Environmental and Social Impact Assessments (ESIA) for the Proposed 400 kV Power Transmission Line Iringa - Dodoma - Singida - Shinyanga

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0. Executive Summary

0.1 Project Background and Rationale

TANESCO plans to establish a 400 kV transmission line from Iringa via Dodoma and Singida to Shinyanga with a total length of 670 (initially 683) km. This new power line will link existing and future generating sources in the south and southwest of Tanzania to the load centres in the Mwanza and Arusha regions in the north. In anticipation of future interconnections with neighbouring countries of Kenya in the north and Zambia in the south, this reinforcement of the grid is a key component of regional economic cooperation and development.

World Bank regulations as well as the Tanzanian Environmental Management Act (2004) and the Regulations for EIA and auditing (2005), mandatorily require a full EIA for projects which are considered to have major environmental and social consequences. This ESIA will meet this obligation.

0.2 Description of Project Environment

The line route and associated substations are located in the central highlands of Tanzania between 32° to 36° east and 4° to 8° south.

The line is divided into three line sections, with the following section lengths that will be changed due to the findings of the ESIA (as far as the proposed routing alternatives will be approved by TANESCO):

- Iringa - Dodoma 225 km (initially 238 km)
- Dodoma - Singida 217 km (initially 214 km)
- Singida - Shinyanga 228 km (initially 231 km)

The total length will be 670 km (initially 683 km).

The transmission line will traverse areas with a differentiated topography with a highest elevation of 1,650 m a.s.l. in the Kidunda hills at Iringa and a lowest elevation of 750 m a.s.l. at the Mtera Reservoir, and therefore also slightly different climatic characteristics. The mean annual ranges between 400 - 600 mm from north of Iringa to Dodoma, whereas in the semi-arid climate of Shinyanga there is slightly higher rainfall, with an average annual rainfall of 800 mm. The vegetation type varies depending on the climate pattern, rainfall quantity and soil characteristics of the area. However, crops induced by human cultivation activities and livestock grazing have replaced much of the natural vegetation.

The new line will pass cultivated farmland as well as grass-, bush- and woodland with scattered cultivation over a length of 440 km or 66% (initially 445 km or 65%), including settlements with a length of about 20 km or 3% of the total line length (initially 34 km or 5%). Main crops are maize, sorghum, rice, sunflower and cotton. Forest reserves will be crossed over a length of about 48 km (7%). The rest, some 180 km or 27% (initially 190 km or 28%) of the line will pass also uncultivated land, such as bush-, grass- and open woodland.

In some areas, the soil is vulnerable to erosion due to soil structure, orography, vegetation cover and the water regime. Along the line, at least along the stretch from Iringa to Dodoma, some sites with severe erosion problems have been observed.
The 400 kV transmission line passes areas with a variety of socio-economic conditions prevailing, as indicated by type and size of residential houses, type and amount of household income from crop yields and livestock keeping, and other assets. The socio-economic survey reveals that the average annual income per household in villages along the line from Mpwapwa District up to Manyoni District is about 31% smaller than in the villages of the other Districts. The report presents a socio-economic characterization of the affected communities and villages based on the information gathered from Statistical Offices.

0.3 Stakeholders and their Involvement in the EIA Process

Extensive stakeholder consultations were undertaken to ensure that major stakeholders and most of the issues were covered. Consultations included several stakeholders in relevant ministries and sectors in Dar es Salaam, Regions, Districts, various institutions including NGOs/CBOs operating at district levels and all villages where the 400 kV line is to pass. Awareness campaigns and participatory assessments such as discussions with local leaders, public village meetings, meetings and interviews with focus groups and various officials from public and private offices were held. Project affected villagers have also been visited to hear their views and concerns.

