EN environmental & social impact assessment
for the zambian section of the zambia-democratic republic
of congo 220kv electricity interconnector to be developed
by
copperbelt energy corporation plc

A Component of the World Bank's Southern
African Power Market Project

second edition
January 2009
Revision Control

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ACRONYMS

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<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>a.c</td>
<td>Alternate current</td>
</tr>
<tr>
<td>CEC</td>
<td>Copperbelt Energy Corporation</td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
</tr>
<tr>
<td>CSO</td>
<td>Central Statistical Office</td>
</tr>
<tr>
<td>d.c</td>
<td>Direct current</td>
</tr>
<tr>
<td>Dbh</td>
<td>Diameter at breast height</td>
</tr>
<tr>
<td>DRC</td>
<td>Democratic Republic of Congo</td>
</tr>
<tr>
<td>°C</td>
<td>Degree Celsius</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
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<tr>
<td>EMC</td>
<td>Electro - Magnetic Compatibility</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
</tr>
<tr>
<td>Hz</td>
<td>Herz</td>
</tr>
<tr>
<td>ITCZ</td>
<td>Inter-Tropical Convergence Zone</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for conservation of Nature</td>
</tr>
<tr>
<td>KCM</td>
<td>Konkola Copper Mines</td>
</tr>
<tr>
<td>km</td>
<td>Kilometres</td>
</tr>
<tr>
<td>kV</td>
<td>kilovolts</td>
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<td>m</td>
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</tr>
<tr>
<td>MW</td>
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</tr>
<tr>
<td>NEPAD</td>
<td>New Economic Partnership for Africa</td>
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<tr>
<td>NTU</td>
<td>Nephelometric Turbidity Units</td>
</tr>
<tr>
<td>pH</td>
<td>Intensity of the acid or alkaline condition of solution</td>
</tr>
<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
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<td>SAPP</td>
<td>Southern African Power Pool</td>
</tr>
<tr>
<td>SNEL</td>
<td>Societe National d'Electricite</td>
</tr>
<tr>
<td>T_co</td>
<td>Total Cobalt</td>
</tr>
<tr>
<td>T_cu</td>
<td>Total Copper</td>
</tr>
<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
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<td>WESTCO</td>
<td>Western Corridor</td>
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<tr>
<td>ZAFFICO</td>
<td>Zambia Forestry and Forest Corporation Limited</td>
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<tr>
<td>ZAMTEL</td>
<td>Zambia Telecommunication Limited</td>
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Zambia - DRC 220kV Interconnector - Environmental and Social Impact Assessment Report [Zambian section]

ZRA Zambezi River Authority
PREFACE TO THIS SECOND EDITION

This Environmental and Social Impact Assessment report (ESIA) is being re-submitted to the Environmental Council of Zambia (ECZ) in compliance with its management decision made on 15 January 2009 and based on the provisions of the Environmental and Social Impact Assessment Regulations of 1997. The first ESIA report was initially submitted to the Environmental Council of Zambia on 18 July 2003 and after the review process, consent to implement the project was granted. However because of the international nature of the project, implementation of the project has not taken place to date. Considering the time lapse, it has become necessary to update the report to reflect the environmental and social factors that are currently prevailing in the project area.

In general, there has not been any significant change in terms of the environmental and social conditions identified and considered during the initial ESIA study. Despite the fact that the project has not been implemented to date, CEC has implemented most of the recommendations in the original version of this report and this include, compensation and relocation of the affected parties and the compensation for the forest resource; clearing of the some parts of the wayleave.

The review and updating of the first edition of the ESIA report to this second edition has been undertaken by the Compliance and Quality Department of CEC by the following:

1. Francis Kasongo Environmental Officer
2. Collins Chabuka Risk and Compliance Manager
3. Owen Silavwe Project Manager/Engineer
ACKNOWLEDGEMENTS

The Environmental and Social Impact Assessment Team wishes to acknowledge the inputs from the various stakeholders towards the production of this Report. In particular the team wishes to thank the following: The Deputy Permanent secretary of the Copperbelt province, the Provincial Planning Officer and officers from cabinet office in Ndola, the District Administrators in both Chingola and Chililabombwe, The town clerk of Chililabombwe district, Government officers in the Departments of Agriculture and Forestry at the District level, Planning officers in the two districts, Management of ZAFFICO, the Director of the Copperbelt Museum, Officers from Fisheries Department, Council officials in Chingola and Chililabombwe, Immigration Department and the Police Service.

Of course we cannot forget the management of the Copperbelt Energy Corporation Plc for the valuable information and assistance they have been able to provide the team with. In particular the team wishes to express gratitude to the following CEC staff Mr. Sindowe, Mr. Chapman, Mr. Silavwe, Mr. Chabuka, Mr. Kasongo, Mr. Lisita and Mr. Lwiindi whose help is acknowledged.

Last but not least we wish to commend and thank the communities of Chingola and Chililabombwe for actively supporting and participating in this project.
NON-TECHNICAL EXECUTIVE SUMMARY IN ENGLISH

The Copperbelt Energy Corporation Plc (CEC), a Copperbelt based power transmission company, has applied to construct a 47km, 220kV dual circuit power line from Luano Substation in Zambia to DRC frontier. The new line will increase the power transmission capacity of the interconnector from 210MW to 500MW.

The proposed dual circuit new power line to be built by CEC is approximately 47km in length, and is part of the estimated 138km transmission line from Zambia to the DRC.

The line on the Zambian side will run from Luano Substation to Kasumbalesa on the DRC side. The new line will be all overhead built using 45km steel lattice towers and aluminium conductors supported on polymeric insulators. CEC will source funds for the cost of the line on the Zambian side while SNEL will be assisted by the World Bank for the DRC component of the line.

After considering the merits and demerits of the available three alternative routes, it was decided to build the new dual circuit line alongside the existing 210MW, 220kV Luano to Karavia line. Cost, time frame, safety from vandals led to choosing an overhead system instead of an underground system.

Construction of the line should take about twelve months and the supporting towers will be constructed on pre-cast concrete foundations. Access to the new line route will be via the existing access road.

The new line will be constructed next to an existing line in a wayleave on which CEC already owns transmission rights of way. However, the change of the border crossing point at Kasumbalesa has introduced a new 2km wayleave stretch just before the DRC frontier, for which CEC has to acquire transmission rights of way. No planning policies will be breached. The proposed line route is very sparsely populated hence very few people will be affected in terms of relocation.

Following approval of the ESIA report submitted by the CEC and approved by the ECZ in 2003, CEC undertook all resettlement and compensation requirements identified at the time.
Details of the resettlement and compensation undertaken are provided in Exhibits 1 to 3 of this summary. It should be noted that the 2 churches that were impacted upon by the choice of this route were satisfactorily resettled. Continuous monitoring of the proposed line route over the years by CEC has ensured that there are no new household settlements along the project area. This has eliminated additional requirement to settle or compensate new household issues. This scenario is reflected even along the additional wayleave of about 2km on which CEC is pursuing transmission rights of way.

The proposed line has been designed in such a way that the only impacts it will have is upon the landscape which will not be worse than that of the existing line. The line design will result into virtually no negative impacts (electrically) on the health of the settlers though they will be restricted from carrying out farming activities along the wayleave.

Vegetation clearing will be one of the major environmental impacts during construction. However, between 50 and 90 hectares of natural forest and 6.83ha of ZAFFICO plantation will be cleared, which is significantly less than if the line were to follow a different route. In order to avoid wood wastage CEC through the Forest department and ZAFFICO will encourage forest based industries to salvage sawable timber. The local charcoal producers will be encouraged to utilise the felled trees. Cutting of trees will be at stump level (10 - 20cm) from the ground. This will enhance quick recovery of natural forest in cleared areas through coppicing of stumps and shooting of roots. CEC has already compensated ZAFFICO for early clearing of their 6.83ha plantation and pay stumpage fees to government through the Forest Department for clearing between 50 and 90 ha of the natural forest. Stumpage fees for the 18 ha of natural forest in the additional 2km wayleave will be paid to the Forest Department in addition to the direct or indirect participation in the re-planting of trees in the Forestry Department's area of choice.

Originally the area had quite a number of fauna species, among them were elephant (*Petrodromus tetradactylus*), bush buck (*Tragelaphus, scriptus*), etc. Due to farming activities and poaching for the past years, big fauna has disappeared, only small animals like Grass cutter (*Thryonomys swindesiAnus*), mole rat (*Cryptomys hottentotus*), Bush squirrel (*Paratenus cepapi*) etc are found in the area. However a number of bird species like common bulb (*pwele*), Capeturtle dove (*Nkapole*), green pigeon (*Inkondokondo*), etc are found in the area. Rarely do you find large birds. Thus the project will not greatly impact on fauna in the area, although some may be chased away due to construction but at operations level some fauna species will be attracted in the cleared areas.
Non-timber forest products like bowa (mushroom), natural fruits, medicinal plants etc play very important role at domestic and commercial level. These contribute to household food security, income generation, improve income and security etc. The construction of transmission line will involve clearing a 15 – 30m width for a distance of 47km. The negative impact on non-wood timber forest products will be very low.

Forest fires usually occur between July and October. Late fires may kill vegetation and open up landscape for farming and settlement. During construction and operation phases, awareness campaigns about the dangers of fires will be carried out. This will also involve putting up warning signs about the dangers of fires in the area.

The major negative impact of the project was identified as being the relocating of the three affected households and two churches. This is in addition to clearing of exotic trees under ZAFFICO management and natural forests under oversight of Forestry Department. About 150 ha of vegetation will have to be cleared from the new wayleave. In mitigation CEC has undertaken compensation of all affected people with the view of leaving them in a better situation than they were found. As for the reforestation, CEC will support tree planting in cooperation with the Forest Department and the local communities in addition to payment of regulatory stumpage fees.

