PROJECT: EAST AFRICAN COASTAL CORRIDOR
DEVELOPMENT PROJECT: BAGAMOYO – TANGA – HOROHORO/ LUNGA LUNGA – MALINDI ROAD PROJECT: PHASE 1
COUNTRIES: KENYA AND TANZANIA

ESIA SUMMARY FOR THE PROPOSED UPGRADING TANGA - PANGANI - SAADANI - MAKURUNGE (229 KM) ROAD TO BITUMEN STANDARD IN TANGA AND COAST REGIONS, TANZANIA

Date: May 2019

<table>
<thead>
<tr>
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</thead>
<tbody>
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</table>
1. INTRODUCTION

1.1 The Government of the United Republic of Tanzania (GOT) and the Government of the Republic of Kenya (GOK), with the support of the East Africa Community (EAC), intend to improve the transport infrastructure in order to support economic development programs within the two countries, deepen economic co-operation and foster regional integration within the EAC. EAC has received a grant from the African Development Bank (AfDB) to carry out the Feasibility Studies and Detailed Engineering Design of the Tanga-Pangani-Saadani-Makurunge Road (179km).

1.2 The proposed Pangani – Saadani - Makurunge road forms part of the East African Community Regional Road Network Programme. In Kenya, the road links with Malindi – Mombasa - Lunga Lunga Road. This road is the most important link between Tanzania and Kenya, to and from Coastal areas of Tanzania and Kenya. The road facilitates cross border trade with Kenya (through Horohoro). The movement of people, goods, including agricultural produce from Tanga and Coast regions will be facilitated at national and international levels. The project road therefore provides an alternative trunk road between Dar es Salaam, Tanga and Mombasa facilitating transport and travel along the road impact areas and beyond.

2. PROJECT DESCRIPTION AND JUSTIFICATION

2.1 The road forms part of the Eastern Corridor that connects Dar-Es-Salaam to Tanga and Mombasa in Kenya. The present state of the road requires major rehabilitation and frequent maintenance. The upgrading aims at revamping its versatility so as to contribute more to the socio economic progression of the Coast and Tanga Regions, and especially Bagamoyo and Pangani Districts.

2.2 The project has been split into two lots to easy implementation as indicated below:

- Lot 2 – Upgrading Works Tungamaa – Pangani including Pangani Bridge (525m span) approach road (14.3 km), Ushongo Spur road (5.9 km) and Pangani Access road (5.4 km) to Bitumen standard);
- Lot 3 – Mkange – Mkwaja – Tungamaa (95.2 km) inclusive of 3.7km of spur road to Kipumbwi port to be implemented under complementary initiaives.
Figure 1: Map of the Project Area
2.3 **Major parts of the existing road are in poor conditions making it impassable during the rainy seasons.** The upgrade of the project road shall revamp the project areas versatility which shall contribute to the socio-economic progression of the Coast and Tanga Regions, and especially Bagamoyo and Pangani Districts. The road will also provide an alternative trunk road between Dar es Salaam, Tanga and Mombasa in neighboring country of Kenya. This shall ease and enhance communication between Tanzania and Kenya from Dar es Salaam via the touristic and historical town of Bagamoyo, Pangani, Tanga Mombasa to Malindi.

2.4 The northern part of the road i.e. Pangani and Saadani via Mkaja is normally covered in two hours while using a 4x4 vehicle, and becomes impassable after the rains. The problem is even serious in the southern part of the same road (a coastal route to Saadani) because of lack of a bridge at Wami River North of Bagamoyo. This short coming in areas transport infrastructures forces commuters to take a circuitous route from Dar es Salaam via Chalinze to Bagamoyo then further North which translate to takes 4-5 hours of additional travel time. The development of the proposed road from Makurunge with the construction of a bridge at Wami River crossing will attract visitation to the closest wildlife destination to Dar es Salaam located 130km away which offer combination of beach and wildlife viewing opportunity.

2.5 **Justification for ESIA:** It is a known fact that development of road projects often brings significant economic and social improvements. However, if these projects are designed and implemented without adequate integration of social, chemical and bio-physical environmental concerns, they might cause significant adverse impacts on the local communities, the general public and the natural environment. As a part of the larger project, the Environmental and Social Impact Assessment (ESIA) is used for the purpose of guiding the incorporation of the various environmental management considerations in the planning and development process of the project. The implementation of the findings from the ESIA enhances the project proposal to be implemented in sustainable manner.

3. **ALTERNATIVE ANALYSIS**

3.1. According to the field survey and stakeholders consultations it was noted that alternative consideration needs to be evaluated at some sections of the project roads. Alternative selection for this project is very challenging as the project area has a forest, Ocean and Park. The consultants tried as much as possible to avoid all the three ecosystems but at least one has to be affected. In the end the selected alternative of route managed to avoid the park and Ocean but sections of the forest could not be avoided thus it was agreed the route selected should be the shortest through the forest.

3.2. Apart from selection of routes based on environmental impact the route had to also make economic sense and according to practice a highway corridor should not be so close to another one as it shall not be economical viable. The existing highway from Dar-es-Salaam to Arusha was seen run parallel option B with 50km in between them which according to the economists is considered not economically viable.

3.3. **Description of the Key Sensitive Areas that Necessitated Alternative**

3.3.1. **Option A:** Road through Saadani Park Area: There is need to consider alternative route for the section of the road traversing through the park in order to reduce the anticipated impact to it and its associated forests. This led to the identification of three alternative alignments namely Option B, C and D as shown on the map found the map above. The aim of identifying the options is to provide the developer with alternatives to Option A as it was seen to traverse through a large section of sensitive ecosystems namely turtles breeding sites, elephants corridors and other wild animals habitat found within the park.
3.3.2. **Option B:** This alternative was selected to minimize the impact on Saadani National Park and therefore chosen to navigate around the boundaries of Saadani National Park, but on an existing track/gravel road alignment. This will be a complete new road as shown in blue on the map above. The route is more rolling than the coastal route, but with better expected foundation conditions as opposed to the black cotton soil found on the coastal route. It will also start on the Bagamoyo to Msata road near Kiwanga, which is currently being upgraded and will link with Mkange, Kwamsisi and Mkwaja. From Mkwaja the route passes beyond the park (although a short section will cut through the northern part) and from there it will follow the coastal alignment up to Tanga.

3.3.3. This route will still require bridges across the Wami and Pangani rivers, and will have one additional railway crossing near Mkalamo. This alternative is 17 km longer in terms of new constructed length and will add 46 km to the travel length between Bagamoyo and Tanga as compared to Option A. However, a higher operating speed will be possible on Option B, since speed restriction will have to be enforced through the park, should the coastal road be selected. There are some existing tracks going from Kiwangwa to the Wami river and then to Mkange that are used by locals to access the river to collect water. The section between Mkange and Kwamsisi is currently only a track, which is used by locals and only passable by off-road vehicles. This route avoids the Kiono/Zaraninge forest by moving outside its boundaries. Area after Kwamsisi through outside the forest and park is densely vegetated and is inhabited by tsetse flies.

