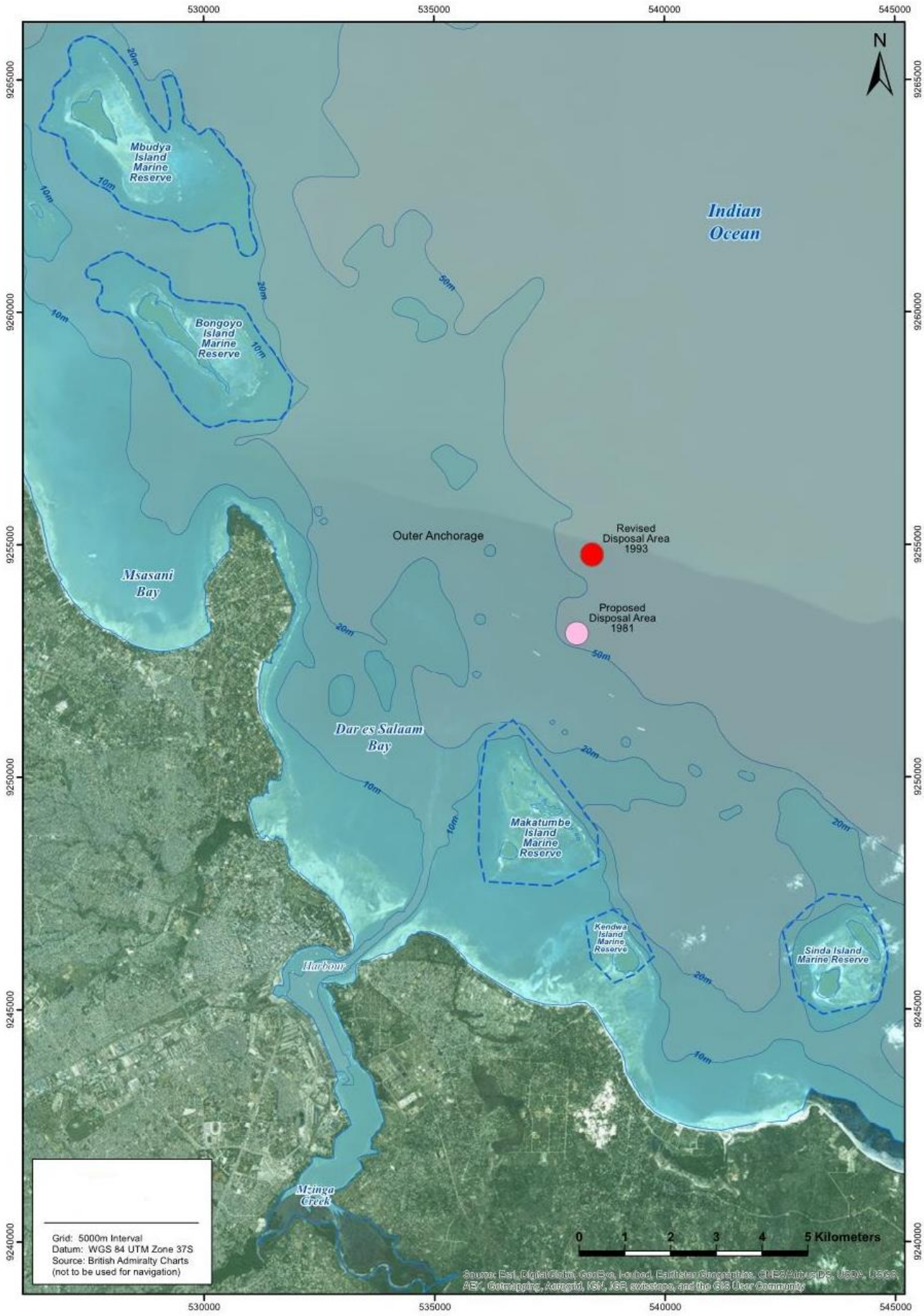


Figure 6-2 Map showing position for disposal of dredged sediments, based on the previous studies conducted by Scott Bertlin (revised 1993). Sources: COWI Tanzania Ltd. 2016.

6.4.2 Significance of impacts

The significance rating for impacts specific to the improvements on Berths 1 to 7 is presented in Table 6-7. The significance of other impacts similar in other sub-projects are described as cumulative impacts in Section 6.7.

Table 6-7 Significance of Impacts – Deepening and strengthening of Berths 1 to 7.

Impact			Impact evaluation criteria			Significance rating
Phase	**Description**	**Nature**	**Extent**	**Magnitude**	**Duration**	
Pre-construction	Disruption of services on Berths 1 to 7	Direct	Site specific	Moderate	Short term	-ve Moderate
Construction	Increased suspended sediment from dredging activities impacting marine life	Direct	Site-specific	Low	Short term	-ve Minor
	Fishing activities affected by suspended sediment	Indirect	Site-specific	Low	Short term	-ve Minor
	Changes in marine water quality due to released chemicals and heavy metals while dredging or backfilling	Indirect	Site-specific	Medium	Medium term	-ve Moderate
	Marine pollution due to disposal of dredged materials	Indirect	Site-specific	High	Long term	-ve Major
	Restricted access of other port users	Indirect	Site-specific	Medium	Short term	-ve Moderate
	Damage/disruption of surface water drainage channels on existing berths	Indirect	Site-specific	Low	Short term	-ve Minor
Operation	Re-suspension of sediments during maintenance dredging	Direct	Site-specific	Low	Long term	-ve Moderate

6.5 Impacts from Improving and Expansion of the Grain Silo

6.5.1 Types of Impacts

6.5.1.1 Pre-construction Phase

1. *Disruption of services due to the demolition of existing structures*

The planned expansion of the silos will require some of the existing infrastructure to be removed/demolished i.e. the existing roof and the bagging machines. Therefore, there will be temporary disruptions in offloading and loading grain imported. The demolition of these structures will have a negative, short term and site-specific and moderate impact on existing services.

6.5.1.2 Construction Phase

1. *Restricted access of other port users*

The construction of the new silos, distribution tower and conveyor system may require for access to some sections of the Port to be restricted as a precautionary (occupational health and safety) measure. This will impact the ability to receive and offload vessels importing grain, the loading of grain in trucks or bags for transportation, TPA staff operations and other private company operations at the Port. This will have an indirect impact on the livelihoods especially for casual labourers (e.g. bag carriers and truck drivers) who, periods during construction, may not be employed. This is a negative, site-specific, short-term impact of moderate magnitude.

2. *Damage/disruption of surface water drainage channels on existing berths*

Construction works during construction of the silos, distribution tower and high capacity conveyor system may damage or disrupt existing surface water drainage channels on berths. This may create pools of stagnant water on the quays during construction after heavy rains. This will result in a general slowing down of construction and other on-going Port operations. This is a negative, short-term, site-specific impact of low magnitude.

6.5.1.3 Operation Phase

1. *Redundancy of casual labourers required for stevedoring activities*

The introduction of a new automated conveyor system will mean that casual labourers used as stevedores may not be needed for future operations (i.e. for shuttling for grain deliveries). This impact needs to be further investigated in order to determine an estimated number of casual labourers that will be affected (refer to section 2.5). This can be considered a negative, local, long-term impact of uncertain magnitude.

2. *Increase vehicular traffic of trucks transporting grain*

The increased capacity of the grain silos will directly have an increase in the number of trucks that will be required to offload the grain for transportation. This will increase traffic flow and risk of accidents during operation and indirectly increase the likelihood of traffic jams occurring on the already congested roads near the Port. This is a negative, short-term, site-specific and/or local impact of moderate magnitude.

3. *Reduced dust during offloading of grains*

The existing system of offloading grain produces a lot of dust that negatively affects workers. During fieldwork, high dust level was recorded in Berth 7 (in comparison to the threshold limit set by the TBS TZS 845:2005, IFC 2007 and WHO-AQG 2006) mainly resulting from the unloading of wheat from the ship and movement of trucks. The proposed mechanised improvements uses funnel shaped hoppers and grabbers that direct dust upwards. Therefore, it is anticipated that there will be a positive reduction of dust that affects the workers visibility and respiratory tract. This is a positive, site specific, long term impact of high magnitude.

4. *Contaminated grain from damaged infrastructure*

The preferred alternative for the conveyor system is a chain conveyor (an en masse chain conveyor referred to in Table 6-3), which is closed to prevent contamination of grain from rain or dust while transferring it to the silos. However, grain can still be contaminated by rain and dust in the event that a conveyor or any of the other infrastructure (i.e. hoppers, grabbers, silos) is damaged without knowledge. This is a negative, site-specific short-term impact of low magnitude.

6.5.2 Significance of impacts

The significance rating for impacts specific to the expansion and improvements of the grain silo is presented in Table 6-8. The significance of other impacts similar in other sub-projects are described as cumulative impacts in Section 6.7.

Table 6-8 Significance of impacts – expansion of the grain silo.

Impact			Impact evaluation criteria			Significance rating
Phase	**Description**	**Nature**	**Extent**	**Magnitude**	**Duration**	
Pre-construction	Disruption of services	Direct	Site-specific	Medium	Short term	-ve Moderate
Construction	Restricted access of other port users	Indirect	Site-specific	Medium	Short term	-ve Moderate
	Damage to surface water drainage	Indirect	Site-specific	Low	Short term	-ve Minor
Operation	Redundancy of casual labourers as stevedores	Direct	Local	TBD		
	Increased vehicle traffic	Indirect	Local	Medium	Long term	-ve Major
	Reduced dust offloading grain	Direct	Site Specific	High	Long term	+ve Major
	Contaminated grain from damaged infrastructure	Indirect	Site specific	Low	Short term	-ve Minor

Note: TBD = To Be Determined

6.6 Impacts from Improving the Railway Linkages

6.6.1 Type of impacts

6.6.1.1 Pre-construction Phase

1. *Disruption of train services due to the demolition of existing structures*

The planned relocation of existing railway tracks will require some of the existing infrastructure to be removed/demolished i.e. the existing railway tracks. Therefore, there will be temporary disruptions in movement of trains within the Port. The demolition of these structures will have a negative, short term and site-specific and moderate impact on existing services.

6.6.1.2 Construction Phase

1. *Increased noise and vibrations during construction of the railway tracks*

The construction equipment for construction of the railway lines creates loud noise and vibrations. This is a negative, short-term, site-specific impact of medium magnitude.

6.6.1.3 Operation Phase

2. *Increase in noise and vibrations*

Trains that will traverse the Port for loading and offloading containers emit loud noise and strong vibrations. This will have an impact on workers at the Port and loose cargo temporarily stored that are easily shaken by vibrations. This is a negative, long-term, site-specific impact. Since trains are already entering the Port, this is not a new impact within the Port area, therefore it is considered of a low magnitude.

3. *Occupational risks and accidents*

The operation of the new railway tracks involves occupational health and safety risks resulting in risks of injury especially at the vehicle and pedestrian railway crossing points. In addition, at the platform where containers will be lifted by crane onto trains, workers are exposed to occupational safety risks. This impact is negative, long-term, site-specific and of high magnitude.

4. *Increased efficiency in removing large containers outside the Port*

The proposed improvements on the Port railway linkages will enable large amounts of containers to be transported outside of the Port area. This will firstly reduce the number of container trucks required to

enter the Port, reducing the current congestion of trucks. Secondly, the new platform and rail tracks will enable containers to be transported faster, reducing the turnover time and costs for goods in the containers to reach their destinations. This is a positive, long-term, local and international impact of high magnitude.

6.6.2 Significance of impacts

The significance rating for impacts specific to the expansion and improvements of the grain silo is presented in Table 6-9. The significance of other impacts similar in other sub-projects are described as cumulative impacts in Section 6.7.

Table 6-9 Significance of impacts – improvement of railway linkages.

Impact			Impact evaluation criteria			Significance rating
Phase	**Description**	**Direct/Indirect**	**Extent**	**Magnitude**	**Duration**	
Pre-construction	Disruption of train services	Direct	Site-specific	Medium	Short term	-ve Moderate
Construction	Loud noise and vibration	Direct	Site-specific	Medium	Short term	-ve Moderate
Operation	Occupational risks and accidents at rail crossings	Direct	Site-specific	High	Long term	-ve Major
	Increased noise and vibration	Direct	Site-specific	Low	Long term	-ve Moderate
	Increased efficiency in container handling	Direct	Local and Regional	High	Long term	+ve Major

6.7 Cumulative Impacts

This ESIA has defined cumulative impacts as impacts that are similar in all the sub-projects/components so that when their effect are combined, they have a larger impact on a valued receptor than if each of the sub-projects were implemented separately.

6.7.1 Impacts from general construction works

6.7.1.1 Extraction of construction materials from quarries and borrow pits

The proposed project would require large quantum of construction material for the following components:

- The Ro-Ro terminal will need an estimated 208,000 m³ of aggregate for backfilling the area where the culvert will be constructed and to create the planned reverted slope for the piles that will support the deck;
- The deepening and strengthening of Berths 1 to 7 will not involve backfilling because the preferred alternative is construction of a suspended deck on concrete piles. Raw construction materials will be required for the construction of the concrete piles;
- The construction of foundations for the new grain distribution tower and additional silos; and
- The construction of a platform for loading containers.

Based on Stakeholder consultations with Temeke District Council, construction materials are to be sourced from existing quarries in Coast Region at either Kisarawe, Msolwa or Lugoba quarries. Extraction of construction materials leaves large areas of land exposed and susceptible to soil erosion. This is a negative, direct, local and medium term impacts. However, no new quarries are proposed for the present expansion therefore concluded as moderate in magnitude.

6.7.1.2 Increased demand on existing infrastructure and social services

The demand load on the existing roads and demand on social services will increase during construction through to operation phase. The mobilization of labour, movement of equipment, machinery and construction materials will use existing road infrastructure. In addition, the increase of traffic flow during the construction phase will increase the likelihood of traffic jams occurring on the already congested roads near the Port, and likely increase motor accidents. Other planned projects within TPA include the upgrading of access roads and the construction of a southern bypass to the Port. These projects will mitigate the magnitude of the increases vehicle traffic.

The increased number of human traffic from construction workers will result in an increased demand in sanitation facilities resulting in increased wastewater that has to be collected to treatment at the oxidation ponds in Kurasini Ward. During operation as well, expansion of the Port facility will attract more trade and people at the Port. This increase will result into more wastewater generation and the need for additional facilities for waste management.

Construction works will increase demand on water supply using existing DAWASCO pipes. This will increase cost to TPA.

The multitude of construction activities will also raise the demand on solid waste management infrastructure as waste generation associated with the increase in disposable supplementary construction materials, such as packaging materials (e.g. plastic covers, tarpaulins, plastic containers etc.), pallets, crates, fencing planks/sheets, paper and certain Personal Protective Equipment (PPE) (e.g., dust masks, electrical gloves etc.).

This increase in demand for existing infrastructure and social services is a negative, local, short-term impact of high magnitude.

6.7.1.3 Increased demand on limited energy and water resources

Project operations to be executed in the construction phase will heighten the demand for limited energy, water and material resources. Cleaning of machinery and equipment, mixing of cement concrete, curing work, dust control and provision of onsite sanitary services will raise the level of water consumption during construction. Operation of construction machinery, motor vehicles, pumping equipment and lighting systems will also elevate power usage and thereby necessitate an increased supply of fuels and electricity; this represents a potential contribution not only to the city's current energy crisis but also to the ongoing global climate change. This increase in demand for existing infrastructure and social services is a negative, local, short-term impact of high magnitude.

6.7.1.4 Occupational Health and Safety risks

Several activities during construction expose labourers, staff and the general public to potential risks to injury and accidents. Such activities include:

- Mobilization of equipment and machinery;
- The dismantling of existing structures;
- Movement of large vehicles;
- Construction near deep water increases risk of drowning;
- Dismantling of existing structures and infrastructure at the Port to make space for construction (dismantling of existing structures at the current silo and roof to create space for the additional silos, dismantling of ladders and fenders on Berths 1 to 7, dismantling of existing railway tracks, etc.);
- Removal and dismantling of construction block or wall required by CRB at all construction sites to protect the public;
- Operating heavy machinery for the construction of the berths and Ro-Ro terminal and

- Laying of new railway tracks in the midst of on-going Port operations at the berths and container terminal.

This is a direct, negative, short-term, site-specific and high magnitude impact.

6.7.1.5 Pollution due to poor waste management (construction waste)

During construction, piles of debris, packing bags, plastics, cement bags, wood and glass remains will be a common feature at the site. Apart from that, waste may pollute the surrounding areas on land; the waste may enter the sea through storm water and affect marine transport and aquatic life. This is a negative, local, medium-term impact of moderate magnitude.

6.7.1.6 Increased dust generation during construction works

The deterioration of ambient air quality from dust generated during the construction phase is expected. Dust generated during construction may cause respiratory problems for the construction workers, TPA staff and the public within the vicinity of the construction works. This is a negative, short-term, site-specific impact of low magnitude.

6.7.1.7 Increased noise during construction works

The major operation of various construction equipment is a major source of noise during the construction phase. The baseline noise levels were taken at various points along the TPA compound and results are detailed in Section 4.2.14. In most parts of the Port, noise levels were found to be well below the threshold levels of 85 dBA. The movement of machinery and equipment; the use of heavy machinery; dredging; and construction of the concrete piles for the suspended decks emit loud noise and vibrations. These will likely affect workers in the Port and within the immediate vicinity of the project site. This is a negative, short-term, site-specific impact of low magnitude.

6.7.1.8 Generation of temporary employment opportunities

The creation of employment opportunities is expected to benefit both skilled and non-skilled construction workers. This is a direct, positive, short-term, and local impact of moderate magnitude.

6.7.1.9 Increase in income generating activities

Construction work will indirectly cause an increase of individuals from the informal sector and service providers who may come from different areas beyond the project's primary influence area. Increase in small vendors and businesses will increase generation of income. A noteworthy consequence of the labour-intensive activities to take place during this phase is that food vendors, public motorcycle service providers (*bodabodas*), small kiosks, mobile fruit and ice-cream vendors located within close proximity to the Port are expected to experience an increase in demand. This is a direct, positive, short-term, and local impact of high magnitude.

6.7.1.10 Increase in crime level

Influx of job seekers to the area is likely to attract criminals into/around the project area and hence pose a threat to security of people and property in the project area. This impact is considered negative, a short term and of low magnitude. After the construction, phase the project will only maintain skilled labourers

6.7.2 Impacts from improved Port operations

6.7.2.1 Increased revenue

Establishment of the Ro-Ro terminal will greatly increase the number of vehicles imported via Dar es Salaam Port. This will increase revenue collection at the Port collected as tax or fees. This is a positive, national, long-term impact of high magnitude.

6.7.2.2 Improved trade with the neighbouring landlocked countries

The Dar es Salaam Port serves more than five landlocked countries in Africa, e.g. DRC, Uganda, Malawi, Zambia, Burundi and Rwanda. As the Port is improved and expanded, it will be able to receive larger volumes of goods imported and exported and handle more vessels at a shorter period of time. Therefore, trade within Tanzania and in neighbouring countries is anticipated to increase and this in turn will increase the country's revenue from taxes, fees and sales of goods and services. This is a positive, national and international, long-term impact of high magnitude.

6.7.2.3 Increased indirect income generation opportunities

Increased volume of goods traded means increased flows of services, goods, capital and labour. This will indirectly create employment opportunities as various types of businesses such as shops, food stalls, tea stalls, restaurants, workshops, etc. within Kurasini Ward will be established or will grow in size. A variety of suppliers, traders, transporters, service providers, etc. are also likely to concentrate in the project area and benefit immensely, as demand for almost all types of goods and services will increase significantly. The business community as a whole will benefit. A consequence of the increased trade activities to take place in the Port is that food vendors (*mamalishe*) located within close proximity to the Port are expected to experience an increased generation of income as demand increases. This is a positive, local, long-term impact of high magnitude.

6.7.2.4 Increase efficiency of cargo handling

Improvements in Port will increase efficiency in handling cargo, reducing the current long delays. During the ESIA, a docked vessel carrying 44,000 t of bulk cargo took 3 to 4 days to offload. This is about 1,833 t/hour (if working continuously for 24 hours). The proposed chain conveyors have a capacity of 100,000 bu/hour, which is equivalent to about 2,500 t/hour (if using ratio of 1 tonne: 40bu). Therefore, conveyor belts have the ability to unload up to 25% faster. This will have an indirect impact on cost of goods because suppliers will experience a decrease of fees incurred at the Port due to delays in clearing cargo. This is a positive, long-term, local, national and international impact of high magnitude.

6.7.2.5 Increase in air and noise pollution from increased shipping

Improvements in the Port will increase vessel traffic, which will result in more continuous noise and air pollution. This is a negative, long-term, local, national and international impact of low magnitude.

6.7.2.6 Increased land pollution from improper disposal of waste

Improper disposal of solid waste generated from future operations on Berths 1 to 7 and the Ro-Ro terminal could also be from three sources viz. institutional/ office waste, domestic waste and waste from cargo handling etc. This includes biodegradable food waste and paper products from offices and packaging; polythene or plastic materials and packaging; and others identified in Chapter 4 (section 4.2). The improper collection of waste in the Port will increase foul smells, vermin, rodents and contaminated effluent. This is a negative site specific, long-term impact. Since TPA has an existing waste management plan, this impact is expected to be of low magnitude.

6.7.2.7 Indirect increase in HIV/AIDS and sexually transmitted diseases

During consultations, it was revealed that some of the people (especially women) working in the food vendors located within close proximity to the Port are also commercial sex workers. Therefore, an increase in the prevalence of HIV/AIDS and other sexually transmitted diseases (STDs) should be expected because of the influx of the people and truck drivers around the Port from increased trade activities as the Port services and infrastructure will improve. Particularly the truck drivers transporting goods regionally and internationally who have to wait for the trucks to be loaded. This is a negative, national, long-term impact of high magnitude.

6.7.2.8 Increased marine pollution from improper disposal of waste

During the operational phase, there will be increased activities of ship movement on the berths. All these activities will increase sources of waste that if not disposed of correctly will pollute the marine environment. Sources of marine pollution would be from:

- Escapement of cargo during loading/unloading operations;
- Release of wastes generated from the ships including solid waste, oily ballast and bilge water as well as sewage; and
- Wastes generated at the port terminal such as domestic wastewater, effluent from the grit/oil separator and garbage.

Marine pollution is a negative local, long-term impact of moderate magnitude, considering that the Port will be larger and able to accommodate an increased number of vessels.

6.7.2.9 Increased risk of invasive species

The improved handling of cargo and the introduction to the Panamax vessels will increase the number of vessels entering the Dar es Salaam Port. This will increase the risk of invasive species in ballast water. Information presented by Yahya, S. and Ameir, M. at a marine information system workshop in 2015 indicated the following issues of concern:

- At present, 5 introduced species and 3 cryptogenic species in Tanzania including Zanzibar. Of these 1 oyster species and 2 macro-algal species are cultured and not wild populations.
- Introduction of the Asian Mussel *Musculista senhousia*.
- Outbreaks of Crown-of-Thorns starfish (COTS) and harmful algal blooms.

This is a negative, local, long-term impact of moderate magnitude.

6.7.2.10 Occupational risks and accidents

The day-to-day operation at the Berths will involve latching and unlatching of the vessels, offloading of cargo and movement of mobile or rail mounted cranes, trucks and mobile bagging units. During these operational activities, workers, drivers, stevedores and various labour and clearing agents who are exposed to the risk resulting in injury. This impact is negative, long-term, site-specific and of high magnitude.

Operational activities related to movement of heavy vehicles and trains transporting goods to and from the Port present occupational risks to the public such as the NGOs who work within TPA, the *mama lishes,* public transport providers *(bodabodas,* bajaj and taxi drivers) and other users along Bandari road (offices, warehouses, etc.).

6.7.2.11 Interference with smaller vessel traffic

The anticipated increase in shipping traffic in the Dar es Salaam Port may inadvertently interfere with the ferries that shuttle between the Dar Port to Kigamboni and Zanzibar travel. Interference with these smaller ferries can be in the form of either:

- Frequency – the number of travels decrease because the time available to cross the narrow harbour without a larger vessel crossing at the same time decreases, or the existing times which these vessels travel changes because of colliding schedules with larger vessels; and
- Timing – the smaller vessels are inadvertently delayed behind a larger vessel.

This is a negative, long term, regional impact of moderate magnitude.

6.7.3 Significance of cumulative impacts

The significance rating for common across all sub-projects/components is presented in Table 6-10 below.

Table 6-10 Significance of impacts – cumulative impacts common in all sub-projects.

Impact			Impact evaluation criteria			Significance rating
Phase	**Description**	**Nature**	**Extent**	**Magnitude**	**Duration**	
Pre-Construction	Extraction of raw materials from quarry sites	Direct	Local	Medium	Medium term	-ve Major
Construction	Increased demand on existing infrastructure	Direct	Local	High	Short term	-ve Major
	Increased demand on energy and water resources	Direct	Local	High	Short term	-ve Major
	Occupational risks and accidents	Direct	Site-specific	High	Short term	-ve Moderate
	Pollution due to poor waste management	Indirect	Local	Medium	Medium term	-ve Major
	Increased dust during construction works	Direct	Site-specific	Low	Short term	-ve Minor
	Increased noise during construction works	Direct	Site-specific	Medium	Short term	-ve Moderate
	Increase in income generating activities	Indirect	Local	High	Short term	+ve Major
	Creation of temporary employment opportunities of construction workers	Direct	Local	High	Short term	+ve Major
	Increase in crime level	Indirect	Local	Low	Short term	-ve Minor
Operation	Occupational risks and accidents	Direct	Site-specific	High	Long term	-ve Major
	Increase in invasive species	Indirect	Local	Medium	Long term	-ve Major
	Increased marine pollution from improper disposal of waste from marine vessels	Direct	Local	Medium	Long term	-ve Major
	Increased land pollution from improper waste disposal	Direct	Site Specific	Low	Long term	-ve Moderate
	Increase in HIV/AIDs	Indirect	National	High	Long term	-ve Major
	Interference with smaller ferries	Indirect	Regional	Medium	Long term	-ve Major
	Increased revenue from imported vehicles	Direct	National	High	Long term	+ve Major
	Increased income generation opportunities	Indirect	Local	High	Long term	+ve Major
	Improved trade with neighbouring countries	Direct	International	High	Long term	+ve Major
	Increase in efficiency	Direct	National and International	High	Long term	+ve Major
	Increase in air and noise pollution from increased shipping	Direct	National	Low	Long term	-ve Minor

6.8 Impacts from Unplanned Events

6.8.1 Types of accidental impacts

1. *Accidental vessel collisions during dredging*

During dredging, there is the possibility that shipping accidents will occur through collisions with dredging equipment. This is a negative, site-specific, short-term impact of high magnitude.

2. *Accidental collisions of vehicles and trains*

The anticipated increase in traffic within the Port following the completion of the project also increases the likelihood of collisions between trains and other vehicles occurring. This is a negative site-specific, medium-term impact of high magnitude.

3. *Accidental spills during dredging*

During dredging, dredged material may be accidentally spilled in sensitive areas. This would compromise the water quality, marine ecology and benthic organisms. Specifically, spills involving oils and other chemicals found in the dredged material may affect the biological oxygen demand of aerobic biological organisms underwater.

Ship traffic poses a risk of oil pollution from the following sources:

- Small spills caused by the accidental or international release of oil-contaminated bilge water from freights;
- Minor spills caused by release of bunker oil during terminal operations;
- Major spills caused by the rupture of a bunker oil tank in a bulk/cargo vessel collision, shipwreck of a bulk/cargo vessel;
- Equipment failure; and
- Failure in operating procedures related to fuelling or cargo.

The accidental spill of chemicals or bulk cargo also poses an environmental risk, which is exacerbated if the spillage is hazardous. This is a negative, site-specific, medium-term impact of high magnitude.

4. *Accidental spills from vessel collision*

The forecast increased shipping volume from Phase 1 improvements will increase the risk of a collision at sea, around the outer anchorage or entrance to the main shipping channel, that could impacts the neighbouring Marine Reserves, both the north and south portions. This is a negative regional, long-term impact of high magnitude.

5. *Accidental release of/or exposure to hazardous materials*

During operation, the Dar Port handles hazardous materials receiving them from vessels and offloading them for transportation inland. In addition, the Dar Port may use and/or store hazardous substances such as radiative substances, fuels, oils, lubricants and solvents.

TPA's Occupational Safety, Health and Environment Guidelines, outline procedures for management of hazardous materials. However failure in following the guidelines due to ignorance or negligence may result in the accidental release or exposure to hazardous substances. This impact is negative, local (primarily port workers and users), medium term and of high magnitude.

6. *Risk of fire*

Fire propagates quickly in areas with fuel oils and may therefore cause massive economic losses from burning fuels to buildings, and other installations in the Port. If not contained in time, fire outbreak may result in injuries or fatalities not only for those working within the Port but also those working along Bandari Road. In addition, air pollution from smoke and noxious gases goes beyond the Port boundary. This is a negative site-specific, short-term impact of high magnitude.

7. *Accidental blockage of the culvert at the new Ro-Ro terminal*

The design includes a culvert underneath the new Ro-Ro terminal that will discharge water from the Gerezani Creek into the harbour (see section 4.2.3 of the project description). During operation, this culvert can accidentally be blocked if a structure collapses on the Ro-Ro terminal or if large amounts of debris are washed under the deck and clogs the opening. This is a negative, site specific, short-term impact of moderate magnitude as this will disrupt the drainage pattern of Gerezani Creek and potentially result in flooding in the upper Gerezani Creek areas.

6.8.2 Significance of unplanned and accidental impacts

The significance rating for common across all sub-projects/components is presented in Table 6-11 below.

Table 6-11 Significance of impacts from unplanned events.

Impact		Impact evaluation criteria			Significance rating
Description	**Nature**	**Extent**	**Magnitude**	**Duration**	
Accidental vessel collisions during dredging	Direct	Site specific	High	Medium term	-ve Major
Accidental collisions of vehicles and trains	Direct	Site specific	High	Medium term	-ve Major
Accidental spills during dredging	Direct	Site specific	High	Medium term	-ve Major
Accidental spills from collisions	Direct	Regional	High	Long term	-ve Major
Accidental release/exposure to hazardous materials	Direct	Site specific	High	Medium term	-ve Major
Risk of fire	Indirect	Site specific	High	Short term	-ve Moderate
Accidental blockage of the culvert under the Ro-Ro terminal	Indirect	Site specific	High	Short term	-ve Moderate

6.9 Climate Change Impacts

While the proposed project aims to improve various aspects of the Port, external factors such as rising of sea levels may counter these efforts. The global rise of sea levels has been widely documented, particularly in recent IPCC publications. However, consistent sea level rise along the East African coast has not been reported.

According to records from Permanent Services for Mean Sea Level (PSMSL), Tanzania has experienced a mean drop in sea levels over the period 1985 – 2003 (Kebede et al, 2010). More recent information on sea-level change along the Tanzanian coast is not publicly accessible, but up-to-date raw data is available on the University of Hawaii Sea Level Centre website.

The Tanzanian sea level network consists of two operational stations of Zanzibar and Dar es Salaam, and three historic non-operational tide gauges at Mtwara, Tanga and Pemba. The Zanzibar tide gauge station is equipped with a satellite transmitter linked to multiple oceanographic databases, and currently ranks as one of the prime Indian Ocean stations for monitoring long term changes in world sea-level (Mahongo and Khamis, 2006). In Mombasa (located within the same region), a 1.1 mm/year rising sea level trend was recorded over the same period (Kebede et al, 2010).

This impact is negative, site-specific (because the focus is sea level rise on the Port infrastructure), long-term and potentially high in magnitude. However the impact not be substantiated in this ESIA and would require more investigation on projection made for Tanzania (or East Africa) and ongoing urban development adaptation measures that are planned in order to substantiate the magnitude and the potential risk to Dar Port.

6.10 Risk Assessment

A qualitative environmental risk assessment of the above mentioned negative impacts has also been carried out. By environmental risk is understood the combination of the significance of an impact and the probability that an impact actually will occur. The risk assessment therefore includes the following steps:

- Assessment of probability that the impacts will occur using the criteria shown in Table 6-12.
- Assessment of environmental risk combining the significance of a potential impact and probability according to the diagram in Table 6-13.

Table 6-12 Criteria for assessment of probability of impacts.

Probability criterion	Degree of possibility of impact occurrence
Very low	The possibility of occurrence is very low, either due to the project design or due to the project nature, or due to the characteristics of the project area
Low	The possibility of occurrence is low, either due to the project design or due to the project nature, or due to the characteristics of the project area
Probable	There is possibility of impact occurrence
Highly Probable	Possibility of impact occurrence is almost certain
Definite	There is certainty that the impact will occur

Table 6-13 Qualitative risk assessment matrix.

	Significance /severity of impact		
PROBABILITY	**MINOR IMPACT**	**MODERATE IMPACT**	**MAJOR IMPACT**
Definite	Low risk	Significant risk	High risk
Highly probable	Low risk	Significant risk	High risk
Probable	Negligible risk	Significant risk	Significant risk
Low	Negligible risk	Low risk	Low risk
Very low	Negligible risk	Negligible risk	Low risk

The risk assessment of negative impacts related to the different sub-projects, the cumulative impacts, and the accidental events identified above is presented in Table 6-14.

Table 6-14 Qualitative risk assessment of potential impacts from the improvement of Dar es Salaam Port, Phase 1.

Impact	Significance rating	Probability	Risk
Ro-Ro Terminal			
Loss of vegetation due to clearing around Gerezani Creek	-ve Moderate	Definite	Significant risk
Acquisition of land	No impact	Definite	Negligible risk
Disruption of livelihoods at Malindi Wharf	-ve Major	Probable	High risk
Changes in marine water quality due to released chemicals	-ve Major	Probable	Significant risk
Fishing activities affected due to suspended sediment	-ve Minor	Low	Negligible risk
Pollution from disposal of dredged material	-ve Major	Highly probable	High risk
Restricted access of other port users	-ve Moderate	Probable	Significant risk
Flooding of upper Gerezani Creek area due to accidentally	-ve Major	Probable	Significant risk
Occupational risks and accidents offloading vehicles	-ve Major	Low	Low risk
Reduced berth space at Malindi Wharf	-ve Major	Definite	High risk
Increased vehicle traffic	-ve Major	Definite	High risk
Increase in vehicle CO_2 emissions	-ve Major	Definite	High risk

Impact	Significance rating	Probability	Risk
Deepening and Strengthening of Berths 1 to 7			
Disruption of services on Berths 1 to 7	-ve Moderate	Highly probable	Significant risk
Increased suspended sediment from dredging activities impacting marine life	-ve Minor	Definite	Low risk
Fishing activities affected by suspended sediment	-ve Minor	Probable	Negligible risk
Changes in marine water quality due to released chemicals and heavy metals while dredging or backfilling	-ve Moderate	Definite	Significant risk
Marine pollution due to disposal of dredged materials	-ve Major	Definite	High risk
Restricted access of other port users	-ve Moderate	Probable	Significant risk
Damage/disruption of surface water drainage channels on existing berths	-ve Minor	Low	Negligible risk
Re-suspension of sediments during maintenance dredging	-ve Moderate	Definite	Significant risk
Expansion of the grain silo			
Disruption of services	-ve Moderate	Highly probable	Significant risk
Restricted access of other port users	-ve Moderate	Probable	Significant risk
Damage to surface water drainage	-ve Minor	Low	Negligible risk
Redundancy of casual labourers as stevedores	TBD	Definite	TBD
Increased vehicle traffic	-ve Major	Definite	High risk
Contaminated grain from damaged infrastructure	-ve Minor	Low	Negligible risk
Railway linkages impacts			
Disruption of train services	-ve Moderate	Highly probable	Significant risk
Loud noise and vibration during construction	-ve Moderate	Definite	Significant risk
Occupational risks and accidents at rail crossings	-ve Major	Probable	Significant risk
Increased noise and vibration during operation	-ve Moderate	Definite	Significant risk
Cumulative Impacts			
Extraction of raw materials from quarry sites	-ve Major	Definite	High risk
Increased demand on existing infrastructure	-ve Major	Definite	High risk
Increase demand on limited energy and water resources	-ve Major	Definite	High risk
Occupational risks and accidents during construction	-ve Moderate	Highly probable	Significant risk
Increased dust during construction works	-ve Minor	Definite	Low risk
Increased noise during construction works	-ve Moderate	Definite	Significant risk
Occupational risks and accidents during operation	-ve Major	Highly probable	High risk
Increase in invasive species	-ve Major	Probable	High risk
Increased marine pollution from improper disposal of waste	-ve Major	Highly probable	High risk
Increased land pollution from improper waste disposal	-ve Moderate	Probable	Significant risk
Increase in HIV/AIDs	-ve Major	Highly probable	High risk
Increase in air pollution			
Accidental/Unplanned events			
Accidental vessel collisions during dredging	-ve Major	Probable	Significant risk
Accidental collisions of vehicles and trains	-ve Major	Probable	Significant risk
Accidental spills during dredging	-ve Major	Probable	Significant risk
Accidental spills from vessel collision	-ve Major	Very low	Low risk
Accidental exposure to hazardous materials	-ve Major	Probable	Significant risk
Risk of fire	-ve Moderate	Low	Low risk
Accidental blockage of the culvert under the Ro-Ro terminal	-ve Moderate	Low	Low risk
Increase in air and noise pollution from increased shipping	-ve Minor	D	Low risk

Chapter 7: ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

This chapter outlines the mitigation requirements and measures to adopt in response to the potential environmental and social impacts identified in the preceding chapter. A number of enhancement measures for positive impacts and mitigation measures for negative impacts are also proposed. Hereby the positive benefits of the project will be maximised and any adverse negative impacts will be avoided or at least minimised.

The potential mitigation and enhancement measures have been proposed based on stakeholder consultations, expert analysis and opinion, experience with similar and/or related projects and best engineering practices.

7.1 Enhancement measures

7.1.1 Construction Phase

Promoting local job opportunities

Semi-skilled and unskilled labour will be sourced locally to provide communities with employment and the opportunity to earn an income during the construction phase of the proposed project. A special clause that requires local residents to be employed as labourers during construction will be included in the contract.

Promoting income-generating activities

The project proponent/Contractor should encourage/permit small businesses that support the team involved with construction phase activities such as food vendors (*mamalishe* stalls), transport services (*bodaboda*), kiosks, etc. to provide services to the construction staff.

7.1.2 Operation Phase

Managing dust while offloading grain

The proposed mechanised improvements to the offloading system uses funnel shaped hoppers and grabbers that direct dust upwards. To ensure that the dispersion of dust is kept to a minimum. These hoppers and other related equipment will be regularly inspected and repaired when needed.

Managing efficient container handling

Improvements made to the railway system will need to be maintained to ensure sustained efficiency in removing large containers outside the Port. This will entail regular repair and maintenance of the railway system.