Both Zambia and the DRC and related local industries will benefit financially from the project. During construction the local communities along the wayleave will benefit by being employed and from the usage of the wood products from the felled trees. CEC will undertake an awareness campaign for the locals and contractors before construction and during construction on issues of HIV/AIDS, poaching and preservation of the environment.

Overall the Zambia-DRC projects benefits and positive impacts far outweigh the negative impacts and as such the project should proceed.

The ESIA was conducted mainly with reference to the Zambian Regulations on ESIA Statutory Instrument No 28 of 1997 as well as in accordance with appropriate World Bank guidelines and procedures.
### Exhibit 1: Compensation implemented for affected parties in Chililabombwe

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Farmer</th>
<th>Farm No</th>
<th>Locality</th>
<th>Activity</th>
<th>Affected Area (Ha)</th>
<th>Value of Compensation (ZMK)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A Mulola</td>
<td>4121</td>
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<tr>
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<td>8686</td>
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<tr>
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<tr>
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<td>8</td>
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<td>250,000</td>
<td>Relocated Crop Field</td>
</tr>
<tr>
<td>5</td>
<td>C Menshi</td>
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<tr>
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<td>8</td>
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<td>10</td>
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<td>Muteta</td>
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<tr>
<td>12</td>
<td>New Apostolic Church</td>
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<td>Mingombwa</td>
<td>Church</td>
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<tr>
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</tr>
<tr>
<td>14</td>
<td>J Likola</td>
<td>TBA</td>
<td>Mingombwa</td>
<td>Fallow Crop Field 4 mango trees, 1 banana mat, 1 mud Hut</td>
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<td>1,728,000</td>
<td>250,000</td>
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<tr>
<td>15</td>
<td>Bernadette Chilufya Banda</td>
<td>9</td>
<td>Mingombwa</td>
<td>Fallow Crop Field 10 banana mats, 1 guava tree, 6 cane stations, 2 low cost houses</td>
<td>3</td>
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**SUBTOTAL**

|  |  |  |  |  | 300,164,000 |

### Exhibit 2: Compensation implemented for affected parties in Luano Phase 2 Chingola

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Farmer</th>
<th>Farm No</th>
<th>Locality</th>
<th>Activity</th>
<th>Affected Area (Ha)</th>
<th>Value of Compensation (ZMK)</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Nellis Nguni</td>
<td>8</td>
<td>Kafue River</td>
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<td>1.75</td>
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<tr>
<td>2</td>
<td>Zambia Red Cross</td>
<td>7</td>
<td>Luano</td>
<td>Active crop field, 2 mango tree</td>
<td>3.5</td>
<td>4,364,000</td>
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<tr>
<td>3</td>
<td>Christopher Mtonga</td>
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<td>Luano</td>
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<tr>
<td>4</td>
<td>Rodrick Lundulanga</td>
<td>P40</td>
<td>Kamingomo</td>
<td>Active crop field, 120 batches of bananas, 4 mango trees</td>
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<tr>
<td>5</td>
<td>Grasius Maseka</td>
<td>P41</td>
<td>Kamingomo</td>
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<td>3,932,000</td>
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<tr>
<td>6</td>
<td>Pezulu Lwambula</td>
<td>P44</td>
<td>Kamingomo</td>
<td>Active crop field</td>
<td>0.5</td>
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<tr>
<td>7</td>
<td>Chisha Kapele</td>
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<td>Kamingomo</td>
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<tr>
<td>8</td>
<td>Rabbie Lubonde</td>
<td>P46</td>
<td>Kamingomo</td>
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<tr>
<td>9</td>
<td>Phebby Mangala</td>
<td>P47</td>
<td>Kamingomo</td>
<td>Fallow crop field</td>
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<tr>
<td>10</td>
<td>Sanny Mietwa</td>
<td>P48</td>
<td>Kamingomo</td>
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<tr>
<td>11</td>
<td>Esnart Namanje</td>
<td>P49</td>
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<tr>
<td>12</td>
<td>Sichone Darnson</td>
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<tr>
<td>13</td>
<td>Church</td>
<td></td>
<td>Kamingomo</td>
<td>Church</td>
<td></td>
<td>140,000,000</td>
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**Total**

|  |  |  |  |  | 169,626,000 |
### Exhibit 3; Compensation carried out for affected parties in Luano phase 3 - Chingola

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Farmer</th>
<th>Farm No</th>
<th>Locality</th>
<th>Activity</th>
<th>Affected Area (Ha)</th>
<th>Value of Compensation (ZMK)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Luka Mumbi</td>
<td>L/463/m</td>
<td>East of Luano sub</td>
<td>Active Crop Fields</td>
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<td>1,000,000</td>
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<tr>
<td>2</td>
<td>Gilbert Phiri</td>
<td>L/482/m</td>
<td>East of Luano sub</td>
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<td>500,000</td>
<td>Relocated Crop Field</td>
</tr>
<tr>
<td>3</td>
<td>Lackson Banda</td>
<td>L/483/m</td>
<td>East of Luano sub</td>
<td>Active Crop Fields</td>
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<td>1,000,000</td>
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<tr>
<td>4</td>
<td>Blashani Zulu</td>
<td>L/489/m</td>
<td>East of Luano sub</td>
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<tr>
<td>5</td>
<td>Joseph Malichi</td>
<td>L/324/m sub Div B</td>
<td>North of Luano sub</td>
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<tr>
<td>6</td>
<td>Patson Chila</td>
<td>L/462/m</td>
<td>North of Luano sub</td>
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<tr>
<td>7</td>
<td>Austin Moyo</td>
<td>L/342/m</td>
<td>North of Luano sub</td>
<td>Active Crop Field and Garden</td>
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<tr>
<td>8</td>
<td>Shimishi Mulonda</td>
<td>L/282/m</td>
<td>Chininsa Stream</td>
<td>Active Crop Field and Garden</td>
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<tr>
<td>9</td>
<td>Mwandila Vongo</td>
<td>L/331/m</td>
<td>Musenga</td>
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<tr>
<td>10</td>
<td>Matolopa Alweki</td>
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<td>Musenga</td>
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<tr>
<td>11</td>
<td>Henry Manyamoka</td>
<td>L/311/m</td>
<td>Dambo</td>
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<td>Masautso Mbewe</td>
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<td>Garden</td>
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<tr>
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<tr>
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<td>Dambo</td>
<td>Garden &amp; Crop Fields</td>
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<td>Relocated Crop Field</td>
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<td><strong>TOTAL</strong></td>
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<td></td>
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<td><strong>16,864,000</strong></td>
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1.0 INTRODUCTION

1.1 Background

The existing Zambia-DRC power line was built in 1956, and became the region's first electricity interconnector. Over several decades this interconnector has served both countries well. Prior to the development of Zambia's large hydro-power stations, this line enabled Zambia's mining industry to access economic hydro-power from Congo. Later it served as a valuable source of emergency power to mining regions on both sides of the border. It is now one of the backbones for the growing regional electricity trade. The value of expanding the capacity of this interconnection has been recognised by stakeholders for more than a decade. The expansion of this interconnector continues to be one of the Southern African Power Pool (SAPP) number one priority project.

The Copperbelt Energy Corporation (CEC) Plc of Zambia and Societe Nationale d'Electricite (SNEL) of the Democratic Republic of Congo (DRC) are now taking decisive steps to implement this project. The project, which will involve constructing a 220kV, 138km long duo power line adjacent to the existing interconnector is scheduled to be completed during the year 2010. The project will expand the capacity of the Zambia - DRC interconnection from the present 210MW to 500MW. Environmental and Social Impact Assessments have been completed on both sides of the border, and impacts are being addressed.

As is the case at present, electricity delivered through this interconnector by SNEL will be transmitted onwards through the CEC and ZESCO systems to demand centres beyond Zambia, but it will be available for Zambia's own use in the event of emergencies such as droughts.

The DRC currently has an electricity surplus from which it cannot benefit fully until the bottleneck between the SNEL and the CEC system is eliminated (by this project). The most economic approach to satisfy the region's future electricity demand is to harness DRC's huge hydropower reserves for transmission to other parts of the region.

SAPP utilities have indicated their determination to see developments that promote this pattern of trade, such as the reinforcement of the Zambia-DRC interconnector, in view of huge potential benefits to the whole region.
Because of the above regional recommendations, CEC and SNEL are proposing to construct a second 220kV interconnection line between Luano and Karavia, a distance of approximately 138km of which 47km would be in Zambia.

The Zambia-DRC 220kV interconnector project is a joint venture between CEC and SNEL. This involves the construction of a second 220kV transmission line between Luano in Zambia and Karavia in Democratic Republic of Congo, a distance of approximately 138km of which 47km is within Zambia, to be constructed parallel to the existing 220kV CEC line between Luano and Karavia.

The second transmission line will comprise two three phase a.c. circuits utilising aluminium conductors operating at 50Hz and 220kV. The conductors will be supported by steel lattice pylons, which will be approximately 25m in height and will support the phase conductor at minimum height of 7 metres above the ground. About 150 of these towers will be within Zambia with the remainder in the DRC. The new circuit will terminate within the existing substation at both ends and its route in Zambia will be adjacent to the existing circuit for the entire route. The project will involve the clearing of a strip of land about 45 metres in width within the confines of the existing CEC wayleave.

The main objective of this project is to expand the capacity of the Zambia-DRC interconnection from the present limits of 210MW to 500MW. In addition, the security and reliability of the interconnector will be greatly improved as this development will provide capability for planned as well as unplanned outage of one circuit without impacting the electricity trade through this interconnection. The Environmental and Social Impact Assessment has been conducted for the 47km route corridor on the Zambian side.

CEC is committed to provide the means by which customers' electricity needs are satisfied in the most effective way. In order to honour its commitments to meet the needs of users of electricity throughout the region, CEC has put in place a specific program for expansion of this transmission infrastructure. The guiding principal in the planning of this infrastructure development is to provide electricity in the most cost effective manner, while at the same time minimising the negative environmental impacts.