3.3.4. **Option C:** The proposed village route follows the existing road from Makurunge to Gama. After crossing the Wami River, it follows the Wami River upstream to Matipwili. After Matipwili, the route turns away from the river and passes through the Zaraninge forest, which is part of Saadani National Park to Mkange. From Mkange the route follows the same way as option B, through Kwamsisi to Mkwaja. Their proposal will also require bridging at Wami and Pangani, but will give shorter access to the Park from Bagamoyo, without the negative impacts on the park. It will be 45 km longer than Option A in terms of construction length and also 46 km longer travel length between Bagamoyo and Tanga. Two additional grade separated rail crossings will be necessary. Note that Options B and C reduce the travel length from Bagamoyo to Tanga by only 31 km compared to the existing road, whereas Option A reduces the length by 77 km.

3.3.5. **Option D:** The first section will cross through the Sakura Sisal Estate. The road will then follow the existing road through the Msabugwe Forest Reserve (similar impact as Zaraninge forest, where after the road will turn northwards to Segera. The proposed route will cross two streams of the Pangani River and the railway line. This link will only be analyzed with Option A, since it will not attract traffic to Arusha in combination with Options B or C.

3.3.6. Option D will thus incorporate the entire Option A up to Tanga, plus the added link to Segera. This combination will be referred to as Option D. This option shall still join Bagamoyo to Tanga as the Msata-Bagamoyo road is currently undergoing upgrading to bitumen standard but it shall not facilitate movement of locals located in the villages.

3.3.7. The results indicate that the overall Option D (upgrading of section Makurunge-Gama-Mkwaja-Pangani-Tanga to paved standard and construction of Kipumbwi-Segera road) is the most viable option followed by Option A (upgrading of Makurunge-Gama-Mkwaja-Pangani -Tanga to paved standard). Option D however, have the added link that increases the construction cost with about US$70 million. Options B and C are both viable for the optimistic scenario being above 12%.

3.4. **Conclusion:** After a thorough scrutiny and analysis, taking into consideration the sensitive Saadani ecosystem, the best option to be built is option C. The route for this alternative follows the existing road
from Makurunge to Gama. After crossing the Wami River, it follows the Wami River upstream to Matipwili. After Matipwili, the route turns away from the river and passes through the Zaraninge forest, which is part of Saadani National Park to Mkange. From Mkange the route follows the same way as option B, through Kwamsisi to Mkwaja towards Tanga. This option includes 5 river bridges and 3 rail bridges. This access provides shorter access to Saadani from Bagamoyo but lengthens the distance to Tanga from Bagamoyo by 46km. Therefore this option is longer than the existing road by 46km.

3.5. The designed road is therefore 229km out of which, construction of 50km from Tanga – Pangani will be financed by the Government of United Republic of Tanzania and construction of 120km from Pangani – Tungamaa – Kwamsisi and Pangani Bridge will be financed under the AfDB loan in collaboration with the Government of Tanzania. The remaining road section of 59km will be constructed when funding is obtained.

4. POLICY AND LEGAL FRAMEWORK

Important laws that have relevance to road development in respect of environmental management include;
- Environmental Management Act No. 20 of (2004), Cap. 191.
- The Land Act No. 4 of 1999 and the Village Land Act No. 5 of (1999).
- Forest Act, 1957 (Revised in 2002).
- Explosives Act, 56/63.
- Regional and District Act No 9, 1997.
- Mining Act (1998) T.
- The Land Acquisition Act 1967.
- The Contractors Registration Act (1997).

5. PROJECT DESCRIPTION

5.1. Location: The Tanga - Pangani - Saadani - Makurunge road is located in Coast and Tanga regions. The project has a total length of 179km including link roads and bypasses, starting from Makurunge village located in Bagamoyo in the Coastal Region traversing through the Saadani National Park and Zarininge Forest found along the eastern Coast of Tanzania. The road proceeds further through Pangani and, Muhienza district and ends at Tanga Municipality in Tanga District in Tanga Region. The main road is majorly located in Tanga region (more than 100km) and is built to gravel and earth standard and its layout is provided in Figure 2.1 below. In the Coast region, the road is entirely in Bagamoyo district, while in Tanga the road passes in Pangani, Muheza and Tanga district. In each side the road passes along various villages and settlements such as Makurunge, Saadani, Buyuni, Mukocheni, Pangani and Kingombe. The road forms part of the Eastern Corridor that connects Dar-Es-Salaam to Tanga and Mombasa in Kenya.

5.2. The project area experiences moderate temperatures and rainfall with the average annual temperatures being 32°C. The warm season normally runs from October to February. There are two major
rainfall seasons namely the long rains which occur between March and May and short rains which occur between October and December with average annual quantities of 1200mm. However, the average annual rainfall varies from year to year and between the various ecological zones. Moreover, the coastal nature which forms the larger part of the Region affects the patterns of temperature and rainfall. The coastal plains in Tanga, Pangani and Bagamoyo districts, and part of Muheza district experience moderate high annual rainfall of 800-1,400mm while the dry plains mostly in Handeni and parts of Bagamoyo districts receive low rainfall ranging from 200 to 600mm annually.

5.3. The core impact zone includes the area immediately bordering the project (local). In the case of this project, local impacts will include the site of the construction (borrow areas, quarries and the actual road construction site) and the immediate surrounding areas. The influence impact zone includes the area beyond 500m –1000m from the road alignment. Based on the environment surrounding the road the influence impact zone includes areas such as Saadani Park, the Indian Ocean and the forest.

5.4. Main Road from Bagamoyo to Tanga: The main north-south corridor along the Tanzanian coast from Bagamoyo to Tanga namely the Makurunge -Saadani – Pangani - Tanga road is an existing poor quality gravel road, which reduces to a track in places. The existing route is currently discontinued at the Pangani River, where crossing in only made possible by a ferry and at the Wami River, where crossing is currently provided by a temporary Bailey bridge. For the purpose of this study, the main road has been divided into several sections as described in the sub-sections that follow. The subsections will focus on the sections of the road that shall be financed by the African Development Bank.

5.5. Mkange to Mkwaja: The section is within the bypass that escapes the Saadani National Park. The proposed road start at the junction of the gravel road to Mandera and it passes through a completely new route (Greenfield) up to Kwamsisi. From Kwamsisi it turns back towards the coast up to Mkwaja along an existing gravel road. The road took this route due to the environmental sensitivity of the park and issues raised in regards to upgrading the road through Saadani Park by the Tanzania National Parks Authority and Saadani National Park Authority during consultation. Near Kwamsisi the road deviates from the existing alignment to limit the RAP impact on Kwamsisi and to improve the road geometry. The Mligazi/Msisi River is the regional boundary between the Tanga Region and the Coastal Region which is crossed at km 82.5 within this section.