Increased revenue

TPA is encouraged to develop a streamlined system for the clearance of vehicles, e.g. a one-stop centre where vehicles are cleared. Port infrastructure should also be maintained and repaired regularly to avoid damages and avoidable delays.

Maintaining trade with neighbouring countries

Related to measures to take to enhance Port competition, the proponent will ensure that the improved Port processes and services continue to run efficiently to maintain good trade relations with neighbouring countries. This will entail ensuring that, for example, the silos are regularly cleaned and repaired as needed. TPA is also encouraged to look into the use of online operation systems.

Promoting local job opportunities

The proponent will source Port workers and stevedores from within the country as much as possible. Local communities will be given prior information through local government authorities on available employment opportunities and required qualifications. Where necessary, specialists will be sourced from overseas but capacity building and career progression programmes should be established for local recruits. Port workers

made redundant as a consequence of the mechanisation of the Port will be considered for employment together with surrounding communities.

Maintaining cargo handling efficiency

Port staff are to receive regular training on service delivery. It is also encouraged that the technology and equipment in use at the Port is updated regularly, and the Inland Container Depots (ICDs) are used to reduce delays.

7.2 Mitigation measures

7.2.1 Impacts from the construction of the new Ro-Ro terminal to be mitigated

7.2.1.1 Pre-construction Phase

Managing vegetation clearance

During site preparation activities, vegetation clearance will be limited on the estuary side of Gerezani Creek to the specific space required for construction activities. In this case, vegetation includes only ornamental trees and shrubs that line the roads and pavements.

Managing the suspension of sediment

The area has been screened and no rare, threatened or endangered species endemic to the project location have been identified. Nevertheless, during dredging, suspended particulate matter will be kept low at 5 %. The dredged material will be put in a barge where water will drain out and the remaining solid material will be transported to the disposal site. The material will be deposited at identified area as shown in Figure 6-2 in Chapter 6 off the coral reefs and with the northerly tidal waves will lead the fine silt to the deep sea.

The Contractor should plan for dredging and disposal activities to take place at practical times, to avoid and reduce any adverse impacts on sensitive marine flora and fauna. The aim during the dredging and disposal procedures will be to minimise sediment suspension and the extent of the area affected, and to conserve the ecology of the system. Physical and chemical analyses of sediments should be performed prior to disturbance, and a plan developed to minimise sediment resuspension in environmentally sensitive areas.

In addition to the careful planning and execution of dredging activities, physical barriers can also be established at or near the dredging site to prevent the spread of suspended sediments. These 'barriers' are typically silt screens/curtains that control the dispersion of turbid water by diverting the flow under the barrier. This minimises the spread of turbidity to the upper layers of the water column beyond the silt screen/curtain. A bubble curtain is sometimes considered as an alternative to a silt screen. The upwelling of bubbles from the sea or riverbed to the surface prevents fine sediments from passing across. Both techniques are only effective where current conditions are relatively slow.

Managing the relocation of livelihoods based at Malindi Wharf

Existing banking and office facilities are in the process of being relocated to the new TPA building. All stakeholders based at Malindi Wharf will be kept informed of the project phases and progression.

7.2.1.2 Construction Phase

Controlling release of chemicals and heavy metals from dredging

Based on results from the subsea geological (geotechnical) survey, an expert advice, a suitable approach to managing the release of chemicals and heavy metals from dredged material will be adopted. Because the sediments to be dredged have already been dredged in the past twenty years, hence proposed dredged can be considered "maintenance" dredging, the levels of contaminants are not expected to be high. Nevertheless, if deemed necessary, remedial dredging can be conducted to remove sediments contaminated above certain levels whilst minimising the spread of contaminants to the surrounding environment during the dredging process. It requires the cautious removal of the contaminated material and is often linked to further treatment, reuse or relocation of these materials. Remedial dredging can only be successful if the source of the contamination is removed prior to this operation.

Managing fishing activities affected by suspended sediment

Silt or bubble curtains will be used to limit sediment from spreading beyond the designated dredging area.

Mitigation measures for disposal of dredged material

The material will be deposited at the identified area shown in Figure 6-2 (Chapter 6). The northerly current is expected to transport fine silt to the deep sea, though verification is needed at the time of dumping, supported by expert advice. Dredged material amounting to a volume of 0.5 million cubic metres will be disposed of in the identified area, which is about 5 km off the coast away from the coral reefs. Dredging will be done at the location most appropriate to carry any suspended fine material further into deep sea. In addition, following bathymetric surveys, siting the disposal at subaquatic depressions where sediment would be more laterally confined help mitigate movement or re-suspension of material on the seabed.

A monitoring study will be carried out after the dredging activity to locate pools of relatively higher sedimentation rates.

Managing limited access to Port facilities

TPA and the Contractor will develop and circulate a schedule indicating the times at which various Port services will be accessible as well as the tentative duration for which other facilities will be inaccessible during the construction phase. Where possible, alternative solutions will be created and communicated to Port users.

Mitigation measures for surface water flooding

To avoid the flooding of the upper Gerezani Creek area, a channel will be created to allow for the continued flow of surface water into the harbour. As a preventive measure, this channel will be maintained to ensure that it is not obstructed.

7.2.1.3 Operation Phase

Managing occupational accidents from offloading vehicles

Ensure proper maintenance and good condition of equipment, vehicles and tools used for Port activities, including the availability of adequate fire-fighting equipment. In addition, workers will be provided with PPE as required by local laws and health and safety training. Specialised training shall be given to the workers in charge of handling heavy machinery, etc. A first aid kit will be available onsite.

Reduced berth space at at Malindi Wharf

The formation of a dedicated DSMGP Phase 1 Malindi Wharf Steering Committee, to focus exclusively on issues related to operations in that area of the Port, especially related to water depth along the available berths and vehicle access (during construction and later during operations of the Ro-Ro Terminal), to minimise any inconvenience to shipping operations. Proving appropriate road access to Gate No. 2 will mitigate access problems caused during construction and operation of the Ro-Ro Terminal, and maintenance dredging along wharf (380 m), to -5 m CD, x 30 m width (= 57,000 m^3).

Managing increased vehicle traffic

The connecting roads may be congested during peak hours and traffic accidents may occur when entering or leaving the Container Terminal. The truck traffic to and from the terminal may also contribute to the occurrence of traffic accidents due to the high degree of movement. Such accidents will be mitigated by display of road signage and construction of speed bumps where necessary.

Mitigating increased CO_2 emissions from vehicular traffic

Minor air quality impacts will be caused by emissions from equipment and transportation traffic. The following measures are recommended to control air pollution:

- Equipment will be turned off when not used for extended periods.
- Unnecessary idling of vehicles will be prohibited.

- Effective traffic management measures will be employed to avoid significant delays in and around the project area.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

7.2.2 Impacts from the deepening and strengthening of Berths 1 to 7 to be mitigated

7.2.2.1 Pre-construction Phase

Mitigating disruption of services

TPA will produce a schedule of pre-construction and construction works to keep all Port staff informed about current and future project activities. Vessel operators will also be informed. It is recommended that the complete rehabilitation of one berth be completed before beginning works on the subsequent berths.

7.2.2.2 Construction Phase

Managing the suspension of sediment

The area has been screened and no rare, threatened or endangered species endemic to the project location have been identified. Nevertheless, during dredging, suspended particle matter (SPM) will be kept low at 5 %. The dredged material will be put in a barge where water will drain out and the remaining solid material will be transported to the disposal site. The material will be deposited at identified area as shown in Figure 6-2 in Chapter 6 off the coral reefs and with the northerly tidal waves will lead the fine silt to the deep sea.

The Contractor should plan for dredging and disposal activities to take place at practical times, to avoid and reduce any adverse impacts on sensitive marine flora and fauna. The aim during the dredging and disposal procedures will be to minimise sediment suspension and the extent of the area affected, and to conserve the ecology of the system. Physical and chemical analyses of sediments should be performed prior to disturbance, and a plan developed to minimise sediment resuspension in environmentally sensitive areas.

In addition to the careful planning and execution of dredging activities, physical barriers can also be established at or near the dredging site to prevent the spread of suspended sediments. These 'barriers' are typically silt screens/curtains that control the dispersion of turbid water by diverting the flow under the barrier. This minimises the spread of turbidity to the upper layers of the water column beyond the silt screen/curtain. A bubble curtain is sometimes considered as an alternative to a silt screen. The upwelling of bubbles from the sea or riverbed to the surface prevents fine sediments from passing across. Both techniques are only effective where current conditions are relatively slow.

Managing fishing activities affected by suspended sediment

Silt or bubble curtains will be used to limit sediment from spreading beyond the designated dredging area.

Controlling release of chemicals and heavy metals from dredging

At the Contractor's discretion, and based on results from the subsea geological (geotechnical) survey, a suitable approach to managing the release of chemicals and heavy metals from dredged material will be adopted.

Remedial dredging can be conducted to remove sediments contaminated above certain action levels whilst minimising the spread of contaminants to the surrounding environment during the dredging process. It requires the cautious removal of the contaminated material and is often linked to further treatment, reuse or relocation of these materials. Remedial dredging can only be successful if the source of the contamination is removed prior to this operation.

Mitigation measures for disposal of dredged material

The material will be deposited at the identified area shown in Figure 6-2 in Chapter 6. The northerly tidal waves will transport the fine silt to the deep sea. Dredged material amounting to a volume of 0.5 million cubic metres will be disposed of in the identified area, which is about 5 km off the coast away from the

coral reefs. Dredging will be done at the location most appropriate to carry any suspended fine material further into deep sea. In addition, following bathymetric surveys, siting the disposal at subaquatic depressions where sediment would be more laterally confined help mitigate movement or re-suspension of material on the seabed.

A monitoring study will be carried out after the dredging activity to locate the pools of relatively higher sedimentation rates.

Managing limited access to Port facilities

TPA and the Contractor will develop and circulate a schedule indicating the times at which various Port services will be accessible as well as the tentative duration for which other facilities will be inaccessible during the construction phase. Where possible, alternative solutions (e.g. alternative locations within TPA, sharing of areas and equipment, rescheduling, etc.) will be created and communicated to Port users.

Mitigating damage to/disruption of surface water drainage channels

To avoid damaging surface water drainage channels on the existing berths, on-site flow diversions will be created where necessary. Culverts will be installed if needed and activities will be managed with a view to eliminating the need to change the current surface runoff drainage system.

Mitigation measures for noise and vibration

Activities during the operation phase that may be a source of noise include the conveying of bulk from vessels to the silo and the loading of trucks collecting grains from the silos. Unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible. Notices of major noise generating activities will be posted around the site and along Bandari Road. In the event that the pre-determined acceptable noise levels are exceeded during operations, Port operators will remedy the situation. Workers will use ear muffs.

It is known that continuous exposure to noise levels above 90 dB(A) affects the hearing of the workers/operators and hence has to be avoided. Other physiological and psychological effects have also been reported in literature, but the effect on hearing acuity has been specially stressed. To prevent these effects, it has been recommended by international specialist organizations that the exposure period of affected persons be limited as specified in Table 7-1.

Table 7-1 Maximum Exposure Periods specified by OSHA.

Maximum equivalent continuous noise level dB(A)	Hours of permissible unprotected exposure per day
90	8
95	4
100	2
105	1
110	½
115	¼
120	No exposure permitted at or above this level

Source: Tanzania Bureau of Standards, National Environmental Standards Compendium, EMDC 6(1733) – ACOUSTICS - General Tolerance Limits for Environmental Noise.

7.2.2.3 Operation Phase

Mitigation measures for maintenance dredging

The area has been screened and no rare, threatened or endangered species endemic to the project location have been identified. Nevertheless, during dredging, suspended particle matter (SPM) will be kept low at 5 %. The dredged material will be loaded in barges from which water will drain and remaining solid material

will be transported to the disposal site. The material will be deposited at identified area as shown in Figure 6-2 in Chapter 6 off the coral reefs and with the northerly tidal waves will lead the fine silt to the deep sea.

The dredging equipment will be stationed at the dredging site to avoid blocking part of the sea, which will inconvenience other waterway users, increase probability of accidents and may cause economic loss to the waterway users. Dredger operators should follow proper safety procedures to avoid accidents and spills. TPA will ensure that all the ships moving in proximity to the area to be dredged or disposal sites do not affect such activities or vice-versa.

The Contractor should plan for dredging and disposal activities to take place at practical times, to avoid and reduce any adverse impacts on sensitive marine flora and fauna. The aim during the dredging and disposal procedures will be to minimise sediment suspension and the extent of the area affected, and to conserve the ecology of the system.

7.2.3 Impacts from the expansion and rehabilitation of the grain silos to be mitigated

7.2.3.1 Pre-construction Phase

Managing the disruption of services due to the demolition of existing structures

Port Authorities will develop and circulate a schedule for pre-construction activities to stakeholders at the Port involved in offloading and loading imported grain. Tentative dates for resumed loading and offloading activities will also be communicated.

7.2.3.2 Construction Phase

Managing limited access to Port facilities

The Port Authorities will develop and circulate a schedule indicating the times at which various Port services will be accessible as well as the tentative duration for which other facilities will be inaccessible during the construction phase. Where possible, alternative solutions will be created and communicated to affected Port workers.

Mitigating damage to/disruption of surface water drainage channels

To avoid damaging surface water drainage channels on the existing berths, on-site flow diversions will be created where necessary. Culverts will be installed if needed and activities will be managed with a view to eliminating the need to change the current surface runoff drainage system.

7.2.3.3 Operation Phase

Managing the redundancy of casual labourers following mechanisation of Port

Given plans to mechanise Port operations, workers have to be prepared for forced retirement. It is possible that the skilled workers will find alternative jobs. Others will need to develop skills for self-employment. Training on using the new technology and system should be provided where possible to casual labourers. Retrenched labourers are to be given first priority for other TPA opportunities, should these arise, for example at inland services at ICDs, etc.

The Project needs to be compliant with national labour laws and take workers' rights into consideration during redundancy with severance packages for those who will be laid off.

To some extent, involve casual labourers for those activities that are more labour intensive rather than highly mechanised For example, during operations workers could be involved in offloading machinery, equipment and other essential services for operation purposes. Prior notice should be given to those casual labourers who will be laid off before project implementation.

It is important to identify personnel to be retrenched and inform them about the possible opportunities that may arise during construction. For example, a group of casual labourers could undergo training on how to manage traffic movement in and out the project area especially for large vehicles transporting construction materials such as sand, aggregates and borrow pits material entering construction sites. This

group could be trained on how to use flags and should be equipped with communication equipment's such as VHF radios.

Managing increased vehicular traffic

Road and safety signs will be positioned along the network running through the Port vicinity. Speed bumps will be constructed where necessary and speed limits imposed. Unnecessary idling of vehicles to be prohibited. Effective traffic management to be undertaken to avoid significant delays in and around the project area. Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

Mitigating contamination of grain

As a precautionary measure, silos will be routinely cleaned and inspected for repair purposes. Silos that pose a high risk in terms of contamination will not be used for storage until further investigation and resolution of the issue.

7.2.4 Impacts from the improvement of railway linkages in the Port to be mitigated

7.2.4.1 Pre-construction Phase

Managing disrupted train services

The Ports Authority will publish and circulate details regarding disrupted train services within the Port. Alternative routes of transport will also be provided where possible. Relocation works of the railway tracks will take place during off-peak hours.

7.2.4.2 Construction Phase

Mitigation measures for noise and vibration

Activities during the operation phase that may be a source of noise include the conveying of bulk from vessels to the silo and the loading of trucks collecting grains from the silos. Unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible. Notices of major noise generating activities will be posted around the site and along Bandari Road. In the event that the pre-determined acceptable noise levels are exceeded during operations, port operators will remedy the situation. Workers will use ear muffs. To prevent damage to hearing caused by exposure to noise levels exceeding 90 dB(A), the Contractor is advised to observe the exposure period of affected persons as specified in Table 7-1.

7.2.4.3 Operation Phase

Mitigation measures for noise and vibration

Activities during the operation phase that may be a source of noise include the conveying of bulk from vessels to the silo and the loading of trucks collecting grains from the silos. Unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible. Notice will also be given to residents within 100 m of major noise generating activities, describing the noise abatement measures that will be implemented. In the event that the pre-determined acceptable noise levels are exceeded during operations, port operators will remedy the situation. Workers will use ear muffs.

Maximum exposure limits as specified in Table7-1 are to be adhered to.

Managing occupational risks and accidents

Railway crossing signs, warning lights and audible signals for trains using the tracks will be put at main rail crossings within TPA. TPA's OSHE Committee is encouraged to organise awareness raising activities on safety around trains.

7.3 Cumulative impacts

7.3.1 Construction Phase

Managing impacts from quarrying

If land-based backfill material is required, Contractors must use existing licensed quarries as advised by Temeke Municipal Council. These have been identified as being located in the Coastal Region. No new quarries are to be established for this TPA Port expansion works unless pre-authorised and relevant licenses are obtained. The Contractor is advised to minimise dust generation during the collection of raw materials from these quarries by water sprinkling and covering of loose materials. The licensed holder of the existing quarry site where the construction material will be sourced is to ensure that care will be exercised during drilling operations to ensure that:

- the extraction process inflicts minimal damage on the environment;
- if necessary, drill patterns will be modified to optimise extraction;
- drilling personnel will be supplied with dust masks and other suitable PPE; and
- noise and dust management schemes are developed for use at the quarry site(s).

Managing increased demand on existing infrstructure and facilities

Temeke Municipal is to be notified at the beginning of construction about the intended roads to be used by the Contractor transporting materials and equipment. For proper waste management, the existing system needs to be upgraded so as to absorb an increase in waste generation at the Port. Additional toilets and cesspits are to be established and connected to existing septic tanks for removal and treatment at Kurasini oxidation ponds. TPA is advised to increase the budget allocation for water and to purchase necessary solid waste containers and skips.

Adopting resource efficiency measures

In order to reduce the demand for regionally strained resources, a number of resource efficiency initiatives should be instituted. The following measures can be implemented to minimize power consumption and fuel-based greenhouse emissions in the course of construction works:

- Adoption of a cost effective and technically feasible renewable energy source e.g. solar power for some port operations;
- Limiting the timing of machinery operations in an efficient manner to minimize energy wastage and exhaust outputs;
- Installation of power-saving electrical appliances and;
- Conducting frequent inspection and servicing for construction machinery to prevent the occurrence of fugitive emissions.

Water consumption can be reduced by implementing all practicable means of minimizing wastage and overconsumption of water supplied by DAWASCO. These include:

- Use of TPA's boreholes as water sources for construction purposes and allocation of the DAWASCO mains mostly to sanitary facilities stationed for construction labour;
- Avoiding wastage of water by providing water-conservation training to construction labour and monitoring water usage throughout construction operations; and
- Conducting frequent maintenance checks on water supply systems for early detection of wasteful leakages and use of water-saving sprinkler systems (used for dust control).

Inefficient use of supplementary construction materials and subsequently high levels of construction waste generation can be lowered by enforcing the re-use of materials falsely deemed as single-use products, and

by recovering recyclables from the construction waste stream for re-processing by local smelters and recycle plants.

The sustainability measures recommended above apply more to the construction phase of the project. Impacts associated with non-sustainable consumption of resources during the operational phase of the project are to be fully integrated in the EMS currently being developed by TPA.

Managing occupational risks and accidents

All labourers exposed to vehicle traffic and pre-construction operations are to be provided with PPE such as reflective vests, helmets as well as hazard cones to demarcate the working area. This will improve the visibility of the construction work to drivers on nearby roads and thereby help prevent accidents. A well-stocked first aid kit (administered by a trained first aider) shall be made available at the site. In addition, a health, safety, security and environment induction course shall be conducted for all workers before beginning construction activities. The construction site will be fenced in to control access to the site. Warning signs and notices will be placed around the site.

Mitigation measures to avoid pollution from poor solid waste management

Debris from excavation and other construction activities will be used as fillers within the Port.

Solid waste will be sorted into different containers for appropriate disposal. For example, waste paper and cardboard boxes will be recycled and/or re-used. Scrap metals such as iron & steel, copper and aluminium will be availed to smelters.

Other solid waste collection duties will be fulfilled by the Authorised Municipal collectors of wastes for disposal at the sanitary landfill.

Incineration of solid waste at the premises will be prohibited.

Dust control mitigation measures

To minimize impacts related to the generation of dust during the construction phase of the project, the following measures have been identified:

- Identification of construction limits (minimal area required for construction activities);
- When practical, excavated soils will be removed as the Contractor proceeds throughout the phase of the activity;
- When necessary, stockpiling of excavated material will be covered or located offsite location with quantities being delivered as needed during the course of construction;
- Excessive soil on paved areas will be sprayed and/or swept, and unpaved areas will be sprayed and/or mulched. The use of petroleum products or similar products for such activities will be strictly prohibited; and
- The Contractor will be required to cover stockpiled soils and trucks hauling soil, sand, and other loose materials.

The construction area and vicinity (access roads, and working areas) shall be swept with water sweepers on a daily basis or as often as necessary to ensure there is no visible dust.

Mitigation measures for noise and vibration

The Contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. Available noise suppression devices and properly maintained mufflers will be affixed to construction equipment in use.

- Vehicles to be equipped with mufflers recommended by the vehicle manufacturer.
- Unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible.
- Notices will be posted within TPA property and along Bandari Road about major noise generating activities.

- Noise levels will be monitored during the construction phase of the project. When the pre-determined acceptable noise levels are exceeded by the machinery in use, the Contractor(s) will postpone the construction activity until the situation is remedied.
- Workers will use PPE.
- Noise monitoring studies will be conducted quarterly to update the Contractors on major maintenance requirements of equipment.

The following noise standards for DG sets are recommended for running diesel generator (DG) sets during the construction phase:

- The maximum permissible sound pressure level for new DG sets with rated capacity up to 1000 KVA is 75 dB(A) at 1 m from the enclosure surface;
- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the enclosure acoustically;
- The walls of the enclosure should be insulated with fire retardant foam to comply with the 75 dBA at 1m sound levels;
- The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side;
- The DG set should also be provided with proper exhaust muffler;
- Proper efforts to be made to bring down the noise levels due to the DG set, outside its premises, within the ambient noise requirements by proper siting and control measures; and
- A proper routine and preventive maintenance procedure for the DG set should be established and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

The Contractor is to ensure that the maximum exposure limits specified by OSHA (Table 7-1 above) are adhered to during the construction phase.

Mitigating increase in crime level

To avoid increasing rate of crime; the client in collaboration with the local authority shall be advised to monitor movement of new comers/people in out of the project area. All visitors need to have gate passes/be suspicious for those who will be roving around the project area.

7.3.2 Operation Phase

Mitigation measures to avoid pollution from poor waste management

Solid waste will be collected at the point of origin and sorted into different containers for appropriate disposal. For example, waste paper and cardboard boxes will be recycled or re-used. Scrap metals such as iron and steel, copper and aluminium will be availed to smelters. Other solid waste collection will be assigned to Authorised Municipal collectors of wastes for disposal at the sanitary landfill. Incineration of solid waste at the premises will be prohibited.

Additionally, as per Section 7.0 of TPA's Waste Management Plan, waste containers are to be colour coded, and multiple waste skips are to be positioned near the Ro-Ro terminal and Berths 1 to 7. Sections 7.2 and 7.3 of the same plan explain that the waste is then taken to a temporary storage station for collection by a Contractor licensed by Temeke Municipal Council. The waste is then disposed of at the designated dumpsite.

As per Section 7.7 of the TPA Waste Management Plan, TPA is to ensure that "all Contractors shall institute an on-site waste management programme that will address but not limited to the following:

- An inventory of the nature of the waste handled;
- Categories of waste-hazardous, general, recyclable, and re- usable construction waste;

- Plan of dealing with waste and methods of disposal;
- Compliance with local authority requirements and other legislative requirements;
- Monitoring and the method of dealing with spillages and clean-up; and
- Contractors shall at all times ensure that their activities are not contradictory to all rules as laid down in this plan."

In addition, TPA is to use a licensed Contractor to handle hazardous waste (e.g. used lubricating oils and engine degreasing solvents) in the Port since hazardous waste is to be stored separately from the rest of the waste (as per Section 7.3). On-site storage of hazardous materials and wastes should be minimised, and wastes promptly disposed of in accordance with local requirements. Current hazardous waste management practices in Tanzania include:

- Discharge into municipal ponds and sewerage systems following adequate treatment;
- Discharge into treatment ponds;
- Deposition into tailings storage facility;
- Backfilling of open pits at mining sites; and
- Illicit disposal at the Pugu Kinyamwezi dumpsite.

To date, there are no designated facilities for environmentally sound treatment and/or disposal of e-waste (a major category of hazardous waste) in the country.

General requirements for disposal of hazardous waste:

- Burning of hazardous waste is strictly prohibited;
- Hazardous waste may be treated and discharged into a municipal sewerage system provided that the national effluent standards are met;
- For disposal of hazardous waste, any organization intending to treat or dispose hazardous waste must submit the following documents to the Director of Environment for the acquisition of a disposal license:
    - Fully filled application form
    - Environmental Impact Assessment Certificate
    - Emergency plan
- Disposal options for untreatable hazardous waste are limited to discharge into engineered landfills (presently unavailable) and trans-boundary disposal (export). In both cases, an application for the requisite license is to be made to the Director of Environment; and
- The disposal license is valid for one year and necessitates the submission of bi-annual reports on the implementation of the proposed activity.

TPA is encouraged to review its Waste Management Plan to ensure it meets international standards under the 1989 Basel Convention on Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal and the Environmental Health and Safety Guidelines for Hazardous Materials Management.

Mitigating increase of HIV/AIDS and sexually transmitted diseases

TPA's OSHE Committee is advised to collaborate with local NGOs such as North Star Alliance and WASO and continue with the existing health, safety and awareness counselling programmes and workshops. The programmes are to include sensitisation activities, testing, counselling and promotion of condom use, etc.

Mitigating marine pollution

As per the 1997 MARPOL Regulations outlined in TPA's Waste Management Plan, incoming ships to the Port must:

- Provide notification before entry into port of the waste they will discharge, including information on types and quantities;

- Deliver their waste to port reception facilities before leaving port, unless they have sufficient dedicated storage capacity for waste and for it to be accumulated until the next port of call;
- Pay a mandatory charge to significantly contribute to the cost of port reception facilities for ship-generated waste, whether they use them or not; and
- Design and implement a ship waste management plan.

The other major source of water pollution is oil spills, which may occur during bunkering operations. To combat oil pollution near the Port, portable oil skimmers should be available at the Port.

Mitigating the introduction of invasive species

Exchanging ballast water in the middle of the ocean to reduce the risk of transferring organisms from one ecosystem to another is the primary management tool available for ships to control the introduction of invasive species. Public education is also a vital component for TPA to develop a prevention strategy and a specific ballast water management plan. Individuals must understand that their actions can have major, potentially irreversible, economic and ecological consequences. Increasing awareness among regular users of the Port, and suggesting actions that can be taken to reduce introductions, can help prevent the spread of invasive species. Port facilities should conduct cleaning or repair of ballast tanks, and should be equipped with adequate reception facilities able to prevent the introduction of invasive species. Treatment technologies may include those applied to other effluents accepted in port reception facilities or more specific methods such as filtration, sterilisation (using ozone or ultraviolet light), or chemical treatment (e.g. biocides). In addition, TPA is encouraged to develop detection and rapid response plans.

Managing occupational risks and accidents

All labourers exposed to vehicle and rail traffic operations are to be provided with PPE such as reflective vests, helmets as well as hazard cones to demarcate working areas.. In addition, health, safety, security and environment awareness campaigns shall be conducted annually on occupational risks to the public such as the NGOs who work within TPA, the *mamalishes*, public transport providers (*bodabodas*, bajaj and taxi drivers) and other users along Bandari road (offices, warehouses, etc.). Warning signs and notices will be placed around TPA and along other public roads surrounding TPA where there is frequent movement of heavy vehicles and trains transporting goods to and from the Port. Adherence to TPA's Occupational Safety, Health and Environment Guidelines and Procedures (section 3.5.2 and Appendix 10).

Mitigating interference with smaller vessels

TPA is advised to consider improving the current navigation system and revisit current shipping schedules to accommodate the anticipated increase in Port traffic. Any revisions to shipping schedules are to be shared with smaller ferry operators. This is with a view to minimising the likelihood of vessel schedules and routes coinciding with those of ferries to Kigamboni and Zanzibar and thereby causing delays.

7.4 Unplanned events

7.4.1 Construction phase

Mitigating vessel collisions

During dredging activities, vessel speed restrictions will be imposed for waters within the Port jurisdiction. Additionally, a dredging vessel with restricted manoeuvrability will exhibit three all-round lights and three shapes in a vertical line where they can best be seen in addition to a masthead light, sidelights and a sternlight (as per the 1972 Convention on International Regulations for Preventing Collisions at Sea). Port risks and navigational hazards will continue to be managed throughout the dredging process.

Mitigation measures for discharge from ships

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the protocol of 1978 (MARPOL, 1973/78), has issued guidelines for the prevention of marine pollution. These are listed below, and should be strictly adhered to for prevention of marine pollution:

- Ships are prohibited from discharging oil or oily water such as oily bilge water containing more than 15 ppm of oil within 19 km (12 miles) of land;
- Chemicals are evaluated for potential environmental hazards if discharged into the sea (categories A, B, C and D). Discharge into the sea of the most harmful chemicals (category A) is prohibited. Tank washings and other residues of less harmful substances (categories B, C and D) may only be discharged keeping in mind certain conditions e.g. total quantity of discharge, distance from the shore, depth of water prescribed depending on the hazards. There are no restrictions on substances such as water, wine, acetone, etc.;
- Harmful substances in packaged form should not be disposed into the sea;
- Sewage generated on vessels should not be disposed of into the sea, unless it is treated or it is disposed of at a certain distance from land; and
- Garbage produced on ship must be kept on board and discharged either ashore or into the sea in accordance with directives from the 1972 London Convention (see Chapter 3). Discharge of all plastics is prohibited.

Most of the above would also be included in a ship waste management plan, developed specifically for the Dar es Salaam Port.

The other major source of water pollution is accidental oil spills, which may occur during bunkering operations (or from vessel collision). To combat oil pollution near the Port, booms and other equipment are available in the TPA oil spill container (see Appendix 7). Dispersants should not be used, unless over deep waters offshore.

Management of oil spills

To successfully combat an oil spill, the manpower needs to be thoroughly trained since quick and efficient response is the primary factor deciding the efficiency of the operation. It is also vital that all equipment is routinely inspected and regular mocks are held. All responses to oil spills will be guided by TPA's Oil Spill Contingency Plan for Dar es Salaam Port, up to a Tier 1 spill, beyond which the National Plan, implemented by SUMATRA and Ministry of Transport would be responsible.

The oil spill combating equipment will be stored in the vicinity of the oil berth and a suitable vessel will be always kept standby for quick response during loading/unloading operations of petroleum and while providing bunker. Equipment for spills on land, to prevent entry to the marine environment, are also important.

The oil spill combating equipment will be inspected regularly as recommended by the manufacturers and records of inspection will be maintained. Prompt action will be taken to attend to deficiencies, if identified during inspection.

Mitigation measures for fire outbreak

Fire detectors, alarms and fire extinguishers will be placed in all specified points and routinely inspected. All employees will be adequately trained on how to handle fire cases and follow the escape procedure. There will be a water reservoir tank with sufficient water to contain major fire outbreaks using a sprinkler system. TPA has a working emergency preparedness and emergency plan (Appendix 8) and officer in-charge of fire issues trained to respond in case of a fire outbreak or explosion.

7.4.2 Operation phase

Managing exposure/release of hazardous substances

Workers and Port users to follow in TPA's Occupational Safety, Health and Environment guidelines (Appendix 10) with annual awareness and training organised by the OSHE committee. Workers and Port users to follow procedures in Emergency Response Plan (Appendix 8) in situation where there is spillage of hazardous substances.

Mitigating road and rail accidents

Road and rail safety signs will be positioned along the network running through the Port vicinity. Speed bumps will be constructed where necessary and speed limits imposed.

Mitigation measures for fire outbreak

Fire detectors, alarms and fire extinguishers will be placed in all specified points and routinely inspected. All employees will be adequately trained on how to handle fire cases and follow the escape procedure.

There will be a water reservoir tank with sufficient water to contain major fire outbreaks using a sprinkler system.

TPA has a working emergency preparedness and emergency plan and officer in-charge of fire issues knows exactly what to do in case of a fire outbreak or explosion.

Managing culvert at new Ro-Ro terminal

The culvert to be constructed at the Ro-Ro terminal will undergo regular monitoring and unclogging to ensure the outlet is not accidentally blocked.

Managing spills from vessel collision and pollution

The Dar es Salaam Port has an oil spill contingency plan (see Appendix 7) that covers Tier 1 level oil spills around the Port area and the existing oil delivery through the SPM located close to the southern Marine Reserve, but not the outer anchorage. That area would be convered under the remit of the national oil spill contingency plan coordinated by SUMATRA, as is. In order to ensure that the Dar es Salaam Marine Reserves do not become impacted by an accidental oil spill resulting for collisions or other events, the Port needs to work with SUMATRA to ensure that the capabilities of address a spill are maintained and updated.

7.5 Adaptation to climate change

The impacts of climate change are both direct (for example, a port experiencing higher mean sea level over time) and indirect (for example, a port experiencing electricity failures due to scarce rains affecting hydroelectric power generation). The climate impacts may affect the economic profitability of port operations, the environmental sustainability of the port, the types of trade goods going through the port and, ultimately, the functions of the port.

TPA is encouraged to incorporate a climate risk assessment as part of the Dar es Salaam Port's broader risk management process. This assessment identifies the risks to the Port of existing and future climate hazards with the aim of providing data to inform decisions concerning how and when to deal with hazards resulting from climate change. The assessment would be based on identifying, analysing and evaluating risks, followed by the development of a plan to address the risks. Ideally, this approach would involve engaging with other pertinent stakeholders (e.g. Ministry responsible for Environment, Tanzania Meteorological society, local government authorities, surrounding fishing communities, etc.) throughout the process and regular monitoring and review of the implemented measures.

Chapter 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

The World Bank Operational Policy 4.01 requires an Environmental Management Plan (EMP) to be developed that consists of "the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels." The EMP has been separated into two chapters to comply with national requirements. This chapter presents the mitigation or enhancement measure proposed, institution responsible for implementation, cost estimates (wherever possible) and implementation timeframe. TPA is committed to implement the mitigation measures suggested by the Environmental and Social Management Plans (ESMP) in Tables 8-1 and 8-2 below.

Chapter 9 identifies monitoring requirements with linkages to the impacts assessed and the mitigation measures described in this chapter.

The proposed costs are only indicative. Should the proposed development proceed with the suggested changes, the developer will work out actual costs and include them in the overall cost of the project.

8.1 Implementation of the ESMP

8.1.1 Institutions involved

Contractor(s)

The Contractor is primarily responsible for implementing environmental and social control measures recommended in the ESMP. Therefore, this ESMP is to be included in the Contractor's bidding documents, where the Contractor is to develop a more specific ESMP for construction activities, adjusting the bill of quantities as needed to mitigate impacts. The Contractor(s) is/are advised to have a Health, Safety and Environment Officer or procure a qualified consultant to oversee the implementation of the ESMP during construction.

Tanzania Port Authority (TPA)

The overall implementation of the ESMP is the responsibility of the proponent of the ESIA i.e. TPA. However, the TPA Environmental Management Systems (EMS) Section identified in Chapter 3 has neither the mandate nor the capacity to ensure the implementation of EIAs and ESMPs. Their current responsibilities are more on the development, implementation and monitoring of environmental management procedures and ensuring compliance to legislative and international requirements on environment. Furthermore, different aspects of environmental management are managed in different departments. The Civil Engineering Department manages waste management in the Port, while the Port's Occupational Safety, Health and Environment (OSHE) Committee oversee Occupational Health and Safety (OHS) issues.

To keep within the existing administrative setup in TPA, it is recommended that a Dar es Salaam Port OSHE committee is to be custodian of this ESMP and will be responsible for:

- Ensuring that recommendations in the ESMP to be implemented during construction are incorporated into the Contractor tendering process;
- Procuring a supervising ESMP consultant to assist them in monitoring the Contractor to ensure that the mitigation measures are implemented and revise the ESMP to improve effectiveness where necessary. The ESIA recognises that TPA are hoping to expand the EMS section and potentially hire additional Environmental Management System Officers answerable to the EMS Section (see section 3.5.2). An EMS officer would also be relevant TPA staff to monitor the implementation of the ESMP. However, it is not known if this shall be done before commencement of Phase 1 activities;
- Ensuring that respective sections/divisions at Dar es Salaam Port implement mitigation measures during the operation phase;
- Preparing monthly reports; and

- Liaising with other institutions with respect to obtaining licenses, complying with standards and reporting on environmental and social issues identified in the ESMP.

Members of this Dar es Salaam Port OSHE committee are to include representatives from (but not limited to) the following departments:

1. Civil Engineering - Sanitary Section
2. Fire and Safety Department
3. Dar es Salaam Port Operations Department
4. Medical Department
5. Directorate of Management Systems - EMS Section

Temeke Municipal Council

The Dar es Salaam Port OSHE sub-committee is to coordinate with Temeke Municipal Council with regard to:

- Ensuring that the Contractors use licensed quarries as advised by the Municipal Council to extract raw materials for construction;
- The collection of solid waste from within TPA to the designated waste disposal site; and
- HIV/AIDs awareness and counselling services in collaboration with existing NGOs that currently work with the Port.

Kurasini Ward

The Dar es Salaam Port OSHE sub-committee is to coordinate with Kurasini Ward with regard to:

- HIV/AIDS awareness and counselling services in collaboration with the existing NGOs that currently work with the Port
- Coordinating with environmental committee at ward level for all activities related to protection of environment in the project area

OSHA

The Dar es Salaam Port OSHE sub-committee is to coordinate with OSHA for the implementation of the ESMP with a view to:

- Ensuring that the Contractor complies with OHS standards and receives registration of the construction site; and
- Ensuring that Dar es Salaam Port operations meet OHS workplace standards.

SUMATRA

The Dar es Salaam Port OSHE sub-committee is to coordinate with SUMATRA for the implementation of the ESMP with a view to:

- Enforcing maritime safety and pollution prevention standards;
- Regulating marine transport routes, safety and security; and
- Regulating and monitoring marine vessels in Tanzanian waters including the registration of vessels, issuance of licences and manning and certification of seafarers on vessels.

8.1.2 Reporting on implementation progress

The Dar es Salaam Port EMS section is to collect reports from the Contractor(s) on the implementation of the ESMP. These reports are incorporated into an internal monitoring that can be submitted to the Director of Management Systems. After being satisfied, the EMS section will submit the report to the regulatory body (NEMC) any other statutory organs and the financing institution(s) as may be required.