0.4 Results of Public Consultation

Discussions with officials from various districts and those at village level showed concern about the way the land acquisition procedure for development activities is undertaken in the country. In most cases local communities are not well informed of their rights and of the procedure as a whole. Another concern raised by stakeholders regarding compensation was on the duration of which one should be compensated once properties including land have been acquired by a developer. Another concern with regard to compensation was on prices/value given to affected properties. It was noted that prices given to crops, both seasonal and perennial were very low compared to the actual price or investment cost of that particular crop. In order to address some of these concerns some stakeholders recommended the following:

- Review of price of crops for compensation should be conducted every year and should involve relevant District Agriculture Officials. It is important to involve district officials because investment costs of crops differ from area to area due to variation in physical environment.
- Compensation of land value should include investment cost; for example, rice/paddy cultivation requires higher investment than the cultivation of maize.
- Compensation should also consider the fertility of land and the much higher prices that have to be paid to fertile land. For instance, the price of a land adjacent to a water source v/s a barren land should be much higher.

Several stakeholders raised their concerns regarding the prospect of increased spread of HIV/AIDS in their villages or even in the district as a result of the proposed project. World Vision, an NGO that operates in most of the areas covered by the project was also concerned about this and requested that measures for a prevention of spreading of HIV/AIDS should be taken, e.g. by the intensification of awareness campaigns among the local population and camp workers. In most areas the infection rate is already alarming and all possible measures should be taken to avoid a further spreading of the disease.

Most of the consulted District Council and Municipal officials as well as those at village level have highlighted the importance of the proposed development project to the Nation, Districts as well as the
local communities at large. Districts support the project with the expectation that the increased production of electricity in the national grid will lead to an increased electricity supply in their district areas. Currently two districts, Bahi and Kishapu, which will be traversed by the transmission line, are not connected to the national grid. However, local communities are still concerned as to when they will benefit from this project. Similarly, private companies working in the mining sector highlighted the benefits from the project that according to their point of view will ease the problem of electricity supply to the industries (currently the national electricity demand is not covered by the supply), increase power stability and reduce electricity tariffs. Investors also argued that the proposed development project would improve industrial development in Tanzania as well as increase the national income.

Other stakeholders mentioned benefits from the project, which include the possibility of increased employment opportunities for many people, especially for young ones; though they were concerned that employment may be given to people from outside the region, whilst local people will be left with simple casual jobs.

Other concerns are from villagers that settlements are likely to be impacted by the proposed project. At villages such as Mtera in Mpwapwa district about 125 houses may have to be removed to give way to the proposed project. However, rerouting decision could solve this problem completely. Other mostly impacted villages include Puma in Singida Rural and Bahi town where 50 respectively 85 houses would be impacted following the old line routing proposal. Also for the towns of Puma and Bahi, these impacts could be reasonably reduced or completely avoided by new line routing alternatives.

Though villagers are concerned about loosing their properties, especially houses and farmland, they also revealed their willingness to relocate, as they consider this project as very important for the Nation. Discussions with relevant District Land officers indicated that it is still possible to relocate project affected people within the districts, as there are other villages with sufficient and not occupied or cultivated land.

0.5 Major Significant Impacts

The main elements of the project causing environmental and social impacts will be the construction of

- the transmission line including the wayleave with conductors, towers and access ways
- 4 substations at Iringa, Dodoma, Singida and Shinyanga with capacitors, transformers, switching facilities and work shops
- about 6 - 7 temporary camps with storage areas, workshops and accommodation facilities.

The impact of utmost importance to the natural environment will be the clearance of the wayleave (about 51 km²) and the consequences hereof for most impacts with high significance. The area initially affected by changes of land cover and land use with diminished ecological functions due to the removal or at least degradation of the vegetation cover will amount to 17 km². As far as the proposed mitigation measures will be implemented, this impact will be reasonable more than fully compensated.

In some areas, the soil is vulnerable to erosion due to soil structure, orography, vegetation cover and the water regime. The most affected sections will be the line stretch from Iringa to Dodoma and the Wembere floodplain. This will not only be a threat to the soil in terms of soil loss and degradation, but also a serious danger to the stability of many towers along the existing line. Construction work may cause a serious acceleration of ongoing erosion processes or initiate new erosion threats.
The energy transported via the new line will be fed in mainly by hydropower plants. This may avoid or minimize future power production by thermal power plants in the areas served by the new line, making a considerable contribution to stabilising CO\textsubscript{2}-emissions (some 2.5 Million tons of CO\textsubscript{2} per year).