5.6. Mkwaja to Pangani: From Mkwaja the road follows the existing gravel road alignment to Pangani with some local improvements to the horizontal alignment. At Pangani the road deviates around the town due to the position of the proposed new Pangani River Bridge to reduce the impact on the historic town center. The road section between Mkwaja and Pangani is currently a gravel surfaced road with a rough surface that results in poor riding quality. The existing route is currently discontinued at the Pangani River, where crossing in only made possible by a ferry. The road through Pangani Town is surfaced. However, if a bridge is to be constructed across the Pangani River, careful consideration will have to be given to the route selection through the town. Our proposed position for such a bridge will incorporate a bypass around the town to allow for approaches to be constructed. Land availability at the current ferry crossing is not sufficient on both banks to allow for construction of the bridge approaches. The formation is good and can be utilized by adding the strength layers on top.

5.7. Pangani Streets: The main road will bypass Pangani on the western side. To provide proper access from the main road some streets in Pangani needs to be upgraded. On the southern side of the river the existing road will be re-graveled. A new surfaced road will be constructed from the Pangani South road to pass under the new bridge and connect to the main road to provide surfaced access. On the northern side a main street of 500m will be constructed to link the town center to the new road. The existing northern
approach road will also be surfaced. This will then provide Pangani with three surfaced access streets roads from the main road.

5.8.  **Bypasses in the Project:** Two bypasses of Saadani bypass and Pangani have been proposed in connection with the main project.

5.9.  **Saadani Bypass:** The aim of the Saadani bypass is to escape and reduce environmental impacts to the Saadani National Park and Zaraninge Forest. The bypass leaves the main road from Matipwili through the existing tracks and passes through the villages of Tumbini, Gongo, Mkainge, Manda and ends at Kwamsisi Village where it joins the main road from Mkata.

5.10. **Pangani Bypass (10km):** The purpose of this bypass is to provide a clear link with the proposed Pangani Bridge. The route also bypasses the built up area of the historical Pangani town. The Pangani Bypass diverts to the western side of the existing road from km 174.9. It roughly follows some informal track and descent through bush towards a side valley of the Pangani River. In the valley it follows the edge of the hill till near the Pangani River where it cuts into the mountain to connect with the bridge. The road then passes around Pangani Town Centre on the western side until it meets the existing road at km 184.3.

5.11. **Link Roads:** Being a coastal road, the main road provides access to a series of coastal resorts in Kenya and Tanzania. Some of the access roads to these hotels and resorts were identified for inclusion under this project for upgraded to surfaced standards. Three link roads were investigated and two shall be constructed under this project.

5.11.1. **Ushongo Link Road (5.9km):** Ushongo link road (5.9Km) is connecting to the Ushongo beach that is located between Mkwaja and Pangani at approximately at km 120. There are five (5) resorts along the beach road. Access to this beach is via the Mwera Sisal Estate. Currently, the most frequently used access meanders through the built-up area of the estate, where the processing takes place. The old alignment is now proposed for the new access to be constructed.

5.11.2. The existing structure over the Tungamaa River found on the link road does not meet the required safety standards and need to be reconstructed as part of this link road.
5.11.3. Kipumbwe Link Road (3.7km): The Kipumbwi Link road (3.7Km) provides access to Kipumbwi from Kwakibuyu from the main road. Kwakibuyu village is located between Mkwaja and Pangani at km 104 on the main road. Kipumbwi is a local fishing port. The link road is currently gravel surfaced, traverses a fairly flat terrain. The road will cross the Beji and Manomvi streams and will end at the entrance to the Kipumbwi village with a small roundabout. The proposal is to upgrade the road to bitumen surfaced standards.

5.12. Bridging Options
5.12.1. **Pangani River**: Pangani Town is situated on the northern bank near the mouth of the Pangani River. On the southern embankment, a large hill restricts the geometrical alignment of the road on the approach to the river. The river is currently crossed by means of a ferry. At the ferry crossing the river is about 300m wide. River traffic appears limited, with a regular ferry during the day and some dhows and motorboats moving out to the sea. Three alternative routes were investigated at the Pangani crossing as shown in the Figure below.

![Figure 4: Layout of Pangani River Bridging Option](image)

5.12.2. **The first option is to improve the existing road alignment slightly and to cross over the river at the current ferry position, which is the shortest distance.** On the northern side, the bridge approach will have to line up with the existing street approach to the ferry docking position, which comes directly from the town centre. This will have a major social impact due to the higher traffic volumes, higher speeds and expropriation of historical buildings to enable construction of the bridge approaches.

5.12.3. **The second option investigated was a bridge crossing closer to the sea.** This would require a much longer bridge as well as a new road corridor through old section of Pangani town. This option was not deemed viable due to poor foundation conditions and the associated cost of the long structure required and not pursued any further.

5.12.4. **The third option investigated was to cross the river inland of the ferry with a fairly short structure similar to the first option.** This will require a new road alignment to be constructed that will bypass Pangani town on the western side, with less social impact on the town, and will divert around the western side of the hill on the southern bank.
5.13. **The Road Reserve:** In Tanzania the road reserve width is 60m as per the new Road Act of 2007. Before amendment of the Roads Act, the road reserve was 45m. The government is now identifying the properties within the additional road reserve area throughout the country so that they can be compensated. These properties were also identified in this project for record.

5.14. **The proposed project will be implemented in 45m RoW. Census of the properties in this section** has been identified for compensation before construction. Properties in the proposed Bypasses have also been identified for compensation to pave the way for construction of the road. The properties at 45m ROW that were identified for compensation are as indicated in Table below.

<table>
<thead>
<tr>
<th>District</th>
<th>Number of PAPs</th>
<th>Structures</th>
<th>Crops</th>
<th>Mosques</th>
<th>Churches</th>
<th>Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagamoyo</td>
<td>186</td>
<td>107</td>
<td>1325</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Handeni</td>
<td>470</td>
<td>107</td>
<td>678</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pangani</td>
<td>930</td>
<td>367</td>
<td>24156</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1,586</td>
<td>581</td>
<td>26159</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

5.15. **Project Design:** The proposed road is a multinational passing through the two countries of Kenya and Tanzania and therefore classified as a Trunk Road (Class A). This type of classification leads to design criteria for mobility such as higher speed, higher level of service and longer trips with less access where low speed is required for controlled access. With a functional classification of A, the traffic volume is used to determine the road design class. A DC3 road design class is recommended for an AADT value between 1000 and 4000. This DC3 design class recommends a 3.5m lane with surfaced shoulders.

5.15.1. **Typical Cross Section:** The project has a single typical road cross-section as shown below. The design Class (DS3) has specified the road width and carriageway widths. The normal cross-fall of the road will be 2.5% from the road centerline. The maximum super elevation of 8% has been implemented on the flat and rolling sections with a 6% maximum on mountainous sections and in villages with 50km/h speed limit. The typical side slopes and back slopes of the road that has been used are given on the typical drawings. These comply with the maximum rates as specified in the RGM.