The existing EMS section is to initiate an annual audit of the project that is to be conducted independently. The purpose of the audit is to determine how the project has conformed to the ESMP, to TPAs EMS and to national environmental quality standards.

Additionally, the existing EMS Section is to initiate an independent audit to be carried out by a registered consultant, as guided by NEMC. The consultant shall prepare an audit report on behalf of TPA that is to be submitted to NEMC for approval. This independent audit is to review the project's compliance to the ESMP, national environmental quality standards and any conditions placed on the environmental certificate obtained as a result of this ESIA.

8.1.3 Capacity needs within TPA and recommendations

Consultations with the EMS Section at TPA revealed some capacity needs:

1. **Definition of roles.** There is need for clear description of who is responsible for overall environmental management in Dar es Salaam Port. Currently the existing EMS Section responsibilities covers all ports in Tanzania. However, their responsibilities with respect to environmental management for specific projects on a particular point do not seem to be well defined. Therefore, the Section seems to end up taking on the responsibilities of initiating and overseeing ESIAs, ESMPs, environmental monitoring and environmental audits for specific projects at all Ports. It is recommended that port-specific environmental units be established in the future, responsible for ESIAs, ESMP and environmental monitoring at the respective ports, reporting to the TPA EMS section.

2. **Insufficient resources.** During the ESIA, it appeared that four staff at national level are not sufficient to manage environmental management issues at each port. However, during consultations with TPA, Dar es Salaam Port (like other ports in the country) does not have a sub-section responsible for environmental management of day-to-day operations and specific projects. Consultations with TPA also revealed that the EMS Section has limited financial resources, no designated vehicle, and has neither monitoring equipment nor communication radios that would assist in implementing and monitoring ESMPs and general environmental monitoring of daily operations.

It is recommended that the capacity gaps are to be assessed further and an environmental management capacity development program be developed. In addition, the capacity development plan should look into establishing port-specific environmental units responsible for ESIAs, ESMP and environmental monitoring at the respective ports. These port environmental units can report to the existing TPA EMS Section.

The standard ESMP is made-up of the following major components:

- Description of an impact;
- Description of proposed enhancement or mitigation measures;
- Institution responsible for implementation of the measures;
- Cost estimates (wherever possible); and
- Implementation time frame.

8.1.4 Development of a TPA Environmental Management System

TPA Board of Directors have made a decision to establish an Environmental Management System (EMS) compatible to ISO 14001 standard for Environmental Management Systems. To date TPA has made steps in developing their own EMS including preparation of their environmental policies and their Initial Environmental Review procedures. It is assumed that the EMS that TPA is developing encompasses both general operations and project specific operations. For general operations, TPA should consider the following key aspects (amongst others) in their EMS:

1. Resource efficiency measures: water consumption (efficient water usage and water recycling measures), energy consumption (efficient energy use and promotion of renewable energy sources that can be easily installed such as solar) and transport (type and number of company vehicles and frequency and type of travel).

2. Waste management operating procedures in line with the Waste Management Plan (Appendix 6) from onshore and offshore activities: solid waste from offices and cargo handling services; liquid waste from sanitation and cleaning facilities; waste from vessels including ballast; management of hazardous waste and any other waste stream identified in the Waste Management Plan.
3. Hazardous material: operating procedures for the receiving, storing and transporting imported or exported materials that are categorised as hazardous.
4. Health and Safety of TPA workers and any other affected communities surrounding the ports

In addition to the above, the EMS should consider the following aspects (amongst others) for project operations (expansion, rehabilitation and maintenance):

1. Marine water quality impacts related to maintenance dredging.
2. Protection of sensitive habitats surrounding the ports e.g. mangroves, coral reefs sand banks, etc.
3. Embedding EIAs in project cycles to ensure that EIAs are initiated and the ESMPs are implemented and monitored.

Implications of implementing the EMS on projects

The aim of establishing an EMS is to improve the overall environmental performance of TPA operations and the project activities. An EMS promotes a more proactive approach to environmental management and creates a sense of ownership and environmental responsibility across various departments.

Once an EMS is established in TPA, the project will have to align to the EMS. For example:

- ESMPs developed will have to follow the internal controls/operating procedures set in the EMS,
- Mitigation measures set are to be reviewed to meet the environmental performance objectives and targets in the EMS, and Specific roles and responsibilities for implementation and monitoring of the ESMP will be determined by the EMS increasing the efficiency of ESMP implementation.

8.2 ESMP Cost

The ESMP for the proposed project is summarised in Tables 8-1 and 8-2. Many of the costs associated with the four activities are one-off, though some include the costs of monitoring in which case these are considered as annual costs. The costs for enhancing the overall positive measures associated with all four activities was estimated at TSh 270 million (USD 125,581) (see Table 8-1). Other total costs are:

- construction of the Ro-Ro terminal TSh 567 million (USD 263,721);
- strengthening and deepening Berths 1 to 7, TSh 213 million (USD 99,069);
- improvements to the grain delivery and silos TSh 112 million (USD 52,093);
- improvements to rail links TSh 41,000 (USD 19,069) ;
- addressing cumulative impacts TSh 312 million (USD 145,116); and
- addressing accidental events TSh 95 million (USD 44,186).

The overall estimated costs of proposed ESMP is TSh 1,610 million (USD 748,837) (see Table 8-2).

Table 8-1 ESMP measure to enhance positive impacts.

Phase	Impact	Enhancement Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
Construction	Generation of temporary employment opportunities	Engagement with nearby communities; communicating jobs available that do not require specialised skills	Contractor	Construction phase	To be included in Contractors Bid
	Increase in income generating activities	Employment of local residents; permitting small businesses to provide services to construction staff	Contractor	Construction phase	10,000,000
Operation	Reduced dust offloading grain	Regular maintenance and timely repair of offloading system	TPA	Operation phase	To be incorporated into TPA operational budget
	Increased efficiency in removing large containers outside the Port	Regular maintenance and timely repair of railway system	TPA	Operation phase	100,000,000
	Increased revenue from more vehicles imported	Streamlined process to clear vehicles faster with all charges incorporated; regular maintenance	TPA	Operation phase	50,000,000
	Improved trade	Maintaining port processes, service delivery and infrastructure	TPA	Operation phase	No cost
	Increased indirect income generation opportunities	Communicating available employment opportunities to local communities; establish capacity building and career progression programmes for local recruits	TPA	Operation phase	10,000,000
	Increased efficiency of cargo handling	Regular training on service delivery; technology, ICT and equipment to be regularly updated; use of Inland Container Depots to reduce delays	TPA	Operation phase	100,000,000
Total: TSh 270,000,000 (*USD 125,581)					

*Exchange rate USD = 2,150 TSh

Table 8-2 ESMP for mitigation measures.

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
Ro-Ro terminal					
Pre-construction	Loss of vegetation within Port areas due to site preparation activities	Controlled vegetation clearance limited only to the specific space required for construction; vegetation restoration during demobilisation	Contractor	Pre-construction to Construction phase	To be included in Contractors Bid 5,000,000
	Resuspension of sediment	Suspended particle matter to be kept at 5 % and physical barriers to be established (using a silt screen/curtain, 300 m long, 15 m deep, and associated deployment vessels)	Contractor	Pre-construction to Construction phase	100,000,000
	Acquisition of land	N/A	N/A	N/A	N/A
	Disruption of livelihoods due to the demolition of existing structures at Malindi Wharf	Informing and giving sufficient forewarning to stakeholders based at Malindi Wharf before commencing demolition of structures/exclusion area for dredging	TPA	Pre-construction phase	Part of TPA operation meetings 1,000,000
Construction	Changes in marine water quality due to released chemicals and heavy metals while dredging or backfilling	Remedial dredging to be conducted to remove sediments contaminated above acceptable levels; necessary treatment of dredged material to be undertaken prior to disposal	Contractor	Construction phase	Pending detailed analysis; to be included in Contractors Bid
	Fishing activities affected by suspended sediment	Physical barriers to be established (e.g. silt screens/curtains)	Contractor	Construction phase	Costed above (silt screen, in pre-construction) + handling vessel operations 50,000,000 + monitoring 100,000,000
	Marine/land pollution from the disposal of dredged material	Dredging to be done during the rainy season; siting disposal at subaquatic depressions where sediment would be more laterally confined; weekly monitoring study to be undertaken during and following termination of dredging activity	Contractor	Construction phase	
	Restricted access of other port users	Schedule indicating accessibility and timing of project activities to be developed and circulated among relevant port users	TPA, Contractor	Construction phase	1,000,000

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
Operation	Occupational accidents from offloading vehicles	Ensure proper maintenance and good condition of equipment, vehicles and tools used; workers to be given PPE; specialised training to be given to workers in charge of handling heavy machinery	TPA	Operation phase	To be included as part of TPA daily operations 10,000,000
	Reduced berth space at Malindi Wharf	Relocation of banking services to other TPA building; Malindi Wharf berth apron to be strengthened and docking bays re-established	Contractor	Construction phase	Service relocation already part of TPA's develop-ment plans; strengthening of Malindi Wharf apron 200,000,000
	Increased vehicle traffic	Display of road signage; construction of speed bumps where necessary	TPA	Operation phase	50,000,000
	Increase in CO_2 emissions from increased vehicular traffic	Unnecessary idling of vehicles and equipment to be avoided; traffic management plan to be implemented; maintenance and prompt repair of damaged roads	TPA	Operation phase	50,000,000
Total: TSh 567,000,000 (USD 263,721)					
Berths 1 to 7					
Pre-construction	Disruption of services due to the demolition of existing structures on Berths 1 to 7	Schedule of pre-construc-tion and construction works to be developed and circulated among Port staff and vessel operators; total rehabilitation to take place one berth at a time	TPA, Contractor	Pre-construction phase	2,000,000
Construction	Increased suspen-ded sediment from dredging activities impacting marine life	Suspended particle matter to be kept at 5 % and physical barriers to be established (e.g. silt screens/curtains)	Contractor	Construction phase	20,000,000
	Fishing activities affected by suspended sediment	Physical barriers to be established (e.g. silt screens/curtains)	Contractor	Construction phase	Costed above for Ro-Ro terminal (silt screen, in pre-construction) + handling vessel

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
	Changes in marine water quality due to released chemicals and heavy metals while dredging	Remedial dredging to be conducted to remove sediments contaminated above acceptable levels; necessary treatment of dredged material to be undertaken prior to disposal	Contractor	Construction phase	operations 50,000,000 Pending detailed analysis; to be included in Contractors Bid
	Marine pollution due to disposal of dredged material	Dredging to be done during the rainy season; siting disposal at subaquatic depressions where sediment would be more laterally confined; weekly monitoring study to be undertaken during and following termination of dredging activity	Contractor	Construction phase	Costed for Ro-Ro terminal (silt screen, in pre-construction) + handling vessel operations above + monitoring 100,000,000
	Restricted access of other port users	Schedule indicating accessibility and timing of project activities to be developed and circulated among relevant port users	Contractor	Construction phase	1,000,000
	Damage/disruption of surface water drainage channels on existing berths	On-site flow diversions to be created where necessary; culverts to be installed if needed	Contractor	Construction phase	20,000,000
	Increased noise during construction works	Properly functioning equipment to be maintained in compliance with occupational health and safety standards; mufflers to be affixed to construction equipment in use; workers to be given PPE; notice to be given to neighbouring communities	Contractor	Construction phase	20,000,000
Operation	Resuspension of sediment during maintenance dredging	Suspended particle matter to be kept at 5 % and physical barriers to be established (e.g. silt screens/curtains)	Contractor	Operation phase	To be included in TPA maintenance operations
					Total: TSh 213,000,000 (USD 99,069)
Grain silo					
Pre-construction	Disruption of services due to the demolition of existing structures	Pre-construction activities schedule developed and circulated among affected port stakeholders; tentative dates for resumed loading and offloading activities to	TPA	Construction phase	1,000,000

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
		be communicated			
Construction	Restricted access of other port users	Schedule indicating accessibility and timing of project activities to be developed and circulated among relevant port users	TPA	Construction phase	1,000,000
	Damage/disruption of surface water drainage channels on existing berths	On-site flow diversions to be created where necessary; culverts to be installed if needed	Contractor	Construction phase	20,000,000
Operation	Redundancy of casual labourers required for stevedoring activities	Train workers on new technology and system; retrenched labourers given first priority for re-employment; compliance with national labour laws and workers' rights during redundancy; consider severance packages for those who will be laid off, involve casual labourers for those activities that are more labour intensive rather than highly mechanised For example, during operations workers could be involved in offloading machinery, equipment and other essential services for operation purposes, prior notice and capacity building opportunities	TPA	Operation phase	20,000,000 (to be confirmed following detailed labour study)
	Increased vehicular traffic of trucks transporting grain	Road and safety signs to be positioned along road network; speed bumps to be constructed where necessary; speed limits to be imposed; idling of vehicles to be prohibited; road damage to be attended to promptly	TPA	Operation phase	50,000,000
	Contaminated grain from damaged infrastructure	Silos to be routinely cleaned and inspected for repair purposes; high-risk contaminated silos not to be used	TPA	Operation phase	20,000,000
Total: TSh 112,000,000 (USD 52,093)					

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
Railway links					
Pre-construction	Disruption of train services due to the demolition of existing structures	Details regarding disrupted train services within Port to be published and circulated; alternative routes to be provided where possible; re-location of tracks to take place during off-peak hours	TPA, Contractor	Pre-construction phase	1,000,000
Construction	Increased noise and vibrations during construction of the railway tracks	Properly functioning equipment to be maintained in compliance with occupational health and safety standards; mufflers to be affixed to construction equipment in use; workers to be given earmuffs; notices to be given to Port users and along Bandari Road	Contractor	Construction phase	10,000,000
Operation	Increase in noise and vibrations	Properly functioning equipment to be maintained in compliance with occupational health and safety standards; mufflers to be affixed to equipment/machinery in use; workers to be given ear muffs	TPA	Operation phase	10,000,000
	Occupational risks and accidents	Signage, lights and audible signals at main railway crossings; TPA OSHE committee to include safety with training and organising annual awareness campaigns	TPA	Operation phase	20,000,000
Total: TSh 41,000,000 (USD 19,069)					
Cumulative					
Construction	Extraction of construction materials from quarries and borrow pits	Use of only existing licensed quarries in the Coastal Region, that undertake dust minimising procedures during collection of raw materials from quarries (e.g. use of water sprinkling and covering of loose materials when transported)	Contractor, Licensed quarry owner	Construction phase	No cost (part of Contractor's normal work procedures)

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
	Increased demand on existing infrastructure and facilities	Temeke Municipal to be notified on roads to be used; existing liquid waste management system to be upgraded, additional toilets and cesspits connected to existing septic tanks to be constructed (two units proposed to start) for use by construction workers; TPA to increase budget for increased costs related to water supply, sewage and solid waste	Contractor, TPA	Construction phase	35,000,000 (two septic tanks)
	Increased demand on energy and limited water resources	Installation of power-saving electrical appliances, adoption of a cost effective and technically feasible renewable energy sources e.g. solar power for some port operations; limiting the timing of machinery operations in an efficient manner to minimize energy wastage and exhaust outputs; use of TPA's boreholes as water sources for construction purposes and allocation of the DAWASCO mains mostly to sanitary facilities stationed for construction labour; water-conservation training to construction labour and monitoring water usage; frequent maintenance checks on water supply systems	Contractor, TPA	Construction phase	50,000,000
	Occupational health and safety risks	Labourers to be provided with PPE; first aid kit to be available onsite; health, safety, security and environment induction course to be conducted for workers; controlled access to site with warning signs around perimeter	Contractor	Construction phase	20,000,000
	Pollution due to poor waste management (construction waste)	Debris from excavation to be used as fillers within Port; solid waste to be sorted into different containers for appropriate disposal	Contractor	Construction phase	10,000,000

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
	Increased dust generation during construction works	Stockpiled and excavated material to be covered on site and on hauling trucks or located offsite; construction area and vicinity to be swept with water sweepers daily	Contractor	Construction phase	10,000,000
	Increased noise during construction works	Properly functioning equipment to be maintained in compliance with occupational health and safety standards; mufflers to be affixed to construction equipment in use; workers to be given PPE; Notices to be posted within core impact area	Contractor	Construction phase	15,000,000
	Increase rate of crime	To avoid increasing rate of crime; the client in collaboration with the local authority shall be advised to monitor movement of new comers/people in out of the project area.	TPA,Temeke Municipality and Kurasini Ward	Construction phase	10,000,000
Operation	Increased land pollution from improper disposal of waste	Solid waste to be collected at point of origin and then taken to storage before disposal; Contractor to institute an on-site waste management programme; licensed Contractor to handle hazardous waste	TPA, Temeke Municipality, Kurasini Ward and local NGOs	Operation phase	20,000,000
	Indirect increase in HIV/AIDS	Workshops on HIV/AIDS and prevention to be conducted routinely for Port staff; conduct sensitisation activities, testing, counselling and promotion of condom use, etc.	TPA	Operation phase	10,000,000
	Increased marine pollution from improper disposal of waste	Oil skimmers to be available at the Port as well as chemical dispersants; waste generated on vessels to be collected and appropriately disposed of (as per 1973 MARPOL Convention); design and implement a ship waste management plan	TPA	Operation phase	100,000,000

Phase	Impact	Mitigation Measure	Implementation		
			Responsible Institution	Time Frame	Estimated cost (TSh)
	Increased risk of invasive species	Prevention strategy and detection/rapid response plans to be developed; awareness among regular port users to be increased through workshops; Port to develop ballast water management plan, and conduct cleaning or repair of ballast tanks; treatment technologies to be adopted	TPA	Operation phase	20,000,000 20,000,000 (annual)
	Occupational risks and accidents	Port workers to be provided with PPE; first aid kit to be available on-site; health, safety, security and environment workshops to be held routinely for Port staff; HSE signage to be placed around the Port area	TPA	Operation phase	2,000,000 (annual)
	Interference with smaller shipping traffic	Navigation system and schedule updated to acco-mmodate increased traffic; shipping schedule shared with smaller ferry operators	TPA	Operation phase	
					Total: TSh 312,000,000 (USD 145,116)
Accidental events					
Construction and operation	Accidental vessel collisions during dredging	Vessel speed restrictions to be imposed; dredging vessel to display required lights and signs for visibility; Port risks and navigational hazards to be managed	Contractor	Construction phase	No cost (part of TPA emergency response operation budget) Appendix 8 50,000,000
	Accidental spills during dredging operations and collisions from increased traffic	Vessels reminded on MARPOL obligations; Port staff to be trained; equipment routinely inspe-cted; drills held regularly	TPA and SUMATRA	Construction phase	
	Risk of fire	Fire detectors, alarms and extinguishers to be placed in all specified locations and routinely inspected; employ-ees trained for fire response and drills regularly held	TPA	Construction phase	40,000,000
	Extensive flooding of inner Gerezani Creek area from accidental blockage of culvert at Ro-Ro berth	Ensure existing channel allows flow of water between inner farmland and mudflat area and harbour; regularly inspect and maintain culvert outlet	TPA	Operation phase	5,000,000
					Total: TSh 95,000,000 (USD 44,186)

Chapter 9: ENVIRONMENTAL AND SOCIAL MONITORING PLAN

To ensure that mitigation measures are effective in minimizing negative impacts, monitoring is essential. This chapter presents an Environmental and Social Monitoring Plan describing the attributes (parameters) to be monitored, frequency, method, sampling area, institutional responsibility and estimated costs in Table 9-1 below. The estimated costs, totalling TSh 2,886 million (or USD 1.33 million), are calculated over a full year, and are only approximations (thus indicative) of costs that are to be covered by the developer and included in the project.

9.1 Implementation and reporting

The supervising ESMP consultant or an EMS officer (if skills and staff time are available) will be responsible for coordinating the implementation of the monitoring plan in collaboration with other TPA staff. Impacts affecting day-to-day port operations and port services shall be monitored by the TPA operations manager so that there is coordination with the provision of port services. The TPA EMS section shall follow-up on these activities during various stages of implementation.

The Contractor has a duty to prepare the revised Environmental and Social Monitoring Plan and implement the monitoring procedures identified and agreed with the TPA (EMS working with the ESMP consultant if appropriate). Based on frequent reporting from the Contractor, the ESMP consultant and TPA operations manager shall prepare monthly progress reports submitted to the EMS section. The EMS section shall compile the progress reports into an annual compliance monitoring report. This annual monitoring report should be made available to NEMC or any other authority upon request and is to be used as a reference document when conducting audits.

Table 9-1 Environmental and Social Monitoring Plan.

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
Ro-Ro terminal						
Loss of vegetation due to site preparation activities	Monthly	Vegetation cover Calculate area in m²	Gerezani creek –inner farmland and mudflat	Minimum vegetation disturbance	Supervising ESMP Consultant	3,000,000/ month
Resuspension of sediment	Monthly	Sediment plume Measure turbidity in NTU and/or Secchi disk at sample areas	Construction areas	5% sediments suspension	Supervising ESMP Consultant	10,000,000/ month
Acquisition of land	N/A	N/A	N/A	N/A	N/A	N/A
Disruption of livelihoods due to the demolition of existing structures at Malindi Wharf	Monthly	Livelihood activities likely to be affected Record changes in types and	Malindi wharf	Continued livelihood activities	Supervising ESMP Consultant	3,000,000/ month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
		volume of Malindi Wharf users				
Changes in marine water quality due to released chemicals and heavy metals while dredging or backfilling	Monthly	Heavy metals, COC, VOC, hydrocarbons, PCB, PAH SPM, Salinity, Temperature, Oxygen, BOD5, Ntot, Ptot and coliform Water samples	Gerezani creek estuary and along Berth 1 to 7	TBS standard (TZS 860: 2005 Municipal and Industrial Wastewaters)	Supervising ESMP Consultant	20,000,000/ month
Fishing activities affected by suspended sediment	Monthly	Complaints from fishers Written record of complaints from fishers	Kurasini fish landing site	No complaints	Supervising ESMP Consultant	N/A
Marine/land pollution from the disposal of dredged material	Quarterly	Groundwater and seawater monitoring (pH, conduc-tivity, hydro-carbons, TSS, Cr, Pb, BOD5, TKN, SO4.) Water samples	TPA boreholes	MARPOL	Supervising ESMP Consultant	35,000,000 / quarter
Restricted access of other port users	Monthly	Access and manoeuvring within the Port Record changes in types and volume of port users	Works areas within the Port	Continued Port operations	TPA operations manager	5,000,000 / month
Flooding of inner Gerezani Creek area	Weekly during rainy season	Area of inner Gerezani Creek underwater Measure land area underwater in	Gerezani creek farmland	no changes to baseline	Supervising ESMP Consultant	5,000,000 / month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
		m^2				
Occupational accidents from offloading vehicles	Daily	Number of accidents and injuries Written records of injuries reported	Ro-Ro terminal	No incident recorded	TPA operations manager	200,000 / day
Reduced berth space at Malindi Wharf	Quarterly	Number of vessels using Malindi wharf Complaints; record of changes in types/ volume of Malindi Wharf users	Malindi wharf	No decrease in number of vessels using Malindi Wharf	TPA operations manager	200,000
Increased vehicle traffic	Weekly	Complaints on traffic flow/ congestion within Port Record of number of vehicles in and out of port and complaints	Port area	No complaints	TPA operations manager	200,000 / week
Increase in CO_2 emissions from increased vehicular traffic	Quarterly	Ambient gaseous Record of type and number of vehicles in and out of Port	Port area	TBS (TZS 845:2005)	Supervising ESMP Consultant	2,000,000 / quarter
Berths 1 to 7						
Disruption of livelihoods due to the demolition of existing structures on Berths 1 to 7	Weekly	Increased delays in cargo handling Recorded time to unload cargo.	Berths 1-7	Delays not to exceed 1 week	TPA operations manager	3,000,000/ month
Increased suspended sediment from dredging	Monthly	Marine water quality (Temperature, Oxygen,	Within 1km along Berths 1-7	5% suspended matter	Supervising ESMP Consultant	10,000,000/ month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
activities impacting marine life		turbidity) Water samples				
Fishing activities affected by suspended sediment	Monthly	Complaints from fishers Written record of complaints from fishers	Kurasini fish landing site	No complaints	Supervising ESMP Consultant	1,000,000/ month
Changes in marine water quality due to released chemicals and heavy metals while dredging	Monthly	Heavy metals, COC, VOC, hydrocarbons, PCB, PAH SPM, Salinity, Temperature, Oxygen, BOD5, Ntot, Ptot and coliform Water samples	Within 1km along Berths 1-7	TBS standard (TZS 860: 2005 Municipal and Industrial Wastewaters)	Supervising ESMP Consultant	20,000,000/ month
Marine pollution due to disposal of dredged material	Monthly	Heavy metals, COC, VOC, hydrocarbons, PCB, PAH SPM, Salinity, Temperature, Oxygen, BOD5, Ntot, Ptot and coliform Water samples	Disposal area	MARPOL	Supervising ESMP Consultant	20,000,000/ month
Restricted access of other port users	Weekly	Access and manoeuvring within the Port Record of type and number of vehicles in and out of port	Works areas within the Port	Continued Port operations	TPA operations manager	200,000 / week
Damage/disruption of surface water drainage channels on existing berths	Monthly	Number of surface drains blocked/dam-aged Physical inspection of drains	Berths 1 - 7	No damage to existing drainage infrastructure	TPA operations manager	500,000 / month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
Increased noise during construction works	Weekly	Ambient noise levels Digital sound level meter	Berth 1- 7	TBS-EMDC6 (1733) P2 threshold limit	Supervising ESMP Consultant	500,000 / week
Resuspension of sediment during maintenance dredging	Quarterly	Sediment plume Turbidity in NTU and/or Secchi disk	Berths 1-7	5% suspended matter	Supervising ESMP Consultant	2,000,000 / quarter
Grain Silo						
Disruption of grain offloading services due to the demolition of existing structures	Weekly	Increased delays in cargo handling Recorded time to unload cargo	Berths 1-7	Delays not to exceed 1 week	TPA operations manager	Part of operations
Restricted access of other port users	Weekly	Access and manoeuvring within the Port Record changes in types and volume of Malindi Wharf users	Works areas within the Port	Continued Port operations	TPA operations manager	200,000 / week
Damage/disruption of surface water drainage channels on existing berths	Weekly	number of surface drains blocked/dam-aged Physical inspection of drains	Berths 1 - 7	No damage to existing drainage infrastructure	TPA operations manager	500,000 / week
Redundancy of casual labourers required for stevedoring activities	Monthly for the first 4 months after operations begin	Number of stevedores for grain Recorded number of casual labourers/ shipment	grain terminal & silos	Minimum redundancies	TPA, Labour agencies	To be determined following detailed labour study
Increased vehicular traffic of trucks transporting grain	Weekly	Complaints on traffic flow/ congestion within the Port	Within Port area	No complaints	TPA operations manager	200,000 / week

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
		Record of number of vehicles in and out of port and complaints				
Contaminated grain from damaged infrastructure	Daily	Moisture and dust Grain samples measured by TFDA	Silos	Tanzania food and drug authority standard	Supervising ESMP Consultant	200,000 / day
Railway linkages						
Disruption of train services due to the demolition of existing structures	Daily	Delays in container handling services Recorded time to unload cargo	Container loading and offloading platform on trains	Continued service provision	TPA operations manager	Part of operations
Increased noise and vibrations during construction of the railway tracks	Weekly	Noise and vibrations Digital sound level and vibrations meter	Works areas within the Port	TBS-EMDC6 (1733) P2 threshold limit and EN 14253:2003 respectively	Supervising ESMP Consultant	500,000 / week
Increase in noise and vibrations	Monthly	Noise and vibrations digital sound level and vibrations meter	Works areas within the Port	TBS-EMDC6 (1733) P2 threshold limit and EN 14253:2003 respectively	Supervising ESMP Consultant	5,000,000 / month
Occupational risks and accidents	Weekly	Number of accidents and injuries Record of injuries	Around the Port	No accidents and injuries recorded operations	Supervising ESMP Consultant	500,000 / week
Cumulative						
Extraction of construction materials from quarries and borrow pits	Monthly	Quarries and borrow pits used Written record of source and	Temeke Municipal	No new quarry/ borrow pit established	Supervising ESMP Consultant	5,000,000 / month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
		volume				
Increased demand on existing infrastructure and social services in IIA	Weekly	Frequency of repairs on infrastructure Review of budget, records on money spent on infrastru-cture repairs	Within Port area	Less pressure on existing facilities	TPA operations manager	5,000,000 / week
Increased demand on energy and limited water resources	Daily	Water and energy consumption Water and electricity bills	Within Port area	Less pressure on water and energy resources	TPA operations manager	200,000 / day
Occupational health and safety risks	Weekly	Number of accidents and injuries Written records of injuries reported	Within Port area	No accidents and injuries recorded	TPA operations manager	Part of operations
Pollution due to poor waste management (construction waste)	Monthly	Soil pollution (pH, electro-conductivity, hydrocarbons, permeability levels of MAC) Soil samples	Within Port area		TPA, Supervising Consultant?, Contractor	4,000,000 / month
Increased dust generation during construction works	Monthly	Ambient dust levels Suspended particulate matter monitor / meter	Around works areas	TBS [TZS 845:2005] limits	Supervising ESMP Consultant	2,000,000 / month
Increased noise during construction works	Monthly	Ambient noise levels Digital sound level meter	Around works areas	TBS-EMDC6 (1733) P2 threshold limit	Supervising ESMP Consultant	2,000,000 / month
Increased land pollution from improper disposal of	Monthly	Waste disposal Inspection of amount of	Transfer stations and disposal areas	All wastes are appropriately disposed	TPA	2,000,000 / month

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
waste		waste not contained in specified collection containers/ skips				
Indirect increase in HIV/AIDS	Quarterly	New HIVAIDS cases Records from local NGOs and counselling centres	Around the Port	No new transmission cases, no increased infection rate	TPA, local NGOs, Temeke Municipality, Kurasini Ward	20,000,000 / quarter
Increase rate of crime	Quarterly	Number of items stolen/ vandalised Records from port security	Around the Port area	No reported cases of crime	TPA, Police, local community	10,000,000 quarterly
Increased marine pollution from improper disposal of waste	Weekly	Heavy metals, COC, VOC, hydrocarbons, PCB, PAH SPM, Salinity, Temperature, Oxygen, BOD5, Ntot, Ptot and coliform Water samples	Within harbour	Pollution-free marine life	TPA, shipping agents	20,000,000 / quarter
Increased risk of marine invasive species	Baseline survey and after five years of operation	Number of invasive species Harbour survey	Within harbour	Zero	Supervising ESMP Consultant	200,000,000
Occupational risks and accidents	Weekly	Number of accidents and injuries Written records of injuries reported	Within the Port	No injury or accident recorded during operations	TPA operations manager	2,000,000 / week
Interference with smaller ferries to Kigamboni and Zanzibar	Weekly	Number of complaints of delays/disruptions from smaller ferry operators Written records of	Malindi wharf	No complaints, minimal delays, no disruptions	TPA operations manager	2,000,000 / week

Impact	Monitoring					
	Monitoring Frequency	**Parameter and Method**	**Sampling Area**	**Target Level/ Standard**	**Responsibility for Monitoring**	**Estimated Cost (TShs)**
		delay duration / disruption of services				
Unplanned events						
Accidental vessel collisions during dredging	Monthly	Collisions Written record of number and nature of collisions	Dredging areas	No vessel-vessel collision recorded	TPA	Part of operations
Accidental spills	Monthly	Spills Written record of volume of and type of fluid spilled	Within the Port (on land and at sea)	No accidental spills	TPA	Part of operations
Risk of fire	Monthly	Fire outbreaks Written record of fire incidents and extent	Within the Port	No fire incident	TPA	2,000,000 / month
Accidental collisions of vehicles and trains	Monthly	Accidents and injuries Written records of injuries reported	Within the Port	No train and vehicle collision recorded	TPA	2,000,000 / month
Accidental blockage of the culvert at the new Ro-Ro terminal	Monthly	Flow of surface drainage Physical inspection of drains	Ro-Ro terminal	Smooth drainage flow at the terminal	TPA	2,000,000 / month

Chapter 10: COST BENEFIT ANALYSIS

10.1 Anticipated Long-term Benefits

The Dar es Salaam Port is the biggest port in Tanzania and second most, next to Mombasa, crucial gateway for regional trade in East and Central Africa. The Port handles approximately 90% of the import and export cargo including transhipment cargo to and from the landlocked countries of Zambia, Malawi, DRC, Burundi, Rwanda, and Uganda. The transit trade counts for as much as 50% of exports and 32% of imports (Feasibility/Needs Assessment, Dar Port Expansion, 2011). If the proposed project will be implemented and the envisaged efficiency is attained, Tanzania's economy is expected to gain almost USD 1.8 billion per year (~ 7% of current GDP) and the regional gains (exclusive of Tanzania) would be in the range of USD 800 million per year. Therefore, Tanzania and regional countries could earn as much as USD 2.6 billion per year; and based on average level of consumption, it is estimated that Tanzanian households may be able to save up to 8.5% of total expenditures, or USD 147 per year (Feasibility/Needs Assessment, 2011).

10.2 Investment Costs

Tentatively, the investment costs for Phase I activities is approximately USD 275 million.

10.3 Financial Analysis

According to the Financial Analysis conducted during feasibility, result shows that the proposed project at the Port will be highly profitable for the TPA, shareholders, investors, and the public at large although the planning horizon covers only 15 years whereas the life-cycle of the investments is between 20 and 50 years (weighted average 28 years). The result covers both high and low traffic forecast scenarios. After taxation, the Financial Internal Rate of Return (FIRR) of the project is 25.9% with high and 9.6% with low traffic forecast (Financial and Economic Analysis, July 2013).

10.4 Economic Analysis

Results of the Economic Analysis conducted during feasibility study shows that the proposed project is highly beneficial for the national economy of Tanzania despite a planning horizon of only 15 years whereas the life-cycle of the investments is between 20 and 50 years (weighted average 32 years). The result covers both high and low traffic forecast scenarios (Financial and Economic Analysis, July 2013). The Economic Internal Rate of Return (EIRR) of the project is 31.3% with high and 15.4% with low traffic forecast. The project cost is only 17.7% of the economic value of project benefits under the high traffic forecast scenario and 42.0% under the low traffic scenario (Financial and Economic Analysis, July 2013).

10.5 Other Benefits and Costs not Quantified

The national economy and local residents living in proximity to the harbour will benefit from the proposed project in several other ways including:

- Increased revenues;
- Improved efficiency and competitiveness of the Dar es Salaam Port as compared to other ports in the region (e.g. Mombasa Port) and consequently attraction of additional cargo flows;
- Increase of cargo throughput, as a result of the project, would have a significant favourable economic impact on other parts of the national economy notably road and railway infrastructure, supplies of goods and services within TPA premises, supply of the entire national economy with additional goods, facilitation of export etc.;
- Direct and indirect employment opportunities, secured livelihoods and welfare of the people connected to the Port's operations;
- Increased income generation opportunities;
- Increase in HIV/AIDS;
- Marine pollution due to disposal of dredged materials;
- Reduced berth space at Malindi Wharf;

- Risk of increase in invasive species;
- Redundancy of casual labourers as stevedores in the grain operations;
- Occupational risks and accidents;
- Increased demand on existing infrastructure and utilities; and
- Increased vehicle traffic and CO_2 emissions.

Generally, the anticipated socio-economic benefits of the project outweighs the associated repercussions. The proposed project is of great benefit to the country and regional economy at large, and at the same time community members at the local scale will benefit in various ways. The anticipated desirable outcomes will be felt at both the micro- and macro-levels.

Chapter 11: DECOMMISSIONING PLAN

11.1 Introduction

A decommissioning plan will be prepared to specify the undertakings to be implemented in the event that the program operations reach a point of termination. Notwithstanding the project's estimated life span of over a hundred years, continuous advancement in maritime infrastructure technology is likely to phase out the technical deliverables of the program in the long run. The technical, socio-economic and environmental hurdles associated with the closure of this national facility necessitate the institution of a comprehensive plan to ensure all aspects of decommission works are successfully executed and that negative impacts are adequately abated. When the program approaches the end of its long-established operational phase, a detailed decommissioning plan will be framed by TPA, in collaboration with key stakeholders, and approved by relevant authorities. The main aspects of the Port decommissioning plan should include:

- Deconstruction and disassembly of the Port facility (feasibility study, pre-demolition surveys, demolition work plan etc.);
- Disposal of materials, equipment and inventory;
- Requisite infrastructure;
- Health and safety management;
- Environmental management;
- Site Security System;
- Community support; and
- Decommissioning cost report.

11.2 Further Considerations

Decommissioning works will involve a wide range of closure activities to abolish parts of the Port facility. The main deliverables associated with this phase of the project include labour demobilization, asset recovery, deconstruction, site rehabilitation and waste management.

Labour Demobilization

The onset of the decommissioning phase will render many of the Port workers unemployed. While some of the workforce may be channelled to other harbours for continued service, increased automation of cargo handling systems in modernized ports elsewhere will reduce the demand for manual labour. Despite the prospect of alternative employment, the vast loss of jobs and livelihoods upon decommissioning may lead to some people's impoverishment. The TPA can alleviate subsequent unemployment through community support initiatives such training services for recruitment in new facilities, reallocation of workers to other public work centres and resettlement aid. Employers must make an effort to ensure that all employees are members of the Social Security Fund (SSF) and that employer obligations are remitted early enough for the workers to be eligible for retirement benefits.

Asset Recovery

Serviceable machinery and equipment could be relocated to small, under-equipped ports recommended by TPA. Obsolete and inoperative equipment can be auctioned to the public or sent off to recycle plants for dismantling and subsequent material recovery. Any other valuables deemed appropriate for communal ownership can be entrusted to public authorities. A site security plan must be put in place to ensure that access to the abandoned facility is restricted to authorized personnel only, and that no trespassing or misappropriation occurs in the course of decommission works.

Deconstruction and Site Rehabilitation

Deconstruction and disassembly works will aim at returning the site to a brownfield state suitable for proposed re-development schemes, which are likely to range from recreational amenities to residential facilities. Major activities include mobilization of the requisite resources, utility isolation, demolition works, uninstallation of sub-sea components and land rehabilitation. In the absence of immediate redevelopment proposals (for urban land-use), site clean-up and natural landscaping will be carried out, with

complementary efforts in ecosystem enhancement for adjacent ecological systems. Key personnel include the project manager, decommissioning Contractors' representative, decommissioning engineer, cost/planning engineer, risk assessment analyst, landscaping specialists and environmental consultants.