The Zambia – DRC interconnection line is not only required as part of the strengthening of the Southern Africa Power Pool (SAPP), but is also regarded as an important economic project...
under the New Economic Partnership for Africa (NEPAD). This is a new African initiative that seeks to promote African economic development through intra-African co-operation and joint efforts with the developed countries.

1.2 Purpose of the Environmental and Social Impact Assessment

The carrying out of the Environmental and Social Impact Assessment (ESIA) for the 47km. Zambian section of the proposed development, allows the measurable economic benefits of the project to be reconciled to environmental (ecological) and social attributes of the project, in accordance with the legal requirements of the Environmental Protection and Pollution Control Act. The purpose of the Environmental and Social Impact Assessment is to determine whether the project would cause any negative impacts on the social and ecological setting of the project area. Mitigation measures are then put in place to ameliorate negative impacts.

ESIAs specifically address the unintended impact of the project on the local ecology, land use and society. Furthermore, they seek possible environmental benefits to be secured and weighed against the negative impacts.

In the case of Zambia-DRC interconnector power transmission line, the effect on economic, social and ecological issues are imperative to assess. The projects seeks to avoid built-up and otherwise developed areas, to keep out of wetlands, cultural sites, moderate to steep slopes, vital natural resources and ecologically sensitive areas.

The original version of this ESIA report was completed by CEC and submitted to the ECZ for approval in 2003. In its decision letter of 18th July 2003, the ECZ gave its regulatory consent for CEC to proceed with project implementation, stipulating a number of conditions that required to be adhered to by CEC during project implementation. In line with the EPPCA, since more than three years have passed since the ESIA approval of 2003, the 2003 report has been considered to have lapsed. Hence this version of the ESIA report which seeks to upgrade the 2003 report will be resubmitted to ECZ.

1.3 Scope of the Environmental and Social Impact Assessment

The study is concerned with the ecological and social aspects of the project within Zambia, particularly the possible adverse consequences such as pollution, disturbance of habitat, truncation of land uses, dislocation of people and other forms of social distress, loss of
buildings and fields, and dangers to people and animals. It is also concerned with how society utilises renewable natural resources for farming, animal husbandry, wildlife and purchase of natural products such as thatching grass, medicinal herbs, wood-fuel and poles for building.

The study has addressed indirect as well as direct impacts but emphasises on mitigation measures.

Apart from possible effect on the catchment area, natural forest and the ZAFFICO plantations, there are no major social impacts to be experienced since the area is largely unsettled. There are quite a few authorised settlements in the area with permits obtained from the Department of Agriculture and the local authorities in the area. Only three of the properties currently have title deeds, and the majority of the other sitting tenants have not yet obtained title deeds.
2.0 PROJECT DESCRIPTION

2.0.1 Introduction

The project being contemplated by this study is a joint venture between CEC of Zambia and SNEL of the DRC with the specific objective of increasing the capacity and improving the security of the existing electricity interconnector between Zambia and the DRC.

This is also a project that has been recognised as contributing to the principles of NEPAD by fostering increased regional trade and economic integration within Africa. In addition this project has been endorsed by the World Bank as being a priority for the advancement of the Southern African Power Pool and to help realise further the benefits attendant to the creation of a strongly connected power system within a developing and expanding energy market.

This is a project that also benefits the whole electricity sector of Zambia and positions Zambia to play an increasingly important role as a power corridor within the expanding energy markets of southern and eastern Africa.

2.0.2 Project Details

The major objective of this development is to increase the capacity and security provided by the existing 220kV interconnector between Luano (Zambia) and Karavia (DRC) from its current level of around 210MW to 500MW. This is a joint project contemplated between CEC and SNEL and comprises the following major components.

- The construction of a second 220kV duo circuit a.c. transmission line from Luano in Zambia to the DRC frontier utilising, in Zambia, for the first 45km, the wayleave corridor provided for along the existing line's wayleave rights and a new and additional wayleave spanning about 2km before the DRC frontier.
- The installation of associated terminal equipment at Luano substation.
- The installation of any required reactive power compensation equipment in DRC (and possibly Zambia).
- The installation of associated metering, protection and telecommunication equipment to facilitate effective system operation.
It is envisaged that these activities will increase the transfer capacity of the interconnector to around 500MW as well as improving the interconnector performance through the introduction of security and redundancy provided for by existence of parallel circuits.

In addition to the activities directly associated with the upgrade of the regional interconnector, activities are required within the DRC to ensure that surplus power can be reliably delivered to their border for export. These activities include investments to increase the available capacity of their installed generation assets as well as improvements in their internal a.c. and d.c. transmission systems.

Whilst these investments are outside the scope of the joint CEC-SNEL project, they obviously need to be closely co-ordinated with the interconnector upgrade project.

At this stage the construction phase of the project is currently being targeted to commence in 2009 such that commercial operation of the upgraded interconnector can begin during 2010.

2.0.3 Financing Details

Each of the major sponsors, CEC and SNEL, will assume responsibility for financing the elements of the project that occur within their own countries of Zambia and DRC respectively.

CEC will finance its element of the project through a combination of internal resources and debt funding from either commercial or development financing institutions.

Investment within the DRC will be supported through the auspices of the World Bank as part of a wider multi-sectorial rehabilitation programme that attempts to help the DRC overcome the effects of its recent civil conflicts.

2.0.4 Technical Details

The existing 220kV circuit was constructed in 1956 and comprises a twin copper conductor suspended by porcelain insulators onto self-supporting galvanised steel lattice towers. The line is generally in good condition following major refurbishment work carried out in 2005 to ensure that its performance and availability will match that of the new dual circuit line. Replacement of terminal equipment in the form of line traps, current transformers, and circuit breakers was done to remove the capacity constraints that existed before.
The new circuit will take the form of a 220kV dual circuit utilising twin aluminium conductor with steel lattice towers. The conductors will be suspended from supported steel lattice towers with a height of approximately 25m above the ground. The towers will be equipped with an earth wire (guard wire) to provide protection against lightning strikes. This earth wire will also be equipped with a fibre-optic capability to provide telecommunication services for the purposes of protection and metering.

2.1 Construction Methodology

2.1.1 Introduction

This section provides an overview of the construction process to assist in the assessment of the environmental impacts associated with this project.

2.1.2 Pre-Construction Activities

Prior to the construction of the proposed 220kV line, a detailed ground survey will be carried out to determine the ground profile along the route. During this process the prospective location for the sitting of the tower structures will be determined to ensure that the criteria for span lengths and clearances can be achieved. Wherever possible the views of the local inhabitants will be taken into account in determining the exact location of each specific tower.

A detailed search of any existing services and local utilities along the project route will also be carried out to ensure that the risk of damage to other company's assets is minimised. In the event that services of other utilities are situated within the proposed route, these will be located and clearly identified prior to the commencement of any construction activities.

2.1.3 Route Clearance

Based upon the results of a comprehensive land survey along the route of the proposed line, the area within the existing wayleave that is required to be cleared will be identified through the use of marker beacons. The clearance of the trees along the route for a strip of between 15m and 30m can then commence in accordance with the measures outlined later in this report.

At this stage, it is worthwhile to note that clearance and relocation of buildings and structures has already been undertaken in accordance with the provisions agreed between the affected
parties as outlined in the associated Resettlement Action Plan (RAP) that has been prepared by CEC, and in consultation with the appropriate local authorities.

2.1.4 Access Arrangements

The CEC maintenance and inspection road, which will be used for construction activities, also lies within the existing CEC wayleave.

Co-incident with the route clearance activities will be the necessary works required in ensuring that access provisions to the route are adequate for the project to be constructed. This will be undertaken in accordance with a plan agreed with the local authorities and may include the construction of temporary access routes for certain sections of the line.

The construction activities will use CEC's existing maintenance and inspection roads, which are generally in a condition that can accommodate the construction vehicles being contemplated. However the wayleave road will be upgraded. This work will involve grading and addition of laterite in poor sections of the road. Some road sections may be widened, bridges and culverts may be reinforced to accommodate passage of light trucks that will be used during construction. Access to site and traffic management will be arranged in a manner that avoids the need to traverse the more sensitive dambo areas as well as the need to reinforce the two bridge structures in the project area. Minor improvements to the CEC wayleave road may need to be carried out in the form of levelling and re-grading surfaces in a couple of locations.

The relevant immigration and law-enforcement agencies in both DRC and Zambia will be consulted and procedures developed for working adjacent to, and in some cases, across the border of the neighbouring countries.

2.1.5 Creation of a Workers Construction Camp.

A tented construction workers camp would be established at a central location within the project area to house the non-resident workers that are recruited to undertake the construction activities. This camp would accommodate approximately 30 people and would be self-contained in terms of security, ablution and catering facilities.
The sitting of the camp would be agreed with local authorities with due regard to reducing the impact upon the surrounding communities whilst maintaining sensible proximity to the work area. At the end of the construction phase, the camp would be fully demobilised and the area returned as far as possible to its original condition.

2.1.6 Installation of Tower Foundations

The first significant construction activities relate to the installation of the foundations for each tower. In the case of the Zambian section of the project, it is envisaged that approximately 155 towers will need to be constructed.

Due to the relatively straight line that the route would be following the majority of the tower structures would be suspension types which involve lower mechanical stresses and therefore require smaller foundations.

Based upon the current information regarding ground conditions it is envisaged that cast-concrete foundations would be utilised. For each tower an appropriate level of excavation would take place and the foundation would be constructed using a specially designed steel framework. After a period of 48 hours the framework would be removed and the excavation would be back-filled and compacted. Topsoil around the foundation would be replaced as near as possible in the condition in which it was found.