5.15.2. **In this project there are three variations to the typical cross-section.** At climbing lanes an extra lane of 3.5m width is added and the shoulder is reduced to 1.0m. In the urban areas such as Pangani, walkways for the non-motorized traffic will be provided. The shoulders widths on these urban sections are reduced to 1.5m and 3.0m wide walkways are added on both sides. The third variation is where black cotton soils are encountered. The PMM specify flatter side slopes of 1:6 instead of the typical 1:2 side slope for 1 to 3m fill heights. On fills higher than 6m a bench of 4m wide was added to limit the extent of the side slope and to improve access for maintenance. A similar bench was also introduced on 6m or deeper cuttings.
5.15.3. **Design Speed:** The Design Speed of a road dictates various geometrical design elements. The recommended design speeds for Design Class 3 is shown in Table below. Where the road passes through villages the Speed limit will be 50km/h.

*Table 2: Design speed - Design Class 3*

<table>
<thead>
<tr>
<th>Terrain</th>
<th>Recommended Design Speed (km/h)</th>
<th>Minimum Design Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat to Rolling</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>Rolling to Hilly</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Mountainous</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

5.15.4. The horizontal alignment contains 25 curves on this section of the road of which 11 curves have a radius of less than 750m. Five curves have a radius of 600m which is the desirable minimum radius. The spacing of the curves is sufficient to fit the super elevation run-off lengths.

5.15.5. **Vertical Alignment:** The terrain is very flat dominated by clay soil with most of the road longitudinal slope less than 1.0%. Therefore, due to the flat terrain and clay soil, the road construction shall involve major cutting and filling.

5.16. **Drainage Structures**

5.16.1. **Cross Drainage:** The drainage requirements across the road have been determined by the hydrological study. The drainage structure will consist of concrete pipe structures. The pipe drainage structures consist of two sizes namely 900mm diameter and a 1200mm diameter. The two sizes will ease the construction process. The nominal size of 900mm is currently specified mainly for maintenance and cleaning purposes.

5.16.2. **Side drains will be constructed in all cuttings and are mainly gravel lined.** Concrete lining of the side drains are expected where the slope is steeper than 6%. Side drains with slopes steeper than 4% will be protected against erosion with energy dissipaters. The erosion potential of the soil in which the side drain is excavated will ultimately govern the protection required. Where the side drains cross through side access roads a 900mm diameter concrete pipe needs to be installed.

5.16.3. **Subsoil drains are normally installed where the ground water could influence the road pavement structure.** During the material investigation ground water was encountered and subsequently
provision has been made to install subsoil drainage in deep cuttings. The extent and final position of the subsoil drains need to be determined during construction.

5.17. Road Furniture
5.17.1. Road Signs and Road Markings: The proposed road signs and road markings are shown on the Plan and Profile drawings. There is also Schedule Drawings containing the road signs. The proposed sign size as per Traffic Sign Guide of 2007 is tabled in Table below:

<table>
<thead>
<tr>
<th></th>
<th>Speed Limit 100km/h or higher</th>
<th>Speed limit below 100km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory Signs</td>
<td>1200mm diameter</td>
<td>900mm diameter</td>
</tr>
<tr>
<td>Warning Signs</td>
<td>1500mm side length</td>
<td>1200mm side length</td>
</tr>
</tbody>
</table>

5.17.2. Safety Features at the Park: Due to the fact that part of this road is passing in the periphery of Saadani National Park, special features will be installed for animal safety. Warning boards, day and night speed limit signs will be installed in the road. Also proper marking and speed humps will be installed.

5.17.3. Guardrails: Guardrails will be provided on the approaches to all the bridges as well as at all box culverts. Where the fill is more than 4m, guardrails will also be provided where the side slope is 1:1.5. The guardrails will be the standard w-shape steel profile on steel post.

5.17.4. Road Edge Markers: The Draft Tanzania Traffic Signs Manual specify that warning signs be placed on curves with radii of 600m or smaller. Hazard signs W401 or W402 should also be provided at drainage structures. The Tanzania Traffic Manual is in line with the SADC Manual on the use of road signs. The Tanzania Geometrical Manual however, specifies concrete road edge markers. The Bill of Quantities includes both concrete markers and road signs and TANROADS should instruct the Contractor on the final markers to be placed.

5.17.5. Kilometers: Concrete kilometer markers will be installed at 5km intervals on alternating sides of the road. The two destinations are Tanga and Bagamoyo. The distance from Bagamoyo to Makurunge is 13km. The project road length to Tanga is 229km, thus the distance from Bagamoyo to Tanga will be 241km or rounded to 240km. The abbreviation on the markers will be TNG for Tanga and BGM for Bagamoyo.

5.17.6. Service Ducts: It is proposed that dual 300mm service ducts are installed for future underground services such as electricity or telecommunication cables. The position of such service ducts is at all type 1 and 2 junctions as well as at villages at 500m intervals.

5.17.7. Utilities: Electrical services are all overhead power-lines. The water services are mainly along the existing gravel roads from Kwamsisi to Pangani Telephone lines were surveyed in km 171 in Mzambarauni.

5.17.8. Street Lighting: The Bills of Quantities include the provisional sums for installation of street lighting along the Pangani Bypass. The successful Contractor must provide the detail design as part of the installation of the street lighting.

5.17.9. Bus bays: Bus bays will be provided at all villages and towns. The proposed position of the bus bays are provided in the drawings. These need to be finalized during construction in liaison with the local authorities.
5.17.10. **Bus Terminal**: The Bus terminal at Pangani is not part of the design but shall be implemented under this project as the complementary project. The Pangani town is a big town but has no designated bus station.

5.18. **Construction Materials**: The main construction materials for the road include sand, gravel, hard stones (aggregates), reinforcement iron bars, water and bitumen. Most of the materials shall be obtained locally (within Tanzania) except bitumen which shall be imported. Material investigations have been made with the aim of identifying sources for suitable construction materials including borrow pits, sand pits, construction water sources and quarry sites.

5.18.1. **Borrow Areas**: Based on field studies several borrow pits were seen especially along the Mkange - Pangani sections of the road.