Waste Management

Demolition waste is expected to comprise of mostly concrete, bricks, ceramics, wood, plastic, glass, metallic debris, insulation materials, packaging material, gypsum-based materials, electronic refuse, dredging spoils and bituminous mixtures. An effective waste management plan must be formulated to ensure re-usable waste is salvaged for beneficial utilization, and that the remaining fraction, particularly hazardous waste, is disposed of in an environmentally sound manner. The demolition waste stream must therefore undergo a screening process to separate the different waste components. Rubble, which typically constitutes about 73% of demolition waste, can be used as landfill in sites recommended by the authorities. Scrap metals and recyclable plastics can be sold off in bulk to recycling plants and local smelters. Unusable waste will be disposed in designated dumpsites, as directed by environmental authorities (e.g. NEMC and municipal councils). Of paramount concern are the hazardous substances present in a wide array of building materials. The main hazardous components of demolition waste are:

- Asbestos – found in insulation, roofs, tiles and fire resistant sealing;
- Lead based paints – found on roofs, tiles and electrical cables;
- Phenols – Found in resin based coatings and adhesives;
- Polychlorinated Biphenyls (PCBs) – found frequently in joint sealing, flame retardant coats and electrical items;
- Polycyclic Aromatic Hydrocarbons (PAHs) – commonly found in roofing felt and floorings; and
- Toxic trace metals (Mercury, Cadmium) – found in electronic devices (European Commission: Institute for Environment and Sustainability, 2011).

Any waste components classified as hazardous must undergo due treatment prior to disposal in an engineered landfill facility. This task should be carried out by a licenced waste management Contractor in full conformance with pertinent regulations. Sewage from temporary sanitary facilities onsite must be managed accordingly.

Decommissioning Committee

A decommissioning committee should be deployed prior to the launch of decommission undertakings. The committee will include the company management, government officials as well as local community representatives. The functions of the decommissioning committee are as follows:

- To guide decision making for any issues that may arise in the course of decommissioning works, and to pass the resolution on the best practicable redevelopment alternatives;
- To oversee the execution of the decommissioning plan and to seek to ensure any unforeseen challenges are tackled accordingly;
- To monitor the project performance and provide directives to attempt to ensure that decommissioning requirements are achieved on schedule, within budget and in full scope; and
- To identify and pursue any key opportunities for social development to enable the fulfilment of TPA's corporate social responsibility throughout the program closure.

11.3 Preliminary Decommissioning and Closure Plan Summary

The fundamental elements of the preliminary decommissioning plan and responsible parties are outlined in the table 11-1 overleaf. The proposed deliverables have not been costed herein, given the magnitude of uncertainty associated with project specifications, cumulative inflation and other temporal factors expected to vary over the long period leading up to the decommissioning phase.

Table 11-1 Decommissioning and closure plan and responsibilities.

Deliverable	Activity	Responsibility
Employee Demobilization	▪ Training services for reassignment of demobilized workers to the facilities. ▪ Community support initiatives and resettlement aid. ▪ Ensuring Social Security Fund (SSF) membership and that employer obligations are remitted early enough for the workers to be eligible for retirement benefits.	TPA; Ministry of Labour, Employment and Youth Development; Closure committee.
Asset Recovery and Reallocation	▪ Relocation of serviceable machinery and equipment to underequipped ports or any other TPA facilities. ▪ Auction of obsolete and inoperative equipment to the public or transfer of these to recycle plants for dismantling and subsequent material recovery. ▪ Entrustment of any other valuables deemed appropriate for communal ownership to public authorities. ▪ Storage of salvage material for re-use. ▪ Enforcement of the site security plan.	TPA; Construction Engineers; Machinery Valuers; Equipment Technicians.
Deconstruction and Site Rehabilitation	▪ Mobilization of decommissioning infrastructure and execution of demolition work plan in full conformity to pertinent regulations. ▪ Implementation of the Environmental Management Plan (EMP), Operational Health and Safety Plan (OHSP) and Risk Management Plan (RMP). ▪ Site clean-up and natural landscaping (native gardening). ▪ Alternatively, preparation of the brownfield site for the proposed re-development scheme.	TPA; Local Communities, Ministry of Lands, Housing and Human Settlements Development; Demolition Contractors; Environmental Consultants; Landscaping Specialists; OSHA.
Waste Management	▪ Implementation of the waste management plan, which includes waste collection, screening, recovery and commercialization of re-usable waste, proper disposal of municipal (and hazardous) waste in designated deposition sites.	TPA; Temeke Municipal; NEMC; OSHA; Waste management Contractors.

Chapter 12: SUMMARY AND CONCLUSIONS

12.1 Summary

The ESIA identified a number of issues pertaining to the proposed Dar es Salaam Port improvements under Phase 1 of the DSMGP. The issues/impacts have been assessed and described in some detail in this EIS to gain an adequate understanding of possible environmental and socio-economic effects of the proposed project – from site selection to decommission - in order to formulate mitigation measures in response to negative aspects which have emerged over the course of this study.

The result of the study indicates that the project is beneficial to the TPA in terms of income generation. It will also benefit the adjacent communities by ways of employment creation, which is likely to reduce poverty levels. The government will also realise increased revenue from the services offered by the proposed port. Further, the envisaged construction of the four project activities under this Phase 1 is to be implemented on TPA-owned land and in an existing area such that no land take is required. This project will not require any resettlement of project affected people, i.e. neither physical nor economic displacement. Therefore, a Resettlement Action Plan (RAP) is unnecessary for this project.

Regarding impacts of the project on the environment, all identified negative impacts that have been predicted appear to be of small-scale. Dust (air pollution), noises, and other wastes may occur, but are of little significance. These impacts are temporary in nature considering the mitigation measures that have been proposed.

Impacts related to land acquisition are not anticipated because land required for Phase 1 activities are located within TPA boundaries. In addition, the ESIA identified existing sites that the Contractor(s) employed for the construction can use: one is within the TPA area towards the Ship Yard area; the second is where the current Contractor's camp for the Kigamboni Bridge located on Nelson Mandela Road. Therefore, the project does not require the preparation of a Resettlement Action Plan for Phase 1 activities.

Of note are impacts associated with potential (loss of) employment, interference with and land-take at the Malindi Wharf area, providing a suitable supply of backfill materials for the Gerezani Ro-Ro Terminal (avoiding bring material by road) and potential impacts associated with dredging (including disposal of spoils).

12.2 Recommendations

For sustainability of the project and the ecosystems in general, the following recommendations should be implemented:

- TPA should undertake a stakeholders awareness campaign before construction begins, that is maintained during construction and operation phases. This can be in the form of meetings with all interested and affected parties. Stakeholders' site visits prior to the meeting will provide a better understanding of the project. In addition, project brochures can be disseminated to all key stakeholders including public offices in Temeke, Ilala and Kinondoni municipalities and City Council.
- All relevant government taxes associated with operations should be paid in a transparent way.
- Jobs and employment associated with the proposed project development as a matter of priority should be given to local communities with appropriate skills, or to those who have lost their jobs due to the mechanisation of the Port. The impact on existing job opportunities, particularly of casual labourers provided by the labour agencies, cannot be determined precisely at this stage, because details of the workforce required to operate the new facilities is in most instances not known at present. A detailed analysis of labour requirements associated with each of the four activities in Phase 1 is needed and should be shared with the agents and the community at a later stage. In case collective de facto redundancy of a large group of casual labour is unavoidable, TPA should aim to comply with IFC's Performance Standard 2 on labour and working conditions (2012), which presents guidelines for an appropriate retrenchment plan. In addition, the forming of a DSMGP Phase 1 Labour Steering Committee is recommended, to focus exclusively on labour-related issues, especially once the

operations of the new port improvements have been determined with respect to their labour requirements, so as to maximise use of existing personnel where opportunities exist, and minimise loss of employment.

- Solid and liquid waste management should be strictly practiced in a systematic way to avoid systems malfunctioning and hence pollution to Port waters, soils and groundwater with emphasis given to maintaining a clean environment around construction areas. Due to the anticipated increase in solid waste generation (from the forecast increase shipping volume), and the increase in liquid waste (mainly from the construction phases of the four activities), existing handling infrastructure at the Port such as solid waste Contractors' capacity and cesspits need to be expanded. Further, TPA are encouraged to review their Waste Management Plan to ensure they meet international standards under the 1989 Basel Convention on Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal and the Environmental Health and Safety Guidelines doe Hazardous Materials Management.
- Information gained from the sediment sampling surveys undertaken during the ESIA related to dredging (on sediment particle size and chemical composition), suggests that more comprehensive studies are required, particularly deeper into the sediment, before decisions can be made on the fate of the dredged material. This should also be conducted as part of the ESIA for the dredging of entrance channel and turning basin.
- Detailed geotechnical, soils and materials investigations should be conducted before project implementation begins.
- Malindi Wharf and adjacent wharves will be significantly impacted by the construction of the Gerezani Ro-Ro Terminal. Maintenance dredging of approximately 57,000 m³ along the Dhow, Lighter and Malindi wharves will allow vessels to moor along the entire length and not be restricted to the southern corner only. In addition, the forming of a DSMGP Phase 1 Malindi Wharf Steering Committee is recommended, to focus exclusively on issues related to operations in that area of the Port, especially related to water depth along the available berths and vehicle access (during construction and later during operations of the Ro-Ro Terminal), so as to minimise any inconvenience to shipping operations.
- Implementation of the Environmental and Social Monitoring Programme should be the responsibility of the Contractors engaged on the activities, with TPA participating in a supervisory role.
- To accompany developments associated with Phase 1 of the DSMGP, the EMS should be strengthened technically and in terms of equipment and resources at its disposal.

The Environmental and Social Management Plan provides the way forward for implementation of the identified mitigation measures. The estimated costs for implementing the mitigation measures should guide appropriate bills of quantities.

The Environmental and Social Monitoring Programme provides parameters to be monitored and responsibilities allocated. Again, the estimated budget provides an indication. Actual costs will be determined precisely when monitoring activities will be finalised once Contractors have prepared method statements for the activities and sub-activities therein.

12.3 Conclusion

Given the nature and location of the project, the conclusion is that the proposed Phase 1 components of the DSMGP at Dar es Salaam Port will entail no significant impacts provided that the recommended mitigation measures are adequately and timely implemented. The potential impacts associated with the proposed developments are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate mitigation measures, as presented in Chapter 7.

The consultants from WAPCOS Ltd. are of the opinion that almost all potential environmental and social impacts identified may be mitigated against. There are few impacts that are considered residual in nature. The proposed environmental management plan and environmental monitoring programme if implemented will safeguard the integrity of the natural and social environment.

BIBLIOGRAPHY

Bern, C.J., 2006. Mechanical Grain Conveying. Agricultural and Biosystems Engineering Department, Iowa State University

Bocchetti R., Fattorini D., Pisanelli B., Macchiab S., Olivierob L., Pilatob F., Pellegrini D., Regoli F. (2008). Contaminant accumulation and biomarker responses in caged mussels, Mytilus galloprovincialis, to evaluate bioavailability and toxicological effects of remobilized chemicals during dredging and disposal operations in harbour areas. *Aquatic Toxicology*, 89, pp. 257-266.

Bortone G., Arevalo E., Deibel I., Detzner H., Propris L., Elskens F., Giordano A., Hakstege P., Hamer K., Harmsen J., Hauge A., L Palumbo L., Veen J. (2004). Sediment and dredged material treatment. *JSS – J Soils & Sediments*, 4(4), pp. 225 – 232.

Convention on the International Regulations for Preventing Collisions at Sea, 1972. Available Online: http://www.mar.ist.utl.pt/mventura/Projecto-Navios-I/IMO-Conventions%20(copies)/COLREG-1972.pdf [Accessed 21 January 2016].

Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter. Available Online: http://www.imo.org/en/OurWork/Environment/LCLP/Documents/LC1972.pdf [Accessed 18 January 2016].

Erftemeijer P. L., Lewis R. R. (2006). Environmental impacts of dredging on seagrasses: A review. *Marine Pollution Bulletin*, 52, pp. 1553-1572.

European Commission: Institute for Environment and Sustainability. (2011). Construction and demolition waste: composition, p. 23. In *Supporting Environmentally Sound Decisions for Construction and Demolition Waste Management*. Luxembourg: Publications Office of the European Union.

Folk R.L., Ward W.C. (1957). Brazos River bar: A study in the significance of grain size parameters. *Journal of Sedimentary Petrology*, 27, pp. 3–26.

Intergovernmental Panel on Climate Change, 2007. IPCC Fourth Assessment Report: Climate Change. Available Online: https://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html [Accessed 25 January 2016].

International Finance Corporation, 2012. Performance Standard 2: Labor and Working Conditions. Available Online: http://www.ifc.org/wps/wcm/connect/2408320049a78e5db7f4f7a8c6a8312a/PS2_English_2012.pdf?MOD=AJPERES [Accessed 25 January 2016].

International Labour Organization (ILO), 1977. Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148). Available Online: http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312293 [Accessed 6 January 2016].

International Maritime Organization (IMO), 1973. International Convention for the Prevention of Pollution from Ships. [Online]. Available: http://library.arcticportal.org/1699/1/marpol.pdf [Accessed 6 January 2016].

International Maritime Organization (IMO), 2009. Hong Kong Convention. Available Online: http://www.basel.int/Portals/4/Basel%20Convention/docs/ships/HongKongConvention.pdf [Accessed 6 January 2016].

Kamukuru, A.T., Mgaya Y.D. (2004). Effects of exploitation on reproductive capacity of black spot spanner, *Lutjanus fulviflamma* (Pisces: Lutjanidae) in Mafia Island, Tanzania. *African Journal of Ecology*, 42:270-280.

Kebede A. Brown S, and Nicholls R. J. (2010). Synthesis Report: *The Implications of Climate Change on Sea Level Rise in Tanzania – The Coastal Zones*. Report Submitted to Global Climate Adaptation Partnership (GCAP), Oxford, UK, 32 pp.

Lwiza K. K., (1994). Beach erosion north of Dar es Salaam. Proceedings of the IOC-UNEP-WMO-SAREC Workshop on an integrated approach to coastal erosion, sea level changes and their impacts. *Intergovernmental Oceanographic Commission Workshop Report,* No. 96, Supplement 1:107-111.

MacDonald D. D. (1994). Approach to the assessment of sediment quality in Florida coastal waters. *Development and Evaluation of Sediment Quality Assessment Guidelines*, Volume 1.

Mahongo S. B., and Khamis O. I. (2006). The Tanzania National Sea Level Report. Tanzania Fisheries Research Institute and Department of Survey and Urban Planning. Available Online: http://www.gloss-sealevel.org/publications/documents/tanzania2006.pdf [Accessed 22 January 2016].

NRC, 2003. Oil in the Sea III. Inputs, fates and effects. National Research Council. National Academic Press. Washington DC. Available Online: http://www.ncbi.nlm.nih.gov/pubmed/25057607 [Accessed 25 January 2016].

San Francisco Bay Conservation and Development Commission. Dredging and dredged material characteristics – An overview. Available at http://www.bcdc.ca.gov/pdf/Dredging/EIS_EIR/chpt3.pdf. [Accessed 19th January 2016].

Sanga. I. P., Dubi. A. M. (2004). Impact of improvement of the entrance channel on the rate of sediment deposition into the Dar es Salaam Harbour. *Western Indian Ocean Journal of Marine Science*, 3:105-112.

Scott Bertlin Consulting Engineers and Planners. (1993). Port of Dar es Salaam. Feasibility and Environment Study for Improvements to the Entrance Channel. Vol. 1, Feasibility Study.

Sturve J., Berglund A., Balk L., Broeg K., Bohmert B., Massey S., Savva D., Parkkonnen J., Stephensen E., Koehler A., Forlin L. (2005). Effects of dredging in Goteborg Harbor, Sweden, assessed by biomarkers in eelpout (Zoarces viviparus). *Environmental Toxicology and Chemistry*, 24 (8), pp. 1951-1961.

United Nations Environmental Programme (UNEP), 1992. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Available Online: http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf [Accessed 6 January 2016].

United Nations Environmental Programme (UNEP), 1992. Convention of Biological Diversity. Available Online: https://www.cbd.int/doc/legal/cbd-en.pdf [Accessed 6 January 2016].

United Nations Environmental Programme (UNEP), 1998. Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa. Available Online: www.lrct.go.tz/download/treaty-convention/bamako.pdf [Accessed 6 January 2016].

United States Environmental Protection Agency: Office of Transportation and Air Quality. (2014). Greenhouse Gas Emissions from a Typical Passenger Vehicle. Available Online: http://www3.epa.gov/otaq/climate/documents/420f14040a.pdf [Accessed 20th January 2016].

URT, 1963. The Explosives Act, No. 56. Government Printers, Dar es Salaam.

URT, 1991. The Tanzanian Harbors Regulations. Government Printers, Dar es Salaam.

URT, 1994. The Marine Parks and Reserves Act, No. 29. Government Printers, Dar es Salaam.

URT, 1996. The National Investment Promotion Policy. Government Printers, Dar es Salaam.

URT, 1996. The Sustainable Industrial Development Policy. Government Printers, Dar es Salaam.

URT, 1997. The National Environmental Policy. Government Printers, Dar es Salaam.

URT, 1997. The National Land Policy. Government Printers, Dar es Salaam.

URT, 1998. The National Tourism Policy. Government Printers, Dar es Salaam.

URT, 1999. The Contractors Registration Act, No. 17. Government Printers, Dar es Salaam.

URT, 1999. The Land Act, No.4. Government Printers, Dar es Salaam.

URT, 2000. The National Human Settlements Development Policy. Government Printers, Dar es Salaam.

URT, 2001. The National Policy on HIV/AIDS. Government Printers, Dar es Salaam.

URT, 2001. The Surface and Marine Transport Regulatory Authority (SUMATRA) Act. Government Printers, Dar es Salaam.

URT, 2002. The Energy and Water Utilities Regulatory Authority Act, Cap 414, R.E. Government Printers, Dar es Salaam.

URT, 2002. The Land Act, Cap 113, R.E. Government Printers, Dar es Salaam.

URT, 2002. The Local Government (Urban Authorities) Acts, Cap 288, R.E. Government Printers, Dar es Salaam.

URT, 2002. The National Water Policy. Government Printers, Dar es Salaam.

URT, 2003. The Construction Industry Policy. Government Printers, Dar es Salaam.

URT, 2003. The Industrial and Consumer Chemicals (Management and Control) Act, No. 3. Government Printers, Dar es Salaam.

URT, 2003. The Merchant Shipping Act, No. 21. Government Printers, Dar es Salaam.

URT, 2003. The National Energy Policy. Government printers, Dar es Salaam.

URT, 2003. The National Health Policy. Government Printers, Dar es Salaam.

URT, 2003. The National Transport Policy. Government Printers, Dar es Salaam.

URT, 2003. The Occupational Health and Safety Act. Government Printers, Dar es Salaam.

URT, 2003. The Tanzania Food, Drug and Cosmetics Act, No. 1. Government Printers, Dar es Salaam.

URT, 2004. Tanzania Port Authority Act, No.17. Government Printers, Dar es Salaam.

URT, 2004. The Employment and Labor Relations Act, No. 6. Government Printers, Dar es Salaam.

URT, 2004. The Environmental Management Act, Cap 191. Government Printers, Dar es Salaam.

URT, 2005. The Environmental (Registration of Environmental Experts) Regulations. Government Printers, Dar es Salaam.

URT, 2005. The National Strategy for Growth and Reduction of Poverty (NSGRP/ MKUKUTA). Government Printers, Dar es Salaam.

URT, 2006. The Tanzania Food, Drug and Cosmetics (Food Hygiene) Regulations. Government Printers, Dar es Salaam.

URT, 2007. The Environmental Management (Air, Water, Soil Quality Standards and Control of Ozone Depleting Substances G.N. No. 237, 238, 239 and 240) Regulations. Government Printers, Dar es Salaam.

URT, 2007. The Land Use Planning Act, No.10. Government Printers, Dar es Salaam.

URT, 2007. The Roads Act, No.17. Government Printers, Dar es Salaam.

URT, 2007. The Urban Planning Act, No.8. Government Printers, Dar es Salaam.

URT, 2008. The Workers Compensation Act, No. 20. Government Printers, Dar es Salaam.

URT, 2009. The Cereals and Other Produce Act, No. 19. Government Printers, Dar es Salaam.

URT, 2009. The Fertilizers Act, No. 9. Government Printers, Dar es Salaam.

URT, 2009. The Water Resource Management Act, No.11. Government Printers, Dar es Salaam.

URT, 2010. The Mining Act, No. 14. Government Printers, Dar es Salaam.

URT, 2011. The Cereals and Other Produce Regulations. Government Printers, Dar es Salaam.

URT, 2011. The Port Service Charge Act, Cap 264. Government Printers, Dar es Salaam.

US Environmental Protection Agency Greenhouse Gas Emissions from a Typical Passenger Vehicle (http://www3.epa.gov/otaq/climate/documents/420f14040a.pdf)

World Bank, 1999. Environmental Assessment Policy. Available Online: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064724~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html [Accessed 6 January 2016].

World Bank, 2001. Involuntary Resettlement Policy. [Online]. Available Online: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064610~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184~isCURL:Y,00.html [Accessed 6 January 2016].

World Bank, 2001. Natural Habitat Policy. Available Online: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064757~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184~isCURL:Y,00.html [Accessed 6 January 2016].

World Bank, 2002. Policy on Disclosure of Information. Available Online: http://siteresources.worldbank.org/OPSMANUAL/Resources/DisclosurePolicy.pdf [Accessed 6 January 2016].

World Bank, 2006. Physical and Cultural Resources Policy. Available Online: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20970737~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184~isCURL:Y,00.html [Accessed 6 January 2016].

APPENDICES

Appendix 1: Terms of Reference Approved by NEMC

Terms of Reference for undertaking the Environmental Impact Assessment study for the proposed improvement of Dar es Salaam Port: Phase 1 of Dar es Salaam Maritime Gateway Program (DSMGP) in Temeke Municipal, Dar es Salaam Region

Introduction

Tanzania Ports Authority (TPA) was established on 15th April 2005 following the repeal of Tanzania Harbours Authority (THA) Act No. 17/2004. The TPA's major responsibilities are to provide, maintain, promote and operate ports facilities of the country's main ports (Dar es Salaam, Tanga, Mtwara) and secondary ports (e.g. Pangani, Bagamoyo, Kilindoni, Kilwa, etc.) and the inland waterway ports located at Lake Victoria, Lake Tanganyika and Lake Nyasa. Additionally, the TPA performs the role of a landlord, leasing out to private operators the commercial activities of ports. The EIA therefore will be designed closely to meet the requirements of the Environmental Management Act Cap 191 and the Environmental Impact Assessment and Audit Regulations G.N. No 349 of June 2005 and will involve the following:

Scope of the Services

The Consultant shall perform all environmental and social impact analyses related to the project as described herein with due care and diligence to attain the objectives of the assessment. Among others, the Consultant will perform the following tasks:

Task (I) Brief on Project Background

The Consultant shall provide description or the profile of the developer, background to the project proposal and its justification, need and purpose of undertaking the EIA study, EIA study methodologies and approaches applied and structure of the report. The initial stage is normally registration with National Environment Management Council (NEMC) where a registration form and ten copies of the project were submitted for screening.

Task (ii): Description of the Proposed Project

The Consultant shall describe project components and activities to be implemented in each phase(s) of the project life i.e. *pre-construction or mobilization, construction, operation and post-construction (demobilization).* This part is meant to give a general idea of what the project will entail. To avoid unnecessary details, focus on the project activities based on project phases {i.e. mobilization or pre-construction phase, construction phase, operation phase and demobilization phase}. The description shall include the following information:

i. Background information:

Background information shall include: Title of the proposed project and developer; Project justification and objectives; Funds and source of funding or financier(s); Project location including maps of appropriate scale; Project design , size, and capacity; Area of influence of the project works; Project life span and Project components; Land size required;

ii. Project activities

Description of project activities shall be based on phases of project life cycle i.e. mobilization or pre-construction, construction, operation and maintenance, demobilization and decommissioning phases:-

iii. *Mobilization or Pre-construction activities*;

Describe activities pertaining to land acquisition; construction camp and site workshop; project design; land dispossession and property valuation; relocation and compensation arrangements if any;

iv. Construction activities;

Description of all associated activities during construction work such as extraction construction materials and water indicating its types and sources; blasting; cut and fill; land clearance; soil and gravel compaction

and levelling, types, sources and amount of liquid and solid waste generation and including their disposal; dust etc.

v. Operation and maintenance activities;

Identification and description of all the associated activities to be conducted during project operation and maintenance such as project health and safety measures, operation and management of project facilities along the project such as public toilets, etc.

vi. Demobilization Activities

Identification and elaboration on the activities to be conducted during demobilization or decommissioning of the project including movement and demolition of construction facilities, restoration of project site, termination of the temporary workers' employment, waste management, etc.

Task (iii): Provide Baseline Conditions or Description of the Environment to be affected

In order to forecast the impacts, it will be necessary to determine the initial reference or baseline state. It is therefore, required to describe the existing environment that would be directly and/or indirectly affected by the construction and operation of the proposed project. The 'environment' to be affected must be based on the project definition of the term that would include physical, biological socio-economic, cultural and historical factors. Only those environmental factors that are necessary for understanding the impacts of the planned development will be considered.

- **Physical environment:** This shall cover geology; topography; soils; climate and meteorology; ambient air quality; surface and groundwater hydrology; existing sources of air emissions; existing water pollution discharges; receiving water quality; traffic data etc.
- **Meteorolog**y: wind patterns, monthly average temperatures, rainfall, snowfall and runoff characteristics, extreme storm and precipitation events.
- **Marine - Biological environment:** existing terrestrial flora, avi-fauna and fauna, rare, threatened or endangered species, ecologically important or sensitive habitats, significant natural species of commercial importance; and species with potential to become nuisances, vectors, or dangerous (of project site and potential area of influence of the project); and
- **Socio-economic and socio-cultural environment**: population; land use; planned development activities in the area; community structure; employment; distribution of income, goods and services; recreation; public health; Gender issues and HIV/AIDS, cultural / historic properties; tribal peoples; and customs, aspirations, and attitudes to the project.

The consultant will indicate sources of data and methodologies used to acquire data.

Task (iv): Describe the Policy, Legal and Institutional Framework

The consultant will describe the policy, legal, institutional framework as well as regulations, strategies, standards, international conventions and treaties that are of relevance to the environmental management and the proposed undertaking in particular.

Furthermore, the consultant shall clearly describe the linkage between the functions of the relevant institutional or administrative frameworks in Tanzania and the proposed project undertaking. The study will examine relevant policies, legal and administrative framework including but not limited to the following:

Relevant policies pertaining to proposed project as new facilities at the Port have been examined. These include: The National Environmental Policy, the National Land Policy, the National Water Policy, Health Policy and Poverty Reduction Strategy and Construction Policy etc. These policies affect directly to the project activities and were examined because of their role in guiding the project.

Others include:

- National Environmental Policy (1997)
- The National Energy Policy (2003)

- National Land Policy (1995 revised 1997)
- The National Employment Policy (1997)
- The National Investment Policy (1997)
- National Policy on HIV/AIDS (2001)
- National Sustainable Industrial Development Policy (1996)
- Tanzania Ports Authority, Occupational Safety, Health and Environmental Policy (2008)
- National water policy 2002
- Women and gender Development Policy 2000
- National Transport policy 2003
- Construction Industry Policy 2002
- National Forest Policy 1998
- National Tourism Policy 1998
- National Human Settlement Development Policy 2000
- Road Safety Policy 2009
- Agriculture and Livestock Policy 1997
- The National Investment Promotion Policy (1996)
- The National Economic Empowerment Policy (2004

Legislation

- Environmental Management Act, No.20 of 2004
- Occupational Health and Safety Authority Act, 2003
- Tanzania Bureau of Standard Act, 1975
- Environment Impact Assessment and Audit Regulations, 2005 GN No.349 of 2005
- Water Resource Management Act, 2009
- The Urban Planning Act No. 8 of 2007
- Road Act 2007
- Forest Act No. 14 of 2002
- Environmental code for road works 2008
- Environmental Assessment and Management Guidelines in the Road Sector 2004
- Land Act No.2/04 (2004) amendment of the Land Act (1999)
- HIV and AIDS Prevention and Control Act No 28/08 (2008)
- The Land Use Planning Act No.6 of 2007
- Energy and Water Utilities Authority Act 2001
- Explosives Act Cap 45 R.E 2002
- Railway Act No of 2002
- The employment and Labour relations Act 2004
- SUMATRA Act 2001
- The Ports Act 2004
- Marine Parks and Reserves Act 1994

World Bank Safeguard Policies

- OP/BP 4.01 (Environmental Assessment Policy)
- OP/BP 4.04 (Natural Habitats Policy)
- OP/BP 4.11 (Physical and Cultural resources)
- OP/BP 4.12 (Involuntary Resettlement Policy)
- OP/BP 17.50 (Disclosure Policy)

International Obligations/Treaties:

- International Convention on Trade of Endangered Species (CITES)
- Convention on Biological Diversity (1996)
- Basel Convention on Control on the Trans-boundary Movement of Hazardous Waste and Disposal.
- Hong Kong Convention 2009 (Ship Breaking, Recycling/Dismantling/Disposal in Environmental friendly way)
- MARPOL Convention 73/78

Administrative Framework

The Tanzania EIA practice gives different functions and responsibilities to all parties involved in the EIA and environmental audit process of any proposed development undertaking to which EIA is obligatory. Table-3.1 provides key institutions to the proposed project. The Environmental Management Act (EMA, Cap 191) give mandate to NEMC to undertake enforcement, compliance, review and monitoring of environmental impact assessment and has a role of facilitating public participation in environmental decision-making, exercise general supervision and coordinating over all matters relating to the environment. The Act empowers NEMC to determine whether a proposed project should be subjected to an EIA or EA, approves consultants to undertake the EIA and EA studies, invites public comments and also has the statutory authority to issue the certificates of approval via the Minister responsible for environment. NEMC is currently the designated authority to carry out the review of EIA and EA including site visit and handling TAC meeting, monitoring and auditing of environmental performance of the project (periodic and independent re-assessment of the undertaking).

Task (V): Stakeholders' Consultations and Public Involvement

The Consultant shall identify and consult all the relevant stakeholders at national, regional and local levels. These include the Government Agencies, local NGOs, affected groups and other interested parties in order to obtain their views regarding the proposed project works. Indicate who they are, where they are, why they are important in this project, which issues are critical to them and how they will be involved in the EIA study.

The consultant shall describe methodology applied during stakeholder consultations and public participation such as consultative meetings, household, focus groups interviews and other most appropriate methods to establish public views on the proposed project. Meetings with local authorities and the public shall be held to obtain their views on the project and its implication to the environment and social aspects. The consultant shall propose public consultation programme during the EIA study and the most appropriate methods to establish public views will be used. The consultation process shall be open and transparent to ensure that the views of interested and affected parties are incorporated in the project design. There should be evidence in the Environmental Impact Statement (EIS) to the effect that there were stakeholders' consultations at all levels. Photographs, minutes of the meetings, names and signatures of consulted people are necessary in this regard.

Task (vi): Analysis of Alternatives to the Proposed Project

The Consultant shall describe different project alternatives that will be examined in the course of designing the proposed project and identify other alternatives, which would achieve the same objectives. This will include the **'No action' alternative** to demonstrate environmental and social conditions without the project. The consideration of alternatives will extend to siting, design, technology, construction techniques, phasing and schedule, and operating and maintenance procedures. The alternatives will be compared in terms of potential environmental and social impacts; capital and operating costs; suitability under local conditions; and institutional, training, and monitoring requirements.

Task (VII): Impact Identification and Assessment

The Consultant shall identify, analyse and assess environmental and social impacts (positive and negative) of the proposed project works on natural resources, human beings and the ecosystems based on the phases of project life cycle i.e. mobilization or pre-construction phase, construction phase, operation phase

and decommissioning phase. Methods applied in impact identification and the criteria used in evaluating the levels of impacts significance of the proposed project works will also be specified. The EIA study will clearly identify and analyse cumulative, and residue impacts.

Task (VIII): Propose Impact Mitigation Measures

The Consultant shall suggest cost-effective measures for minimizing or eliminating adverse impacts of the proposed project. Measures for enhancing positive or beneficial impacts should also be recommended. The costs of implementing these measures shall be estimated and presented.

Task (IX): Resource Evaluation or Cost Benefit Analysis.

The Consultant shall undertake ***qualitative*** and ***quantitative*** analysis of costs and benefits to determine the viability of the proposed project on the environment, social and economic aspects.

Task (X): Development of Environmental Management Plan (EMP)

The Environmental and Social Management Plan focuses on three generic areas: implementation of mitigation measures, institutional strengthening and training, and monitoring. The Consultant shall prepare Environmental Management Plan which will include proposed work programme, budget estimates, schedules, staffing and training requirements and other necessary support services to implement the mitigation measures. Institutional arrangements required for implementing this management plan shall be indicated. The cost of implementing the monitoring and evaluation including staffing, training and institutional arrangements must be specified.

EMP will specify impact mitigation plan and environmental monitoring plan requirements. Costs, responsibility and timeframe for mitigating each impact and monitoring of each environmental parameter will also be indicated. Impact Mitigation plan and monitoring plan will be based on the project phases i.e. mobilization or Pre-construction, Construction, Operation and Decommissioning phase.

Task (XI): Reporting

Notwithstanding the above requirements, the contents and the structure of the Environmental and Social Impact Assessment Report will be in accordance with the Environmental Impact Assessment and Audit Regulations, 2005.

a) Organisation and Staffing

The EIA study team will include a total of four professional experts and three helping staffs all of which will perform the required tasks. The descriptions of each expert will tally with the requirement of the proponents ToR and will involve the following:

- Team Leader
- Environmental specialist
- Social specialist
- Marine Biologist
- Marine ecologist
- Socio-economist
- Port (mechanical/civil) engineer,
- Dredging Specialist

References

The EIA study team shall identify and record all written materials used in the study.

Appendix 2: NEMC Scoping Feedback Letter

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)
BARAZA LA TAIFA LA HIFADHI NA USIMAMIZI WA MAZINGIRA

Tel: Dir: +255 22 277 4852
Tel: +255 22 277 4889
Mob: +255 713 - 608930
Fax: +255 22 277 4901
E-mail: dg@nemc.or.tz
Website: www.nemc.or.tz

Regent Estate Plot No. 29/30,
P.O. Box 63154,
DAR ES SALAAM
TANZANIA

In reply please quote:
Ref: **NEMC/EIA/11/0012/Vol.1/4**

Date: **10/12/2015**

Director General,
Tanzania Ports Authority,
P.O. Box 9184,
Dar es Salaam.

RE: SCOPING REPORT AND TERMS OF REFERENCE (ToR) FOR UNDERTAKING AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY FOR THE PROPOSED DAR ES SALAAM PORT IMPROVEMENT PROJECT

The above caption heading refers.

We acknowledge receipt of your letter dated 15th November, 2015 attached with Scoping Report and Terms of Reference (ToR) for undertaking an Environmental Impact Assessment (EIA) study for the above mentioned project.

The Council has reviewed the scoping report and ToR and found that there are some areas that need to be worked on to improve the ToR so that they can in turn be used to guide the EIA study. You are therefore advised to work on the comments provided in the attachment to fine-tune the terms.

In addition to observing the ToR, we emphasize that you undertake the EIA study, prepare the EIA report and submit the EIS to the National Environment Management Council, according to the requirements of the EIA and Audit Regulations, 2005.

However, the EIA study should take note of the following;

1. The following stakeholders should be consulted and their concerns should be addressed in this EIA report i.e. Ministry of Livestock Development and

All correspondence should be addressed to the Director - General

Fisheries, Ministry of Natural Resources and Tourism, Ministry of Land, ministry of Works, Dar Es Salaam City Council and Temeke Municipal Council,

2. The project alternatives should be exhaustively analyzed and the selection should take into consideration the environmental, social and economic importances (e.g. alternative location and design),

3. Baseline information should be specific to the project area and should address the most current physical, biological, cultural, socio-economic and scientific data requirements relevant to this project.

Upon submission of the EIA report, the Council will arrange for a technical review of the document by the Cross-sectoral Technical Advisory Committee (TAC). Prior to review, representatives of the TAC will visit the project area and surrounding environment to verify the adequacy of the EIA report.

The budget for these review activities amounts to **(Tshs 4,906,000/=)** as elaborated on the attached sheet **(Attached_ BB)**. The funds must be paid by Cheque, deposit in NEMC`s Account **No. 2011100084**, and submit the pay-slip to NEMC. Please note that the cost does not include transport cost for the site visit team from Dar es Salaam to the project site and back.

You are also reminded that the revised ToR and a copy of this letter should be appended to the Environmental Impact Statement (EIS) that will be submitted to the Council for review.

In case you need further clarification on this matter, please do not hesitate to contact us on Tel. No. 0715 511131.

Yours sincerely,

Makene

Dr. M.H. Makene
For: Director General

Cc: WAPCOS Ltd and ENV Consult Ltd,
P.O. Box
Dar es Salaam.

Appendix 3: Public Notices Newspapers Advertisement (English and Swahili)

16 DAILY NEWS FRIDAY JANUARY 15, 2016 SCIENCE &

NOTICE TO THE PUBLIC

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT

PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DMGP) AT DAR ES SALAAM PORT IN TEMEKE MUNICIPAL, DAR ES SALAAM REGION

In compliance with the Environmental Management Act Cap 191 (No.20 of 2004) and the subsequent Environmental Impact Assessment and Audit Regulations of 2005, this notice is hereby posted to inform the public that WAPCOS Limited has been commissioned on behalf of the Tanzania Ports Authority (TPA) to undertake a full Environmental and Social Impact Assessment for the proposed improvement of Dares Salaam port in Temeke Municipal, Dar es Salaam Region.

The project activities for this phase 1 are as follows:

1. Construction of a new multipurpose RoRo Terminal at Gerezani Creek
   To create space for a new RoRo Terminal at Gerezani Creek to cover an area of 93,000 m^2

2. Deepening and strengthening Berths 1 to 7 to 14m below Chart Datum (CD)
   This will include the rehabilitation of Berths 1 to 7 platforms, the extension of water depths in front of the quay wall Berths 1 to 7,the horizontal widening of quay apron and extension of quay wall seawards to approximately 11.5m

3. Increasing the capacity of the grain silo and supporting the installation of a conveyor system and high-speed bulk grab

4. Improving rail linkages and platform in the port to harmonise changes to the railway network in the port

According to the 2005 Environmental Impact Assessment and Audit Regulations, activities such as these fall under Schedule 1, Type A - Projects requiring mandatory EIA (Section No. 9 titled "Transport and infrastructure", particularly no. (iv):"Construction of new, or expansion of shipyards or harbour facilities".

The Environmental and Social Impact Assessment aims to address all potential significant impacts (both positive and negative) associated with the proposed project to provide objective information to the decision makers. This notice is published to solicit the concerns and seek theviews of all interested and affected parties. For any requests, additional information, suggestions, opinions, or concerns please contact:

The Director General
National Environment Management Council (NEMC)
Regent Estate Plot No. 29/30
P.O.BOX 3154
Dar es Salaam
Tel: +255 22 277 4852
E-mail: dg@nemc.or.tz

The Director General
Tanzania Port Authority
P.O. Box 9184
Dar Es Salaam
Tel: +255 22 221 10401-5 / 22110371-5 / 21137630-5
E-mail: dg@tanzaniaports.com.