Approximately 6 cubic metres of concrete would be required for each tower, which equates to a total requirement for the Zambian section of about 2000 tonnes. The necessary materials would be sourced locally and would be delivered and mixed on site.

2.1.7 Tower Construction

The next major task involves the assembly and erection of the tower structure. This commences with the delivery on site of the bundled steelwork members using a 25/28 tonnes load-trailer. Each tower structure will require approximately 5 tonnes of steelwork, which equates to a total requirement of about 775 tonnes for the Zambian section of the route. The tower structure will be assembled on the ground and erected by means of a suitable mobile crane.
As far as possible the towers will be erected consecutively at a rate of 2 towers per day. Anti-climbing guards would be fitted and maintained at an early stage of erection.

2.1.8 Conductor Stringing

The next stage of the process will be to install onto the tower structures the necessary insulators to support the conductors as well as the equipment necessary for running out and stringing the conductors.

The installation equipment and conductor drums would be delivered to each number of pre-selected stages along the line route to allow for stringing using the winch and brake method. A pilot wire would initially be installed for each conductor and then used to draw through the conductor under constant tension. This would minimise both conductor damages as well as ground damage during installation. The conductor would then be tensioned to the correct value and clamped at each tower position. Spacers would then be fitted between the pairs of conductors in each phase.

The total weight of conductor to be used on the Zambian portion of the line would be approximately 800 tonnes.

2.1.9 Work at the Terminal Substation

Within Zambia the work will terminate within CEC's existing 220kV substations at Luano/Michelo. Circuit bays within these substations exist already, substantially reducing the amount of work required.

The work will involve the erection of electrical components and structures onto a pre cast concrete foundation, followed by physical connection onto an existing 220kV busbar.

The work within the substation will not involve the removal or disposal of any obsolete equipment nor will any polychlorinated biphenyls be contained in any of the equipment proposed for this project.

After completion of all construction activities the sites would be cleared and tidied up generally in accordance with the agreed mitigation programme. All surplus materials will be removed and the access routes will be reinstated.
2.1.10 Equipment to be utilised

The types of transport and construction equipment that would typically be used during the construction phase (subject to availability) are detailed below:

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Capacity/Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel Carrier</td>
<td>Max 8 seater</td>
</tr>
<tr>
<td>Car</td>
<td>4 seater</td>
</tr>
<tr>
<td>Lorry</td>
<td>4 x 4 7 tonnes</td>
</tr>
<tr>
<td>Low Loader Lorry</td>
<td>10 tonnes axle weight</td>
</tr>
<tr>
<td>Mobile Crane</td>
<td>12 tonnes axle weight</td>
</tr>
<tr>
<td>Dumper Truck</td>
<td>1 - 3 tonnes</td>
</tr>
<tr>
<td>Excavator</td>
<td>0.25 - 1.5 cubic metres</td>
</tr>
<tr>
<td>Tractor (wheeled)</td>
<td>Up to 100 brake horse power</td>
</tr>
<tr>
<td>Trailers</td>
<td>Up to 35 tonnes laden</td>
</tr>
<tr>
<td>Winch</td>
<td>1 - 5 tonnes</td>
</tr>
<tr>
<td>Conductor Winch</td>
<td>4 - 12 tonnes</td>
</tr>
</tbody>
</table>

2.1.11 Duration of Construction

It is expected that the construction activities for the Zambian section of the project will be completed over a period of about 12 months. However the work at all times will be closely coordinated with the activities being carried out by SNEL in the DRC.

2.2 PROJECT BENEFITS

Whilst the principal sponsors of the project are both CEC in Zambia and SNEL in the DRC, this project should be seen also as a regional project. In fact the expansion of the Zambia-DRC interconnector has been recognised as important under the auspices of the NEPAD initiative and also endorsed by the World Bank as key to the development of the African regional electricity market.
The Table 1, below provides a brief summary of the entities that will benefit from the completion of this project as well as an indication as to the nature of those benefits.

Table 1 Summary of Benefits arising from the Project

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Nature of Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNEL (DRC)</td>
<td>The project will remove a capacity constraint that is denying SNEL from some much-needed additional revenues in the short term.</td>
</tr>
<tr>
<td></td>
<td>Increased access to the SAPP market will assist in the longer term development of the country's abundant sources of hydropower resources providing significant long-term benefits to the industrial performance of the whole of southern Africa.</td>
</tr>
<tr>
<td>CEC (Zambia)</td>
<td>CEC's Diversified Growth Plan strategy will be supported and non-mining related revenues will be generated thereby diluting the present single-commodity risk faced by the business.</td>
</tr>
<tr>
<td></td>
<td>The technical performance of the interconnector will be enhanced reducing the impact of fault-related disturbances to the mining operations.</td>
</tr>
<tr>
<td></td>
<td>The capacity and security of a reserve supply to the strategically important mining operations will be increased.</td>
</tr>
<tr>
<td>ZESCO (Zambia)</td>
<td>A significant increase in wheeling revenue will accrue to ZESCO without the need for additional capital investment on their part.</td>
</tr>
<tr>
<td></td>
<td>The stimulus to regional trade and improved export tariffs will also benefit ZESCO's export activities.</td>
</tr>
<tr>
<td></td>
<td>Access to possible markets in the south of DRC would be improved.</td>
</tr>
<tr>
<td>GRZ (Zambia)</td>
<td>Zambia's position as the gateway for power into southern Africa and, in the longer term, eastern Africa will be enhanced.</td>
</tr>
<tr>
<td></td>
<td>The prospects for the longer term development of Zambia's own hydro-power potential will be improved through the development of increased regional power trading.</td>
</tr>
<tr>
<td>SAPP</td>
<td>The enhanced interconnection will further demonstrate the benefits of an interconnected electricity system and the ability to develop generation projects on a least-cost integrated resource planning.</td>
</tr>
<tr>
<td></td>
<td>The project will enhance competition within the SAPP and reduce the risk of dominance by large players.</td>
</tr>
</tbody>
</table>
2.3 STUDY AREA

This project, as has been described previously, is a joint initiative between CEC in Zambia and SNEL in the DRC and comprises development of electricity infrastructure in both countries.

This ESIA deals only with the 47km. Section of the project that lies within the Republic of Zambia.

The line will be constructed from the Luano Substation on the Copperbelt in Zambia to the Democratic Republic of Congo frontier as shown in Appendix 1. The Copperbelt consists of the following towns: Ndola, Kitwe, Luanshya, Chingola, Kalulushi, Mufulira and Chililabombwe. However, the line will traverse only Chingola and Chililabombwe districts. The proposed line will be constructed to the east of the existing CEC 220kV line and will be within the confines of CEC's existing wayleave throughout its entire route within Zambia. The line will pass through the sparsely populated part of the Luano National Forest and through the ZAFFICO plantations in Chingola. The line would cross the Kafue River and cut through the part of the Kamenza Forest Reserve in Chililabombwe District. The line would however avoid the Border Forest Reserve before it enters Democratic Republic of Congo.

The land in Zambia is primarily owned by the government, which sublets to various institutions.

As the project in Zambia involves construction entirely within the confines of existing CEC wayleaves, (rights of way), a description of these wayleaves will assist in defining the study area more accurately. Copies of the actual wayleave documents are available for inspection at the offices of CEC and can also be obtained directly from the Registry and Land Deeds office in Lusaka.

The existing interconnector is situated in Wayleave S125 running the entire 47km length from Luano substation to the DRC border. This wayleave was granted to CEC predecessor
(Rhodesia Congo Border Power Company) in 1964 and subsequently assigned through ZCCM to CEC. The wayleave is tapered along the route and is 120m, wide for the first 22km, and 90m wide for the remaining 25km section.

To accommodate an additional 66kV circuit in the 1970’s, the wayleave was extended by Wayleave S1031 which is 15m wide and runs for approximately 7km. At the point where S125 tapers from 120m to 90m an additional Wayleave S229 was granted to ensure adequate clearance of the circuits at their points of deviation.

This information is provided in simplified diagrammatical form as follows:-

**Simplified Diagrammatical Representation of the CEC Wayleave & Project Area**

The proposed transmission line will be constructed east of the existing 220 kV Luano-Karavia line. The existing lines will not pose any limitations to the construction of the new dual circuit line as can be seen from the spacing shown below.
Start of Wayleave No.S125 from Luano Substation
3.0 METHODOLOGY

3.1 Baseline Survey

The project required that a baseline survey be undertaken to establish the existing ecological and socio-economic situation in the project area. In this regard the Institute of Environmental Management was active in the study area from November 2002 to January 2003. Initially a scoping study was done. This was followed by a comprehensive baseline survey in the project area.

3.2 Data Collection

Both primary and secondary data were collected. Primary data was collected on the economic characteristics, ecological and electrical details.

3.3 Primary Data

3.3.1 Social Economic Environment

Primary data on the social economic factors was collected through visitation to the project area. Interviews were also conducted with the various stakeholders including council officials, government departments, the affected farmers or individuals within the project area.

A questionnaire (Appendix 8) was also used as an instrument for the collection of primary data.

3.3.2 Ecological Environment

This was through observations, past records, discussions and interviewing the local communities and other stakeholders with interest in the project area.

3.3.2.1 Climatical

Data collected through interviews and past records.

3.3.2.2 Road System

Carried out through visits and observations and interviewing experts.
3.3.2.3 Air

Through interviews with appropriate experts from the meteorological department and reference to published reports, as well as through observations whilst within the study area.

3.3.2.4 Flora

The field surveys for flora and fauna and some compartments of ZAFFICO plantation that will be affected were concurrently carried out along the transmission route corridor to compliment and confirm the assessments carried out by ZAFFICO and Forestry Department.

The route was stratified into different vegetation and land use types. The determination of the different strata along the transmission route corridor was based on field observation.