### Table 4: Proposed borrow areas

<table>
<thead>
<tr>
<th>S/No</th>
<th>Chainage</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>km 138+000 on the RHS</td>
<td>Choba</td>
</tr>
<tr>
<td>2</td>
<td>km 133+000 on the LHS</td>
<td>Boza</td>
</tr>
<tr>
<td>3</td>
<td>km 123+700 on the RHS</td>
<td>Mzambarauni</td>
</tr>
<tr>
<td>4</td>
<td>km 118+500 on the LHS</td>
<td>Tungamaa</td>
</tr>
<tr>
<td>5</td>
<td>km 106+100 on the RHS</td>
<td>Sukura</td>
</tr>
<tr>
<td>6</td>
<td>km 96+200 on the LHS</td>
<td>Msangazi</td>
</tr>
<tr>
<td>7</td>
<td>km 95+100 on the RHS</td>
<td>Msangazi</td>
</tr>
<tr>
<td>8</td>
<td>km 52+000 LHS with an offset of 12km</td>
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</tr>
<tr>
<td>9</td>
<td>km 52+000 LHS with an offset of 17km</td>
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<td>Kidomole</td>
</tr>
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<td>km 0+000 at an offset of 24km towards Msata</td>
<td>Mtakuja</td>
</tr>
<tr>
<td>13</td>
<td>km 0+000 at an offset of 30km towards Msata</td>
<td>Kiwangwa - Madola</td>
</tr>
</tbody>
</table>

5.18.2. **Quarry Sites**: Five quarries were identified in the project area and these include Lugoba, Msata, Kitumbi, Kisasa and Mkata.

- The first four are located along the Chalinze-Segera road while the Mkata one is a potential quarry located in Mkata village along the Mkata - Saadani Road.
- The Lugoba and Msata quarries are operational and are the only sources of granite aggregates which are used within the Coast region. Records show that the crushed aggregates from these two quarries comply with the Tanzanian Standard Specification for Road Works (2000).
- The Lugoba quarry is located about 70km from Makurunge and 92km from Saadani. It is the main quarry in the area with four commercial crushing plants. The site is set on 100 hectare piece of land and has a depth of 30m and is considered to be ample for supply to the proposed project.
- The Msata quarry is located about 60km from Makurunge and 80km from the Saadani National Park. This is also an operational quarry with one private crushing plant. It is
located in 120 hectares of land with a depth of 10m and was considered adequate for the
development of the proposed project.
- The Kitumbi quarry is located about 120km from Tanga and 90km from the Saadani
National Park. This is also an existing quarry which was used as the material source during
the construction of Chalinze-Segera Road in the early nineties. The rocky hill occupies 20
hectares of land and has a depth of 20m. However the use of the quarry is constrained as
locals have developed a village around it thus not found suitable for the project as it shall
require resettlement and other environmental mitigation measures.
- Kisasa hill is located about 106km from Tanga and 100km from the Saadani National Park.
This is a virgin site located in Kisasa village near Kitumbi. The hill occupies about 16
hectares and is considered adequate for the proposed project.
- Mkata site is located about 106km from Mkwaja village in the Saadani National Park. This
rock hill occupies 5 hectares and is adequate for utilization and is also considered as
adequate for the project construction.

5.18.3. Concrete Sand: Three sand sources were identified at the project area and these included: Bigo
Primary School located in Makurunge at km 0 on the LHS at an offset of 2km; Wami River at km 32 on
the LHS; Mkwaja Village located at km 84+500 on the RHS at an offset of 0.2km; The Bigo Primary School
source is found in Makurunge village at the beginning of the project road. The source is being used for
small-scale construction by the locals. However, the area is large but the grading of the sand varies as shown
by its profile some areas have fine and coarse sand while others shows the sand is dominated with silt thus
will require careful selection during utilization.

5.18.4. The sand at Wami shall be sourced from the River banks and its deltas located at least 32km from
Makurunge. The sand at this site was seen to be clean with good grading. Apart from its favorable quality,
the site was seen to be located in areas where major drainage works such as the Wami Bridge shall be
developed. The sand source at Mkwaja village is located at least 46km from Pangani town. The sandy area
stretches under shrubs other potential sandy site near Mkwaja is Makorora village. The grading of the sand
varies from course to fine.

5.18.5. Construction of Water Sources: The area has four main perennial rivers which shall be used as
source of water for the proposed project and these rivers are Ruvu located at km 0+000; Wami located at
km 32+000; Mafuleta located at km 102; and Kirare located at km 159. Samples of water from the sites
were analysed and the results showed that the water is suitable for construction apart from Mafuleta which
had higher chloride content.

5.18.6. Sources of Manufactured Materials for Road Construction: Traditional construction materials
to be used have been tested for compliance and for those manufactured materials for road construction.

5.18.7. Sources of Manufactured Materials for Road Construction: Traditional construction materials
to be used have been tested for compliance and for those manufactured materials for road construction and
their sources are being describes hereunder.

6. PROJECT ACTIVITIES
The project shall have four major activities namely pre-construction, construction, operation and
decommissioning.
6.1. Mobilization or Pre-Construction Phase: This phase entails mobilization of labor force,
equipment and construction of offices/camps as well as acquisition of various permits as required by the
law. The implementation of the project’s design and construction phase will start with thorough
investigation of the site biological and physical resources in order to develop a baseline data bank that shall
guide in impact monitoring.

6.2. **Construction Phase Activities:** The overall objective of the road construction works is to:
Improving the structural capacity, drainage and ride ability of the existing road with some improvement
and realignment of the road geometry; and improve the width to standards acceptable for a trunk road in
Tanzania. The construction phase which shall be undertaken by contractors shall commence after the ESIA
has been approved and the affected people resettled. The project implementation activities undertaken by
the contractor shall be supervised by a contracted resident engineer and monitored by an ESIA expert,
TANROADS and NEMC. The road will be developed to a bitumen surface finish having proper and
adequate drainage structures to ensure passage of traffic throughout the whole year. The road
section is categorized as a national road under the category MOI which is required to have a road
reserve of 60m this is 30m from the either side of the road’s centerline. It is envisage the proposed
road will follow existing road profile in most of the areas apart from sections traversing the Saadani
National Park which shall be realigned to enable reduce impacts of the National Park and its
associated ecosystems this is forests and Ocean.

6.3. **Demobilization Phase:** Upon completion of the Contracted Work, the con-
tractor shall remove all
of its tools, materials and other articles from the construction area. Should the Contractor fail to take prompt
action to this end, TANROADS at its option and without waiver of such other rights as it may have, upon
sixty- (60) calendar days’ notice, may treat such items as abandoned property. The Contractor shall also
clean areas where he worked, remove foreign materials and debris resulting from the contracted work and
shall maintain the site in a clean, orderly and safe condition. Materials and equipment shall be removed
from the site as soon as they are no longer necessary to minimize the demobilization work after completion
of the project. Before the final inspection, the site shall be cleared of equipment, unused materials and
rubbish so as to present a satisfactory clean and neat appearance. All the campsites will be built as temporary
structures and these will also include the use of movable structures such as movable containers. All the
temporary structures will be demolished after accomplishing the contracted jobs.