WAPCOS Limited
House No. 1, Plot No. 66
Regence Apartments, Ursino/Migombani St
Mikocheni, Dar es Salaam
Tanzania.
Email: csk@wapcos.gov.in

113958

30 Nipashe Ijumaa Januari 15, 2016

TAARIFA KWA UMMA

TATHMINI YA ATHARI YA MAZINGIRA JAMII NA UCHUMI KWENYE MRADI ULIOPENDEKEZWA KUBORESHA BANDARI YA DAR ES SALAAM KATIKA MANISPAA YA TEMEKE,MKOA WA DAR ES SALAAM AWAMU YA KWANZA-MPANGO WA KUONGEZA LANGO LA BAHARI YA DAR ES SALAAM

Kwa mujibu wa Sheria ya Usimamizi wa Mazingira namba 20 ya mwaka 2004, ikifuatiwa na mwongozo wa Tathmini ya Athari ya Mazingira ya mwaka 2005, na kanuni zake, taarifa hii inatolewa kwa umma kwamba kampuni ya WAPCOS Ltd imepewa kazi kwa niaba ya Mamlaka ya Bandari Tanzania (TPA) kufanya tathmini ya athari ya mazingira na jamii kwenye mradi uliopendekezwa kuboresha bandari ya Dar es Salaam,katika manispaa ya Temeke,Mkoa wa Dar es salaam.

Awamu ya kwanza ya mradi huu utahusisha shughuli zifuatazwo:

1. Ujenzi wa eneo jipya la kuegesha meli katika mkondo wa Gerezani ambalo litahusisha uhifadhi wa Mizigo mbalimbali Eneo hili litakuwa na ukubwa wa mita za mraba 93,000 m²
2. Kuongeza kina cha maji hadi mita 14 chini ya bahari na kuimarisha maeneo ya kuegesha meli Itahusisha ukarabati wa sehemu za kuegesha meli , upanuzi wa kina cha maji mbele ya sehemu za kuta za kuhifadhi meli, kupanua usawa wa maeneo ya kuegesha meli na upanuzi wa ukuta wa maegesho ya meli kuelekea baharini kwa takriban mita 11.5
3. Kuongeza uwezo wa maghala ya kuhifadhi nafaka kwa kuweka mtambo wenye kasi ya kubeba nafaka
4. Kuboresha na kuunganisha mtandao wa reli katika bandari

Kwa mujibu wa mwongozo wa Tathmini ya Athari ya Mazingira ya mwaka 2005 na kanuni zake,mradi huu upo katika kundi A-Miradi ambayo lazima ifanyiwe tathmini.

Tathimini ya athari za kimazingira na kijamii inaweka bayana na kutambua athari zote ambazo ni nzuri na mbaya kwa mazingira na jamii zitokanazo na mradi ili kuwapa taarifa wapanga mipango kutoa maamuzi sahihi kuhusu ujenzi wa mradi.

Taarifa hii inatolewa ili kubainisha masuala yatakayopewa kipaumbele na kupata maoni ya wadau wote hasa wale watakaoathiriwa na mradi kwa namna moja ama nyingine. Kwa maoni yoyote, ushauri, dukuduku na habari zaidi kuhusu mradi tafadhali usisite kuwasiliana na wafuatao:

Mkurugenzi Mkuu
Baraza la Taifa la Uhifadhi Mazingira
Regent Estate Plot No. 29/30
S. L.P 63154, Dar es Salaam
Simu: +255 (022) 277 4852
Barua pepe: dg@nemc.or.tz

Mkurugenzi Mkuu
Mamlaka ya Bandari Tanzania
S.L.P 9184
Dar Es Salaam
Simu: +255 22 221 10401-5 / 22110371-5 / 21137630-5
Barua pepe: dg@tanzaniaports.com.

WAPCOS Limited
Nyumba No. 1, Kitalu No. 66
Regence Apartments, Urisino/Migombani St
Mikocheni, Dar es Salaam
Tanzania.
Barua pepe: csk@wapcos.gov.in

212896602

Appendix 4: Comments from Consulted Stakeholders

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF ENERGY AND MINERALS

Telegrams "NISHATI"
Teleph: +255-22-2117156-9
Fax: +255-22-2111749
e-mail: ps@mem.go.tz.

5 Samora Machel Avenue,
P.O. Box 2000,
11474 DAR ES SALAAM

08 September, 2015.

In reply please quote this:
Ref. No. **DA 88/129/01**

Project Manager,
WAPCO Limited
House No. 01, Regence Apartment,
Plot No. 66, Ursino/Migombani Street,
Mikocheni,
DAR ES SALAAM

RE: CONSULTATANCY SERVICES FOR ESIA FOR DAR ES SALAAM PORT IMPROVEMENT: REQUEST COMMENTS AND SUGGESTIONS- REG

We acknowledge receipts of your letter with reference No. WAP/TAN/ENV/TPA/SHM-C&S/08-006 dated 31st August, 2015 with afforementioned subject.

We have gone throurogh the project brief and come up with our comments regarding to questioniares you submit. Therefore, please find herwith attached responses from the questionaires for your further action.

Eng. Ephraim J. Mushi
For **PERMANET SECRETARY**

UNITED REPUBLIC OF TANZANIA
MINISTRY OF HOME AFFAIRS

Phone: +255-22-2112035/40
Fax No: +255-2122617/2120486
E- mail: ps@moha.go.tz

9 Ohio Street
P.O. Box 9223
11483 Dar es Salaam

In Reply please refer to:
Ref. No. AB. 281/460/01/71

September 4, 2015

Alok Kumar Vidyarthi
Project Engineer
WAPCOS Limited
DAR ES SALAAM

RE: REQUEST FOR COMMENTS AND SUGGESTIONS ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR DAR ES SALAAM PORT IMPROVEMENT

Reference is made to your letter with reference Number WAP/TAN/ENV/TPA/SHM-C&S/08-008 dated 31/08/2015 regarding the captioned subject.

Attached herewith is the completed ERSIA questionnaire which requested comments and suggestions of the Ministry of Home Affairs on the subject above.

Thanks for your cooperation.

Gerald Remmy
For. **PERMANENT SECRETARY**

COMMENTS FROM THE MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT

The Ministry, MLDF recommend the government for the decision to implement the DAR ES SALAAM MARITIME GATEWAY IMPROVEMENT PROJECT. The project is expecting to bring a positive change to the community around the port area and the country in general. The expected positive impacts include but not limited to

- Increased government revenue through taxation
- Increased employment to the communities
- Improved business due to increased production, distribution of goods and services

Apart from positive impact, the project is also expected to bring negative impact. Since the project will involve dredging activities, the expected social and environmental negative impacts include.

- Severe beach erosion along Ras Mkwavi (TAFICO & MWL NYERERE College).
- The dredging exercise will disturb the bottom substratum and therefore some bentho living organisms will also be affected/lost
- The disposal of the dredged material will have ecological effects to the place where they will be dumped, therefore careful study is needed to find out what species of fish and other organisms will be affected and propose appropriate mitigation measures
- The issues related to displacement of people who were benefiting from the project area in terms of livelihood need to be considered.

RECOMMENDATIONS

- If we're it possible, the dredged material should be used to landfill the eroded area at TAFICO & Mwl. Nyerere College rather than considering its disposal to Deep Ocean. The reason is that this area is being affected greatly by beach erosion, the process that has resulted to loss of useful area of the place.
- If there is no a possibility of using the dredged material to eroded areas, the bottom substratum of the deep ocean should be well studied before being disposed in order to reduce the ecological effects
- The Small scale fishers who will be affected by the project need to be considered for their sustainability.

I submit

Dominic

Magreth Dominic

Senior Fisheries Officer

28th December, 2015

ERSIA QUESTIONNAIRE – STAKEHOLDERS

PROJECT NAME: DAR ES SALAAM MARITIME GATEWAY IMPROVEMENT PROJECT

S/N	Questions	Remarks
1.	Do you think this project will benefit the society in any way (Positively or negatively), Why?	The Project will affect the society in both ways, in one way the project will increase employments and income at the time of physical construction of the port. Society will also benefit from accessible and improved port services. In other way, the project will affect the society along the pipe line and some of construction sites as may be required to vacate their places.
2.	The Dar es Salaam Maritime Gateway Program is a big project which is expected to improve the overall operations at the port. Do you think this program will lead to more or less employments? What advice do you have for TPA in order to increase or decrease the number of employees?	The project will lead to more of short term employments from the construction phases. A modern and improved port operations require modern technology which is capital intensive, so long port services are improved the nation will benefit from tax and other charges.
3.	The EISA consultant is in a process to advice on handling of solid as well as liquid wastes produces at port. What is your view on this	The improvement of overall port operations must go together with construction of new sewerage systems and other west management infrastructures.
4.	As a potential stakeholder to this project, what do you think are the major social as well as environmental impacts to result from its implementation? What advice do you have for TPA to reduce or enhance them?	Improvement of the port operations may result into increase in crime activities at the port sites and during the operations. The project should in advance employ comprehensive security mechanisms to protect the sites and operations. The project may increase water pollution or sea pollution from loading and offloading of oil products. The construction of new oil jetty and pipelines will protect the same as mentioned in the proposal.

SIGNATURE.....

NAME &DESIGNATION.....Gerald Remmy – Senior Economist.....

ERSIA QUESTIONNAIRE – STAKEHOLDERS

PROJECT NAME: DAR ES SALAAM MARITIME GATEWAY IMPROVEMENT PROJECT

Sn	Questions	Remarks
1.	Do you think this project will benefit the society in any way (positively or negatively), why?	For every project there are both +ve and –ve impacts. However for this project, it is likely that there will be more +ve compared
2	The Dar es Salaam Maritime Gateway Program is a big project which is expected to improve the overall operations at the port. Do you think this program will lead to more or less employments? What advice do you have for TPA in order to increase or decrease the number of employees? ESIA is	We need a port that is driven by the State of the Art Technology with few workers but more effici There should be few but multipurpose labour force.
3	The EISA consultant in a process to advice on handling of solid as well as liquid wastes produced at the port. What is your view on this on this?	The project will result into more imp other than solid and liquid wastes. Consultant should identify all impa that are likely to be generated by
4	As a potential stakeholder to this project, what do you think are the major social as well as environmental impacts to result from its implementation? What advice do you have for TPA to reduce or enhance them?	The impacts include: (i) Employment generation (ii) Increased capacity to han long Ocean going vessels (iii) Air po (iv) Noise pollution, marine water pollut (v) Interferance in marine going vesse normal functioning of the port NB: Positive impacts should be enha while potential negative impacts be mitigated. 2. The Consultant should follow an achieve to the requirements of the and Audit Regulations of 200 3. Now, it is not clear what stage of

SIGNATURE.....

NAME & DESIGNATION ..... C. Japhet & G. Albena SENIOR TOWN PLANNERS

0763 815459

वाप्कोस लिमिटेड WAPCOS LIMITED

ESIA QUESTIONNAIRE – STAKEHOLDERS

PROJECT NAME: DAR ES SALAAM MARITIME GATEWAY IMPROVEMENT PROJECT

SN	Questions	Remarks
1.	Do you think this project will benefit the society in any way (positively or negatively)	**YES,** the project will benefit the society in any way for example in:- **Construction phase:** 1. Create an employment to people (+ve) 2. Possibility disturbance of nearby buildings (-ve) 3. Track congestion (-ve) 4. Accidents (-ve) **Operational phase:** 1. Government revenue (+ve) 2. Less employment to people (+ve). 3. Accidents (-ve)
2	The Dar es Salaam Maritime Gateway Program is a big project which is expected to improve the overall operations at the port. Do you think this program will lead to more or less employments? What advice do you have for TPA in order to increase or decrease the number of employees?	Less or more employment it depends on the project phases, technology and modification PTA plan to be installed or implement; **Advice:** This is a situation PTA have to think and look critically, it should be a Win-Win situation, because can cause problem both to PTA and society.
3	The EISA consultant in a process to advice on handling of solid as well as liquid wastes produced at the port. What is your view on this?	Regarding to solid as well as liquid wastes handling, PTA has to install advanced wastewater treatment technology as well as place effective environmental management system.
4	As a potential stakeholder to this project, what do you think are the major social as well as environmental impacts to result from its implementation? What advice do you have for TPA to reduce or enhance them?	**Social impacts** 1. Create an employment to people 2. Attract more people to look for job opportunity (-/+ve) 3. People migrant to look for job 4. Accidents 5. Traffic jams 6. Possibility to interfere ferry daily operations 7. Incidents from oil spills **Environmental impacts** 1. Water pollution (spills of mineral oils that lead to pollution of water and sediments) during the construction and operation phases 2. Noise pollution 3. Air pollution (increase of CO_2 emissions) during the construction and operation phases contribute to greenhouse gas 4. Marine pollution 5. Generation of wastes both solid and liquid during the construction and operation phases 6. Poor handling of dredged materials as result cause piles of it 7. Impact on the ecosystem due to ballast water **Advice;** 1. Need for baseline environmental data and think to re-use dredged materials for construction 2. Keep a good system or mechanisms for employing people 3. Use of PPEs and signs (road and safety) as well as training to minimize or avoid accidents to occur. 4. Regular service of trucks and machines; 5. Environmental awareness to workers and staffs 6. There is a need to consult marine experts and responsible municipal council as well as other key stakeholders 7. There is a need to consider possibility of cumulative impacts 8. The ballast water has to be treated with chemical substances or be filtered – proper Management of ballast water. 9. Use of port state authority to enforce environmental protection measures

SIGNATURE.....

NAME & DESIGNATION..Eng. Ephraem Mrosso
Environmental Officer

TATHMINI YA ATHARI YA MAZINGIRA JAMIINA
UCHUMI KWENYE MRADI WA KUBORESHA
BANDARI YA DAR ES SALAM
MUKTASARI – KATA YA KURASINI
15/01/2016

AGENDA
1: KUFUNGUA KIKAO
2: LENGO LA ~~HOJA~~ KUFANYA KIKAO
3:

1. Kikao kilifunguliwa Saa 4:00 asubuhi na mwenyekiti akisema Mamlaka ya bandari na kushirikia na bandari kuu inampango wa kufanya utafiti wa upanuzi wa bandari kwa kufanya shughuli zifuatazo;-
⇒ Kuongeza kina katika maeneo ya kuegesha reli
⇒ Kujenga eneo la gerezani click
⇒ Kujenga mfumo wa Conveyor System ili uweze kubeba nafaka kutoka melini na kuigiza katika maghala ya nafaka.
⇒ Kuboresha miundo mbinu ya reli iliyoko bandarini
Lengo la kikao ni kupata maoni kutokana na shughuli hizo zitakazofanyika katika mushuala ya ~~maoa~~ uchumi ~~na~~ na mazingira;-
⇒ Mwenyekiti wa mtaa wa kiungani alisema kuwa hofu yake ni kuwa kina kinaweza kupelekea madhara kwa wakazi kama vile nyumba kuchimba nyufa nani atahusika katika madhara hayo. Mwakilishi alisema kwa hategemi kama madhara hayo yatatokea lakini bado mwenyekiti wa mtaa wa kiungani alisema madhara yapo.
⇒ Madhara ~~Stacha~~ ~~tote tote~~ yatakayotokea kupitia kuchimba kina katika maeneo ya kuegesha reli mamlaka ya bandari itawahudumiwa wale wote watakaoathirika ~~na~~ katika kipindi hicho.
⇒ Mtendaji wa kata ya kurasini aliomba vibarua watakaotumika katika shughuli hii anaomba awatumie vijana waliopo katika kata hii ya kurasini
⇒ Mwenyekiti wa minazini aliuliza ujenzi utaanza lini akasema pindi watakapokamilisha zoezi la utafiti ndio ujenzi utaanza na ujenzi utafanyika ndani ya miezi 36.

⇒ Kuwe na Sehemu maalumu ya kutupa taka sio kutupa taka ovyo bila utaratibu. Mwakilishi wa Cow alimjibu kuwa lazima kutakuwa utaratibu. Pia wameomba wakandarasi wao wawe na vifaa ~~Sio~~ ili kazi ifanyike kwa umakini ili kuwe na usalama kazini.

⇒ Ofisi ya mkandarasi inatakiwa iwe ndani ya kata ya Kurasini

⇒ Ofisi ya kata ya Kurasini inafaidika vipi na mradi huu? Kama mkandarasi atajenga ~~of~~ kambi yake ndani ya kata hii vijana watapata ajira, wafanyabiashara wataongezeka kwa ajili ya watu kupata huduma mbalimbali.

⇒ Endapo magari ya ~~ku~~ kubwa yanafuata mchanga na kokote Sehemu ya mbali wanatakiwa wapite mandela road, kilwa road au bend ya tatu ~~ao~~ na tafico au asafirishe mali ghafi usiku mpaka ikifika saa 11:00 alfajiri wawe wamemaliza.

⇒ Maambukizi ya ukimwi yanaweza kuongezeka kutokana na watu watokao kuja kufanya Shughuli hizo kulingana na wingi wa watu wanaokuja. Elimu inatakiwa itolewe ili watu kuwa makini.

⇒ Magonjwa ya ~~ukim~~ mlipuko

⇒ Mimba zisizotarajiwa. Pia elimu ya kutosha itolewe.

<u>Menginevyo</u>

~~Kama~~ Kama viongozi wa kata ya kurasini wamekubali kuipokea mradi huu. Mwakilishi wa aliuliza kuhusu migogoro iliyopo kati ya ~~waendeshaji~~ bandari na wananchi akajibiwa hakuna migogoro hiyo bali kuna migogoro kati ya wizara ya ardhi na wananchi.

Mwenyekiti alifunga kikao ~~St~~ Saa 6:00 mchana na kuwashukuru ~~wananchi wote wali~~ wajumbe wote waliofika.

Mwenyekiti

[signature]

AFISA MTENDAJI WA KATA KURASINI

Katibu

[signature]

AFISA MTENDAJI WA MTAA KIUNGANI

Table 1: Views and concerns from the first stakeholders meeting held at Fire Station Hall.

Details	Issues of concern/suggestions
Ministry of Livestock Development and Fisheries (Fisheries Sector) 27.08.2015 Bulongo Fharah Fire Station Hall TPA	• How will the project affect the fishermen around the Port? • Suppose the markets for fish catch is affected, how will the fishermen be compensated? • The Consultant should provide more detailed information on the extent of the project undertaking and, if possible, information should be made available in time to the ministry detailing, if at all, people will be affected in any way.
Ministry of Natural Resources and Tourism (Forest Division) 27.08.2015 Not recorded Fire Station Hall TPA	• Project to identify proper disposal technology for the dredged materials. • Project is economically viable for improvement in taxes, revenue and employment opportunities. • Project may also affect negatively on the culture and increase in spread of HIV/AIDS.
Ministry of Lands, Housing and Human Settlement 27.08.2015 Anna Misigaro Fire Station Hall TPA	• Project does not interfere with other projects in the area. • Project maintain the existing secure harbour activities. • Proposed project should prevent pollution through oil discharge and soil clearing during ships and boat anchoring.
Ministry of Energy and Minerals 27.08.2015 Eng. Ephraim Mush Fire Station Hall TPA	• Project may lead to employment creation. • Project may disturb nearby societies, congestion of trucks in the roads and accidents. • TPA should also consider modern technologies in handling wastes (solid and liquid) in order to reduce environmental pollution. • Dredged materials to be tested for re-use potential in order to reduce solid wastes. • Employees to be updated on the safety issues regularly to reduce occupational accidents.
Tanzania National Road Agencies (TANROADS) 27.08.2015 Eng. Sanjo Mngeta Fire Station Hall TPA	• The detailed project information should be availed to stakeholders before they are asked to give their views. • The consultants should abide by NEMC Act and regulations by first registering the project with NEMC and the firm of consultants also to be registered.
Tanzania Revenue Authority (TRA) 27.08.2015 NA Fire Station Hall TPA	• Proposed project will improve tax collection (import and corporate taxes) • Project will reduce waiting charges. • With proposed project all imports will be received by TPA, hence, TRA worries are on receiving charges that will go directly to Oil and gas companies and the arrangement could cause tax complications. • Project should strengthen security plan of proposed project.
Dar es Salaam City Council 27.08.2015 Christopher Japhet Grace Mbena Fire Station Hall TPA	• Proposed project should clear all land matters in a proper and official way. • To put all possible measures in place in order to avoid spillage of oils or toxins and hence pollution to the environment • Existing system of delivering product at port and city plan on industry
Marine Parks and Reserved Units 27.08.2015 Jairos Mahenge	• Most important issue is the development without land reclamation to avoid erosion, which can take place to the nearby Dar es Salaam Marine Protected Islands (DMRs). • Dredging wastes should be disposed deep sea, at a distance of more than 10 km from shoreline. • Land filling will impact the coral and other

Details	Issues of concern/suggestions
Fire Station Hall TPA	
Temeke Municipal Council 27.08.2015 Said Mkumba Fire Station Hall TPA	• Marine ecosystems of DMRs. • Proposed project should set effective firefighting in the event of an emergency • Project will encourage emergence of more oil companies and hence increase taxes and fees collection.
Vijibweni Ward and street meeting with villagers and fishermen 27.08.2015 Ward executive officers and street leaders Fire Station Hall TPA	• The project is outside our area therefore no impacts. • Appreciated the efforts of the TPA to involve them in awareness about what is going to happen. • Expect the trade will grow as many and big vessels will come to Dar es Salaam port.
Kurasini Ward 27.08.2015 Ward executive officer and street leaders Fire Station Hall TPA	• The government has acquired land for port activities expansion in Kurasini area so our community accepts the project. • Mechanized operations for conveyor system might affects casual labourers. These casual labourers are the potential customers for motorcyclist and food vendors.

Table 2: Views and concerns from the second stakeholders meeting held at Fire Station Hall.

Details	Issues of concern/suggestions
Ministry of Livestock Development and Fisheries (Fisheries Sector) 21.10.2015 Bulongo Fharah Fire Station Hall TPA	• The report should follow NEMC regulations and standards, otherwise there should be two reports one for WB and the other for NEMC.
Ministry of Lands, Housing and Human Settlement Development 21.10.2015 Anna Misigaro Fire Station Hall TPA	• A past benefits analysis should be done to identify the most appropriate options for development because this is a national project which requires a huge investment. • In the part of institutional strengthening a special training should be provided to workers in order to cope with the growing technology.
Ministry of Water 21.10.2015 Eng. Melania Sengeu Fire Station Hall TPA	• The construction materials, sources and quantities should be presented in the report. • The baseline information should include the characteristics of the dredged materials. • The impacts of noise and vibration should be included.
Ministry of Energy and Minerals 21.10.2015 Eng. Ephraim Mushi Fire Station Hall TPA	• The report should present the phases of the project for easy identification of impacts. • The ESMP should summarized.
Ministry of Home Affairs **21.10.2015** Gerad Remmy	• Issues concerning fire and safety, especially in buildings should be discusses at the design stage. • Fire inspector should advice the Contractor right from the design of the project and all drawings should include fire safety structures.

Details	Issues of concern/suggestions
Fire Station Hall TPA	
Tanzania National Road Agencies (TANROADS) 21.10.2015 Eng. Sanjo Mngeta Fire Station Hall TPA	• Dredged materials disposal mechanism should be identified and documented. • Document all hazardous wastes and its disposal mechanism.
Dar es Salaam City Council 21.10.2015 Christopher Japhet Grace Mbena Fire Station Hall TPA	• The issue of soil erosion should be enriched by adding the effects of climate change and variability and not only the land reclamation/dredging. • The area planned for Ro-Ro terminal may lead to removal of species, this should be investigated.
MPRU 21.10.2015 Jairos Mahenge Fire Station Hall TPA	• The report states that disposal in the sea are to be 3 km away with depth of more than 50m. Are there any studies to be conducted before this exercise • Local currents of the area should also be known and considered
Temeke Municipal council 21.10.2015 Said Mkumba Fire Station Hall TPA	• Project should avoid any source of pollution. • Project encourages emergence of more oil and gas companies and hence will increase taxes and fees collection.
Agencies providing casual labours -Portable enterprises -Hai Sub Supplier -Baga Investment Company 21.10.2015 Mr Gorge Michael Mr Khamis Whamdoi Mr Ammu Selemanu Fire Station Hall TPA	• Provide casual labourers to TPA such as cleaning services, lashing and unlashing and Freight handlers, General cargo handlers, drivers at Ro-Ro terminal. • All workers are unskilled and criteria for recruitment is having a good health. • They are not entitled to any benefits neither health insurance nor pension fund. • Overall, port improvement will enable labour agencies get more works within the Port.

Table 3: Views and concerns from individual stakeholders consulted.

Details	Issues of concerns/suggestions
Ministry of Agriculture, Livestock and Fisheries 29.12.2015 Magreth Dominic-Senior Fisheries Officer Ministry of Agriculture, Livestock and Fisheries-office	**The expected positive impacts include but not limited to;** • Increased government revenue through taxation • Increased employment to communities • Improved business due to increased production, distribution of goods and services **The expected negative impacts include but not limited to;** • Severe beach erosion along RAS Mkwavi (TAFICO&MWL Nyerere College) • The dredging exercises will disturb the bottom substratum and therefore some bentho living organisms will also e affected/lost • The disposal of the dredged materials will have ecological effects to the place where they will be dumped, therefore careful study is needed to find out what species of fish and other organism will be affected and propose appropriate mitigation measures. • The issue related to displacement of people who were benefiting from the project area in terms of livelihood need to be considered

Details	Issues of concerns/suggestions
	Recommendations • If were it possible, the dredged material should be used to landfill the eroded area at TAFICO & Mwl Nyerere College rather than considering its disposal to deep ocean. The reason is that this area is being affected greatly by beach erosion, the process that has resulted to loss of useful area of the place • If there is no a possibility of using the dredged material to eroded areas, the bottom substratum of the deep ocean should be well studied before being disposed in order to reduce the ecological effects • The small scale fishers who will affected by the project need to be considered for their sustainability
Dar es Salaam City Council 08/01/2016 Eng. Chionda Kawawa-City Engineer Benedict Mukasa-Quantity surveyor Engineers Office	• **Solid wastes management**-Currently respective municipal council (Temeke, Ilala and Kinondoni are responsible for the collection of solid wastes (non-hazardous wastes) from source to final disposal at open dumpsite at Pugu Kinyamwezi. Municipal trucks, contracted companies and Community Based organisations (CBOs) collect waste from different locations. All non - hazardous wastes are collected from skip containers by trucks and disposed at open dumpsite at Pugu Kinyamwezi. The role of the Dar es salaam city council is to oversee the daily operations/activities at open dumpsite at Pugu Kinyamwezi. • **Mining activities**-Mining activities in the city is strictly prohibited. Construction materials such as aggregates, sand and borrow pits are sourced in Coast region mainly from Lugoba, Kisarawe, Kibaha and Msolwa. **Potential positive impact** • **Economic gains**-In the past there was a public outcry on the efficiency of the DSM port and some of the business persons evaded using the port due to inefficiency and theft of the valuable goods. Improvement of the port especially for births 1-7 will attract more big ships with more goods coming in the country hence increases more revenues to the country. • **Increase of storage capacity**. This will make DSM port to be more competitive with neighbouring ports such as Mombasa. • **Employment opportunities-**Improvement of the port will create employment opportunities during construction (construction works such as excavating trenches, works at borrow pits areas etc. • **Increases of business opportunities**-It is likely that small trade such as food vending, petty trade will increase due construction activities that will take place. This will increase income to these groups hence improving their wellbeing. **Potential Negative Impact** • **Disruption of Traffic flow-**DSM port is adjacent to the CBD area therefore construction activities would likely paralysed traffic flow especially when heavy equipment's and construction materials are brought to construction area during day light. To avoid this consider transporting construction materials at night or consider alternatives routes. • **Air pollution-**Transportation of construction materials (sands, aggregates, borrow pits) from source to destinations if not well covered some of the materials may be blown by wind hence polluting the air • **HIV/AIDS**-It is normally in the construction areas where interactions is very high spread of HIV/AIDS is inevitable. • **Loss of employment** -Modernizing the grain silos through introduction of conveyor belt will render some workers jobless. Port need to find ways of compensating those who will lose jobs. **Recommendations** • Project need to comply with OSHA requirement especially on issues of health safety

<table>
<tr><th>Details</th><th>Issues of concerns/suggestions</th></tr>
<tr><td></td><td>security and environment.
• Dredging is the most sophisticated activity which need special care-it needs competent international Contractor</td></tr>
<tr><td>Temeke Municipal Council</td><td>General overview of the Temeke and Port Area

• DSM port is located within Temeke Municipality, Kurasini Ward and Mivinjeni Ward. Wards that borders the port are Mtoni, Kijichi, Kigamboni, Mjimwema, Vijibweni, Somangila and Pemba Mnazi.
• HIV/AIDS prevalence for the municipality is 5.9%.The rate for HIV/AIDS within the municipality is decreasing due number of interventions which are in place such as Video trucks, provision of condoms, Education awareness targeting most vulnerable groups such as commercial sex workers and drug users
Factors which triggers HIV/AIDS increase are as follows;
-Presence of trucks at the port area where interactions is high between drivers and other port users
-Excessive drinking and accidents
There are two NGOs namely NOFI and HTC who are actively working in the port area. The latter dealing with prevention and the other one dealing with curatives.
• Socio economic activities taking place in the project area are
-Fishing, food vending and petty trade
Potential Positive Impacts

• Employment opportunities-During constructions for both skilled and unskilled

Potential Negative Impact

• Spread of HIV/AIDS -Port expansions with associated activities will attract many people in the project area hence interactions will be high.
Those working at the port (truck drivers, food vendors etc.) are aware of the HIV/AIDS pandemic since there have been interventions taking place in the area such as provision of condoms, education to commercial sex workers and counselling.
North Star Alliance and Waso Organisation are the two NGOs working along the Bandari road

• Solid waste management issues
All non-hazardous wastes are collected from the source and dumped to an open landfill at Pugu Kinyamwezi
Contracted company known as Pick traders manages collection of solid wastes at the Municipal
TPA has its own systems of collecting solid wastes therefore there is a need to have more collection points within the port
• Liquid wastes

All liquid wastes are collected and dumped at Kurasini oxidation ponds
TPA has its own system of collecting liquid wastes(either through on site or collected by trucks and empty and Kurasini oxidation ponds
• Sensitive habitats-Mangroves

• Areas prone to erosion-Kizinga and Mzinga river

• Potential construction materials within Temeke Municipality

<table>
<tr><th>Borrow pit name</th><th>Location</th><th>Status</th></tr>
<tr><td>Mji mwema, Lingato and Gezaulole</td><td>Temeke Municipality</td><td>Not used</td></tr>
</table>

Please note: All construction materials are sourced in Coast regions especially at</td></tr>
</table>

Details	Issues of concerns/suggestions
11.08.2016 -Municipal Community Development Officer(MCD) -Council HIV/AIDS Coordinator (CHAC) -Municipal Environmental Management Officer (MEMO) Municipal Economist Municipal Council Hall	Lugoba quarry site, Kisarawe and Msolwa **Potential positive impacts** • Increase of cargo hence more revenues to port • Employment opportunities **Potential negative impacts** **Disruption of traffic flow in the city centers** for large trucks carrying sand, aggregates and borrow pits. Transportation of construction materials to be done at night preferably around 11 pm. Alternatively construction materials can be transported using rail system. • Noise during dredging-proper equipment to monitor noise level • Dust during construction-Contractor is obliged to sprinkle water during construction Overall improvement/expansion of the Dar es salaam port will have positive impacts to the nation as follows; • **Stimulation of economic activities**-such as construction of more ICDs to cater for increasing containers, more godowns will be constructed • **Increase of service levy to Temeke due to port expansion-** As part of the agreement, Temeke municipality receives service levy annually from port operations. • **Employment opportunities-**During construction for both skilled and unskilled and during operations for skilled and some casual labour
National Microfinance Bank (NMB) 11.1.2016 Mr Richard Pembe Team Leader-NMB NMB office within Port premises	The presence of financial institutions within the port is a government move to help clearing agents to pay government taxes for the imported fleets/goods **Potential positive impact** • Port expansion will increase customer base and will accommodate more customers. Might consider to extend working hours as the daily operations starts at 8:30 am and ends at 10:00pm • This is a positive move as it will increase revenue collection to the government **Potential Negative Impact** • Construction activities might interfere with network system. Dust generations, noises from construction workers
HESU Investment limited 11.01.2016 Ahma Ng'itu-Driver Port Area	Casual labour who picks cars from the ship and drives to temporary lighter quay area (within the port) and later at night they drive cars to storage yard located at Temeke area. They all work on temporary basis and they are not entitled to any benefits e.g. wages, social security fund, health insurance etc. Modality of work agreement is first come and first served. If someone falls sick, there is always replacement. The project will have major positive effects to the population including increase in employment opportunities growth in business activities availability of goods and services.
TAN Driver Company 13.01.2016 Salehe Mhando Port Area	Casual labour who picks cars from the ship and drives to temporary lighter quay area (within the port) and later at night they drive cars to storage yard located at Mbagala area. They all work on temporary basis and they are not entitled to any benefits e.g. wages, social security fund, health insurance etc. Modality of work agreement is first come and first served. If someone falls sick, there is always replacement.