Firstly, physical inspection was carried out, i.e. traversing the whole route corridor to find out areas of homogeneity in the vegetation cover in order to demarcate strata according to areas which look similar. The distance of each strata along the corridor was measured by vehicle speedometer. Field surveys and parameters' measurements were based on these strata.

In natural forest the team used the same sizes of sample plots except these were randomly located. So square plots measuring 26.45m x 26.45m (0.07ha) were located randomly in each strata. This method was used due to the suitability of the method that was also quick to verify the earlier data.

In the Zambia Forestry and Forest Industries Co-operation (ZAFFICO) plantation square plots of 10m x 10m (0.01ha) were established randomly to verify the ZAFFICO data. The information recorded was on:

(i) Flora and fauna species
(ii) Dbh (cm)
(iii) Height (m)
(iv) Regeneration
(v) Land use practices
(vi) Agriculture practices
(vii) Tree and agricultural crops grown in the project area (by observation)
(viii) Domesticated fauna (by observation)
In order to get information on the composition and the quantity of vegetation in the area, individual plants in a plot were recorded by name, diameter at breast height (dbh$_{1.3m}$); measured by rounded down diameter tape, total tree height; measured by Suunto hyposmeter, and species frequency by diameter class. Also plot information was obtained in terms of structure of the vegetation, species composition, relative number of individual plants and size of individuals.

The data from plots in strata provided a list of present species and frequency distribution of diameter classes.

3.3.2.5 Fauna

Fauna was recorded on plots and along the transmission route. Fauna identification was done through direct observation, sounds, spoors, droppings, nests and other signs of their presence. Literature review also gave the fauna species that were originally found in the area according to feeding habits and habitat occupation.

As for fish, literature review and interviews were used. Data so collected provided the following information:

(i) Fauna species found in the project area
(ii) Type of habitat occupation by each species
(iii) Feeding ecological habits
(iv) Rare, protected and endangered species

3.3.2.6 Biodiversity

This was carried out through assessing the number of species per area of that particular habitat in the study area.

3.3.2.7 Rare, Protected and Endangered Species

This was based on literature review and the World Monitoring Centre Classification of the Conservation status of plants and animals, and on the Red Book on endangered plants.
3.3.2.8 Threats

Identification of major threats to the biophysical ecological status of the environment of the transmission route corridor was based on the results along consultations with experts, field observation and literature review. Human threats were identified through observation of human activities in the project area.

3.3.3 Electrical Data Collection

Primary data was collected through

(i) Visits along the proposed route
(ii) Observation of the existing lines between Parklands and Riverside residential areas.
(iii) Sample tests along the existing lines.
(iv) Access to CEC system performance data.

3.4 Secondary Data

The other data, which was a supplement to the primary data, was collected through a wide literature review on the project area, both published and unpublished. Most of the data was on plant species, fauna, soils, water, geology, etc. Copperbelt University, Forest Department Research, Environmental Council and National Scientific and Industrial Research Libraries were visited to find out the type of literature they have on the project area, and a quite number of references were found.

3.5 Public Awareness and Sensitisation

Public awareness and sensitisation was considered as an important activity in the Environmental and Social Impact Assessment as all the major stakeholders had to be involved and made aware about the project. Appendix 5 is a list of people that were contacted. In this regard between 14th October 2002 and 28th January 2003 the ESIA team undertook the following activities:

(a). On 14th October 2002 an initial stakeholders meeting was held in Chingola to brief the public about the project. The list of participants and issues raised are as indicated in Appendix 4.
(b). Between 8th November 2002 and 9th November 2002, the Consultants undertook two familiarisation tours within the proposed wayleave corridor. These trips constituted the scoping study and started with the Chingola district and later Chililabombwe district.

(c). Advertisements were placed in the national dailies explaining the proposed project and its expected benefits. (See Appendix 6)

(d). On 15th November a second trip was undertaken along the wayleave in the company of an official from the Department of Agriculture. This trip was part of the baseline survey phase of the project. The Chingola portion of the wayleave was surveyed and landowners were interviewed.

(e). On 18th November the third trip was made to cover the Chililabombwe portion of the wayleave. The team was accompanied by an officer from the Department of Agriculture based in Chililabombwe and this visit also formed part of the baseline survey.

(f). Two other trips were made to Ndola for the purpose of interviewing some government provincial officials, the Copperbelt Museum and management of ZAFFICO. Those interviewed included the Copperbelt Province Deputy Permanent Secretary, the Provincial Planning Officer, the management of ZAFFICO and the officials at Lands Department and the Forestry Department. These trips were made on 28th November and 16th December 2002.

(g). Fliers written in Bemba and English explaining the project to people along the wayleave and the local population in Chingola and Chililabombwe were also distributed. (See Appendix 7)

(h). A stakeholder meeting was held in Chingola on 28th January 2003. (See Appendix 9 containing the minutes of the meeting).

(i). Another stakeholders' meeting was held in Chililabombwe on 29th January 2003. (See Appendix 10 containing the minutes of the meeting).
(j). Since the project has been delayed, CEC was conscious of the fact that the people in the project area may assume that the project has been cancelled. In this respect CEC carried out regular campaigns in the area to remind the community in the project area that the project would be implemented at any time and at short notice. In particular, prior to planting seasons, door to door campaigns continued to be carried out to advise the community in project area not to plant crops in the area designated for the project (for which they had already received compensation). To this end there has been full compliance by the community in the project area.

(k). Three weeks prior to contractor mobilisation, CEC intends to hold meetings in Chingola and Chililabombwe to confirm commencement of project implementation with all interested parties.
(I). ALTERNATIVE CONSIDERATION

4.1 The "Do Nothing" Alternative

This project has been identified as the next logical expansion of the southern African Power Pool and has been confirmed by external experts as representing the most efficient manner of delivering the current levels of surplus power into the existing energy market.

If this project were not to be pursued, other projects could be developed which would have a higher environmental impact arising out of the need to construct new transmission lines within corridors that do not have an existing wayleave. Such projects would also require higher levels of investment and therefore would not provide the least cost solution to meet the opportunity.

If no new transmission lines at all were to be constructed, the stimulus to construct new thermal power stations in southern Africa would be increased, resulting in additional environmental impacts for the region through the impact of increased CO₂ emissions.

The "do nothing" alternative does therefore not represent an option that meets the best interests of Africa and its environment.

4.2 Line Routing Alternatives

4.2.1 Methodology

The selection of the most appropriate routing for the construction of a new transmission line is normally an iterative process that tries to secure the most environmentally acceptable route that is both technically and economically feasible. The process commences with the identification of constraints and then looks at finding a route that avoids those constraints as much as possible.

A starting point would be to investigate the route that provides a direct line between the points to be connected and then identify reasons why this option cannot be selected. The major constraint would be the need to avoid completely any sites with a high amenity value such as:

- Areas of outstanding natural beauty
- Heritage Sites
In addition, for technical considerations, as well as to reduce the visual impact of any proposed lines, heavily developed and residential areas should be avoided as much as possible.

The placing of transmission lines within an existing route corridor provides significant advantages both in terms of reducing visual impact but more importantly in reducing the environmental impact of the project. This is based on the understanding that a wayleave carrying two lines requires less ground area than two wayleaves each carrying one line.

Therefore the next stage of the iterative process involves looking at existing lines and wayleaves to see if these can be included for some or all of the proposed new line.

Finally the process concludes with a detailed analysis of a variety of options to ensure that the best compromise of all the above actors can be adopted.

4.2.2 Options Considered

4.2.2.1 Line Routing Options Considered

After a detailed desktop review of the possible line routing options, three potential routes were considered to be sufficiently viable to warrant a further detailed investigation.

Option A – The Direct Route

This route was identified simply by creating a straight line between the terminal substations of Luano (Zambia) and Karavia (DRC) and modifying the route of the line to avoid any significant constraints. This option therefore identifies the shortest possible theoretical distance that could be adopted by the Project and is a useful means of identifying the constraints that exist in selecting an appropriate line route.

Option B – Use of Existing Wayleave:

This routing option utilises the space provided within the CEC wayleave for the existing 220kV Zambia-DRC interconnector. The circuit runs adjacent to, and to the east of the existing circuit from Luano to the DRC border.
Option C – Southern Routing

Recognising the reduction of environmental impact arising from the use of an existing wayleave, this option initially follows the route of the existing wayleaves for the 66kV transmission line from Luano to Solwezi. After looping round the south of the city of Chingola, the line route then heads approximately North in a relatively straight direction towards the border on its way to Karavia.