The new line traverses the forest reserves Nyang'oro, Choda, and Sekenke -Tulya. About 40 km of the line will cross high valued and 8 km degraded forest reserves, all in all an area of 350 ha. Also these impacts may be more than fully compensated. Seasonally inundated areas will be crossed at a length of about 26 km, most of these in the floodplains of the Wembere River and its tributaries. Such areas are preferred breeding and feeding habitats of migrating waterfowls. Along the line, at least two (seasonal) wetlands of high value for birdlife will be directly concerned, Singidan Lakes (about 4 km line length) and the Wembere floodplain (about 20 km or more). National Parks or Game Reserves will not be affected.

Collisions will be a major cause of unnatural mortality for several species of threatened birds. The highest collision risk will be for large terrestrial birds where the earth wires are mounted ahead of the conductors. Some 80% of bird collisions happen at the earth wires. The areas concerned will be the wetlands mentioned before.

The most important negative social and economic impact will be the necessary removal of houses affected by the wayleave. Altogether, about 840 houses (initially 1,300 houses) will have to be relocated. This might be about 300 households and 1,500 people which have to be resettled, i. e. about 4.3 people out of 1,000, living in villages affected by the line will be concerned.

Due to the fact that within the wayleave no buildings will be permitted, some areas potentially suitable for settlements will be lost. Counting the area within settlements or near by settled areas, about 20 km line length (initially 34 km) will be affected, i.e. 150 ha (initially 250 ha) of potential settlement area will be lost. This impact will be reduced.

Agricultural activities in the wayleave area are generally tolerated (but not formally allowed), as long as the height of plants does not exceed 3 m. The area lost for cultivation will be limited to the space needed for substations, tower foundations, access ways and the ways for inspection along the line. Taking into account that access roads and ways will be useful (and also used) for agricultural purposes, these losses will be reduced to 122 ha during construction and later to 35 ha for operation. The benefit the farmers will have from using these ways / roads for their purposes may reduce or even more than fully compensate their losses in the long term.

Complaints of stakeholders have to be accepted also as indicators for social impacts. Most people do not see a benefit for themselves. Basically, the discussion focussed on the sentence "We only see the towers and the transmission line dissecting our villages, we provide security services to this important infrastructure, but we don't have the opportunity to utilize this service". Despite general expectations concerning job opportunities and rising income level, these effects will be very low taking into account the total number of people looking for jobs and income opportunities in the concerned villages. A proposal for a low-cost rural electrification technique along the new line is part of the Environmental and Social Mitigation Plan.

Health effects are focussed on the HIV/AIDS problems which are by nature challenging with regard to mitigation measures, as single men earning money and local girls struggling for their livelihood will be a risky combination.

Table 0-1 presents an overview of all impacts, which are expected to have at least a minor significance.
### Table 0-1: Assessed Impact Levels With / Without Mitigation Plan