Details	Issues of concerns/suggestions
	• Port expansion will increase government revenues through increase of imported goods from overseas. • Port will have more spaces for the storage of cargos especially for the Ro-Ro terminal hence more security and safety for the imported goods. Goods stored in ICD are in higher risks of being stolen and most of the countries such as Rwanda, Burundi and Congo DRC prefers goods to be stored within the port area to avoid thefts.
Tanzania Social Action Fund (TASAF) 13.01.2016 Paul Kijazi-Environmental Officer TASAF Office-Head quarter	**Potential positive Impacts** • Opportunities for small business to grow-This will be an opportunity for food vendors/mama lishe to expand their businesses hence increase income. • Increase efficiency at the port. Port expansion might attract more countries to use Dar port as final destinations for the cargos/goods. This will also increases competitions with neighbouring ports such as Mombasa **Potential negative impacts** • Movement of the cars especially at gate no 2 might disrupt TASAF activities-Most of the in- transit cars use gate number 2 which borders with TASAF. Fleet of cars from the port use this road as an outlet to final destinations, which sometimes restrict other users of this road. Construction activities such as transporting construction materials-sand-borrow pits, aggregate might use this road. Client should notify the users of the road before transporting construction materials • Dust/air pollution-Construction materials such as borrow pits and sand if not well covered might be blown by wind hence polluting the environment. • Leakage. All poisonous materials need to have proper handling and well-sealed in proper containers to avoid leakages. • Noises from dredging activities -Dredging is the most sophisticated activity and need proper care. During dredging neighbours and other offices surrounding the port, need to be aware of what is going on to avoid havoc and panic. • Waste generations. All biodegradable materials need to be collected and dumped to designated dumping sites .Project proponent need to consider disposable toilets during constructions.
CRDB Bank 13.01.2016 Juma B. Ng'oko-Incharge CRDB office within port premises	**Potential positive impact** • Increases of tax base because more of goods will be imported in the port • Employment opportunities during constructions as both skilled and unskilled will be employed. **Potential negative impact** Respiratory diseases-emanating from dust, air pollution
Malindi wharfs 13.01.2016 Mr Hafidh Mohamed-Ship owner (Seven Seas) Mr Hadad Sheha-Chief Officer (Jitihada) Malindi wharfs operations office	Malindi wharfs handles general cargo destined to Zanzibar (Unguja and Pemba), Mafia, Comoro Island, Songo songo island. All imported and exported goods destined to Zanzibar use Malindi wharf these includes crops such as sweet potatoes, maize, rice ,beans, bananas etc. and fruits such as watermelon, pineapples, oranges etc. Customers from mainland who imports cars from Zanzibar uses Malindi wharfs as well. In general, Malindi wharfs is a gateway to Zanzibar for all kind of goods (import & export). **Concerns from stakeholders** • Project to consider deepening and expanding Malindi wharfs to accommodate more ships. Currently, the area can accommodate only 2 or 3 ships. • Any land take onshore of the Malindi wharfs would affect shipping activities in the

Details	Issues of concerns/suggestions
	area especially for domestic cargos transported to Zanzibar from mainland. This will consequently affect Zanzibar's economy. • Expansion and deepening of births 1-7 will create employment opportunities during construction. • Entrance channel is too small for ships to manoeuvre During dredging people and other users of the port need to have prior information and closing, the entire port is not recommended.
Tanzania Railway Ltd (TRL) 14.01.2016 Eng. Vicent Assey- Assistant Chief Civil Engineer TRL office	• TRL is not aware of the proposed expansion of the Dar es salaam port • TPA manages all the railway operations including infrastructures within the port • TRL does no oppose port expansion but any rail improvement within the port should align with existing rail lines which are connected to the port (consider challenges in crossings etc.)
Kurasini fishermen landing site 14.01.2016 Group of fishermen, fish traders and motorcyclist Kurasini landing site	**Concerns** • More than 200 people are directly involved in fishing activities, while 400 to 500 are indirectly employed in various fishery-related activities e.g. retailers, net repair, fish frying and gutting. • Motorcyclist from the landing site takes passengers, customers and fishermen in and out of the area. Each trip costs 1,000 TSh. It is an opportunity to cyclists as they earn living from fishing activities in the area. Any disturbances on fishing activities will also affect fishermen in one way or another. • Fishing activities depends on seasons-during high season catching increases (about 30-40 basket of fish) the amount decreases during low season • Fishing markets are Magogoni area (ferry) and some do take fish and sell in other areas such as Mtoni kijichi, Mbagala etc. • Dredging activities if not handled carefully might affect fishing hatching area due to underground disturbances hence in-availability of fish. To them the project area is far from fishing grounds thus will not be affected. • The project is accepted by the fishing communities as they will get more customers during constructions hence increases their income
Ward executive officer- Kurasini Ward and Mtaa leaders 15.01.2016 Members from; Kurasini Ward Kurasini mtaa Kiungani mtaa Minazini mtaa Mivinjeni mtaa Kurasini Ward Office	**Baseline information at Kurasini Ward** • **Population-**The Ward has a total population of 26,193 people of whom 13,362 are female and 12,831 are male. Average household size is 3.9 • **Solid waste collection**-Waste is collected at household level and transfer to waste collection points (skip containers) and then taken by trucks to Pugu Kinyamwezi • **Liquid waste collection-**On site (cesspit) and transfer to oxidation ponds at Kurasini • **Socio economic activities**-Formal employment, small business (petty trade, mama lishe) and urban agriculture (horticulture) **Socio-economic services**-Hospital :Bandari dispensary and police dispensary; Education: 1 secondary school at ward level and 4 primary school; Water: Household use boreholes throughout a year not connected to DAWASCO **Concerns about port improvement:** **Potential positive impact** • **Considerations for local employment**-during mobilization, construction and operations especially on those activities which does not requires skills such as cleaning Contractors camp, masonry work, digging trenches etc. Preferably, casual labourers to be sourced at Kurasini Ward and Mitaa. • **Increased socio-cultural interaction-**The implementation of the project will bring many people from different cultural backgrounds. The interactions may bring about social changes in the communities and along the project area. The local people will acquire skills from technical people

Details	Issues of concerns/suggestions
	Potential negative impacts • **Early pregnancies for schoolchildren**. Project workers will induce school children as the result unwanted early pregnancies by school children will increase. There are many parking lots for trucks around Kurasini area and some of the drivers can stay in the area for about a week waiting to load a cargo, it is easier for idle person to lure school children. Awareness should be built on the potential social impact from incoming communities by the local government, NGOs working in the area, as it is the norm with any development. • **Increases of HIV/AIDS**- Kurasini Ward being proximity to port socio interactions is very high especially for truck drivers, motorcycle (*bodaboda*) food vendors etc. hence risks of spreading HIV/AIDS during construction. It was noted that the project workers will have more money to attract women into unprotected/ unsafe sex resulting into the spread of the disease. They suggested that existing HIV/ AIDs programmes offered by two NGOs working in the project area should be facilitated to cope with the potential impacts. • **Increased traffic jam and accidents during construction**-Vehicles carrying tonnes of sands, aggregates and borrow pits if no alternative routes is identified may cause havoc and accidents to other road users. Alternatively, all trucks carrying construction materials need to operate at midnight and they can use Mivinjeni-Taffico road during night. Awareness to other road users is important during peak hours • **Provision of Safety gears during construction-**Contractor need to adhere to safety issues to its workers i.e. provision of safety boots, reflective jacket and gloves to avoid body harm/injuries. • **Dredging activities might affects neighbouring houses-**through noises emanating from dredging activities. Neighbours need to be informed when the activity starts to avoid panic and stress to neighbours • **Loss of employment and income**-This is anticipated after completion of the project as many unskilled labour will lose job vendors **Recommendations;** Proposed Contractors camp to be located within Kurasini Ward
North Star Alliance-Non Governmental Organisation under TACAIDS Umbrella 15.01.2016 Mariam Mlimira-Site coordinator Raphael Mwangu-Clinician Magreth Lucas-HIV/Testing &Counselling North Star Alliance Office-Along Bandari Road	Currently, their scope of work is limited to following; •HIV Testing, Malaria and Blood pressure Target groups are as follows; •truck drivers, community surrounding the port area, commercial sex workers and port staffs In order to deal with HIV/AIDS pandemic and other sexual transmitted diseases they do the following interventions to communities'; •Proper usage of condoms •Education on sexual transmitted diseases •Family planning methods •TV/video programs **Potential positive impacts** • They will increase number of coverage hence meet their target level-at the moment they serve between 20-30 people per day and with port expansions the number will likely increase • Employment opportunities during constructions-both skilled and unskilled **Potential negative impacts** HIV/AIDS increase-despite the interventions offered by the NGOs it is likely that the

Details	Issues of concerns/suggestions
	HIV/AIDS will increase due to social cultural interactions. This will jeopardize working force.
Wake And Support other Organization (WASO) NGO funded under USAID 15.01.2016 Program manager-WASO WASO office-Along Bandari road	It is a positive move to expand the port activities, because as an NGO it will increase number of coverage in terms of customers hence meeting their target level. Target groups –drivers within and outside Tanzania (they served drivers from Congo DRC, Zambia ,Burundi ,Kenya, Rwanda and Zimbabwe) Other groups are port staffs, sexual workers and community in the surrounding area. A**ctivities/interventions provided are as follows;** • HIV testing and counselling targeting truck drivers • Condom distributions, lubricants-drivers, and assistant truck drivers are in dire need of lubricants and among 100 truck drivers who uses lubricants, 42% are HIV/positive. • Family planning method (unwanted pregnancies)-for long distances drivers who leaves their spouses at home • Referral to Temeke hospital under escort and get feedback • Male circumcision • Posters/brochures –for information sharing • Clinical services(mobile biomedical services • Health Education on behavioural change,/HIVAIDS prevention measures at individual and community level, reducing sexual partners, importance of treating sexual transmitted infections STIs and STDs, Reducing alcohol consumption in light of HIV/IDS preventions • Cancer screening-frequently sexual activity with different partners are in high risks of getting cervix cancer **Factors triggering HIV/AIDS in the project area are as follows** • Socio-cultural interactions-long distance drivers are detached from their families and loved ones hence by having multiple partners increases their chances of contracting HIV/AIDS • Poverty • Alcoholism • Lack of condoms due to absence of pharmacy in the area **Potential positive impacts** • Economic gains-More revenues will be generated because of large ships will enter at the Dar es Salaam port. The port will be more competitive with other neighbouring ports such as Mombasa. • Employment opportunities-for both skilled and unskilled during construction **Potential negative impact** HIV/AIDS increase-Spread of HIV/AIDS and other sexually transmitted infections. During construction, workers and other users at the port are in higher risk of being affected with HIV/AIDS and other sexual transmitted diseases. The Contractor is required to conduct relevant awareness seminars and campaigns on HIV/AIDS to both workers and communities, provision of condoms, posters etc. Contractor need to liaise with local NGOs working along the Bandari road for further assistances.
Food vendors 15.01.2016 Various food vendors Along Bandari road-Kurasini area	• About 200 food vendors are available around the Port area and provide mostly food services. Potential customers are the long distance truck, oil tank drivers and their assistances from different nationalities. Countries of destinations are Rwanda, Zambia, Burundi, Congo DRC, Malawi and Zimbabwe. • The kind of dishes served are soup and tea in the morning, lunch (rice, ugali with beef, beans and vegetables) and barbecue (piece of meat) in the evening. • January and February are not good months (low seasons) for food vendors because

Details	Issues of concerns/suggestions
	customers (truck drivers, oil tankers) have other commitment at home paying schools fees etc. Hence, some skip meals. • They serve between 30-50 customers per day. • They pay 500 TSh to officer in charge for services like collection of wastes, security at night and cleaning of toilets. • Some of the foods vendors do offer temporary employment (casual labour) to the assistances who accompanies long distance drivers most girls. They do cooking and fetching water. **Concerns about port improvement** • Most of the food vendors are not aware of the port improvement and it is a good news for them as they will get more customers • HIV/AIDS is at alarming rate and some of them do practise commercial sex as a means of diversifying livelihood. Some do accompany long distance drivers. • Increases of small business-Project implementation would increase customers in the area hence increase their income.
National Health Insurance Fund (NHIF) 22.01.2016 Eng. Simon Seleman -Civil Engineer NHIF office -Along Bandari road	• Construction activities will cause traffic congestion especially along Bandari Road. • Vibrations due to heavy equipment brought on site.
Shipping Agents 22.01.2016 Said Nzlamo -Chief operator(WASAC LTD) Kassim Ngonyani-Agent (Seaforth LTD) Along Bandari Road	There are at least twenty agencies responsible for assisting vessels with port procedures. Notable ones for general cargo are SEAFORTH (Wheat in Bulk) and WOSAC (Ro-Ro terminal). Other shipping agents assist in container shipping and valuable items. One ship can load maximum 20,000-40,000 t of wheat and has a total length of 9-10 m. There is draft restrictions for some of the berths such as Berths 7 where draft restrictions is 10.5 m. Therefore, a ship-loading wheat is restricted to Berth 7 only. Berth 7 is prioritized for container vessels because unloading/loading a container can take maximum of two days unlike wheat in bulk, which can take maximum of seven days. Berthing delays is one of the factors, which causes in efficiency in the port. • Berthing delay for other goods (such as wheat in bulk) port prefers container vessels to be offloaded first because they stay in short time (2-3) days • Positive move for the project as it will relieve congestion for the ships.

Appendix 5: Signatures of the Consulted Stakeholders

TPA

TANZANIA PORTS AUTHORITY

MODERNIZATION OF DSM PORT

FULL ESIA FOR DREDGING OF ENTRANCE CHANNEL AND TURNING BASIN, BERTHS 1-7 WORKS, AND ALL PROGRAM ACTIVITIES (INCLUDING RoRo TERMINAL, SPATIAL IMPROVEMENT) AT DSM PORT

STAKEHOLDERS' WORKSHOP CONDUCTED AT DSM PORT-FIRE AND SAFETY CONFERENCE HALL
27TH AUGUST 2015
ATTENDANCE REGISTER

S/N	NAME	ORGANIZATION	POSITION	Mobile Phone/ Email	SIGNATURE
1	Eng. Mohamed S. Mkumba	Temeke M Council	Env. Management Officer	[illegible]	[illegible]
2	Eng. [illegible] S. M	Dar City Council	Road Engineer	0754-624670 [illegible]@yahoo.com	
3	Eng. [illegible]	NEMC	[illegible] Engineer	[illegible]	[illegible]
4	Arch. Magonga L.	T.P.A	Architect	[illegible]	[illegible]
5	[illegible]	T.P.A (Engineering)	Engineer	[illegible]	[illegible]
6	JAIRUS MAHENGE	MARINE PARK & RESERVES UNIT	WARDEN IN-CHARGE FOR DSM MARINE RESERVES	[illegible] jmahenge@yahoo.com	[illegible]
7	Goodluck A. Kwayu	WAPCOS Ltd	Administrator	[illegible]	[illegible]
8	ALOK KUMAR VIDYARTHI	WAPCOS Ltd.	PROJECT ENGINEER	[illegible] [illegible]@wapcos.gov.in	[illegible]
9	BEATUS MBOYA	WAPCOS Ltd	Environmental & [illegible]	[illegible]	[illegible]
10	Chandrasekhar [illegible]	WAPCOS Ltd.	Project Manager	[illegible] [illegible]@wapcos.gov.in	[illegible]

TPA

TANZANIA PORTS AUTHORITY

MODERNIZATION OF DSM PORT

FULL ESIA FOR DREDGING OF ENTRANCE CHANNEL AND TURNING BASIN, BERTHS 1-7 WORKS, AND ALL PROGRAM ACTIVITIES (INCLUDING RoRo TERMINAL, SPATIAL IMPROVEMENT) AT DSM PORT

STAKEHOLDERS' WORKSHOP CONDUCTED AT DSM PORT-FIRE AND SAFETY CONFERENCE HALL
27TH AUGUST 2015
ATTENDANCE REGISTER

S/N	NAME	ORGANIZATION	POSITION	Mobile Phone/ Email	SIGNATURE
11	Eng. [illegible] Chirwa	[illegible]	[illegible]	[illegible] 0657357131	
12	RE. James H. [illegible]	TPA	[illegible]	[illegible] 0767456286	
13	A.G. Musewonda	TMCA	PM	0754 21 0303	
14	Eng Abraham Mwak[illegible]	TPA	CIVIL ENGINEER	0655 315960 gjmakala@gmail.com	
15	Eng. Sanjo N. [illegible]	TANROADS	[illegible] ENVIRONMENTALIST	Sanjomm@yahoo.com	
16	[illegible]	MLFD	[illegible] (MCS)	0718-418529 [illegible]	
17	[illegible] Dominic	MLFD	SENIOR [illegible]	078[illegible]4000	
18	Eng. V.J. Madinga	TPA	Engineering Manager	+255-713-561976	
19	Lucy Magere	TPA	Ag. PFSO	0717012014	
20	[illegible] Kapinga	TPA	for DAR	[illegible]@yahoo.com [illegible]	

TPA

TANZANIA PORTS AUTHORITY

MODERNIZATION OF DSM PORT

FULL ESIA FOR DREDGING OF ENTRANCE CHANNEL AND TURNING BASIN, BERTHS 1-7 WORKS, AND ALL PROGRAM ACTIVITIES (INCLUDING RoRo TERMINAL, SPATIAL IMPROVEMENT) AT DSM PORT

STAKEHOLDERS' WORKSHOP CONDUCTED AT DSM PORT-FIRE AND SAFETY CONFERENCE HALL
27TH AUGUST 2015
ATTENDANCE REGISTER

0788 849868

S/N	NAME	ORGANIZATION	POSITION	Mobile Phone/ Email	SIGNATURE
21	Lazaro Thonge	TPA	COS	thonge2007@gmail.com	
22	Zaynab Mnyinge	TPA	MSO	zaynmnyinge@gmail.com	
23	Alfred P Mwaimba	TPA	PPO	[illegible]@tanzaniaports.com	
24	Ayub Salum	TPA	FSO	0716 15 7658 ayubsalum@yahoo.com	[illegible]
25					
26					
27					
28					
29					
30					

The stakeholder meeting has an overall objective to find out the following views, concerns, informational requirements and alternate options from stakeholders that shall be addressed when carrying out environmental and social impact assessment study:

SN	Name, Designation & Organization	Contact (Mobile & Email)	Signature
1.	JAIRUS MAHENGE WARDEN IN-CHARGE-DMRS, MARINE PARKS	0784 366405 0767 366403 jmahenge@yahoo.com	[signature]
2.	MAGRETH F. DOMINIC SENIOR FISHERIES OFF. MLDF	0788 904080	[signature]
3.	Zonal Officer Fisheries - Monitoring Control and Surveillance - MLFD FARAH S. Bulumbo	0716 413529 [illegible]@gmail.com	[signature]
4.	SANJO M MGETA Tan Roads	0715 373630 sanjomm@yahoo.com	[signature]
5.	Eng ABRAHAM MSINA TPA	0655 315960 ajmakali@gmail.com	[signature]
6.	Atu Mwakyembe - TMEA	0784 [illegible] atu.mwakyembe@trademarkea.com	[signature]
7.	QS. JAMES H. GWAGILA	jgwagila@gmail.com 0767 456286	[signature]
8.	Eng. Melania M. Sangeu	melania_sangeu@yahoo.com 0754 753179	[signature]
9.	ALFRED P. MATUMWERA	amatumwera@tanzaniaports.com 0754 [illegible]	[signature]
10.	Zaynab Mnyanga	[illegible]@gmail.com 0755 993379	[signature]
11.	Lazaro Twange	0756 849868 twange2009@gmail.com	[signature]
12.	Eng. V. J. Madingo	valemadingo@yahoo.com	[signature]

SN	Name, Designation & Organization	Contact (Mobile & Email)	Signature
13.	ORAN MWAKHIHAVA (Civil Engineer) TPA HQ	0753-543534 orantz2002@gmail.com	[signature]
14.	MAPANGA LUCAS M. ARCHITECT TPA HQ	0754 776201 mclelucas@yahoo.com	[signature]
15.	Eng Ephraim Mushi	0712 074337 ejmushi@gmail.com	
16.	Eng. Nyenye S M	0754-674690 snyenye@yahoo.com	[signature]
17.	Eng Mohamed S. Mkumba	0717-156630 moshm56@yahoo.co.uk	[signature]
18.	Eng. Melania M. Sangeu	melania_sangeu@yahoo.com 0754 753179	[signature]
19.	QS. JAMES H. GWAGULA	jgwagula@gmail.com 0767 456286	[signature]
20.	Goodluck A. Kwayu	0768 815459 gakwayu3784@gmail.com	[signature]
21.	Ankit M. Paredis	0657872595 tanzania@wapcos.gov.in	[signature]
22.	ALOK KUMAR VIDYARTHI WAPCOS Ltd (Project Engineer)	0682899994 akv@wapcos.gov.in	[signature]
23.	CHANDRASEKHAR.K. WAPCOS. Ltd. (Project Manager)	0689917446 csk@wapcos.gov.in	[signature]
24.	Kertius MBOYA Environmental & Natural Resources Engr	bertus.mboya@yahoo.com	[signature]
25.	Lucy MAGERE TPA	lmagere@yahoo.com	[signature]
26.	VITUS M. KAPINGA (TPA)	vmkapinga@yahoo.com	[signature]
27.	Ayub, FSO TPA	ayubSalum@yahoo.com	[signature]
28.			

ATTENDANCE REGISTER

DATE: 21st October, 2015

S/NO	NAME	ORGANIZATION	POSITION	MOBILE PHONE/EMAIL	SIGNATURE
1.	S. A. Mlabwa	TPA	BDM	smlabwa@tanzaniaports.com	
2.	Thobias Sonda	TPA	SMSO	0785299873	
3	ALFRED. P. MATUNTERA	TPA	PPO	0754035727	
4	CHRISTOPHER JAPHET	DCC	S/T/ PLANNER	0784866778	
5.	GRACE B. MBENA	DCC	C-EPM	0713757501	
6	Yusuph A. Muya	MOT	ENV-OFFICER	0715855556 yusmuya@gmail.com	
7	Gerald Remmy	MOHA	Economist	0682022680 geraldremmy99@gmail.com	
8	Eng. Ephraim Kingu	MEM	Env. Engineer	0752024337 [illegible]	
9	GOODLUCK NG'INDO	TICTS	SNR. CONTROLLER	0787684994 / goodluck@ticts.com	
10.	Magrett Dominic	MLFD	Fisheries Off	0788904080	
11	JAIROS MAHENGE	MPRU	SNR WARDEN	0754366451 / jmahenge@[illegible]	
12	Bulayo Fhorah	MLFD	fisheries officer	0718413529 / 270379 [illegible]	
13	MATHIAS KESSY	TICTS	SNR CONTROLLER	0784-444214 / mkessy@ticts.com	
14	ANNA E. MISIGARO	MLHHSD	PTP	0787 483377	
15.	Eng. Sonjo M. Mgeta	TANROADS	Environmentalist	0715373630	
16.	John. S. Makoza	TPA	PPO(P)	0688763031	
17.	JACKLINE E. SWAI	TPA	MSO	0762395632	
18	MOHAMED S. HEMED	HAI SUB SUPPLIER LTD	GM	0754498199	
19	GEORGE MICHAEL	PORTABLE ENTERP LTD	DIRECTOR OF OPERATIONS	0713 760828	
20.	[illegible] SELEMANI	Beger Investment	DIRECTOR	0719 286064	
21	MELANIA MARY SANGEU	MOW	ASS DIRECTOR	0754753179 melania_sangeu@[illegible]	
22	SIANA AMOS	TPA	P/S	0754 263051	
23	EVELINE CLEMENT	TPA	OFF ASST	0713 413126	
24	Salma hussein	TPA	OM	0716 - 806349	
25.	Eng Pius Lunyi[illegible]	MOW	Sr Environmentalist	0712 526767	
26	Goodluck A. Kwayu	WAPCOS	Administrator	0763 815459	
27	Beatus Mboya	WAPCOS	ESIA expert	0784033937	
28.	ALOK KUMAR VIDYARTHI	WAPCOS	Project Engineer	0689899994	
29.	Zaynab Nnyange	TPA	MSO	0755993379	

Environmental and Social Impact Assessment for Proposed Improvement of Dar es Salaam Port
Phase 1 of Dar es salaam Maritime Gateway Program (DMGP)
Stakeholders Consulted

Date	Name	Position	Institutions	Contacts/Mobile	Signature
08-01-16	CHIONDA KAWAWA	CIVIL ENG. CITY ENGINEER OFFICE	DSM CITY COUNCIL	engchionda@gmail.com 0754199193	
08-01-2016	Benedict J. Mukasa	Qs - DCC	DSM City Council	bejomu2013@gmail.com	Mukasa
11/01/2016	JOHN BWANA	MCBO - [illegible]	TMC	bwanaji@yahoo.com 0713236905	
11/01/2016	Molongori Chacha	Env. officer	TMC	molongorichacha@yahoo.com 0767444250	
11/01/2016	E RIC MLAMLWA	MUNICIPAL ENGINEER	TMC	e.mlangwa@yahoo.com	
11/01/2016	HERIETH MAKEMBE	CHTAC	TMC	htmakemba@rocketmail.com 0713 684926	
11/01/2016	Richard Lembe	CCP-TPA Team leader	NMB-BANDARI	0716903606	
11/01/2016	AHMAD H. NG'ITU	HESU-INVESTMENT HESU-CONSULTANTS	DRIVER.	0712 282912.	
13/01/2016	PAUL KIJAZI	Env. Officer	TASAF	0786 121121	

13.1.2016	SALEHE MHANDO	MEREUA	TAN DRIVER COMPANY	0713-030679	
13.01.2016	JUMA B. NG'OKA	INCHARGE	CRDB TPA S/C	0763600661	
13/01/2016	HAMIDU MOHD	SEVEN SEAS	SHIP OWNER	0713413061	
13/01/2016	HADAD JI. SHEHA	"	LCT-JITIHADA CHIEF OFFICER	0715 417895	
14/01/2016	Eng. Vincent Assey	Assist chief Civil Engineer	TRL	0715 440508	
14/01/2016	MOHAMED SULEMAN	MVUVI	KURASINI LANDINGSITE	—	
14/01/2016	OSWALD STANBULI	MVUVI	KURASINI LANDSITE	—	
22/1/2016	Eng. SIMON SULEMAN	CIVIL ENGINEER	NHIF	0789292058	
22/1/2016	SAIDI NZIAMO	WOSAC LTD	OPERATION	0744-912866	
22/1/2016	WILLIAM NGOWYANI	SEAFORTH AGENCIES LTD	AGENT	0713-292296	
18/02/2016	MAUA MOHAMED	BRANCH MANAGER	ZANZIBAR SHIPPING CORPORATION	0787448556	

Environmental and Social Impact Assessment for Proposed Improvement of Dar es Salaam Port Phase 1 of Dar es salaam Maritime Gateway Program (DMGP)

Stakeholders Consulted

Date	Name	Position	Institutions	Contacts/Mobile	Signature
15/01/2016	Shalifa ayubu	mamalishe	JITIHADA Group	0675162974	S.a
15/01/2016	PETRONELI SAMBOSS	LISHE	JITIHADA Group	0712-451899	[signature]
15/01/2016	ANNA F. KALINGA	MAMA LISHE	JITIHADA	0659223334	[signature]
15/01/2016	MARIAM MLIMIRA	SITE COORDINATOR	NGO NORTH STAR ALLIANCE	0756863201	Mlimira
15/01/2016	RAPHAEL MWANGO	CLINICIAN	NGO NORTH STAR ALLIANCE	0717002699	[signature]
15/01/2016	MAGRETH LUCAS	HTC PROVIDER	(NGO) NORTH STAR ALLIANCE	0787211341	[signature]
15/01/2016	Dr Lussumo Samson	Program Manager	WASO Organization	0754675840	[signature]

Environmental and Social Impact Assessment for Proposed Improvement of Dar es Salaam Port Phase 1 of Dar es salaam Maritime Gateway Program (DMGP)

Stakeholders Consulted

Date	Name	Position	Institutions	Contacts/Mobile	Signature
15/1/2016	PASINA MTANGO	WEO	KURASINI	0714217868	[signature]
	ELIZABETH SIMITI	MEO	KIUNGANI	0719399493	[signature]
	STEVEN KIANDO	M/KITI KUNGANI	KIUNGANI	0713-109493	[signature]
	MARIAM MKONDYA	EHO	KURASINI	0713549771	[signature]
"	A.H. DACHI	M/KITI S/MTAA	MINAZINI	0787537575	[signature]
"	TITUS P. MAGUBIKA	M/KITI MTAA KURASINI	KURASINI	0652287390	[signature]
	TUMAINI MWAMFYI	MEK. KATA	KURASINI	0713570953	[signature]
—"—	EDSON W. ZANZIA	MWAKILISHI M/KITI S/UDONGO	S/UDONGO	0719507117	[signature]
—"—	JULIUS SAGATI	MWAKILISHI MIVINJENI	MIVINJENI	0655600877	[signature]
	JOYCE MCHOPA	MJUMBE	MINAZINI	0718443110	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT- PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DSMGP)

FINAL DISCLOSURE STAKEHOLDERS MEETING
TPA HEADQUARTER CONFERENCE ROOM- 2ND FLOOR
15TH FEBRUARY 2016

PARTICIPANTS LIST

NO	FULL NAMES	INSTITUTION/ORGANISATION	POSITION/ROLE	CONTACTS/MOBILE	SIGNATURE
1	ADAM H. DACHI	MINAZINI KURASINI	MKITI S/MTAA	0787 537575 ahd@Yahoo.com	[signature]
2	JOHN N GOLDEN	M-KITI MTONI/ MWAKILISHI WAHUVI	KURASINI/MTONI	0714828268	[signature]
3	Lugano L. Mwakyusa	Jitihada Group Trh.	Mwenyekiti	0655-436519	[signature]
4	Mariam Lupiana	Jitihada G-Mjumbe	Mjumbe	0755-398459.	[signature]
5	ENG. NORMAN KINGU	TICTS	ENGINEERING PROJECT MANAGER	nkingu@ticts.com 0754434291	[signature]
6	Magreth Lucas	NORTHSTAR ALLIANCE	HTC PROVIDER	0787211341	[signature]
7	Ar Lussumo Samson	WASO Organization	Program Manager	0754675840	[signature]
8	HAFIDH BAFAGIH	MIKOAM TRADERS LTD	OPERATION MANAGER	0714527979	[signature]
9	[illegible]	BAGH INVESTMENT	DIRECTOR	0719286064	[signature]
10	MAJ. R M NTARE	TANZANIA NAVY	MARINE CHIEF ENGINEER - NAVY	0762650650	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT- PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DSMGP)

FINAL DISCLOSURE STAKEHOLDERS MEETING
TPA HEADQUARTER CONFERENCE ROOM- 2ND FLOOR
15TH FEBRUARY 2016

PARTICIPANTS LIST

NO	FULL NAMES	INSTITUTION/ORGANISATION	POSITION/ROLE	CONTACTS/MOBILE	SIGNATURE
11	Machibya Masanja	RAHCO	Engineer Projects	0765581068 shiwachibya@g.com	[signature]
12	Mgessy T. Ryoba	TPA	Procurement	0713 440481 mgessyTino@gmail.com	[signature]
13	Gustav Hueppe	TPA - PIT	Contract Management	0742 907777 gustav.hueppe@sellhorn-hamburg.de	[signature]
14	Gladson Urioh	TPA	Ag DPI	urioh@tanzaniaports.co.	[signature]
15	ALFRED .P. MATUNTERA	TPA	PPO	amatuntera@tanzaniaports.com 0754035727	[signature]
16.	Binyahwaho Ellis	T. P. A.	Procurement Specialist	ebiryahwaho@gmail.com	[signature]
17.	ALOK KUMAR VIDYARTHI	WAPCOS Ltd.	Project Engineer	akv@wapcos.gov.in	[signature]
18	IGNATIUS NGAMESHA	COWI	CONSULTANT	0715 512675	[signature]
19.	Edward Ezekiel	COWI	-II-	0753091435	[signature]
20.	Beatus Mboya	WAPCOS Ltd	EIA Consultant	0784033937	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT-PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DSMGP)

FINAL DISCLOSURE STAKEHOLDERS MEETING
TPA HEADQUARTER CONFERENCE ROOM- 2ND FLOOR
15TH FEBRUARY 2016

PARTICIPANTS LIST

NO	FULL NAMES	INSTITUTION/ORGANISATION	POSITION/ROLE	CONTACTS/MOBILE	SIGNATURE
21	Emmanuel E. Kipembe	ILALA – MCHAFUKOGE	MEO	0716236363	[signature]
22	Matthew Richmond	COWI Tanzania	Team leader EIA	0754 222410	[signature]
23	GERALD MAGANGA	EWURA	TMP	0754 288509	[signature]
24	OMARI DARWESI	SHIRIKA LA MELI ZNZ	BOARDING OFFICER	0655-555561	[signature]
25	GEORGE MICHAEL	PORTABLE ENT LTD	DIRECTOR	0713 760828	[signature]
26	MAGESA MBASA	KURASINI AREA MOTOR CYCLE CHAIRMAN	CHAIRMAN	0715-712030	[signature]
27	RASHID MOHD	SEMEN SEAWEEDS	OPERATION	0713-603	[signature]
28	JOHN F. CHOGGO	AL-GHUBRA MARINE	OPERATION	0713 252755	[signature]
29	ELIZABETH Z. SIMITI	~~MEO~~ TEMEKE-KIUNGANI	MEO	0719 399493	[signature]
30	GREY DAVID	MEO - MWINJEENI MASJID ??? TMK	MEO	0717-908677	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR PROPOSED IMPROVEMENT OF DAR ES SALAAM PORT-PHASE 1 OF DAR ES SALAAM MARITIME GATEWAY PROGRAM (DSMGP)

FINAL DISCLOSURE STAKEHOLDERS MEETING
TPA HEADQUARTER CONFERENCE ROOM- 2ND FLOOR
15TH FEBRUARY 2016

PARTICIPANTS LIST

S/N	FULL NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	CONTACTS/SIMU	SIGNATURE/SAHIHI
31	PAULINA MTAMBO	KURASINI WARD	WEO	0714 217868	[signature]
32	THOBIAS SONDA	TPA	SMSO	0763 732967	[signature]
33	LILIAN DEOGRATIAS	COWI	CONSULTANT	0717532999	[signature]

Appendix 6: TPA Proposed Waste Management Plan - Draft (excerpt)

TANZANIA PORTS AUTHORITY

TPA

TANZANIA PORTS AUTHORITY

PROPOSED PORT WASTE MANAGEMENT PLAN FOR TANZANIA PORTS AUTHORITY (TPA)

DRAFT

AUGUST, 2011

TABLE OF CONTENTS:

DRAFT

Appendix 7: TPA Local Marine Oil Spill Contingency Plan (excerpt)

TANZANIA PORTS AUTHORITY

TPA

TANZANIA PORTS AUTHORITY

LOCAL MARINE OIL SPILL

CONTINGENCY PLAN

DAR ES SALAAM PORT

MAY, 2015

APPROVAL

The increasing demand of petroleum fuels in the Eastern and Central African Region has resulted into higher tanker traffic plying within our territorial waters.

Deep draught tankers from the Middle East which cannot transit the Suez Canal bound for Western Europe and the continents of North and South America, sail southward-bound for the Cape of Good Hope through shipping lanes in the international waters adjacent to our territorial waters.

This situation coupled with oil terminal activities pose high pollution risks with detrimental effects to human livelihood, environment and port assets.

In recognition of this, TPA embarked on developing this plan which shall be used in a pollution incident.

PORT MANAGER - DAR ES SALAAM PORT

Name: ..... Signature: .....

Date: .....

APPROVED BY:

DIRECTOR GENERAL - TANZANIA PORTS AUTHORITY

Name: ..... Signature: .....

Date: .....

TABLE OF CONTENTS

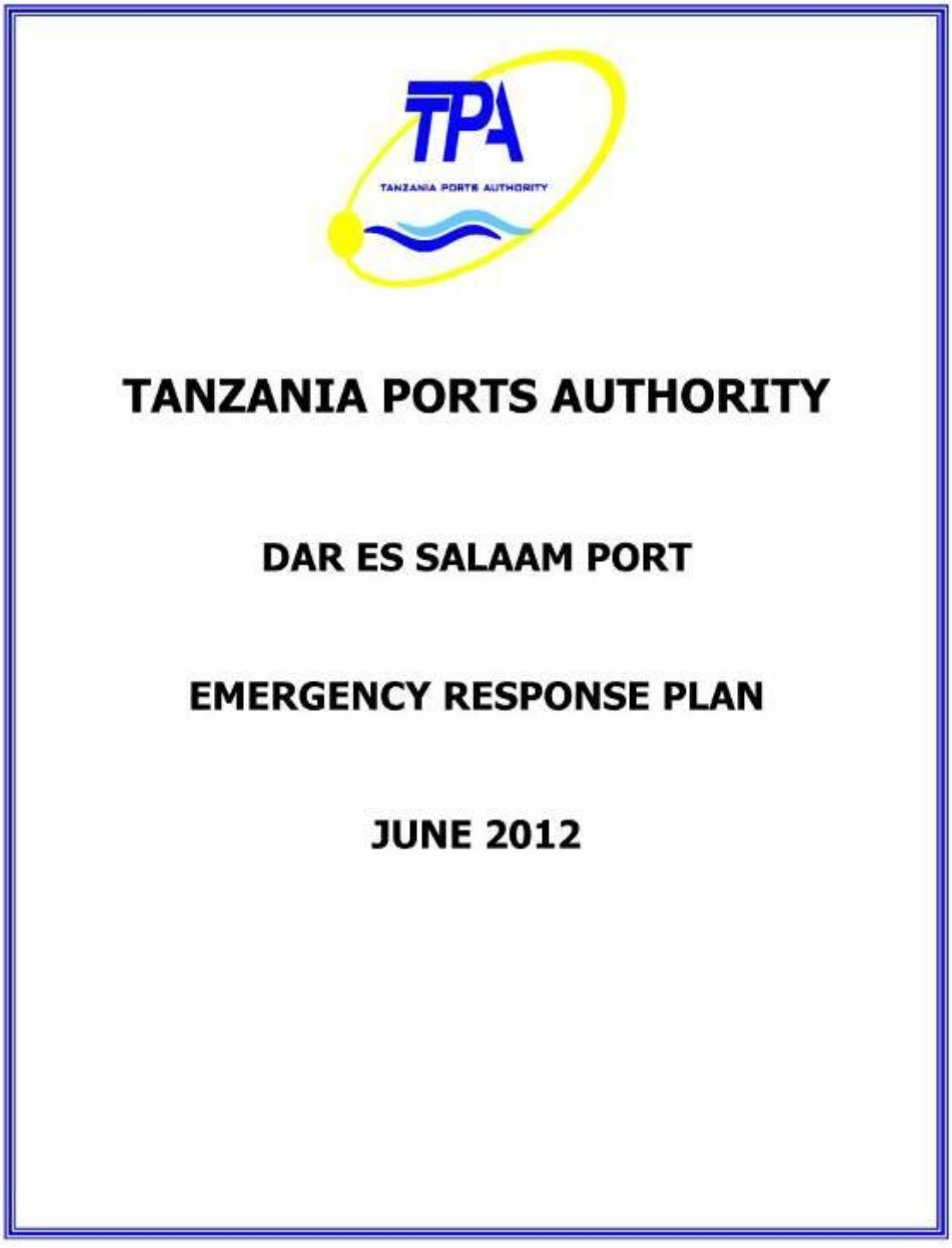
APPENDIX 7

CONTAINERISED OIL SPILL EQUIPMENT AT THE KOJ

CODE	DESCRIPTION	QUANTITY	STATUS	COMMENT
IB001000127	300m DRIZIT ESTUARY BOOM SUPPLIED IN 25 m LENGTHS MAN. FROM 950g/m^2 PU COATED NYLON MATERIAL	300m	PRESENT	
IB001000127	TOWING BRIDLES-300m	6	PRESENT	
IB001000127	ELECTRIC BOOM INFLATOR WITH MONSUN VALVE ADAPTOR	2	PRESENT	
IB001000127	EXHAUST INFLATOR WITH MONSUN VALVE ADAPTOR	1	PRESENT	
CP001000127	ROPE (ROLL)	1	PRESENT	
EP001000127	REELS TO TAKE 75m ESTUARY BOOM	4	PRESENT	
	SKIMMING EQUIPMENT:			
PU001000127	SPATE 75C PUMP	1	PRESENT	
EP001000127	DRIZIT YANMAR DIESEL DRIVEN 750 SKIMMER	1	MISSING	
EP001000127	FGP300 FLOATING GUIDE PULLEY	1	MISSING	
	DRIZIT ABSORBENTS:			
DR001000006	DRIZIT CLASSIC BOOMS (4m x 180 x 2 PER PACK)	3	PRESENT	
DR00100002	DRIZIT CLASSIC LOOSE FIBRE	10	PRESENT	

28

Appendix 8: TPA Emergency Response Plan (excerpt)



APPROVAL

An Emergency Incident can occur at any time, usually with little or no warning, causing major business disruption, attracting intense public and customer scrutiny and threatening the corporate image.

To ensure preparedness for an emergency incident and mount an effective response, certain prerequisites for team members must exist. This needs detailed planning and testing, along with skill training for key personnel.

In recognition of this, TPA embarked on developing The Dar es Salaam Emergency Response Plan.

The Plan reflects the best efforts of Tanzania Ports Authority to provide the most effective emergency response to an emergency incident that may impact any area within the limits of the Dar es Salaam harbour jurisdiction.

By enhancing risk awareness, the plan seeks to foster an environment where the uncertainties associated with some port operations are reduced not solely by prescription, but also by encouraging employees to identify the risks in everything they are doing and to then implement fit-for-purpose risk reduction measures. The plan will not only contribute to further improvement of the port industry's good safety record but will also bring us closer to the goal of zero accidents to which we all aspire.

The information contained in this document shall act as a guide only and may require some additional responses, depending on the circumstances of the individual emergency situation.

The Plan shall therefore be used in all emergency incidences.

PORT MANAGER - DAR ES SALAAM PORT

Name: ..... Signature:.....Date.....

APPROVED BY:

DIRECTOR GENERAL - TANZANIA PORTS AUTHORITY

Name: ..... Signature:.....Date.....