6.4. **Operation Phase:** The actual usage of the roads is expected to commence after the construction
works. The project road is under “trunk road” category and therefore will be directly managed by
TANROADS. During this time, TANROADS will carry out routine maintenance by attending to cracks,
pot holes, clearance of vegetation within the ROW (road reserve area) and monitoring. Other activities
includes Installation of road signs, thermo-plastic road marking, reinforcement and replacement of road
furniture, control of litter accumulation on road sides, awareness rising on proper road use and road
management to the communities, monitoring and evaluation, management to reduce pollutant
concentrations in runoff, disposal of wastes from road maintenance activities, storage and management of
maintenance materials and equipment. The duration of this phase will be twenty (20) years for roads
and fifty (50) years for the bridge.

7. **ENVIRONMENTAL AND SOCIAL CHARACTERISITS**

7.1. **Project Location:** The proposed road project traverses the regions of Coast and Tanga as indicated
in the Map below, figure below
7.2. The Tanga Region was previously known as Tanga Province which included Same and Mwanga districts that are at present in Kilimanjaro Region. Administratively is divided into ten (10) districts. As per the 2012 census, it has a population of 2,045,205\(^2\). The tribes that have migrated to the region are the Pare, Wataita, Wasambaa, Wambugu, Segeju, Wadigo, Wanago and Wazigu.

7.3. Administratively Coast region is divided into six Districts, namely Bagamoyo, Kibaha, Kisarawe, Mkuranga, Rufiji and Mafia. There are also seven local authorities of which six are district councils (Bagamoyo, Kibaha, Kisarawe, Mkuranga, Rufiji, and Mafia) and one is an urban council - Kibaha Town Council.

7.4. Biological Environment (Flora and Fauna of Saadani with Zaraninge Forest Reserve: The Saadani National Park contains distinctive and rare habitats, (Unique in East Africa) beach with salt grass flats along the Indian Ocean. One can live at Saadani where river, beach and bush have been thrown together in a clash of colorful ecosystems found nowhere on the Eastern Coast of Africa. However, there is a confusion of nature that crocodiles vie with coral reefs, lions roar at Lionfish and baboons bound along the beach. Neatly described in a “Symbiosis of luxury with nature” the enthusiasm for nature here is infections.

7.5. The warmth of service and comfort provide and perfect backdrop from which you can, relax and adventure through Saadani National Park extraordinarily diverse scenery and wildlife National Park. At least 24 species of large mammals are found there, including the rare Roosevelt Sable Antelope, Furthermore the beach areas contain a number of the last significant East African breeding beaches for the green turtle. At the Warm River mouth, there is large and still well preserved mangrove swamps. The northern part, which was a cattle ranch is now dominated with coastal lowland mosaic, presenting an exceptional variety of habitats, woodland, forest, coastal thicket, semi-and Grassland, wetlands, salt
marshes, mangroves and beaches, this vegetation has a considerable number of elephants, buffaloes, antelopes and the rare Giant brown bat.

7.6. On the coast of Indian Ocean, the park, have unique land form, which includes several pristine dunes with interesting vegetation types. The Zaraninge Wilderness Forest Reserve is also found in the South western of the Park.

7.7. Vegetation (Flora): Tanga and Coast Regions are endowed with unique Biodiversity and natural resources including the natural ecosystems of forests, savannah, pastures and rangelands as well as, wetlands, rivers and the Ocean which form the basis of the natural resource wealth. The grassland savannas provide habitats for large mammals in Saadani National Park. The two regions are dominated by Natural forests of miombo woodlands, Montana forests and mangroves forests. These forests are either Reserved or managed by Local government community owned. The Miombo woodlands are the most extensive woodland area in Tanga and Coast regions covering a large part of the hinterland from the coastal area. The miombo ecosystem is dominated by dry woodlands. Significant amount of wildlife areas is within the Savannah grasslands characterized by dry miombo woodlands dominated by the genera of Acacia, Combretum and Commiphora.

7.8. Both Tanga and Coast regions are bordering the Saadani National Park with Zaraninge wilderness forest reserve. These are areas of high biodiversity values and their main purpose is conservation of habitats and wild animals, which constitute unique naturally occurring biodiversity. In the National Park only none consumptive tourism, education and research are permitted. The Saadani National Park and Zaraninge Forest Reserve possess various flora and fauna. They are essential habitats to some of the rare and endemic species of primates, mammals, Birds, invertebrates, reptiles and trees species.

7.8.1. The Montana forests is mostly possessing high water catchment value, hence being main sources of major rivers such as the Wami, Ruvu, and Pangani, just to mention a few. Apart from water catchment values the Montana forests are also centers of high biodiversity resources of flora and fauna including harboring endemic and near endemic species. The Eastern Arc Mountain forests are of exceptional global importance because of their high biodiversity values. A number of plant species including some tree species, are known to be endemic to the Eastern Arc Mountains. Due to such values, the Conservation International included the Eastern Arc Mountain forests together with the Coastal forests are amongst the World's 25 Biodiversity “Hotspots”. The main and much recognizable nature feature of the park is the Zaraninge Forest, 200 square kilo meters (50,000 acres) of closed tropical forest. It is one of the largest coastal forests in Tanzania, and part of the “Eastern Arc and Coastal Forest for Kenya and Tanzania Hotspot.

7.8.2. The Mangrove Forests are found in all coastal districts of Tanzania including Tanga and Coast regions. There are eight species of mangroves in mainland Tanzania. These are Avicenia marina, Bruguiera gymnorhiza, Ceriops tagal, Heritiera littoralis, Luminitzera racemosa, Rhizophora mucronata, Sonneratia alba, and Xylocarpus granatum. In addition to Mangroves, there are adjacent coastal forests that possess important species of flora and fauna. The coastal forests are centers for valuable species such as Dalbergia, melanoxylon, which is an exceptional valuable tree species for wood curving and production of other important products like music clarinets. Plantation Forests Main species planted in the plantations throughout the country include Pinus patula, Cupressus lucitanica, Tectona grandis and some Eucalyptus species.

7.8.3. In the urban areas, the project area is characterized by planted shade trees, lawns, hedges, and gardens with few natural trees like Baobab and Fig trees. Most of the natural vegetation cover has been lost due to urbanization. Different plant species such as palm trees, peacock flower, Christmas trees, neem
(Azadirachta indica), bougainvillea and governors plum (Mchongoma in Swahili), yellow cassia and varieties of grass species are available in the project area.

7.9. Animals (Fauna): The western part of Saadani National Park host new species of reptile (gecko), amphibian (Hyperolius parkeri), an Endemic snail and many other species of invertebrates, 8 bird species. Large mammals, African buffaloes, zebras, giraffes, several antelope’ species including Sable Antelopes (Rare species) lions and elephants (Threatened Species), are all found in the southern portion of the National Park, dominated by Wami river and its delta. The Saadan beach is famous as breeding site of Green Turtles (Endemic species). However, according to the Saadani General Management Plan, the Park does not habitat any endangered species. Mkwaja, which is a part of the Park, has complex ecosystem, which holds a large number of water including the greater flamingo, high concentration of cetacean and important population of crocodiles and hippos. It is important that the park is protected from the projects negative impacts by identifying an alternative route that traverses an area with minimum natural resources and sensitive ecosystem as discussed in the report and various stakeholders meetings.