A detailed plan of the line routing options is shown in Appendix 1 and also shown below in a simplified form. (Not to scale.)
CEC – DRC 2nd 220kV Line – Routing Options Considered
Comparison of the Three Options:

<table>
<thead>
<tr>
<th>Route Option</th>
<th>A – Direct</th>
<th>B – Existing/New</th>
<th>C – Southern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Distance</td>
<td>43km</td>
<td>47km</td>
<td>65km</td>
</tr>
<tr>
<td>Is a Wayleave Required</td>
<td>Yes</td>
<td>Yes last 2km</td>
<td>40km – Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25km – Extension</td>
</tr>
<tr>
<td>Area of land required</td>
<td>approx. 260 Ha</td>
<td>Approx. 202 Ha</td>
<td>approx. 325 Ha</td>
</tr>
<tr>
<td>Proximity to major Residential property</td>
<td>Yes – Chililabombwe town</td>
<td>No - Minor settlements only</td>
<td>Yes – Musenga township</td>
</tr>
<tr>
<td>Proximity to mining activities</td>
<td>Yes – Konkola tailings dam</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Major road crossings.</td>
<td>Chililabombwe – Kasumbalesa</td>
<td>None</td>
<td>Chingola – Kitwe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chingola - Solwezi</td>
</tr>
<tr>
<td>ZAFFICO plantation affected</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Forestry Reserves affected</td>
<td>Kilira reserve no. 18</td>
<td>Kamenza reserve no. 19</td>
<td>Konkola reserve no.20 Dome reserve no. 21</td>
</tr>
<tr>
<td>Crosses State Land</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Crosses existing CEC transmission lines</td>
<td>Yes Luano-Michelo220kV Luano-Bancroft 66kv</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>River Crossings required</td>
<td>Kafue, Luano, Filewoola, Kamenga, Lungela</td>
<td>Kafue, Mishishinga</td>
<td>Kafue, Mushishinga, Kongola, Mutundu</td>
</tr>
<tr>
<td>Anticipated Environmental Impact</td>
<td>Medium</td>
<td>Low</td>
<td>Low/Medium</td>
</tr>
</tbody>
</table>

**Conclusion**

Option A was considered not to be feasible due to the fact that the route would run in very close proximity to the town centre of Chililabombwe as well as a tailings dam associated with Konkola mine in addition it would need to cross existing Copperbelt Energy Corporation transmission lines. The visual impact due to the proximity to residential areas would be much higher and the line would require a couple of large angle deviations as well as a crossing over the main road to Kasumbalesa. A high number of river crossings would also be required for this route and the generally wetter ground conditions could lead to increased environmental damage during the construction phase.
Option B represents an increase in route length of only 2km over the most direct route and follows the sparsely populated route of the existing 220kV line. This route would require ground clearing to be undertaken within the existing wayleave rights of the existing circuit and would have a low visual impact due to the terrain covered. This route is least onerous in terms of both river and road crossings and has suffered only a minor encroachment of farming activities within the present wayleave.

Option C again uses existing wayleaves for part of its route but represents an increased route distance of 20km over route B. This route generally runs through sparsely populated areas but would require a higher number of road and river crossings than Option B. In addition this route requires a completely new wayleave to be cleared for a distance of about 40km and an extension of the existing wayleave by about 45m for about 25km. Near the border this route would traverse a number of farming plots.

In conclusion, it can be seen that the adoption of route option B mitigates the environmental impact of the project significantly. The route is efficient to the extent that it is less than 5% longer in distance than the direct route from Luano to the border crossing. In addition, the sitting of the line within the boundaries of an existing wayleave significantly provides the following benefits:

- the line is constructed in an area that has not been significantly developed
- the visual impact of the line is reduced
- land clearance requirements to accommodate a line within an existing wayleave are significantly lower than if a completely new wayleave had to be established.

4.3 OVERHEAD LINES VERSUS UNDERGROUND CABLES

Apart from the visual positive impact of cables, underground cables do have a number of additional negative impacts that are not associated with overhead lines. The most important are highlighted below:

4.3.1 Construction Impacts

4.3.1.1 Ecological

For overhead lines the only land and habitat really lost is the land around the tower base and the access routes for construction, whereas the cable option affects the 15-30m width of the entire cable route. A greater degree of land will be sterilised with an underground cable due to the restrictions that would need to be placed upon all sub-soil activities as well as the planting
of trees and bushes along the entire route length for safety purposes. An underground option would also require large areas of land to be set aside to accommodate cable joint bays.

The removal of trees and shrubs along the route leads to irreversible ecological damage.

4.3.2 Operational Phase Impacts

4.3.2.1 Visual

Overhead lines impact on the landscape in rural settings and affect scenery in tourist centres and their impact is however only more pronounced in urban settings.

Underground cables show impacts at sealing end points as well as at points where cable cooling systems are sited.

4.3.2.2 Noise

The most notable noise during normal operation is the hissing sound due to the corona effect. This type of noise will however be minimised by the use of bundle line conductors instead of single conductors.

A cable system would have given constant audio noise from cable cooling stations.

4.3.2.3 Water Pollution

There will be no water pollution from the overhead line itself. Had the transmission system been an underground one, pollution would have been expected from cable fluid leaks.

4.3.2.4 Agricultural Impacts

The settlers and other subsistence farmers will be advised not to carry out any farming practices within the wayleave. This restriction applies to both system, but is usually supposed to be more rigidly applicable to the cable systems.

4.3.2.5 Outage Time Impacts

The time required to locate and mend a cable fault is significantly greater than that of an overhead line resulting in reduced system security and availability.
4.3.3 Cost

As has been experienced throughout the whole of Africa, the economic case for the utilisation of an underground circuit cannot be normally justified at this voltage level and this is certainly the case for this project.

With the cost of 220kV underground cable being 15 to 20 times higher than the equivalent capacity of overhead line, the level of investment needed would be beyond the ability of the sponsors both, in Zambia and the DRC, and the project would not be able to be developed.

Experience by ZESCO and ZAMTEL has shown that underground cables attract a high degree of vandalism in Zambia. The mineral content of pieces of underground cable at this voltage level could attract vandals leading to both costly replacement as well as unnecessary disruptions in power delivery.

The environmental and financial impacts highlighted in the sections above prove beyond reasonable doubt that the overhead transmission system is more environmentally friendly and economically the better choice.
5.0 DESCRIPTION OF THE ENVIRONMENT

5.1 Physical Environment

The study area is located on the Copperbelt between longitudes 28° 45' and 28° 05' East and latitudes 12° 15' and 12° 40' South. The Province lies within the Kafue river drainage, which has a well developed dendritic drainage system. Topography is gently undulating and is between elevations of 1200m to 1500m.

5.1.1 Geology

The geology of the area like that of the Copperbelt consists of basement complex overlaid by the Muva, lower and upper Roan, Mwashia, and upper and lower Kundelunga series, large parts of which have been irregularly deposited and irregularly eroded. Generally, it consists of deformed sedimentary rocks (Katanga Supergroup) "draped" around the flanks of the Kafue anticline. Mineralisation occurs within the sedimentary host rock and these rocks are interspersed with dolomite and limestone. Argillites are dolomitic in places and some of the sandstones are cemented by calcium/magnesium carbonates. The meta-sedimentary rocks consists mainly of intercalated quartzites, conglomerate, shales and dolomite beds.

The project area is well served by the Kafue river and by a number of streams. Kafue river crosses the 1230 meter high contour about 16Km north - west of Chingola, close to north of Luano Forest Reserve. Thus a large part of the central and southern part of Copperbelt lies below 1230 meters and the Kafue river is the salient topographical feature. Apart from the areas long the valley the corridor is generally plateau and flat with gentle slopes which are dirvable. Generally the undulating topography varies between 1200 m to 1500 m.

The general level of the plateau is occasionally broken by the occurrences of small, low ranges of hills, or infrequent Kopjes; notably associated with the tributary systems. Various types of rock out crops occur in the Kafue valley, especially where the corridor crosses the river.

5.1.2 Topography

The Copperbelt is situated at an average elevation of 1200 to 1500 metres above sea level. The area forms a gently undulating plateau rising to low hills of about 1370m on the Democratic Republic of Congo border to about, 1,130m to the south. The plateau is broken by
isolated low ranges of granite or quartzite hills rising to heights of 100m above the general level of the plateau.

A widely occurring and noticeable characteristic of the greater part and one arising from a combination of topography and hydrology are the flood plains and dambos. The headwater dambos are a very common feature occurring on all gently sloping valleys. The headwater dambos are significant for the hydrology of the area.

The cross-section of the route of the power line from the Luano substation to the Democratic Congo border, for most of the part represents watershed divides which is relatively flat, with a few valleys and dambos associated with major streams and river crossings.

5.1.3 Soils

The route corridor has various types of soils as described below.

The red lateritic soils have a sandy topsoil overlying a more loamy clayed subsoils. The soils are susceptible to erosion by water if soil conservation measures are not practiced. The soils are generally poor, acidic latosols low humus, fairly strong leached and frequent shallow, particularly over laterite. Generally these soils require careful management for sustained cropping. The high rainfall in the province means there is high leaching in most soils with low reserve of plant nutrients and allow base saturation. The soils are acidic with pH ranging from 4.0 to 5.5 with no discernible change in pH down to a depth of approximately 3 m (KCM 2001).

Soils in the project area are fairly uncontaminated as the project area is a bit away from mining industries especially smelter sites which are likely to degrade soils.

Generally the soils along the proposed wayleave transmission route corridor are classified into:

(i) Those situated on the ridge tops with slopes of 1% to 4%. These soils consist of deep, moderately–rapidly permeable, well drained, very strongly to strongly acid soils. Permeability is estimated between 10 cm and 15.0 cm per hour.

(ii) Those soils which occupy the lower ends of the dambos and are located on gentle slopes of 3% to 4% with short steep dropping into the drainage way and consisting of 5cm to 10
cm of dark gray or very dark gray sand surface. With an under laying of 40cm up to 120 cm of yellowish brown, brownish yellow, or coarse sandy loam. These soils have a quartz gravel stone line frequently occurring underlying these sandy horizons and overlying a saprolite that is approaching rotten granite. These soils are well drained, to extensively drained rapidly permeable soils.

(iii) Poorly drained soils, slowly permeable, very strongly to strongly acid soil that are moderately deep to saprolitic. The soils occur directly above and bordering the dambos on slopes of 4% to 6%. Textures include sand loamy sand, or have a weak or moderate fine granular structure. The upper 10cm - 15cm vary from black to dark gray or dark grayish brown in colour becoming lighter with increase in depth to pale brown, brown or light grayish.

(iv) Areas with hard plinthite crust occurring either as outcrops or else has an overlay of up to 140cm of soil. These soils have a 5cm to 15 cm, very dark gray or dark grayish brown sand or loamy sand surface. This is underlined by several cm of sub rounded quartz and hard plinthite gravel which rests abruptly on a hard plinthite crust in the areas of shallow soils.

(v) Those which are deep poorly drained and slowly permeable, very strongly to strongly acid dambo soils with a dry season water table below 160 cm. This soil is separated from the other on the basis of more intense mottling in the sandy clay and on greater depth to the water table.