TABLE OF CONTENTS

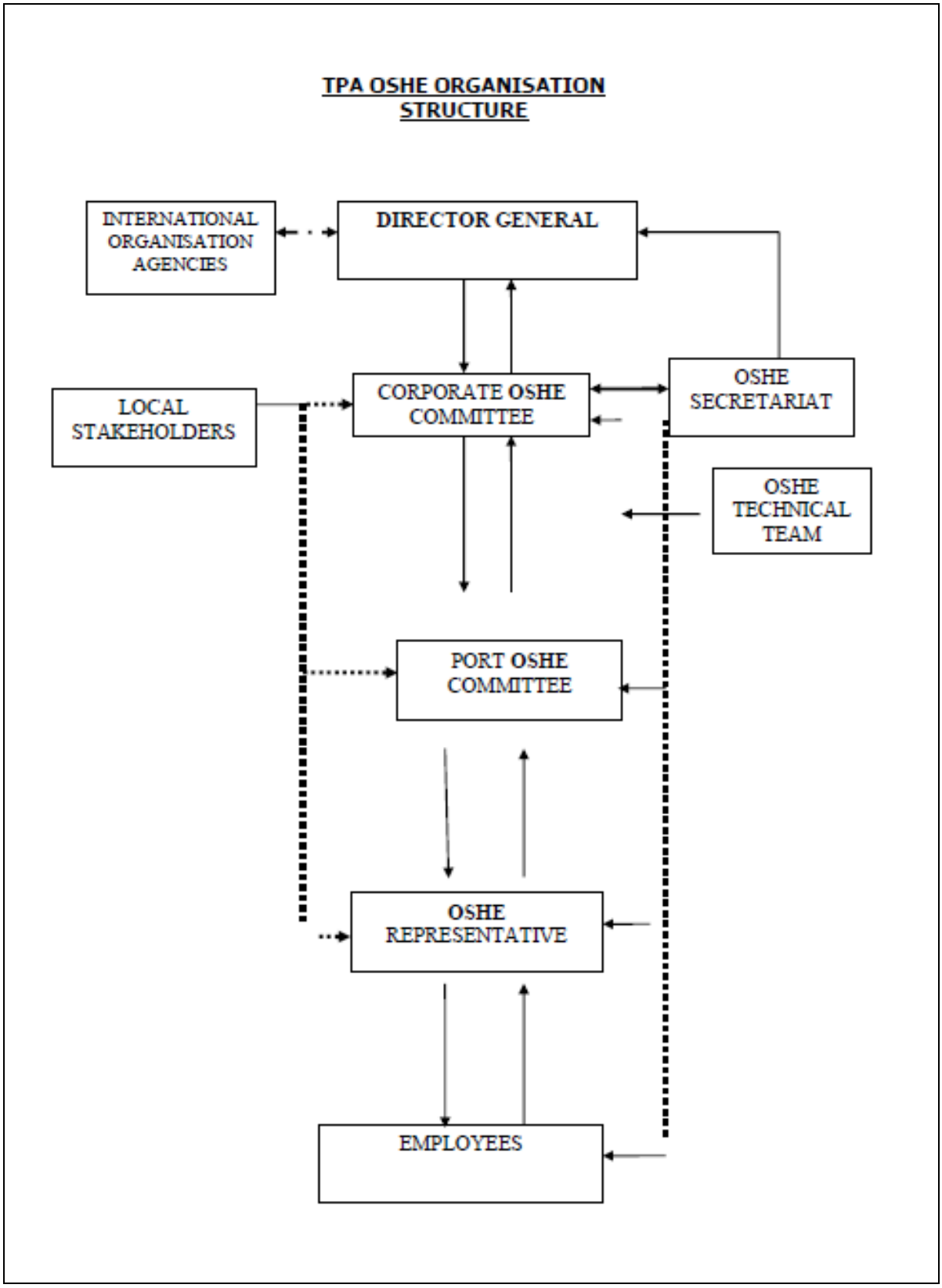
Appendix 9: TPA OSHE Policy (excerpt)

OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENT POLICY (OSHE 2008)

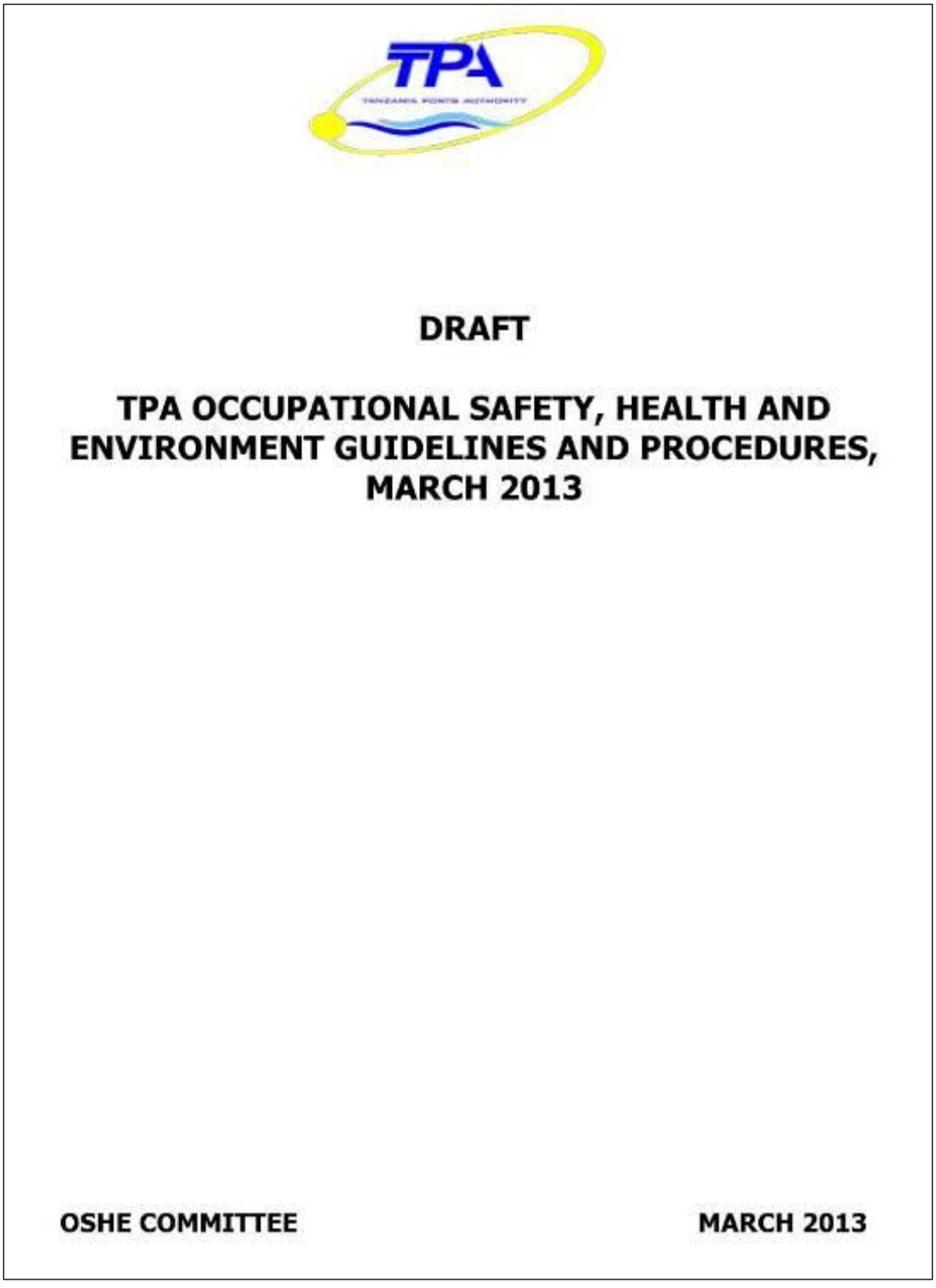
TPA
TANZANIA PORTS AUTHORITY

TANZANIA PORTS AUTHORITY

TABLE OF CONTENTS


TPA OSHE ORGANISATION STRUCTURE
INTERNATIONAL ORGANISATION AGENCIES
DIRECTOR GENERAL
LOCAL STAKEHOLDERS
CORPORATE OSHE COMMITTEE
OSHE SECRETARIAT
OSHE TECHNICAL TEAM
PORT OSHE COMMITTEE
OSHE REPRESENTATIVE
EMPLOYEES

Appendix 10: TPA OSHE Guidelines and Procedures (excerpt)



DRAFT

TPA OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENT GUIDELINES AND PROCEDURES, MARCH 2013

OSHE COMMITTEE

MARCH 2013

TABLE OF CONTENTS

Appendix 11: Bulk Grain Discharge Data (2010 -2015)

BULK VESSEL RECORDS AS FROM JAN, 2010 TO DEC, 2010					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Rio Gold	2	Wheat in Bulk	9569	167	84
Altis	3	Wheat in Bulk	10552	203	68
Maori Maiden	5	Wheat in Bulk	34824	633	127
Paloma C	6	Wheat in Bulk	34845	672	112
Genco Explorer	5	Wheat in Bulk	21928	771	154
Bering ID	8	Wheat in Bulk	26002	772	97
Ocean Friend	5	Wheat in Bulk	37208	543	109
Athos	5	Wheat in Bulk	35269	433	87
Zenith Explorer	8	Wheat in Bulk	27015	1006	126
Nikolaos	5	Wheat in Bulk	32325	580	116
Krikelo	4	Wheat in Bulk	33044	669	167
Spring Wood	7	Wheat in Bulk	34648	680	97
Wichita Belle	6	Wheat in Bulk	20455	788	131
Redwing	4	Wheat in Bulk	23737	392	98
Genco success	5	Wheat in Bulk	35150	432	86
Kittiwake	4	Wheat in Bulk	33462	434	109
Olga Topic	5	Wheat in Bulk	38985	556	111
Gant Vision	8	Wheat in Bulk	24563	1181	148
Alexia	7	Wheat in Bulk	15452	916	131
Navios Mercator	4	Wheat in Bulk	26267	352	88
Roupakia	3	Wheat in Bulk	14334	231	77
Spring Wood	6	Wheat in Bulk	15701	567	95
R.M. Pioneer	4	Wheat in Bulk	30458	346	87
Yangtze River	6	Wheat in Bulk	16138	413	69
Fermata	4	Wheat in Bulk	32968	355	89
Majestic	2	Wheat in Bulk	4149	84	42
VESSEL 26	**131**		**669,048.00**	**14,176.00**	**104**

BULK VESSEL RECORDS AS FROM JAN, 2011 TO DEC, 2011					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Majestic	2	Wheat in Bulk	4255	83	42
Liberty Grace	3	Wheat in Bulk	14002	212	71
Zonda	10	Wheat in Bulk	24530	1163	116
Protector	5	Wheat in Bulk	15511	435	87
Golden Eagle	6	Wheat in Bulk	38860	619	103
Restorer	12	Wheat in Bulk	19430	677	56
Athos	5	Wheat in Bulk	42232	578	116
Al khaliq	10	Wheat in Bulk	34567	762	76
Houma Belle	7	Wheat in Bulk	37439	559	80
Alqawiyyu	7	Wheat in Bulk	8637	570	81
Harriette	8	Wheat in Bulk	5429	896	112
Al Khaliq	7	Wheat in Bulk	17875	598	85
Thor Friendship	3	Wheat in Bulk	20427	263	88
Ponto Klydon	3	Wheat in Bulk	2986	106	35
Alkhaliq	6	Wheat in Bulk	33144	498	83
Liberty Eagle	4	Wheat in Bulk	6745	467	117
Majestic	4	Wheat in Bulk	9739	305	76
Navios Meridean	6	Wheat in Bulk	38781	600	100
B. Handy	5	Wheat in Bulk	13907	397	79
Protector	8	Wheat in Bulk	16143	704	88
Brother Glory	5	Wheat in Bulk	7729	267	53
Alyceone	5	Wheat in Bulk	23500	286	57
Sea Star Empres	4	Wheat in Bulk	32667	417	104
Emerald	5	Wheat in Bulk	36995	593	119
Levante	3	Wheat in Bulk	15878	258	86
Maro L	7	Wheat in Bulk	17383	406	58
Atlantis Pride	5	Wheat in Bulk	26797	370	74
Brother Glory	6	Wheat in Bulk	9489	727	121
Alkil L	4	Wheat in Bulk	7762	678	170
Team Progress	5	Wheat in Bulk	13129	360	72
Originator	5	Wheat in Bulk	30765	430	86
Al Khaliq	3	Wheat in Bulk	10536	281	94
VESSEL 32	**178**		**637,269.00**	**15,565.00**	**87**

BULK VESSEL RECORDS AS FROM JAN, 2012 TO DEC, 2012					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Al Khaliq	3	Wheat in Bulk	5940	162	54
Taxiarhis P	7	Wheat in Bulk	35640	495	71
Ilia	3	Wheat in Bulk	37333	439	146
Crown Princess	10	Wheat in Bulk	31808	786	79
Team Progress	5	Wheat in Bulk	36664	495	99
Kanchana Naree	7	Wheat in Bulk	41505	667	95
Al qawiyyu	7	Wheat in Bulk	21651	998	143
Restorer	6	Wheat in Bulk	17611	1082	180
Barbo	8	Wheat in Bulk	13088	755	94
Advantage	7	Wheat in Bulk	10157	537	77
Al Khaliq	5	Wheat in Bulk	25912	480	96
Provider	8	Wheat in Bulk	19995	658	82
Alkhaliq	3	Wheat in Bulk	1688	33	11
Alycia	5	Wheat in Bulk	32553	502	100
Orient Lotus	3	Wheat in Bulk	15645	222	74
Cmb Jiangling	5	Wheat in Bulk	27691	526	105
Trans Ocean Progress	6	Wheat in Bulk	16741	575	96
Originator	6	Wheat in Bulk	31171	665	111
United Milos	6	Wheat in Bulk	41438	759	127
Orient Lotus	4	Wheat in Bulk	22441	278	70
Onyx I	4	Wheat in Bulk	13312	499	125
Taxiarhis P	4	Wheat in Bulk	26390	475	119
Arieta	4	Wheat in Bulk	6102	217	54
Originator	7	Wheat in Bulk	33271	627	90
Grebe Bulker	5	Wheat in Bulk	38212	588	118
Melody	4	Wheat in Bulk	15204	390	98
Provider	6	Wheat in Bulk	27322	408	68
Eurosky	4	Wheat in Bulk	22197	417	104
Smarty	6	Wheat in Bulk	37106	620	103
Atlantica	6	Wheat in Bulk	40108	756	126
Aurora Amethyst	6	Wheat in Bulk	41044	635	106
Pretty Kneel	6	Wheat in Bulk	21271	591	99
Onyx I	9	Wheat in Bulk	25101	823	91
Zealand Roterdam	6	Wheat in Bulk	40168	633	106
Explorer	4	Wheat in Bulk	15956	339	85
Quest	4	Wheat in Bulk	15018	457	114
Asia	9	Wheat in Bulk	38531	669	74
Clear	3	Wheat in Bulk	7173	238	79
Brother Glory	7	Wheat in bulk	18909	1582	226
Malika Naree	2	Wheat in bulk	14780	204	102
VESSEL 40	**220**		**983,847.00**	**22,282.00**	**100**

BULK VESSEL RECORDS AS FROM JAN, 2013 TO DEC, 2013					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Malika Naree	3	Wheat in Bulk	13677	270	90
Aviona	7	Wheat in Bulk	44351	705	101
First I	4	Wheat in Bulk	26325	332	83
Iskenderun M	3	Wheat in Bulk	8144	255	85
IDC Diamond	4	Wheat in Bulk	18319	437	109
Ikaria Angel	6	Wheat in Bulk	39718	594	99
Explorer	5	Wheat in Bulk	26215	445	89
Grace C	5	Wheat in Bulk	33799	555	111
Simge Aksoy	6	Wheat in Bulk	39332	634	106
Gwendolen	4	Wheat in Bulk	16493	382	96
Voyager	8	Wheat in Bulk	43428	844	106
South	6	Wheat in Bulk	18045	523	87
Liberty Glory	3	Wheat in Bulk	4347	429	143
Bianco Bulker	9	Wheat in Bulk	40135	1386	154
THOR Insuvi	8	Wheat in Bulk	37534	845	106
JS Meuse	7	Wheat in Bulk	40445	739	106
Navios Soleil	7	Wheat in Bulk	41573	839	120
Explorer	6	Wheat in Bulk	19092	583	97
Black Eagle	4	Wheat in Bulk	23502	589	147
Thor Brave	6	Wheat in Bulk	38845	691	115
New Spirit	6	Wheat in Bulk	34718	624	104
Port Hainan	4	Wheat in Bulk	32664	579	145
Amanda	9	Wheat in Bulk	18508	589	65
Ionic Spirit	6	Wheat in Bulk	39377	625	104
Costas L	3	Wheat in Bulk	19434	390	130
Spar Virgo	5	Wheat in Bulk	31234	621	124
Jimilta II	9	Wheat in Bulk	20775	1080	120
Team Progress	5	Wheat in Bulk	11993	365	73
Adelina	3	Wheat in Bulk	21107	340	113
Restorer	7	Wheat in Bulk	8828	984	141
Aquila	5	Wheat in Bulk	41370	719	144
Universal Barcelona	6	Wheat in Bulk	39863	1005	168
Universal Bremen	5	Wheat in Bulk	36983	755	151
Almeria	4	Wheat in Bulk	15975	364	91
Ikaria Angle	6	Wheat in Bulk	14604	582	97
Sam Jaguar	3	Wheat in Bulk	9926	170	57
Sea Lavender	5	Wheat in Bulk	34595	541	108
VESSEL 35	**202**		**1,005,273.00**	**22,410.00**	**117**

BULK VESSEL RECORDS AS FROM JAN, 2014 TO DEC, 2014					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Sam Jaguar	5	Wheat in Bulk	28985	540	108
CY Thunder	4	Wheat in Bulk	17943	382	96
Banos. A	5	Wheat in Bulk	36799	651	130
Nicholas	2	Wheat in Bulk	11221	196	98
Amber L	4	Wheat in Bulk	9623	289	72
Sweet Lady III	5	Wheat in Bulk	37828	811	162
Neutrino	4	Wheat in Bulk	35371	620	155
Chloe Island	3	Wheat in Bulk	28655	469	156
As Venetia	5	Wheat in Bulk	33978	769	154
Thor Endeavour	6	Wheat in Bulk	24457	503	84
Alithia	5	Wheat in Bulk	20795	642	128
Star Fighter	5	Wheat in Bulk	36985	756	151
Lefkoniko	6	Wheat in Bulk	41540	786	131
Liberty Eagle	6	Wheat in Bulk	30093	700	117
Santa Phoenix	4	Wheat in Bulk	26240	431	108
Ocean Colossus	2	Wheat in Bulk	17589	379	190
Bianco Bulker	4	Wheat in Bulk	17020	441	110
Global Hope	6	Wheat in Bulk	32478	710	118
Sky Mariner	3	Wheat in Bulk	31623	554	185
Dorado	6	Wheat in Bulk	25161	875	146
Kyra Palaghia	3	Wheat in Bulk	26980	485	162
Elipida S	4	Wheat in Bulk	31462	657	164
Orient Jasmin	5	Wheat in Bulk	34149	719	144
Konya	4	Wheat in Bulk	19544	440	110
Arcadia	3	Wheat in Bulk	49684	720	240
Doric Pride	7	Wheat in Bulk	26253	858	123
VESSEL 26	**116**		**732,456.00**	**15,383.00**	**136**

BULK VESSEL RECORDS AS FROM JAN, 2015 TO DEC, 2015					
SHIP NAME	**No. OF DAYS IN PORT**	**COMMODITY**	**TOTAL TONS**	**No. OF MEN**	**Mean No./day**
Astra	6	Wheat in Bulk	38269	749	125
Samsun	5	Wheat in Bulk	32999	683	137
Thor Endevour	5	Wheat in Bulk	18945	580	116
Hanjin Seto	6	Wheat in Bulk	41720	714	119
Bianco Zealand	4	Wheat in Bulk	29978	559	140
Clipper Bettina	4	Wheat in Bulk	18805	405	101
Platon	3	Wheat in Bulk	21597	381	127
Santa Ursula	13	Wheat in Bulk	35070	1563	120
Ionic Smyrin	10	Wheat in Bulk	41640	1139	114
Star Athena	6	Wheat in Bulk	22048	478	80
Jaeger	4	Wheat in Bulk	32084	545	136
Santa Phoenix	5	Wheat in Bulk	32642	685	137
Kiana Pioneer	12	Wheat in Bulk	21967	1333	111
Liberty Glory	7	Wheat in Bulk	23977	983	140
Lunita	4	Wheat in Bulk	33644	520	130
Celeste	8	Wheat in Bulk	22304	849	106
Mandarin China	6	Wheat in Bulk	14183	284	47
Tokyo Bulker	5	Wheat in Bulk	44063	667	133
Amis Dolphin	5	Wheat in Bulk	37040	556	111
Clipper Barista	4	Wheat in Bulk	22025	447	112
Jin Fa	5	Wheat in Bulk	44979	691	138
Capetan Vassilis	9	Wheat in Bulk	24313	1296	144
VSC Triton	5	Wheat in Bulk	20442	516	103
Kamari	3	Wheat in Bulk	27584	494	165
Dubai Knight	9	Wheat in Bulk	23346	987	110
Ganneth Bulker	5	Wheat in Bulk	34687	612	122
Bao Run	4	Wheat in Bulk	19529	398	100
Platon Majuro	7	Wheat in Bulk	19933	684	98
Navious Vega	5	Wheat in Bulk	33978	601	120
Clipper Betina	3	Wheat in Bulk	6983	403	134
Thor Breeze	6	Wheat In Bulk	22999	657	110
Tai Health	8	Wheat In Bulk	36656	750	94
Sezai Selah	9	Wheat in Bulk	26097	1114	124
Shanghai Bulker	6	Wheat in Bulk	25443	625	104
The Just	6	Wheat in Bulk	12184	1348	225
VESSEL 35	**212**		**964,153.00**	**25,296.00**	**121**

Appendix 12: Casual Workers Employment – Sample Monthly Summaries

May 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,790	1,779	1,227	1,658
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	658	809	578	672
No. of male	1,132	907	649	986
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	474	474	474	474
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,316	1,305	753	1,184
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/ holiday)	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

June 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,880	1,537	1,608	1,219
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	752	633	658	478
No. of male	1,128	904	950	741
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	424	424	424	424
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,456	1,113	1,184	795
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/ holiday)	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

July 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,810	1,622	1,128	1,372
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	721	651	436	596
No. of male	1,089	971	692	776
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	424	424	424	424
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,386	1,198	704	948
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/ holiday)	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

August 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,610	1,820	1,915	1,475
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	821	851	737	599
No. of male	789	969	1178	876
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	424	424	424	424
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,186	1,396	1,491	1,051
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/ holiday)	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

September 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,600	1,780	1,890	1,375
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	915	635	718	693
No. of male	685	1145	1,172	682
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	424	424	424	424
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,176	1,354	1,466	951
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/ holiday)	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

October 2015				
Details Required	Week 1	Week 2	Week 3	Week 4
No. of labours hired during the week	1,556	1,750	1,750	1,475
Activities performed during the week Activities 1:xxx Nos, Activities 2:YYY Nos, Activities 3:AAA Nos	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations	1.Office Services 2.Cleaning 3.Motorvehicle 4.Operations
No. of female	821	708	837	421
No. of male	735	1,042	913	1,054
Minimum age among labourers	25	25	25	25
Maximum age among labourers	40	40	40	40
Source location of labourers	Labour pool	Labour pool	Labour pool	Labour pool
Method of hiring (tests, qualification criteria)	1.Certificate of 2^{o} school 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of port college	1.Certificate of 2^{o} education 2.Driving licence 3.Certificate of Port College
No. skilled labourers	424	424	424	424
Skilled minimum education qualification	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education	Driving licence & certificate of secondary education
Unskilled minimum education qualification	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education	Certificate of 2^{o} education
No. unskilled labourers	1,135	1,326	1,326	1,051
Minimum wage set by Labour Law	8,330/=	8,330/=	8,330/=	8,330/=
Wage for skilled labourers (weekends)	10,000/=	10,000/=	10,000/=	10,000/=
Skilled labour wage (weekends /holiday)	20,000/=	20,000/=	20,000/=	20,000/=
Unskilled labour wage (weekdays)	9,000/=	9,000/=	9,000/=	9,000/=
Unskilled labour wage (weekdays/	18,000/=	18,000/=	18,000/=	18,000/=
Whether labourers depend on TPA for employment	Yes	Yes	Yes	Yes

Appendix 13: GPS Data for Study Sites

Waypoint No.	WGS84 UTM zone 37S		Notes
	Eastings	Northings	
Sediment/Water Sampling Sites			
1	0531521	9245637	Gerezani creek
2	0531722	9245725	Gerezani Estuary mouth
3	0531707	9245589	Berth 1
4	0531884	9245451	Between Berths 2 & 3
5	0532094	9245277	Berth 4
6	0532279	9245168	Between Berth 4 & 5
7	0532383	9244929	Berth 6
8	0532493	9244661	Berth 7
9	0532596	9244495	Berth 8
10	0531676	9245771	Gerezani mouth/Malindi Wharf
Air/Noise Quality Monitoring Stations			
1	0532452	9243631	Gate No. 5
2	0531805	9244897	Gate No. 3
3	0531850	9244817	NHIF Headquarter
4	0532135	9244485	Grain Silos Area
5	0531672	9245825	Lighter Quay Wharf (Upward Wind Direction)
6	0531574	9245794	Lighter Quay Wharf (Downward Wind Direction)
7	0531443	9245345	Gerezani Creek (LHS)
8	0531389	9245272	Gerezani Creek (Front Side)
9	0531437	9245311	Gerezani Creek (RHS)
10	0531760	9245230	Port Manager Office
11	0531936	9245165	Between Berths 1 & 2
12	0532116	9245020	Berth 3
13	0532262	9244906	Berth 4
14	0532417	9244694	Between Berths 2 & 3 [Berth 5]
15	0532429	9244675	Berth 6
16	0532496	9244496	Berth 7
17	0531434	9245417	TASAF Office (Control Point)
Gerezani Creek and Mouth Surveys			
28	0531134	9245290	Gerezani Newly constructed vehicle storage area (NE side)
29	0531128	9245152	Gerezani Rusty stacked rail tracks (western end)
30	0531150	9245146	Gerezani Edge of swamp, among banana trees
31	0531198	9245187	Gerezani Edge of swamp, on stacked rail tracks (eastern end)
32	0531313	9245256	Gerezani Next to swamp sluice gate
33	0531249	9245246	Gerezani Stacked rail tracks (eastern end)
35	0531117	9245125	Gerezani New culvert draining new vehicle storage area into swamp
36	0531256	9245381	Gerezani Mixed drain sewage and grey water, missing manhole cover
37	0531227	9245439	Gerezani TPA civil engineering section (mam lishe kiosk)
47	0531387	9245272	Gerezani creek sluice gate (water sample taken)
48	0531467	9245351	Gerezani Channel (N side) major drain outlet
51	0531201	9245188	Gerezani water reading No. 1 (15-01-2015 10:15)
52	0531314	9245256	Gerezani water reading No. 2 (15-01-2015 10:18)
54	0531346	9245275	Gerezani water reading No. 3 (15-01-2015 10:20)
Kurasini Mangrove Stations			
38	0532818	9241894	Kurasini-Kigamboni Bridge corner with mangrove fringe
39	0532781	9241939	Kurasini fringe mangrove stn (1)
40	0532819	9242018	Kurasini fringe mangrove stn (2)
41	0532849	9242243	Kurasini fringe mangrove stn (3)
43	0533070	9242441	Kurasini fringe mangrove stn (4)
44	0532942	9242709	Kurasini TPA workshop gate
Other Locations			
45	0532796	9242912	BECO work yard
46	0532761	9243208	Major drain outlet TICTS exit road

Appendix 14: Sediment Analysis Results

SGS

African Assay Laboratories (T) Ltd
Environmental Laboratory
Block C Plot 5 Balewa Road
PO Box 1826
Mwanza, Tanzania
Phone: +255 282501090
Fax: +255 282501093
Email: TZ.Environment@sgs.com
Internet: www.sgs.com

Lab Ref EL150391
Client Ref
Project
Reported 1/22/2016
Status Final
Page 2 of 4

ANALYTICAL REPORT

Sample Ident	Total* Petroleum	Hg	Cd	Cr	Co	Cu
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
S1	185	<0.001	<0.001	<0.001	<0.003	<0.001
S2	59.5	<0.001	<0.001	<0.001	<0.003	<0.001
S3	105	<0.001	<0.001	<0.001	<0.003	<0.001
S4	2.0	<0.001	<0.001	<0.001	<0.003	<0.001
S5	26.0	<0.001	<0.001	<0.001	<0.003	<0.001
S6	<1.0	<0.001	<0.001	<0.001	<0.003	<0.001
S7	37.0	<0.001	<0.001	<0.001	<0.003	<0.001
S8	65.0	<0.001	<0.001	<0.001	<0.003	<0.001
S9	59.5	<0.001	<0.001	<0.001	<0.003	<0.001
S10	14.5	<0.001	<0.001	<0.001	<0.003	<0.001
Method	'etroleum Hydroc	D_Hydrides	Dissolved Metals	Dissolved Metals	Dissolved Metals	Dissolved Metals
Detection Limit	1.0	0.001	0.001	0.001	0.003	0.001
Method Uncertainity	-	±0.0015	±0.044	±0.027	±0.020	±0.016

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

*non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow

SGS

African Assay Laboratories (T) Ltd
Environmental Laboratory
Block C Plot 5 Balewa Road
PO Box 1826
Mwanza, Tanzania
Phone: +255 282501090
Fax: +255 282501093
Email: TZ.Environment@sgs.com
Internet: www.sgs.com

Lab Ref EL150391
Client Ref
Project
Reported 1/22/2016
Status Final
Page 3 of 4

ANALYTICAL REPORT

Sample Ident	*Pb*	*Ni*	*Zn*	*Total Organic Carbon#*	*Polyaromatic Hydrocarbons#*	*BTEX#*
Units	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*
S1	<0.005	<0.004	0.20	368	<0.00002	<0.001
S2	<0.005	<0.004	0.004	132	<0.00002	<0.001
S3	<0.005	<0.004	1.1	68.0	<0.00002	<0.001
S4	<0.005	<0.004	<0.001	68.0	<0.00002	<0.001
S5	<0.005	<0.004	<0.001	48.0	<0.00002	<0.001
S6	<0.005	<0.004	0.020	52.0	<0.00002	<0.001
S7	<0.005	<0.004	0.062	288	<0.00002	<0.001
S8	<0.005	<0.004	0.12	352	<0.00002	0.004
S9	<0.005	<0.004	0.067	224	<0.00002	0.004
S10	<0.005	<0.004	0.012	124	<0.00002	0.004
Method	*Dissolved Metals*	*Dissolved Metals*	*Dissolved Metals*	*EN 1484 HE*	*N EN ISO 17993*	*DIN 38407-9-1*
Detection Limit	*0.005*	*0.004*	*0.001*	*0.50*	*0.00002*	*0.001*
Method Uncertainity	*±0.012*	*±0.023*	*±0.040*	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

African Assay Laboratories (T) Ltd
Environmental Laboratory
Block C Plot 5 Balewa Road
PO Box 1826
Mwanza, Tanzania
Phone: +255 282501090
Fax: +255 282501093
Email: TZ.Environment@sgs.com
Internet: www.sgs.com

Lab Ref EL150391
Client Ref
Project
Reported 1/22/2016
Status Final
Page 4 of 4

ANALYTICAL REPORT

Sample Ident	Organochloride Pesticides#	TBT (tributyl-tin)#
Units	mg/Kg	mg/Kg
S1	<0.00001	<0.005
S2	<0.00001	<0.005
S3	<0.00001	<0.005
S4	<0.00001	<0.005
S5	<0.00001	<0.005
S6	<0.00001	<0.005
S7	<0.00001	<0.005
S8	<0.00001	<0.005
S9	<0.00001	<0.005
S10	<0.00001	<0.005
Method	DIN 38407-2 HE	EN ISO 17353
Detection Limit	0.00001	0.005
Method Uncertainity	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

Appendix 15: Sea Water Analysis Results

SGS

African Assay Laboratories (T) Ltd
Environmental Laboratory
Block C Plot 5 Balewa Road
PO Box 1826
Mwanza, Tanzania
Phone: +255 282501090
Fax: +255 282501093
Email: TZ.Environment@sgs.com
Internet: www.sgs.com

Lab Ref EL150390
Client Ref
Project
Reported 12/23/2015
Status Final
Page 2 of 3

ANALYTICAL REPORT

Sample Ident	*pH*	*Salinity (NaCl)**	*Phosphate*	*Nitrate*	*Nitrite*	*TSS*
Units	*SU*	*‰*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
S1	8.0	28.0	1.3	8.2	0.71	243
S2	7.9	35.8	0.41	0.87	0.06	253
S3	7.9	40.0	0.023	0.15	0.02	172
S4	7.7	33.7	5.0	28.1	0.65	164
S5	8.0	39.4	0.19	0.60	0.06	117
S6	8.0	38.2	0.12	2.1	0.15	108
S7	8.0	36.1	0.26	1.5	0.22	86.2
S8	8.0	37.8	0.013	<0.01	<0.01	90.8
9	8.1	36.6	0.082	<0.01	<0.01	117
S10	7.9	3.9	1.4	<0.01	<0.01	322
Method	*pH in water*	*Salinity (‰)*	*Phosphate*	*Nitrate+Nitrite*	*Nitrate+Nitrite*	*TSS*
Detection Limit	-	-	*0.005*	*0.01*	*0.01*	*1.0*
Method Uncertainity	*±0.012*	-	*±0.004*	*±0.008*	*±0.007*	*±0.76*

NA - not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited* *# - subcontracted* *TNTC - too numerous to count*

SGS

African Assay Laboratories (T) Ltd
Environmental Laboratory
Block C Plot 5 Balewa Road
PO Box 1826
Mwanza, Tanzania
Phone: +255 282501090
Fax: +255 282501093
Email: TZ.Environment@sgs.com
Internet: www.sgs.com

Lab Ref EL150390
Client Ref
Project
Reported 12/23/2015
Status Final
Page 3 of 3

ANALYTICAL REPORT

Sample Ident	*Turbidity*	*DO**	*BOD**
Units	*NTU*	*mg/l*	*mg/l*
S1	76.8	<0.10	210
S2	48.5	<0.10	120
S3	10.1	5.3	27.0
S4	32.2	3.9	100
S5	10.2	5.1	90.0
S6	24.2	4.5	110
S7	18.7	4.7	100
S8	8.0	4.3	90.0
9	13.5	5.7	80.0
S10	312	5.5	70.0
Method	*Turb*	*issolved Oxyge*	*BOD*
Detection Limit	*0.10*	*0.10*	*0.10*
Method Uncertainity	*±0.18*	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count*

END OF REPORT

Appendix 16: Air Quality, Noise and Vibrations Detailed Measurements

A. Details of Suspended Particulate Matter Emission; A1: Details for TSP (mg/m^3); for GPS see Appendix 14.

Point	Measuring Location	Value	DAY TIME TSP (mg/m^3)					Max. Limit IFC/WHO
			Reading 1	Reading 2	Reading 3	Reading 4	Mean	
1	Gate No. 5	Mean	0.233	0.235	0.231	0.256	0.239	0.230
		Max.	0.293	0.251	0.298	0.332	0.294	
2	Grain Silos Area	Mean	0.013	0.152	0.027	0.097	0.072	
		Max.	0.125	0.284	0.115	0.335	0.215	
3	Lighter quay wharf (upward wind direction)	Mean	0.017	0.023	0.044	0.043	0.032	
		Max.	0.256	0.223	0.263	0.213	0.239	
4	Lighter quay wharf (downward wind direction)	Mean	0.018	0.002	0.040	0.042	0.026	
		Max.	0.272	0.314	0.247	0.234	0.267	
5	Gerezani creek (LHS)	Mean	0.001	0.009	0.001	0.002	0.003	
		Max.	0.241	0.216	0.222	0.197	0.219	
6	Gerezani creek (Front Side)	Mean	0.092	0.089	0.086	0.003	0.068	
		Max.	0.176	0.092	0.305	0.138	0.178	
7	Gerezani creek (RHS)	Mean	0.004	0.008	0.008	0.008	0.007	
		Max.	0.349	0.009	0.009	0.010	0.094	
8	Between Berths I & II	Mean	0.004	0.003	0.002	0.003	0.003	
		Max.	0.005	0.004	0.003	0.004	0.004	
9	Between Berth III & IV	Mean	0.002	0.003	0.002	0.003	0.003	
		Max.	0.003	0.003	0.004	0.004	0.004	
10	TASAF Office (control point)	Mean	0.006	0.003	0.002	0.007	0.005	
		Max.	0.011	0.020	0.019	0.080	0.033	
11	Berth VII	Mean	0.241	0.236	0.213	0.247	0.234	
		Max.	0.262	0.238	0.223	0.251	0.244	
12	Berth V	Mean	0.041	0.093	0.066	0.080	0.070	
		Max.	0.190	0.095	0.251	0.162	0.175	

Point	Measuring Location	Value	NIGHT HOURS TSP (mg/m^3)					Max. Limit IFC/WHO
			Reading 1	Reading 2	Reading 3	Reading 4	Mean	
1	Gate No. 5	Mean	0.215	0.211	0.223	0.218	0.217	0.230
		Max.	0.194	0.231	0.265	0.302	0.248	
2	Grain Silos Area	Mean	0.012	0.141	0.016	0.065	0.059	
		Max.	0.115	0.220	0.166	0.293	0.199	
3	Lighter quay wharf upward wind direction)	Mean	0.018	0.016	0.051	0.051	0.034	
		Max.	0.195	0.132	0.211	0.189	0.182	
4	Lighter quay wharf downward wind direction)	Mean	0.019	0.002	0.034	0.032	0.022	
		Max.	0.179	0.215	0.245	0.240	0.220	
5	Gerezani creek (LHS)	Mean	0.001	0.004	0.002	0.003	0.003	
		Max.	0.188	0.198	0.211	0.185	0.196	
6	Gerezani creek (Front Side)	Mean	0.052	0.070	0.051	0.002	0.044	
		Max.	0.156	0.062	0.144	0.144	0.127	
7	Gerezani creek (RHS)	Mean	0.004	0.006	0.006	0.008	0.006	
		Max.	0.140	0.008	0.010	0.010	0.042	
8	Between Berths I & II	Mean	0.002	0.003	0.003	0.003	0.003	
		Max.	0.003	0.004	0.004	0.004	0.004	
9	Between Berth III & IV	Mean	0.001	0.002	0.002	0.002	0.002	
		Max.	0.002	0.002	0.003	0.003	0.003	
10	TASAF Office (control point)	Mean	0.002	0.003	0.002	0.005	0.003	
		Max.	0.070	0.080	0.090	0.090	0.083	
11	Berth VII	Mean	0.187	0.240	0.190	0.240	0.214	
		Max.	0.240	0.243	0.221	0.233	0.234	
12	Berth V	Mean	0.040	0.040	0.051	0.051	0.046	
		Max.	0.170	0.065	0.231	0.231	0.174	

A2: Details for PM10

Point	Measuring Location	Value	DAY TIME PM10 (mg/m^3)					MAX. LIMIT*	
			Reading 1	Reading 2	Reading 3	Reading 4	Mean	IFC/WHO	TBS (TZS 845:2005)
1	Gate No. 5	Mean	0.117	0.118	0.116	0.128	0.119	0.115	0.06-0.09
		Max.	0.147	0.126	0.149	0.166	0.147		
2	Grain Silos Area	Mean	0.007	0.076	0.014	0.049	0.036		
		Max.	0.063	0.142	0.058	0.168	0.107		
3	Lighter quay wharf (upward wind direction)	Mean	0.009	0.012	0.022	0.022	0.016		
		Max.	0.128	0.112	0.132	0.107	0.119		
4	Lighter quay wharf (downward wind direction)	Mean	0.009	0.001	0.020	0.021	0.013		
		Max.	0.136	0.157	0.124	0.117	0.133		
5	Gerezani creek (LHS)	Mean	0.001	0.005	0.001	0.001	0.002		
		Max.	0.121	0.108	0.111	0.099	0.110		
6	Gerezani creek (Front Side)	Mean	0.046	0.045	0.043	0.002	0.034		
		Max.	0.088	0.046	0.153	0.069	0.089		
7	Gerezani creek (RHS)	Mean	0.002	0.004	0.004	0.004	0.004		
		Max.	0.175	0.005	0.005	0.005	0.047		
8	Between Berths I & II	Mean	0.002	0.002	0.001	0.002	0.002		
		Max.	0.003	0.002	0.002	0.002	0.002		
9	Between Berth III & IV	Mean	0.001	0.002	0.001	0.002	0.001		
		Max.	0.002	0.002	0.002	0.002	0.002		
10	TASAF Office (control point)	Mean	0.003	0.002	0.001	0.004	0.002		
		Max.	0.006	0.010	0.010	0.040	0.016		
11	Berth VII	Mean	0.121	0.118	0.107	0.124	0.117		
		Max.	0.131	0.119	0.112	0.126	0.122		
12	Berth V	Mean	0.021	0.047	0.033	0.040	0.035		
		Max.	0.095	0.048	0.126	0.081	0.087		