<table>
<thead>
<tr>
<th>Impact on</th>
<th>without mitigation</th>
<th>with mitigation</th>
<th>add. RE *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>short term</td>
<td>long term</td>
<td>short term</td>
</tr>
<tr>
<td>Vegetation cover</td>
<td>-5</td>
<td>-5</td>
<td>-2</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>-1</td>
<td>-3</td>
<td>-1</td>
</tr>
<tr>
<td>Climate change</td>
<td>0</td>
<td>+3</td>
<td>0</td>
</tr>
<tr>
<td>Landscape aesthetics</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Valuable habitats without protection status</td>
<td>-3</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>Diversity of habitats, wildlife barriers</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>Collision of birds with the Line</td>
<td>0</td>
<td>-4</td>
<td>0</td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td>-2</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>Waste and waste water</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td><strong>sum 1</strong></td>
<td>-14</td>
<td>-16</td>
<td>-7</td>
</tr>
<tr>
<td>Housing and resettlement</td>
<td>-5</td>
<td>-5</td>
<td>-2</td>
</tr>
<tr>
<td>Public infrastructures and services</td>
<td>-2</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>Settlement areas</td>
<td>-3</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>Cultivated areas</td>
<td>-3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cultural heritage</td>
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<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Employment and income</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Complaints of stakeholders</td>
<td>-3</td>
<td>-3</td>
<td>-1</td>
</tr>
<tr>
<td><strong>sum 2</strong></td>
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<td>-13</td>
<td>-4</td>
</tr>
<tr>
<td>Noise, dust and vibrations</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>Electrocution</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Electromagnetic fields</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Accidents</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>HIV/AIDS and other STD’s</td>
<td>-3</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td><strong>sum 3</strong></td>
<td>-5</td>
<td>-5</td>
<td>-4</td>
</tr>
<tr>
<td>total sum</td>
<td>-34</td>
<td>-34</td>
<td>-15</td>
</tr>
</tbody>
</table>

**Legend**

- *Rural electrification of villages along the new line*

- **Significance of impacts**
  - ○ negligible
  - 1 very low
  - 2 low
  - 3 moderate
  - 4 high
  - 5 very high
  - + positive impact
  - - negative impact
0.6 Project Alternatives

A no-project alternative entails that all above mentioned positive impacts will not take place (Chapter 0.1). Therefore, the socio-economic and environmental consequences of a no project alternative for the proposed project remain unrealistic.

An alternative strategy for energy supply at the same level would be the installation of diesel powered thermal power plants only. Costs as well as environmental impacts of this alternative will by far exceed those of the transmission line project.

Line routing alternatives are proposed in order to reduce impacts on houses and public infrastructure as well as conflicts with governmental authorities. Altogether, alternatives for 7 line stretches have been developed with a total length of 98 km, sparing about 460 houses (out of 1,300) and 10 public infrastructures (out of 23), and resulting in compensation savings of about 1,400 TEUR (and additionally lots of social grievances not rateable in monetary units). In summary, cost savings in the range of 6,000 to 8,000 EUR might be realistic, above all due to the fact, that these alternatives will reduce the total line length by about 13 km.

0.7 Mitigation Measures and Mitigation Plan

According to Chapter 0.5, mitigation measures have been defined in order to reduce the impacts of the project, and a mitigation plan has been drawn up.

The most important measure concerning the natural environment targets the wayleave area, where a selective clearing is recommended. That means that areas shall be cleared for construction work and inspection to a not more than absolutely necessary extent. After finalisation of construction work areas not needed anymore should be revegetated / reforested as far as the line safety is not impeded. These measures may reduce the area of necessary vegetation cutting by more than 90% and mitigate also the impacts on protected areas as well as the diversity of habitats, wildlife barriers and landscape aesthetics.

Addressing soil erosion, some technical measures are recommended which may prevent an acceleration of ongoing erosion processes as well as an initiation of new erosion threats in susceptible areas.

The risk for birds to collide with line conductors and shield wire will be reduced significantly by appropriate technical measures. The most efficient measure will require a different type of towers for line stretches crossing the wetlands mentioned in Chapter 0.5.

The impacts on housing, social infrastructures and cultivated areas will be mitigated significantly by the line routing alternatives (see Chapter 0.6) and above all by an Resettlement Action Plan (RAP), which will include all compensation issues and meet many complains of stakeholders.

The serious complaint that villages along the line corridor will not benefit from electrification, might be countered by an electrification of these villages, e.g. a timely deployment of shield wire systems (SWS) at least cost. This is best suited for rural electrification in sparsely populated territories traversed by HV transmission lines, and would be best implemented simultaneously with the construction of the new transmission lines.

The balance of impacts in Table 0-1 demonstrates that the proposed mitigation measures will fully compensate all impacts on the natural environment, whereas the impacts on safety and health condi-
tions will remain negative. The balance for livelihood and living conditions of the villages and people along the transmission line will remain slightly negative, in case electrification of the villages along line will not take place. This will turn into far more than a full compensation with regard to electrification, as this will boost the local economy.