7.9.1. In urban C areas, existing animal species include terrestrial creatures which are domestic and free range animals such as cats, dogs, pigs, cattle, goats, chicken, and other types of birds. Few wild animal including, monkeys, birds, reptiles, and squirrels are found in flood plains, tree groves, shrubs and bushes and along the river banks. The presence of domestic animals in the project area signifies that there is dependence of natural water streams/rivers as a source of drinking water for animals. Prevention of surface and underground waters from pollution is therefore very essential, and the provided mitigation measures have to be implemented.

7.9.2. Biodiversity threats in Forest Ecosystem area due to over exploitation of forest resources Conservation and management of natural forests in Montana, miombo and coastal areas has been a challenging task. This is due to increased human population that exerts great pressure on the forest resources. Pressure on coastal forests is due to more demands for cultivation, timber harvesting, and production of charcoal. Illegal logging in Montana forests and in the miombo woodlands is a big environmental problem throughout Tanga and Coast regions. There is degradation of mangroves in the two regions as it for many other parts of Tanzania. Besides decrease in the area covered by mangroves, there is also a considerable decrease in the density, height and canopy cover of the mangroves within the forests. The areas hardest hit are those near urban centers and forests around Tanga. In some areas mangrove forests have been cleared for paddy cultivation and Salt mining. The major immediate causes of mangrove forest degradation were the over-harvesting of mangrove for firewood; charcoal - making; building poles; and boat construction which accounted for about 46%, and clear-cutting of mangrove for agriculture, solar salt production, road construction, urbanization and hotel construction, firewood for lime making. Near urban centers, various types of pollution including municipal sewage, garbage and oil pollution also pose threat to mangroves. Bush Fires are another hindrance to sustainable forests management in the regions. Thousands of hectares natural forests are set to fire every year thereby reducing their biodiversity values by killing various species of flora and fauna and retarding growth rate to some of the tree species.

7.10. Gender Analysis: Both in Tanga and Coast regions as the case in most parts of Tanzania, Gender relations and structure among the PAPs is dominated by male members of the households. It is generally a patriarchal socio-economic system. The division of labor in such systems is mainly based on gender and age-sets. Among the families and households of the project affected persons, child rearing and other domestic chores such as washing clothes and cleaning houses are the major household activities undertaken by women and girls. Thus women spend an average of 10 hours per day with very limited time for relaxation and resting on these domestic activities. And depending on the season women are expected to play a significant role in farming activities. There is a great deal of commonality between women household
activity profile in the study area with other areas of Tanzania. The implication of this is a possible increased work load for women because of other activities such as construction of houses because of project impacts.

7.11. Data shows that in general women are involved in making decisions on issues that are significant to the households and families including finances, education of child, health of child, purchase of assets, day to day activities and social functions. In 84% of households women were reported to make decisions. However it should be observed that this issue is subject to social desirability responses with a potential for attitude-behavior discontinuity.

8. STAKEHOLDER AND COMMUNITY ENGAGEMENT

8.1. Stakeholder's analysis for the project was undertaken and the key stakeholders identified included: TANROADS Regional Offices, National Environmental Management Council (NEMC), Tanzania Nation Park (TANAPA), District Councils, Departmental Heads at Municipal Councils, Local elders among others. All the key stakeholders were consulted on the proposed project through one to one interviews and stakeholders forums.

8.2. The following issues were the major raised by stakeholders;

- There is need to choose an alternative route so as to avoid the park and at the same time look for a route that shall serve the locals found in the villages neighboring the park;
- Increase in traffic will translate to increased road accidents affecting people and wildlife. Possibility of increased in human activities in the park thus leading to poisoning of animals, poaching and forest fires;
- Contractor should use the existing borrow pits, stone quarries and sand pits in order to minimize the land degradation at new sites;
- Possible population influx into the project areas as a result of improved services and possible with spread of communicable diseases (i.e. HIV/AIDS) and competition for the meagre resources;
- Project Affected People (PAPs) should be compensated using current rates and Local leaders at Wards, street/mtaa level should be involved during the process of compensation; and
- The public should be made aware of the developments planned at their area in advance
- Dust and noise generation during the construction activities should be controlled.

9. MAJOR BENEFICIAL AND ADVERSE IMPACTS

9.1. The development of road infrastructure can cause a wide range of positive and negative impacts on a number of receptors. The significant environmental and social impacts identified for the proposed project included:

9.2. Positive Impacts

- Improvement of transportation services;
- Improved community life and services;
- Job creation and improved employment opportunities;
- Reduced production costs of goods and improved market penetration;
- Increased tourism along the coast.

9.3. Negative Impacts

- Loss of natural habitat;
- Destruction of spawning grounds for fish thus affecting the fishing industry;
- Attracting high population around the Park that will conflicts with wild life;
- Attracting poaching and related activities;
- Serving relatively small proportion of population (by routing road through the park ;).
- Increased accidents due to over speeding vehicles leading to death and injury of wildlife;
- Safety and health risks;
- Landscape modification;
- Immigration /influx of people from other areas;
- Increased spread of HIV/AIDS and other diseases;
- Land expropriation and relocation/ resettlement; and
- Linear settlement along the road reserve once the road is operational which lead to several multiplier impacts such as increased accidents, challenges in road maintenance and expansion, traffic congestions among other impacts.
<table>
<thead>
<tr>
<th>S/N</th>
<th>Environmental parameters/Impacts</th>
<th>Impact Rating Criteria</th>
<th>Impact Significance Rating</th>
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<td>Destruction of public utilities.</td>
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<td>2</td>
<td>Interference in Cultural, traditions, norms and ethics</td>
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<td>Soil erosion and instability of slopes.</td>
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<td>Increased childhood pregnancies and school dropouts</td>
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<td>Increased noise and vibration.</td>
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<td>Land expropriation, loss of property and resettlement.</td>
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<td>Increased values and prices of goods.</td>
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<td>Loss of Definite Materials</td>
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<td>Visual intrusion by dust and smoke during construction phase.</td>
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<td>Environmental and land degradation</td>
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<td>Loss of archeological and ritual sites</td>
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<td>Impaired security in the Region due to threat of penetration of</td>
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<td>terrorists, unknown people and refugees</td>
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<td><strong>POSITIVE IMPACTS</strong></td>
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<td>Job creation and increased income.</td>
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<td>Economic growth and trade.</td>
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<td>Improved Accessibility to Agricultural and Forest Products.</td>
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<td>Enhance Management and Monitoring of the Park and Forest Reserves.</td>
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<td>Diverting traffic volume of public vehicles outside the Park</td>
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<td>Implementation of Social support Complementary activities</td>
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10. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

10.1. The Environmental and Social Management Plan (ESMP) presents the implementation schedule of the proposed mitigation measures for the project’s identified impacts. The ESMP also includes the associated costs needed to implement the recommended mitigation measures. The implementation steps will involve the contractor, the Resident Engineer, Environmentalist, Sociologist, Health and Safety Expert, Municipal Councils, infrastructure users and the local communities at large.