Point	Measuring Location	Value	NIGHT HOURS PM10 (mg/m^3)					MAX. LIMIT*	
			Reading 1	Reading 2	Reading 3	Reading 4	Mean	IFC/ WHO	TBS (TZS 845:2005)
1	Gate No. 5 (along Bandari Road)	Mean	0.108	0.106	0.112	0.109	0.108	0.115	0.06-0.09
		Max.	0.097	0.116	0.133	0.151	0.124		
2	Grain Silos Area	Mean	0.006	0.071	0.008	0.033	0.029		
		Max.	0.058	0.110	0.083	0.147	0.099		
3	Lighter quay wharf (upward wind direction)	Mean	0.009	0.008	0.026	0.026	0.017		
		Max.	0.098	0.066	0.106	0.095	0.091		
4	Lighter quay wharf (downward wind direction)	Mean	0.010	0.001	0.017	0.016	0.011		
		Max.	0.090	0.108	0.123	0.120	0.110		
5	Gerezani creek (LHS)	Mean	0.001	0.002	0.001	0.002	0.001		
		Max.	0.094	0.099	0.106	0.093	0.098		
6	Gerezani creek (Front Side)	Mean	0.026	0.035	0.026	0.001	0.022		
		Max.	0.078	0.031	0.072	0.072	0.063		
7	Gerezani creek (RHS)	Mean	0.002	0.003	0.003	0.004	0.003		
		Max.	0.070	0.004	0.005	0.005	0.021		
8	Between Berths I & II	Mean	0.001	0.002	0.002	0.002	0.001		
		Max.	0.002	0.002	0.002	0.002	0.002		
9	Between Berth III & IV	Mean	0.001	0.001	0.001	0.001	0.001		
		Max.	0.001	0.001	0.002	0.002	0.001		
10	TASAF Office (control point)	Mean	0.001	0.002	0.001	0.003	0.002		
		Max.	0.035	0.040	0.045	0.045	0.041		
11	Berth VII	Mean	0.094	0.120	0.095	0.120	0.107		
		Max.	0.120	0.122	0.111	0.117	0.117		
12	Berth V	Mean	0.020	0.020	0.026	0.026	0.023		
		Max.	0.085	0.033	0.116	0.116	0.087		

B: Details of the Gaseous Emissions

B1: Day time readings

Measuring Location	Reading #	O2 [%]	CO [mg/m^3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m^3]	NO [mg/m^3]	NOx [mg/m^3]	Methane [%]
Gate No. 5 (along Bandari Road)	1	20.90	N.D	N.D	31.40	N.D	0.02	0.02	N.D
	2	20.90	N.D	N.D	31.40	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	31.60	0.01	N.D	N.D	N.D
	4	20.90	N.D	N.D	31.80	0.02	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	31.55	0.02	0.02	0.02	N.D
Grain Silos Area	1	20.90	N.D	N.D	32.20	0.02	0.00	0.00	N.D
	2	20.90	N.D	N.D	32.00	N.D	0.01	0.02	N.D
	3	20.90	N.D	N.D	31.80	N.D	0.01	0.01	N.D
	4	20.90	N.D	N.D	31.80	N.D	0.00	0.00	N.D
	Mean	20.90	N.D	N.D	31.95	0.02	0.01	0.01	N.D
Lighter Quay wharf (Upward Wind Direction)	1	20.90	N.D	N.D	37.70	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	38.40	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	38.40	0.02	0.01	0.01	N.D
	4	20.90	N.D	N.D	38.40	0.00	0.01	0.02	N.D
	Mean	20.90	N.D	N.D	38.23	0.01	0.01	0.02	N.D
Lighter Quay wharf (Downward Wind Direction)	1	20.90	N.D	N.D	37.30	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	34.70	0.02	0.03	0.03	N.D
	3	20.90	N.D	N.D	34.70	0.02	N.D	N.D	N.D
	4	20.90	N.D	N.D	34.70	0.02	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	35.35	0.02	0.03	0.03	N.D
Gerezani creek: (LHS)	1	20.90	N.D	N.D	33.20	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	31.90	N.D	N.D	N.D	N.D
	3	20.80	N.D	N.D	31.60	N.D	N.D	N.D	N.D
	4	20.80	N.D	N.D	31.60	N.D	N.D	N.D	N.D
	Mean	20.85	N.D	N.D	32.08	N.D	N.D	N.D	N.D
Gerezani creek: (Front Side)	1	20.90	N.D	N.D	30.10	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	30.00	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	30.00	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	30.00	N.D	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	30.03	N.D	N.D	N.D	N.D
Gerezani creek: (RHS)	1	21.00	N.D	N.D	36.10	0.02	0.02	0.02	N.D
	2	20.90	N.D	N.D	36.50	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	36.70	0.02	0.05	0.05	N.D
	4	20.90	N.D	N.D	36.90	0.02	0.05	0.05	N.D
	Mean	20.93	N.D	N.D	36.55	0.02	0.04	0.04	N.D
Between Berths I & II	1	20.90	N.D	N.D	38.60	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	38.50	0.02	N.D	N.D	N.D
	3	20.80	N.D	N.D	38.20	N.D	0.05	0.05	N.D
	4	20.90	N.D	N.D	36.30	0.02	0.05	0.05	N.D
	Mean	20.88	N.D	N.D	37.90	0.02	0.05	0.05	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth III	1	20.90	N.D	N.D	36.50	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	36.20	N.D	N.D	N.D	N.D
	3	20.80	N.D	N.D	36.00	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	35.80	N.D	N.D	N.D	N.D
	Mean	20.88	N.D	N.D	36.13	N.D	N.D	N.D	N.D
Berth IV	1	20.80	N.D	N.D	35.40	0.01	N.D	N.D	N.D
	2	20.80	N.D	N.D	35.40	N.D	N.D	N.D	N.D
	3	20.80	N.D	N.D	35.40	N.D	N.D	N.D	N.D
	4	20.80	N.D	N.D	35.60	0.01	N.D	N.D	N.D
	Mean	20.80	N.D	N.D	35.45	0.01	N.D	N.D	N.D
Berth VI	1	20.70	N.D	N.D	35.70	N.D	N.D	N.D	N.D
	2	20.70	N.D	N.D	35.60	N.D	N.D	N.D	N.D
	3	20.80	N.D	N.D	37.50	N.D	N.D	N.D	N.D
	4	20.80	N.D	N.D	37.60	N.D	N.D	N.D	N.D
	Mean	20.75	N.D	N.D	36.60	N.D	N.D	N.D	N.D
TASAF Office (as Control Point)	1	20.90	N.D	N.D	31.90	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	31.80	0.02	N.D	N.D	N.D
	3	20.90	N.D	N.D	32.00	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	32.10	N.D	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	31.95	0.02	N.D	N.D	N.D
Berth VII	1	20.90	N.D	N.D	37.20	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	37.70	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	37.70	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	37.80	N.D	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	37.60	N.D	N.D	N.D	N.D
Berth V	1	20.90	N.D	N.D	38.10	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	38.10	0.02	0.02	0.03	N.D
	3	20.90	N.D	N.D	36.80	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	36.90	N.D	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	37.48	0.02	0.02	0.03	N.D
Gate no.3 along Bandari road	1	20.90	N.D	N.D	35.20	N.D	N.D	N.D	N.D
	2	20.90	N.D	N.D	35.70	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	35.80	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	35.80	N.D	N.D	N.D	N.D
	Mean	20.90	N.D	N.D	35.63	N.D	N.D	N.D	N.D
Port manager office	1	20.90	N.D	N.D	35.30	N.D	0.02	0.01	N.D
	2	20.90	N.D	N.D	35.70	N.D	N.D	N.D	N.D
	3	20.90	N.D	N.D	36.70	N.D	N.D	N.D	N.D
	4	20.90	N.D	N.D	36.80	N.D	0.02	0.01	N.D
	Mean	20.90	N.D	N.D	36.13	N.D	0.02	0.01	N.D
NHIF HQ, along Bandari road	1	20.90	N.D	N.D	36.80	N.D	0.02	0.04	N.D
	2	20.90	N.D	N.D	36.90	N.D	0.02	0.04	N.D
	3	20.90	N.D	N.D	37.30	N.D	0.02	0.02	N.D
	4	20.90	N.D	N.D	37.80	N.D	0.00	0.00	N.D
	Mean	20.90	N.D	N.D	37.20	N.D	0.02	0.03	N.D

B2: Night hours Gases Emission

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Gate No. 5 (Along Bandari Road)	1	20.8	N.D	N.D	31.1	N.D	0.02	0.02	N.D
	2	20.8	N.D	N.D	31.2	N.D	0.02	0.02	N.D
	3	20.8	N.D	N.D	31.1	N.D	0.02	0.02	N.D
	4	20.8	N.D	N.D	30.8	N.D	0.02	0.02	N.D
	Mean	20.8	N.D	N.D	31.1	N.D	0.02	0.02	N.D
Grain Silos Area	1	20.85	N.D	N.D	32.2	N.D	N.D	N.D	N.D
	2	20.85	N.D	N.D	32.2	N.D	N.D	N.D	N.D
	3	20.85	N.D	N.D	31.1	N.D	N.D	N.D	N.D
	4	20.85	N.D	N.D	31.3	N.D	N.D	N.D	N.D
	Mean	20.85	N.D	N.D	31.7	N.D	N.D	N.D	N.D
Lighter Quay Wharf (Upward Wind Direction)	1	20.82	N.D	N.D	37.5	N.D	N.D	N.D	N.D
	2	20.84	N.D	N.D	38.1	N.D	N.D	N.D	N.D
	3	20.82	N.D	N.D	37.4	N.D	N.D	N.D	N.D
	4	20.82	N.D	N.D	37.4	N.D	N.D	N.D	N.D
	Mean	20.83	N.D	N.D	37.6	N.D	N.D	N.D	N.D
Lighter Quay wharf (Downward Wind Direction)	1	20.87	N.D	N.D	37.3	N.D	N.D	N.D	N.D
	2	20.88	N.D	N.D	35.7	0.01	N.D	N.D	N.D
	3	20.88	N.D	N.D	35.1	0.02	N.D	N.D	N.D
	4	20.7	N.D	N.D	34.9	0.01	N.D	N.D	N.D
	Mean	20.83	N.D	N.D	35.2	0.01	N.D	N.D	N.D
Gerezani creek: (LHS)	1	20.8	N.D	N.D	28.8	N.D	N.D	N.D	N.D
	2	20.8	N.D	N.D	29.9	0.01	N.D	N.D	N.D
	3	20.8	N.D	N.D	29.6	0.01	N.D	N.D	N.D
	4	20.8	N.D	N.D	29.8	0.01	N.D	N.D	N.D
	Mean	20.8	N.D	N.D	29.5	0.01	N.D	N.D	N.D
Gerezani creek: (Front Side)	1	20.8	N.D	N.D	30	N.D	N.D	N.D	N.D
	2	20.8	N.D	N.D	30	N.D	N.D	N.D	N.D
	3	20.8	N.D	N.D	30	N.D	N.D	N.D	N.D
	4	20.8	N.D	N.D	30	N.D	N.D	N.D	N.D
	Mean	20.8	N.D	N.D	30	N.D	N.D	N.D	N.D
Gerezani creek: RHS	1	20.81	N.D	N.D	33.7	0.02	0.02	0.02	N.D
	2	20.82	N.D	N.D	33.6	N.D	N.D	N.D	N.D
	3	20.8	N.D	N.D	33.3	N.D	N.D	N.D	N.D
	4	20.8	N.D	N.D	33.8	N.D	N.D	N.D	N.D
	Mean	20.81	N.D	N.D	33.6	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]

Between Berths I & II	1	20.89	N.D	N.D	35.1	N.D	N.D	N.D	N.D
	2	20.88	N.D	N.D	35.2	N.D	N.D	N.D	N.D
	3	20.87	N.D	N.D	35.2	N.D	0.02	0.02	N.D
	4	20.87	N.D	N.D	35.3	N.D	0.02	0.02	N.D
	Mean	20.88	N.D	N.D	35.2	N.D	0.02	0.02	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth III	1	20.9	N.D	N.D	34.5	N.D	N.D	N.D	N.D
	2	20.9	N.D	N.D	34.2	N.D	N.D	N.D	N.D
	3	20.8	N.D	N.D	34	N.D	N.D	N.D	N.D
	4	20.9	N.D	N.D	34.1	N.D	N.D	N.D	N.D
	Mean	20.9	N.D	N.D	34.2	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth IV	1	20.9	N.D	N.D	32.1	N.D	N.D	N.D	N.D
	2	20.9	N.D	N.D	32	N.D	N.D	N.D	N.D
	3	20.9	N.D	N.D	32.1	N.D	N.D	N.D	N.D
	4	20.9	N.D	N.D	32.2	N.D	N.D	N.D	N.D
	Mean	20.9	N.D	N.D	32.1	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth VI	1	20.7	N.D	N.D	33.4	N.D	N.D	N.D	N.D
	2	20.7	N.D	N.D	33.3	N.D	N.D	N.D	N.D
	3	20.7	N.D	N.D	33.1	N.D	N.D	N.D	N.D
	4	20.7	N.D	N.D	33.4	N.D	N.D	N.D	N.D
	Mean	20.7	N.D	N.D	33.3	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
TASAF Office (as Control Point)	1	20.8	N.D	N.D	30.3	N.D	N.D	N.D	N.D
	2	20.8	N.D	N.D	31.1	N.D	N.D	N.D	N.D
	3	20.8	N.D	N.D	30.5	N.D	N.D	N.D	N.D
	4	20.8	N.D	N.D	30.1	N.D	N.D	N.D	N.D
	Mean	20.8	N.D	N.D	30.5	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth VII	1	20.9	N.D	N.D	31.2	N.D	N.D	N.D	N.D
	2	20.9	N.D	N.D	31.3	N.D	N.D	N.D	N.D
	3	20.9	N.D	N.D	31.4	N.D	N.D	N.D	N.D
	4	20.9	N.D	N.D	31.3	N.D	N.D	N.D	N.D
	Mean	20.9	N.D	N.D	31.3	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Berth V	1	20.9	N.D	N.D	34.1	N.D	N.D	N.D	N.D
	2	20.9	N.D	N.D	34.1	0.02	0.03	0.03	N.D
	3	20.9	N.D	N.D	33.9	N.D	N.D	N.D	N.D
	4	20.9	N.D	N.D	33.9	N.D	N.D	N.D	N.D
	Mean	20.9	N.D	N.D	34	0.02	0.03	0.03	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Gate no.3 along Bandari road	1	20.8	N.D	N.D	32.2	N.D	N.D	N.D	N.D
	2	20.8	N.D	N.D	32.3	N.D	1.5	1.5	N.D
	3	20.8	N.D	N.D	32.1	N.D	N.D	N.D	N.D
	4	20.8	N.D	N.D	32.2	N.D	1.5	1.5	N.D
	Mean	20.8	N.D	N.D	32.2	N.D	1.5	1.5	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
Port Manager Office	1	20.9	N.D	N.D	32.5	N.D	N.D	N.D	N.D
	2	20.9	N.D	N.D	32.7	N.D	N.D	N.D	N.D
	3	20.9	N.D	N.D	32.6	N.D	N.D	N.D	N.D
	4	20.9	N.D	N.D	32.6	N.D	N.D	N.D	N.D
	Mean	20.9	N.D	N.D	32.6	N.D	N.D	N.D	N.D

Measuring Location	Reading #	O2 [%]	CO [mg/m3]	CO2 [%]	Ambient Temp. [°C]	SO2 [mg/m3]	NO [mg/m3]	NOx [mg/m3]	Methane [%]
NHIF HQ, along Bandari road	1	20.86	N.D	N.D	33.3	N.D	N.D	N.D	N.D
	2	20.86	N.D	N.D	33.2	N.D	N.D	N.D	N.D
	3	20.85	N.D	N.D	33.1	N.D	N.D	N.D	N.D
	4	20.86	N.D	N.D	33.2	N.D	N.D	N.D	N.D
	Mean	20.86	N.D	N.D	33.2	N.D	N.D	N.D	N.D

C: Details on noise level emissions

Point	Measuring Location	DAY TIME NOISE LEVELS (dBA)					TBS LIMIT- EMDC 6(1733) P2
		Reading1	Reading2	Reading3	Reading4	Mean	
1	Gate No. 5	66.7	85.4	84.9	90.0	81.8	85.0
2	Grain Silos Area	78.5	81.6	74.2	79.5	78.5	
3	Lighter Quay (Upward Wind Direction)	70.6	72.5	80.4	90.3	78.5	
4	Lighter Quay (Downward Wind Direction)	60.9	61.4	66.1	61.3	62.4	
5	Gerezani creek (LHS)	70.0	70.4	58.8	64.1	65.8	
6	Gerezani creek (Front Side)	68.7	57.0	56.8	71.6	63.5	
7	Gerezani creek (RHS)	55.5	58.0	59.0	52.0	56.1	
8	Between Berths I & II	61.5	64.7	66.7	67.8	65.2	
9	Berth III	55.5	80.2	78.5	52.5	66.7	
10	Berth IV	55.2	59.1	60.5	59.1	58.5	
11	Berth VI	61.6	58.8	61.4	60.5	60.6	
12	TASAF Office (as Control Point)	58.1	55.4	61.6	55.7	57.7	
13	Berth VII	75.5	86.1	82.0	90.1	83.4	
14	Berth V	72.6	75.5	77.5	86.4	78.0	
15	Gate No.3 (Along Bandari Road)	68.2	80.8	86.5	89.0	81.1	
16	Port Manager office	62.3	60.1	59.8	65.5	61.9	
17	NHIF HQ (Along Bandari road)	72.1	65.4	80.2	86.0	75.9	

69.2	

Point	Measuring Location	NIGHT TIME NOISE LEVELS (dBA)					TBS LIMIT- EMDC 6 (1733) P2
		Reading1	Reading2	Reading3	Reading4	Mean	
1	Gate No. 5	67.60	68.50	67.70	60.90	66.18	60
2	Grain Silos Area	55.40	59.90	57.70	57.80	57.70	
3	Lighter Quay (Upward Wind Direction)	58.90	58.80	60.50	59.90	59.53	
4	Lighter Quay (Downward Wind Direction)	55.70	59.40	56.10	55.80	56.75	
5	Gerezani creek (LHS)	54.90	55.60	54.90	53.80	54.80	
6	Gerezani creek (Front Side)	50.50	55.70	57.90	60.40	56.13	
7	Gerezani creek (RHS)	53.50	54.00	60.00	55.00	55.63	
8	Between Berths I & II	59.20	50.10	60.00	59.50	57.20	
9	Berth III	56.50	60.10	54.50	62.50	58.40	

10	Berth IV	52.40	57.00	61.20	60.10	57.68	
11	Berth VI	59.60	58.90	60.40	60.50	59.85	
12	TASAF Office (Control Point)	47.90	49.80	50.10	48.90	49.18	
13	Berth VII	66.60	67.20	65.20	60.10	64.78	
14	Berth V	65.50	65.70	60.00	66.10	64.33	
15	Gate No.3 (Along Bandari Road)	75.50	70.80	69.80	58.90	68.75	
16	Port Manager office	59.90	60.10	62.40	60.20	60.65	
17	NHIF HQ (Along Bandari road)	70.30	68.20	69.00	66.70	68.55	
59.77							

D: Details Ground Vibration Levels

D1: Day Time Ground Vibration Levels

1):	**GRAIN SILOS**							
POINT NO.	**Measured Vibration Level (m/s2)**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER ELV****
1	0.0169	0.0238	0.0248	0.0252	0.0227	0.0113	NO	NO
2	0.0251	0.0249	0.0253	0.0243	0.0249	0.0125	NO	NO
3	0.0161	0.0158	0.0160	0.0269	0.0187	0.0094	NO	NO
4	0.02708	0.0266	0.01218	0.01162	0.0194	0.0097	NO	NO
5	0.0115	0.0112	0.0111	0.0259	0.0149	0.0075	NO	NO
Mean Vibration Level					**0.02**	**0.01**	NO	NO
2):	**BERTH III**							
POINT NO.	**Measured Vibration Level (m/s2)**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0110	0.0003	0.0010	0.0008	0.00	0.00	NO	NO
2	0.0017	0.0004	0.0001	0.0000	0.00	0.00	NO	NO
3	0.0000	0.0000	0.0000	0.0000	0.00	0.00	NO	NO
4	0.0000	0.0000	0.0000	0.0000	0.00	0.00	NO	NO
5	0.0000	0.0000	0.0001	0.0000	0.1	0.05	NO	NO
Mean Vibration Level					**0.02**	**0.01**	NO	NO
3):	**BERTH IV**							
POINT NO.	**Measured Vibration Level (m/s2)**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	NO	NO
2	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	NO	NO
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	NO	NO
4	0.0000	0.0001	0.0001	0.0000		0.0000	NO	NO

					0.0000			
5	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	NO	NO
Mean Vibration Level					**0.0000**	**0.0000**	NO	NO

4): BERTH V

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0004	0.0002	0.0002	0.0001	0.0002	0.0001	NO	NO
2	0.0003	0.0002	0.0001	0.0001	0.0002	0.0001	NO	NO
3	0.0002	0.0002	0.0003	0.0003	0.0002	0.0001	NO	NO
4	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	NO	NO
5	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	NO	NO
Mean Vibration Level					**0.0002**	**0.0001**	**NO**	**NO**

5): BERTH VI

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0002	0.0000	0.0000	0.0000	0.0001	0.0000	NO	NO
2	0.0005	0.0001	0.0000	0.0000	0.0002	0.0001	NO	NO
3	0.0001	0.0001	0.0000	0.0000	0.0001	0.0000	NO	NO
4	0.0000	0.0000	0.0000	0.0002	0.0001	0.0000	NO	NO
5	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	NO	NO
Mean Vibration Level					**0.0001**	**0.0000**	**NO**	**NO**

6). Between Berths I&II

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0079	0.0121	0.0004	0.0002	0.0051	0.0026	NO	NO
2	0.0093	0.0102	0.0172	0.0020	0.0097	0.0048	NO	NO
3	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	NO	NO
4	0.0008	0.0003	0.0001	0.0007	0.0005	0.0002	NO	NO
5	0.0001	0.0025	0.0023	0.0001	0.0012	0.0006	NO	NO
Mean Vibration Level					**0.0033**	**0.0017**	**NO**	**NO**

7): BERTH VII

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	**Reading 2**	**Reading 3**	**Reading**	**MEAN**	**DAILY**	**OVER**	**OVER**

				4		EXPOSURE*	EAV**	1.15**
1	0.0086	0.0126	0.0042	0.0022	0.0069	0.0035	NO	NO
2	0.0094	0.0124	0.0176	0.0018	0.0103	0.0052	NO	NO
3	0.0002	0.0008	0.0001	0.0014	0.0006	0.0003	NO	NO
4	0.0008	0.0003	0.0001	0.0007	0.0005	0.0002	NO	NO
5	0.0001	0.0026	0.0028	0.0014	0.0017	0.0009	NO	NO
Mean Vibration Level					**0.0040**	**0.0020**	**NO**	**NO**

8): TASAF Offices as control point (offsite)

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0159	0.0073	0.0088	0.0095	0.0104	0.0052	NO	NO
2	0.0087	0.0090	0.0089	0.0090	0.0089	0.0045	NO	NO
3	0.0091	0.0091	0.0091	0.0092	0.0091	0.0046	NO	NO
4	0.0092	0.0091	0.0091	0.0052	0.0081	0.0041	NO	NO
5	0.0105	0.0105	0.0106	0.0106	0.0106	0.0053	NO	NO
Mean Vibration Level					**0.0094**	**0.0047**	**NO**	**NO**

9): GATE 3 & NHIF

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0073	0.0088	0.0095	0.0087	0.0086	0.0043	NO	NO
2	0.0090	0.0089	0.0090	0.0091	0.0090	0.0045	NO	NO
3	0.0091	0.0091	0.0092	0.0092	0.0091	0.0046	NO	NO
4	0.0091	0.0091	0.0052	0.0105	0.0085	0.0042	NO	NO
5	0.0105	0.0106	0.0106	0.0108	0.0106	0.0053	NO	NO
Mean Vibration Level					**0.0092**	**0.0046**	**NO**	**NO**

10): GATE 05

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0004	0.0002	0.0002	0.0002	0.0003	0.0001	NO	NO
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	NO	NO
3	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	NO	NO
4	0.0001	0.0001	0.0001	0.0000		0.0000	NO	NO

					0.0001			
5	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	NO	NO
Mean Vibration Level					**0.0001**	**0.0001**	**NO**	**NO**

11): Gerezani creek (LHS)

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0021	0.0027	0.0034	0.0022	0.0026	0.0013	NO	NO
2	0.0049	0.0042	0.0040	0.0021	0.0038	0.0019	NO	NO
3	0.0021	0.0030	0.0028	0.0010	0.0022	0.0011	NO	NO
4	0.0024	0.0024	0.0032	0.0020	0.0025	0.0012	NO	NO
5	0.0024	0.0024	0.0032	0.0020	0.0025	0.0012	NO	NO
Mean Vibration Level					**0.0027**	**0.0014**	**NO**	**NO**

12): Gerezani creek (Front side)

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0006	0.0002	0.0011	0.0008	0.0007	0.0003	NO	NO
2	0.0001	0.0003	0.0001	0.0000	0.0001	0.0001	NO	NO
3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	NO	NO
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	NO	NO
5	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	NO	NO
Mean Vibration Level					**0.0002**	**0.0001**	**NO**	**NO**

13): Gerezani creek (RHS)

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0004	0.0001	0.0000	0.0000	0.0001	0.0001	NO	NO
2	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	NO	NO
3	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	NO	NO
4	0.0000	0.0000	0.0001	0.0002	0.0001	0.0000	NO	NO
5	0.0001	0.0001	0.0000	0.0000	0.0001	0.0000	NO	NO
Mean Vibration Level					**0.0001**	**0.0000**	**NO**	**NO**

14): LIGHTER QUAY DOWNWIND

POINT	Measured Vibration Level (m/s2)

NO.	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0003	0.0003	0.0002	0.0002	0.00	0.00	NO	NO
2	0.0002	0.0002	0.0005	0.0004	0.00	0.00	NO	NO
3	0.0003	0.0003	0.0003	0.0003	0.00	0.00	NO	NO
4	0.0003	0.0019	0.0005	0.0003	0.00	0.00	NO	NO
5	0.0007	0.0001	0.0001	0.0001	0.00	0.00	NO	NO
Mean Vibration Level					**0.00**	**0.00**	**NO**	**NO**

15): LIGHTER QUAY UPWIND

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0050	0.0195	0.0046	0.0084	0.0094	0.0047	NO	NO
2	0.0095	0.0003	0.0044	0.0005	0.0037	0.0019	NO	NO
3	0.0007	0.0006	0.0006	0.0004	0.0006	0.0003	NO	NO
4	0.0006	0.0180	0.0059	0.0027	0.0068	0.0034	NO	NO
5	0.0095	0.0045	0.0133	0.0006	0.0070	0.0035	NO	NO
Mean Vibration Level					**0.0055**	**0.0027**	**NO**	**NO**

16): Port Manager office

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0051	0.0049	0.0114	0.0015	0.0057	0.0029	NO	NO
2	0.0051	0.0036	0.0133	0.0029	0.0062	0.0031	NO	NO
3	0.0052	0.0024	0.0151	0.0011	0.0059	0.0030	NO	NO
4	0.0052	0.0011	0.0170	0.0002	0.0059	0.0029	NO	NO
5	0.0052	0.0001	0.0189	0.0012	0.0063	0.0032	NO	NO
Mean Vibration Level					**0.0060**	**0.0030**	**NO**	**NO**

17): NHIF HQ along Bandari Road

POINT NO.	Measured Vibration Level (m/s2)							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0026	0.0084	0.0095	0.0087	0.0073	0.0037	NO	NO
2	0.0090	0.0082	0.0083	0.0008	0.0066	0.0033	NO	NO

3	0.0006	0.0014	0.0016	0.0018	0.0014	0.0007	NO	NO
4	0.0014	0.0006	0.0018	0.0004	0.0011	0.0005	NO	NO
5	0.0105	0.0106	0.0106	0.0108	0.0106	0.0053	NO	NO
Mean Vibration Level					**0.0054**	**0.0027**	**NO**	**NO**

D2: Night time Ground Vibration Levels

1):	**GRAIN SILOS**							
POINT NO.	**MEASURED VIBRATION LEVEL, m/s2**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER ELV****
1	0.0178	0.0241	0.0235	0.0249	0.0226	0.0113	NO	NO
2	0.0261	0.0238	0.0262	0.0233	0.0249	0.0124	NO	NO
3	0.0213	0.0156	0.0235	0.0269	0.0218	0.0109	NO	NO
4	0.02708	0.0266	0.0225	0.0162	0.0231	0.0115	NO	NO
5	0.0115	0.0112	0.0111	0.0259	0.0149	0.0075	NO	NO
MEAN VIBRATION LEVEL					**0.02**	**0.01**	**NO**	**NO**
2):	**BERTH III**							
POINT NO.	**MEASURED VIBRATION LEVEL, m/s2**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0210	0.0013	0.0020	0.0007	0.01	0.00	NO	NO
2	0.0017	0.0004	0.0001	0.0000	0.00	0.00	NO	NO
3	0.0000	0.0000	0.0000	0.0000	-	-	NO	NO
4	0.0000	0.0000	0.0000	0.0000	-	-	NO	NO
5	0.0000	0.0000	0.0001	0.0000	0.00	0.00	NO	NO
MEAN VIBRATION LEVEL					**0.00**	**0.00**	**NO**	**NO**
3):	**BERTH IV**							
POINT NO.	**MEASURED VIBRATION LEVEL, m/s2**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	NO	NO
2	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	NO	NO
3	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	NO	NO
4	0.0000	0.0001	0.0001	0.0000	0.0001	0.0000	NO	NO
5	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	NO	NO
MEAN VIBRATION LEVEL					**0.0001**	**0.0000**	**NO**	**NO**
4):	**BERTH V**							
POINT NO.	**MEASURED VIBRATION LEVEL, m/s2**							
	Reading 1	**Reading 2**	**Reading 3**	**Reading 4**	**MEAN**	**DAILY EXPOSURE***	**OVER EAV****	**OVER 1.15****
1	0.0004	0.0002	0.0002	0.0001	0.0002	0.0001	NO	NO
2	0.0003	0.0002	0.0003	0.0003	0.0003	0.0001	NO	NO
3	0.0002	0.0000	0.0000	0.0003	0.0001	0.0001	NO	NO
4	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	NO	NO
5	0.0002	0.0001	0.0002	0.0001	0.0002	0.0001	NO	NO

MEAN VIBRATION LEVEL				**0.0002**	**0.0001**	**NO**	**NO**

5): BERTH VI

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	NO	NO
2	0.0005	0.0001	0.0000	0.0000	0.0002	0.0001	NO	NO
3	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	NO	NO
4	0.0000	0.0000	0.0000	0.0002	0.0001	0.0000	NO	NO
5	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	NO	NO
MEAN VIBRATION LEVEL					**0.0001**	**0.0000**	**NO**	**NO**

6). BETWEEN BERTHS I &II

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0035	0.0111	0.0001	0.0002	0.0037	0.0019	NO	NO
2	0.0063	0.0112	0.0145	0.0020	0.0085	0.0043	NO	NO
3	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	NO	NO
4	0.0007	0.0003	0.0002	0.0007	0.0005	0.0002	NO	NO
5	0.0001	0.0021	0.0015	0.0002	0.0010	0.0005	NO	NO
MEAN VIBRATION LEVEL					**0.0028**	**0.0014**	**NO**	**NO**

7): BERTH VII

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0016	0.0118	0.0112	0.0012	0.0065	0.0032	NO	NO
2	0.0084	0.0134	0.0045	0.0145	0.0102	0.0051	NO	NO
3	0.0003	0.0008	0.0001	0.0014	0.0007	0.0003	NO	NO
4	0.0004	0.0003	0.0001	0.0007	0.0004	0.0002	NO	NO
5	0.0001	0.0013	0.0025	0.0014	0.0013	0.0007	NO	NO
MEAN VIBRATION LEVEL					**0.0038**	**0.0019**	**NO**	**NO**

8): TASAF OFFICE

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0112	0.0034	0.0022	0.006	0.0057	0.0029	NO	NO
2	0.0017	0.0018	0.0091	0.0073	0.0050	0.0025	NO	NO
3	0.008	0.009	0.0092	0.0093	0.0089	0.0044	NO	NO
4	0.0072	0.0081	0.0063	0.0068	0.0071	0.0036	NO	NO
5	0.0016	0.0120	0.0120	0.0120	0.0094	0.0047	NO	NO
MEAN VIBRATION LEVEL					**0.0072**	**0.0036**	**NO**	**NO**

9): GATE 3 & NHIF

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**

1	0.0013	0.0066	0.0065	0.0067	0.0053	0.0026	NO	NO
2	0.0290	0.0089	0.0190	0.0028	0.0149	0.0075	NO	NO
3	0.0091	0.0091	0.0092	0.0092	0.0092	0.0046	NO	NO
4	0.0091	0.0091	0.0052	0.0105	0.0085	0.0042	NO	NO
5	0.0115	0.0115	0.0116	0.0118	0.0116	0.0058	NO	NO
MEAN VIBRATION LEVEL					**0.0099**	**0.0049**	**NO**	**NO**

10): GATE 05

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0290	0.0089	0.0190	0.0028	0.0149	0.0075	NO	NO
2	0.0091	0.0091	0.0092	0.0092	0.0092	0.0046	NO	NO
3	0.0091	0.0091	0.0052	0.0105	0.0085	0.0042	NO	NO
4	0.0078	0.0078	0.0078	0.0078	0.0078	0.0039	NO	NO
5	0.0091	0.0091	0.0052	0.0105	0.0085	0.0042	NO	NO
MEAN VIBRATION LEVEL					**0.0098**	**0.0049**	**NO**	**NO**

11): GEREZANI CREEK (LHS)

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0011	0.0012	0.0015	0.0015	0.0013	0.0007	NO	NO
2	0.0090	0.0022	0.0032	0.0023	0.0042	0.0021	NO	NO
3	0.0031	0.043	0.0028	0.001	0.0125	0.0062	NO	NO
4	0.0024	0.0023	0.0032	0.0021	0.0025	0.0013	NO	NO
5	0.0022	0.0024	0.0032	0.0022	0.0025	0.0013	NO	NO
MEAN VIBRATION LEVEL					**0.0046**	**0.0023**	**NO**	**NO**

12): GEREZANI CREEK (FRONT SIDE)

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0006	0.0002	0.0011	0.0010	0.0007	0.0004	NO	NO
2	0.0003	0.0003	0.0001	0.0000	0.0002	0.0001	NO	NO
3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	NO	NO
4	0.0001	0.0000	0.0001	0.0002	0.0001	0.0001	NO	NO
5	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	NO	NO
MEAN VIBRATION LEVEL					**0.0002**	**0.0001**	**NO**	**NO**

13): GEREZANI CREEK (RHS)

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0004	0.0001	0.0000	0.0000	0.0001	0.0001	NO	NO
2	0.0006	0.0002	0.0011	0.0008	0.0007	0.0003	NO	NO
3	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	NO	NO
4	0.000	0.000	0.0001	0.0002	0.0001	0.0001	NO	NO
5	0.0001	0.0001	0.0000	0.0000	0.0001	0.0000	NO	NO
MEAN VIBRATION LEVEL					**0.0002**	**0.0001**	**NO**	**NO**

14): LIGHTER QUAY DOWNWIND

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0002	0.0002	0.0002	0.0002	0.00	0.00	NO	NO
2	0.0002	0.0002	0.0005	0.0004	0.00	0.00	NO	NO
3	0.0003	0.0003	0.0003	0.0003	0.00	0.00	NO	NO
4	0.0003	0.0019	0.0005	0.0003	0.00	0.00	NO	NO
5	0.0007	0.0004	0.0003	0.0002	0.00	0.00	NO	NO
MEAN VIBRATION LEVEL					**0.00**	**0.00**	**NO**	**NO**

15): LIGHTER QUAY UPWIND

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0053	0.0053	0.0053	0.0084	0.0061	0.0030	NO	NO
2	0.0095	0.0003	0.0044	0.0005	0.0037	0.0018	NO	NO
3	0.0017	0.0015	0.0017	0.0020	0.0017	0.0009	NO	NO
4	0.0007	0.018	0.0059	0.0027	0.0068	0.0034	NO	NO
5	0.0006	0.0045	0.0033	0.0006	0.0023	0.0011	NO	NO
	MEAN VIBRATION LEVEL				**0.0041**	**0.0021**	**NO**	**NO**

16): PORT MANAGER OFFICE

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0051	0.0049	0.0044	0.0015	0.0040	0.0020	NO	NO
2	0.0015	0.0024	0.0133	0.0029	0.0050	0.0025	NO	NO
3	0.0052	0.0028	0.0151	0.0013	0.0061	0.0031	NO	NO
4	0.0042	0.0011	0.0170	0.0002	0.0056	0.0028	NO	NO
5	0.0062	0.0002	0.0189	0.0012	0.0066	0.0033	NO	NO
MEAN VIBRATION LEVEL					**0.0055**	**0.0027**	**NO**	**NO**

17): NHIF HQ Along Bandari road

POINT NO.	MEASURED VIBRATION LEVEL, m/s2							
	Reading 1	Reading 2	Reading 3	Reading 4	MEAN	DAILY EXPOSURE*	OVER EAV**	OVER 1.15**
1	0.0037	0.0090	0.0068	0.0035	0.0058	0.0029	NO	NO
2	0.01	0.0042	0.0056	0.0027	0.0056	0.0028	NO	NO
3	0.0026	0.0014	0.0028	0.0018	0.0022	0.0011	NO	NO
4	0.0015	0.0015	0.0018	0.0004	0.0013	0.0007	NO	NO
5	0.0104	0.0111	0.0106	0.0112	0.0108	0.0054	NO	NO
MEAN VIBRATION LEVEL					**0.0051**	**0.0026**	**NO**	**NO**