(vi) Deep poorly drained slowly permeable, very strongly to strongly acid dambo soils with a dry season water table below 1m of the surface. These soils have a 30cm black to dark gray sand, loamy sand or sandy loam surface. From 65cm to 140 cm, texture grades into a sandy clay loam or sandy clay with colours of gray, light gray, white, or light greenish grey. These gray horizons have a weak or moderate grade of primatic structure.

In terms of vegetation the high rainfall on the Copperbelt, rather than the soils has induced vigorous tree growth, which permits the establishment of a sparse ground vegetation.

5.1.4 Climate

The Copperbelt Province, like any other province in Zambia has a tropical climate with three distinct seasons: the warm-wet season, stretching from November through April; cool dry cold
season from May to August; and a hot dry season during the September and October. Mean temperatures varying between 14°C and 35°C. The annual rainfall averages 1240mm, most of which falls in the months of December to February.

The main rains in the Copperbelt and Zambia are caused by the convergence of the North-east and South-east Trades forming the Intertropical Convergence Zone (ITCZ). The Copperbelt feels the effect of the early rains before most parts of Zambia and the late rains, as the Inter-Tropical Convergence Zone moves northwards, later than all except the Northern Province, so that the rainy season is relatively long and the mean annual rainfall relatively high. The average length of the rainy season is just over five months with December, January and February being months of greatest rainfall while November and March have less.

The potential evaporation is very much more consistent from year to year than rainfall, being most dependent on temperature, radiation and wind speed. The largest variation occur at the beginning of and end of the rainy season, owing to its variable length and consequent variation in cloud cover, which affects radiation.

5.1.5 Wind

Winds are light and generally easterly although occasionally are south-easterly. High winds are likely to be associated with heavy thunderstorms at the beginning of rain season. During this period the moist air moves from the Atlantic Ocean over the DRC and thus westerly winds. From May to August the winds double in strength and remain at the highest level until the set of the rains in November. The predominant wind direction is from the east to south-east.

Winds are light and generally easterly although occasionally are south -easterly. Table 2 shows the average wind speed kilometres per hour recorded for 10 years from 1954 to 1964.

Table 2 Average wind speed Km/hour and direction – Ndola as the representative of the area

<table>
<thead>
<tr>
<th>Month</th>
<th>Wind direction (true bearing) degrees</th>
<th>Average wind speed (Km/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>112</td>
<td>8</td>
</tr>
<tr>
<td>August</td>
<td>106</td>
<td>10</td>
</tr>
<tr>
<td>September</td>
<td>097</td>
<td>10</td>
</tr>
</tbody>
</table>
There are differences in the wind pattern in the three seasons:

(i) Rain season winds are mostly from north-north west, South easterly for over 10% of the time and can be as strong as 10m/second. For the rest of the time north-west to westerly winds predominant.

(ii) Cool dry season winds are from the east to the south-east quadrant

(iii) Hot dry season winds blow from the east, east-south east and east-north east for over 40% of the time

Vegetation of trees play a very important role in reducing the wind velocity which sometimes damages roof houses and agricultural crops.

5.1.6 Hydrology

The Copperbelt is drained by the Kafue River System. The Kafue headwaters comprise a 1 500km² water catchment area. The Kafue River has its origin north of the Copperbelt, where the Kafue –Congo watershed divide forms the national boundary. It flows in the south-easterly direction to a point near Kitwe where it changes to the south-westerly flow. The Kafue River has a very high density of tributaries in this region which is the result of the interrelationship between the topography and the rainfall. The main topographical feature of great influence in the sustenance of river base flows are the high occurrence of dambos giving all the tributaries perennial status.
The route corridor is mainly on the watershed divide for the Kafue tributaries on the northern side near the Kamenza Forest reserve and crossing the main Kafue River, the Mushishinga and the Chifinsa streams in the south near the Luano Forest reserve. Dambo crossings are on the Chifinsa, Mushishinga, and the Mulyashi headwater dambos. At all stream crossings of the proposed transmission line, the vegetation that is mainly grass. This applies to all the wetland crossings.

The region is one of those associated with high water resources potential both ground and surface water. However, it is said that the raw water drawn from Kafue river has total dissolved solids (TDS) of approximately 400mg/l and T\text{Cu} and T\text{CO} of approximately 0.1mg/l.

### 5.1.7 Significant Pollutant Sources

The route corridor is through an area relatively free from the pollution of the mine effluents. The Upper Kafue, which includes part of the project area, have high levels of dissolved oxygen, satisfactory pH levels, low salinity and turbidities (median of NTU's) and low levels of iron. However, the Upper Kafue River below Konkola mine is heavily loaded with both chemical and suspended pollutants. The bulk of the suspended solids are from the erosion of unconsolidated earth materials from mining excavations which account for very high turbidity level especially in the rain season.

The majority of the chemical pollutants originate from the effluents from the mines, most of it having a tendency to deposit on the stream bed. Both dissolved and suspended, major and trace elements all build up in the Kafue as it flows through the Copperbelt.

### 5.2 Biophysical Environment

The country's Forest resources are habitats to various types of flora and fauna species estimated at 228 mammals, 740 birds, 156 freshwater fish, 152 reptiles and 83 amphibians. Plant genetic diversity is about 6 00 to 700 species. About 5 500 species are flowering plants, 88 mosses, 130 ferns, 400 sedges, 390 Orchids, 630 grasses, 2 000 herbs and 2 300 trees/shrubs. More are still to be discovered and described.
5.2.1 Flora

Various flora species are found in different vegetation types along the corridor and most of it is degraded.

The corridor mostly has vegetation types of secondary miombo, grassland at stream crossing, Riparian-small strips along the stream sides and forest plantation.

Along the corridor there are various species of flora and fauna and the dominant ones are as listed below such as Brachystega, Isoberlinia, Julbernardia, albizia, Syzygium, Baphia, vitex, Uapaca, Pericorpsis, Swartica, Combretum and with a few relics of Pterocarpus angolensis. (See appendix 11)

These supersedes the dry evergreen forests in terms of dominance and are represented by scattered almost pure stands of Brachstegia miyrophylla frequently associated with relics of evergreen thickets and almost invariable presence of a broad-leaved forest grass – Setaria longiseta. The dominant miombo species have an annual increment of about 1 - 2 cubic metres per hectare.

The relatively sparse, discontinuous understorey is dominated by Anisophyllea, Baphia, monotes spp and Uapaca. Common shrubs found in the area include Dichrostachys cinera, Diplorhynchus condylocarpon, Eriosema ellipticum, Flacourtia indica, Hippocratea indica growing as a shrub instead of a climber. Other common shrubs are members of the following genera: Abrus, Adenodolicchos, Aeschynomene, Clerodendrum, Deesmodium, Diplolophhium, Ectadiopsos, Fadogia, Hypoestes, Indigofera, Lannea and Triumphetta with bracken fern (Pterridium aquilinum) and small colonies of the succulent Aloe Christianii.

5.2.1.1 Flora on Anthills

It is estimated that about 10% of the total area of the proposed route corridor is occupied by anthills which in most cases are separated from one another by a distance of about 50 meters to 70 meters. Anthills support growth of a number of specialised tree species, dense evergreen shrubs, herbs and scrambles species and bamboo. In most cases anthills are small thickets. These carry various flora and fauna species adapted to the micro-ecosystem, Table 3.
Table 3  Some common tree species occurring on anthills along the transmission corridor.

<table>
<thead>
<tr>
<th>Tree Name</th>
<th>Local name (Bemba)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassia abbreviata</td>
<td>Munsokansoka</td>
</tr>
<tr>
<td>Combretum spp</td>
<td>Mutala/Muka/Mulama/Munone</td>
</tr>
<tr>
<td>Ficus spp</td>
<td>Mupata/Kanyanguni/Kafumwe/Musati</td>
</tr>
<tr>
<td>Diospyros mespiliformis</td>
<td>Muchenya</td>
</tr>
<tr>
<td>Erythrina spp</td>
<td>Mulunguti/Mufitumbwe</td>
</tr>
<tr>
<td>Kigelia piñata</td>
<td>Mufungufungu</td>
</tr>
<tr>
<td>Stereospermum kunthianum</td>
<td>Kayubule</td>
</tr>
<tr>
<td>Strychnos spp</td>
<td>Kasongole/Musayi/Mulungi/Kampangilwa/Sanaa/Mubanga chulu</td>
</tr>
<tr>
<td>Landolphia parvifolia (Rubber vine)</td>
<td>Mateke/Masala</td>
</tr>
</tbody>
</table>

5.2.1.2 Flora to be cleared

5.2.1.2.1 Natural Forest
The total natural forest reserve area covered by the wayleave is estimated to be 124.2 ha. Of this area, between 40 to 80 hectares of vegetation will need to be cleared to accommodate the proposed 220kV circuit. This approximates to no more than about 9.4m³ and between 20,000 to 30,000 poles of between 15 - 30 cm dbh, altogether worth between K20 million to K40 million. (See Table 4).