10.2. **Environmental Monitoring:** The national EIA guidelines require the developer to prepare and undertake monitoring plan and regular auditing. Monitoring is needed to check if and to what extent the impacts are mitigated, benefits enhanced and new problems addressed. Recommendations for monitoring have been included in the ESMP (Table 9.1). The ESMP also assigns responsibilities for monitoring activities. The However, the divisional/ward/village environmental committees and district environmental committee will participate in the long-term daily monitoring of the project road.

10.3. **Environmental Audit:** Environmental audits determine the long-term effects of adopted mitigation measures. It is recommended that environmental audits be carried out on the project as part of the ongoing maintenance programme. The audits will unveil the actual performance of mitigation measures and will allow effective measures to be included in future projects based on the audit results. As per operative ESIA documents in Tanzania, environmental audits would be a responsibility of the developer (TANROADS).

10.4. **Implementation of the ESMP:** TANROADS as the proponent shall be the Implementer of the ESMP through other organs. The environmental measures incorporated in the detailed engineering design will be attached to the Contract Documents. The Contractor shall take stock of the contents of the Environmental Impact Assessment Statement of the Project. An environmental expert should be appointed to assist the resident engineer, in order to make sure that the environmental measures recommended in this report are effectively complied with and timely adjusted whenever necessary. The expert will be familiar with the scientific measurement of environmental impacts and remedies. He/she will work on a part-time basis and may be selected, by the firm in-charge of supervision works, from the roster of national environmental experts. He will liaise with the relevant public agencies and will carry out the training scheme associated to his assignment.

10.5. **Training Requirements:** The effective implementation of EMP requires that all persons working for the project are aware of the importance of environmental requirements of the project; their roles and responsibilities in the implementation of the EMP. They should also be aware of the significant actual or potential environmental impacts of their work activities; the benefits of improved performance and the consequence of not complying with environmental requirements.

10.6. **Institutional Arrangements and Reporting Procedures:** The City and district councils, assisted by specialists, will be responsible for reviewing civil works contracts in accordance with the ESIA report; (e.g., Ward Development Committees; monitoring the implementation of the ESMP and the civil works contracts in collaboration with NEMC and PMO-LGRG; and, preparing annual environmental progress reports.

10.7. The purpose of environmental and social monitoring is to quantitatively measure the environmental effects of the road project. The environmental monitoring program will operate through the pre-construction, construction, and operation phases. It will consist of a number of activities, each with a specific purpose, key indicators, and significance criteria.
10.8. An Environmental/Social Specialist will carry out the monitoring of mitigation measures during design and construction. He/she will conduct mitigation monitoring as part of the regular works inspections. The responsibility for mitigation monitoring during the operation phase will lie with the Environmental Section in TANROADS.

10.9. The TANROADS will provide PMO-LGRG and NEMC with reports on environmental compliance during implementation as part of their annual progress reports and annual environmental monitoring reports. Depending on the implementation status of in environmentally sensitive areas, NEMC will perform annual environmental reviews in which environmental concerns raised by the project will be reviewed alongside project implementation.

10.10. **Environmental cost:** The principal environmental cost includes the cost of implementing the mitigation measures proposed and that of carrying out monitoring of specific environmental parameters. These costs are indicated in Table below. It should be noted that most of the costs for mitigation measures are already included in the bills of quantities of the overall works. The costs of the environmental supervisor shall be included in the overall supervision cost of the works.

<table>
<thead>
<tr>
<th>Budget Item</th>
<th>Cost in USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation activities and Capacity Building</td>
<td>131,000</td>
</tr>
<tr>
<td>Mitigation Measures during Construction Phase</td>
<td>213,500</td>
</tr>
<tr>
<td>Mitigation Measures during Operation Phase</td>
<td>59,500</td>
</tr>
<tr>
<td>Cost of Baseline Studies Pre-Construction Phase</td>
<td>47,200</td>
</tr>
<tr>
<td>Costs of Monitoring During Construction Phase</td>
<td>128,000</td>
</tr>
<tr>
<td>Costs of Monitoring During Operation Phase</td>
<td>22,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>601,200</strong></td>
</tr>
</tbody>
</table>

11. **SUMMARY AND CONCLUSION**

11.1. The ESIA study results show that the project is associated with negative environmental and social impacts despite that, the project has high socio-economic benefits to the people of Tanga City, Bagamoyo, Pangani, Handeni and Muheza districts and adjoining regions as well. The associated negative impacts, to a large extent can be minimized through appropriate decision, good engineering design and, envisaged construction practices and the mitigation measures proposed in this report. The mitigation measures shall offset some of the inherent adverse impacts especially those linked to land, water and air pollution. Implementing these mitigation measures would increase environmental soundness of the project.

11.2. Due to anticipated negative impacts of the project on the park and its associated ecosystems, the several alternative route were evaluated namely option B, C and D were assessed. After assessment of alternatives, the best alternative was selected based on the environmental impacts and engineering reason. Three alternative routes were assessed where by the best alternative was selected.
11.3. The proposed alternative road will alleviate problems likely to affect the National Park such as pollution, wildlife poaching and accidents among others. In addition, the alternative route identified traverse areas with high potential for agricultural production and tourism development. The identified alternative routes are likely to have sub-spatial contribution towards socio-economic development compared to the Mkwa-ja-Saadani road, due to the fact that it shall serve a number of people and enhance the economic potential of the project area in activities such as small scale-fishing, subsistence farming and livestock keeping. The alternative routes is expected to provide services to more than 17,278 people living in the area as compared to Mkwa-ja-Saadani Route, that will serve a small proportion of the population residing in the area.

11.4. Road transport reduces absolute poverty by improving economic efficiency, as it decreases costs and prices and enhances trade and employment opportunities. Based on our assessment particularly in regards to the well-being of the people, it suffice to say that, the alternative route consideration has to be evaluated in order to minimize negative impact to the national resources and address socio-economic problems in this area such as serving a big proportion of people within the project area.

11.5. It is, therefore, concluded that, implementation of the proposed project will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place. The identified adverse impacts should be managed through the proposed mitigation measures and implementation regime laid down in this ESIA. The responsible parties should be committed in implementing all the recommendations given in the report and further carry out environmental auditing and monitoring schedules to gauge the effectiveness of the mitigation measures.

12. REFERENCES AND CONTACTS

12.1. Reference
GOT (2019) Environmental and Social Impact Study for PROPOSED UPGRADE TANGA - PANGANI - SAADANI - MAKURUNGE (229 KM) ROAD TO BITUMEN STANDARD IN TANGA AND COAST REGIONS

12.2. Contacts
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