Responsibilities and costs for the recommended mitigation measures are listed in an Environmental and Social Mitigation Plan. The total costs of this plan and the Environmental and Social Monitoring Plan (see Chapter 0.8) will be much lower than savings.

### 0.8 Environmental and Social Monitoring Plan

The main objectives of environmental monitoring are:
- to assess the changes in environmental conditions,
- to monitor the effective implementation of mitigation measures,
- to indicate potential problems in order to allow prompt implementation of effective corrective measures.

Monitoring will be particularly important where
- environmental impacts can’t be estimated with suitable certainty
- the efficiency of mitigation measures are uncertain
- effects on socioeconomic items as well as health and safety issues are concerned.

Monitoring will already start in the planning phase, as in several aspects the actual situation is not yet known in the necessary spatial and factual resolution. This is above all true for some biological parameters for example the vegetation cover in the wayleave and the population of endangered birds in the wetlands, for the incidence rates of HIV/AIDS and other STDs, and for all compensation issues. Monitoring during construction time will concentrate on the supervision of activities of the contractor and is mostly based on observations in camps as well as at construction sites.

Responsibilities and costs for the recommended monitoring activities are listed in an Environmental and Social Monitoring Plan. The total costs for the Environmental and Social Monitoring Plan will be far below the expected savings.

### 0.9 Decommissioning

The expected lifetime of a high voltage transmission line may be estimated to be at least 50 years. An early decommissioning is therefore not very likely, but rather a long-ranging repair or exchange of line components.

Decommissioning of technical installations comprises dismantling, decontamination of materials and site, shipment and final disposal of materials as well as site rehabilitation. Disposal of materials can take place either by selling, re-use or depositing. For all metal components from the transmission line this will mainly mean scrapping. Due to high transportation costs and the lack of a scrapping infrastructure in developing countries on the one hand, and the high quality of these materials and value for local people on the other hand, these materials are at present usually left on site for cannibalisation. Any decontamination will not be necessary.
A substation is a very different problem. Due to a lot of hazardous substances such as hydrocarbons and electrical equipment containing heavy metals, a very careful dismantling, decontamination of materials and of the soil down to the deeper layers, shipment and recycling or proper disposal will be obligatory.

0.10 Conclusions and Recommendations

The proposed transmission line is a project of major importance for the infrastructure development and the socio-economic development of Tanzania in general and the north-western region in particular. However, by its nature, such a project will have a lot of impacts on environmental and socio-economic issues with a broad range of significance.

However, the balance of impacts demonstrates that the proposed mitigation measures will fully compensate all impacts on the natural environment, but the balance of impacts on safety and health conditions would remain negative due to the fact, that the main issue HIV/AIDS would be challenging in respect of appropriate measures. Therefore, one essential proposal is to clear the wayleave only to the technically indispensable extent, and to recultivate / reforest / revegetate also the wayleave of the old 220 kV line to the same extent. The balance for livelihood and living conditions of the villages and people along the transmission line will remain slightly negative, in case electrification of the villages along line will not take place. This will turn into far more than a full compensation with regard to electrification, as this will boost the local economy.

Positive impacts like employment opportunities and income rising for local people along the line will normally be by far overestimated. Verifiable effects will be minimal, as long as the construction of this line will not be combined with an electrification of the villages along the line. A least cost solution in time for this issue is part of the recommendations.

It is strongly recommended to start with the following monitoring activities as soon as possible:

• Establishment of a detailed large-scale mapping of the actual vegetation cover along the wayleave as well as of erosion prone areas, following the still pending demarcation of the new line;
• Observation of bird population and bird migration at the line stretches crossing the seasonal wetlands near Singida and at Wembere floodplain. This will be possible during rainy season only, the results will be an input for tendering;
• Documentation of available information on wildlife in areas where a high value for wildlife is indicated.
• Documentation of representative HIV/AIDS rates in the villages along the proposed line

These activities shall be carried out by experienced specialists only.