Table 4a  Stumpage Fees within Total Wayleave Corridor

<table>
<thead>
<tr>
<th>Forest produce</th>
<th>Area affected (ha)</th>
<th>No. of stems</th>
<th>Stumpage per unit (K.N)</th>
<th>Total stumpage (K.N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Sawable stems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Julbernardia paniculata</td>
<td>124.2</td>
<td>119</td>
<td>7 200</td>
<td>856 800</td>
</tr>
<tr>
<td>Isoberlinia angolensis</td>
<td>124.2</td>
<td>119</td>
<td>7 200</td>
<td>856 800</td>
</tr>
<tr>
<td>Pericopsis angolensis</td>
<td>124.2</td>
<td>57</td>
<td>10 000</td>
<td>570 000</td>
</tr>
<tr>
<td>Albizia adantifolia</td>
<td>124.2</td>
<td>476</td>
<td>9 000</td>
<td>4 284 000</td>
</tr>
</tbody>
</table>
**Table 4b Stumpage fees for the additional 2km Wayleave corridor**

<table>
<thead>
<tr>
<th>Forest Produce</th>
<th>Quantity of Forest Produce</th>
<th>Price Per m or m³ or stick (K)</th>
<th>Total Cost (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poles – 0 - 14</td>
<td>4166.4m</td>
<td>5,400.00</td>
<td>22,498,560.00</td>
</tr>
<tr>
<td>Poles - 15 - 19</td>
<td>60m</td>
<td>7,200.00</td>
<td>432,000.00</td>
</tr>
<tr>
<td>Poles – 20 - 24</td>
<td>14m</td>
<td>9,000.00</td>
<td>126,000.00</td>
</tr>
<tr>
<td>Poles – 25 - 29</td>
<td>56m</td>
<td>10,800.00</td>
<td>604,800.00</td>
</tr>
<tr>
<td>Marquesia spp</td>
<td>16.40 m³</td>
<td>81,000.00</td>
<td>1,328,400.00</td>
</tr>
<tr>
<td>Marquesia spp</td>
<td>18.13 m³</td>
<td>81,000.00</td>
<td>1,468,530.00</td>
</tr>
<tr>
<td>Marquesia spp</td>
<td>16.40 m³</td>
<td>81,000.00</td>
<td>1,328,400.00</td>
</tr>
</tbody>
</table>

Source: Forestry Department (Chingola and Chililabombwe) 2002
5.2.1.2.2 ZAFFICO Plantation

In ZAFFICO Plantation 6.83ha which contains 1002.58m³ worth K20 051 600.00 has been cleared already.

5.2.2 Grasses/sedges

A number of grass/sedges species exist in the area (Appendix 13). The season for grasses in the miombo woodlands lasts from October to April. No new species appear after April. There is thus a pre-rains flush partly of annual and partly of perennial bunch grasses. During the rains, there is no significant change till December, when Alloteropsis semialata is the commonest of some nine grasses occasional or best. By January some of the common woodland grasses appear, namely Anthephora acuminata, Aristida adscensionosis, Bewisia biflora, Heteropholis sukata, Sporobolus rhodesiensis, Thysia adscensionosis. Bewisia biflora, Heteropholis sukta, Sporobolus rhodesiensis, Thysia huillensis, and Tristachya hubbardiana. Brachiara brizantha becomes prominent in February. Homozeugos cylesi and Piptostachya inamoena dominate the scene in March. In April Diheteropogon amplectens and Hyparrhenia spp. (of which the commonest is H. cymbaria) are dominant. The Hyparrhenia tend to congregate on the forest margins.

In Zambia it is estimated that there are about 630 grass species and 400 sedges, 390 orchids and 130 ferns which a number of them are grazed by both domestic and wild animals. A number of grass, sedge, herbs and bamboo species which are found in the area (Table 6), and the dominant species are especially found in the dambos.
Table 5  Some Grass, Sedge, Bamboo and herb species found in the area.

<table>
<thead>
<tr>
<th>Type</th>
<th>Parts grazed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grasses</strong></td>
<td></td>
</tr>
<tr>
<td>- Hyparrhenia bracteata</td>
<td>Young leaves</td>
</tr>
<tr>
<td>- Phragmites mauritianus</td>
<td>Young leaves</td>
</tr>
<tr>
<td><strong>Sedges</strong></td>
<td></td>
</tr>
<tr>
<td>- Seirpus mucronatus</td>
<td>Leaves and stems</td>
</tr>
<tr>
<td>- Carex echiocleat</td>
<td>Leaves and stems</td>
</tr>
<tr>
<td>- Cyperus auricomus</td>
<td>Leaves and stems</td>
</tr>
<tr>
<td><strong>Bamboos</strong></td>
<td></td>
</tr>
<tr>
<td>- Oxytenanthera abyssinica</td>
<td>Young leaves</td>
</tr>
<tr>
<td>- Oreobambus buchwaldii</td>
<td>Young leaves</td>
</tr>
<tr>
<td><strong>Palms</strong></td>
<td></td>
</tr>
<tr>
<td>- Phoenix reclinata</td>
<td>To leaves</td>
</tr>
<tr>
<td><strong>Herbs</strong></td>
<td></td>
</tr>
<tr>
<td>- Sonchus elliofiianus</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Dietes prolongata</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Asparagus plumosus</td>
<td>New leaves and young stem</td>
</tr>
<tr>
<td>- Alce bulbicaulis</td>
<td>New leaves and young stem</td>
</tr>
<tr>
<td>- Physostigma mesoponticum</td>
<td>Young leaves</td>
</tr>
<tr>
<td>- Sesamum angolense</td>
<td>Young leaves</td>
</tr>
<tr>
<td>- Sida rhombifolia</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Pseudarthria hockeri</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Bidens pilosa</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Polygonum exellianum</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Phyllanthus reticulates</td>
<td>Leaves</td>
</tr>
<tr>
<td>- Amaranthus hybridus</td>
<td>Leaves</td>
</tr>
</tbody>
</table>

Each of the above grasses may exist in pure stands or in mixture of the two or more.
In non-seepage areas the dominant grasses are Aristida, Eragrostics and Tristachya.
Most of the grasses are palatable and valuable pastures.
5.2.3 Mushrooms

Mushrooms shoot out in the rain season (November – March) and make delicious source and most of the species are found along the proposed 220kV Zambia – DRC corridor proposed way leave.

There are 15 to 25 species of mushrooms which are grouped into five categories: (Table 6)

(i) Termite
   *Termitomyces tetestui*, *Termitomyces titanicus*, *Termitomyces microcarpus*

(ii) Parasols
   *Macrolepiota procera*, *Chlorophyllum molybdites*, *Amanita zambiana*, *Amanita flammeola*

(iii) Russula and Lactarius
   *Lactarius kabanus*

(iv) Chanterelelles
   *Cantharellus miniatecens*, *Cantharellus lonigisporus*

(v) Mushroom from Wood
   *Schizophyllum commune*, *Lantinus cladopus*

<table>
<thead>
<tr>
<th>Table 6 Some Mushroom species found on the Copperbelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
</tr>
<tr>
<td><em>Termitomyces tetestui</em></td>
</tr>
<tr>
<td><em>Termitomyces titanicus</em></td>
</tr>
<tr>
<td><em>Termitomyces microcarpus</em></td>
</tr>
<tr>
<td><em>Termitomyces clypeatus</em></td>
</tr>
<tr>
<td><em>Macrolepiota procera</em></td>
</tr>
<tr>
<td><em>Amanita Zambiana</em></td>
</tr>
<tr>
<td><em>Amanita flammeola</em></td>
</tr>
<tr>
<td><em>Lactarius kabanus</em></td>
</tr>
</tbody>
</table>
Mushrooms play a very important role in the alleviation of hunger and income generation at local community levels. Poisonous mushrooms are also to be found in the study area.

5.2.4 Fauna

5.2.4.1 Mammals

Historically, the area had big game (Appendix 12) e.g. Roan antelope (*Hippotragus equinus*) and Sable antelope (*Hippotragus niger*). All these species are no longer in existence due to poaching and farming. The only big game which may exist in the area is common duiker (*Sylvicapra grimmia*) and grysbok (*Raphiceus sharpei*). Non game which may exist are rodents, rabbits, black rats, frogs, snakes, tortoises, terrapins and turtles. Lizards are also to be found in the project area.

Crocodiles are found in the Kafue and its tributaries. However, the numbers are declining because of poaching.

5.2.4.2 Birds

In Zambia there are a number of bird species whose habitats vary depending on the ecological relationship. The nature of ecological relationship between vegetation and their avifauna in most cases is through bird assemblages or guilds for example;

(i) **Ground Feeders**  
these are invertebrate feeders in open places or thickets.

(ii) **Seed Feeders**  
exploit grass seeds in open spaces and edges of
cleared route corridors and use trees for resting.

(iii) **Invertebrate Feeders** exploit undergrowth and thickets

(iv) **The frugivores** feed on fruits produced by undergrowth plants. Build their nests in the undergrowth plants. Play a key role in seed dispersal

The above different feeding habits entails that although the transmission line will affect various habitats through clearing terms of birds feeding habits, the habitat change will attract other bird species.

(v) **The nectarivores** feed almost exclusively on nectar and pollen carbohydrates by undergrowth flowers

(vi) **Other Birds** using trees only as watching or resting places as observation posts. These species are found at the border of cleared route corridor or plantation watching for prey living in the nearby open spaces.

Birds species are relatively diverse and abundant in the project area although not as before. Deforestation caused through land clearing for agriculture; wood fuel exploitation and hunting activities have led to degradation of the varying habitats (forest, wet lands, grasslands, dambos, water, etc) which provided conducive habitats for birds with various feeding habits.

A number of bird species are found in the area. These include: Lizard buzzard (Akabemba), Common bulbul (Pwele), Conqui francolin (Inkwale), Green pigeon (Inkondokondo) (see Appendix 14).

5.2.4.3 **Fish**

Fishing activities are not significant in the area. Although the Kafue river and a number of streams cross the line, they do not produce any significant fish species which might be harvested for the communities on a commercial scale. Species found in the area include:
breams (*Orechromis andersoni*), nchenga (*Alestes lateralis*) and barbel fish (*Clarias gariepinus*).

5.2.4.4 **Insects**

There are a number of various types of insects and some are edible. These include large variety of crickets, grasshoppers, flying termites and caterpillars. Some of these insects especially caterpillars are economically superior to some subsistence crops.

5.2.5 **National Parks/Forest Reserves**

There are no National Parks in the area. However, there are two National Forest Reserves, which the power line will be crossing; the Luano in Chingola district and Kamenza in Chililabombwe district, including the open natural forest along the route corridor.

Zambia has only recently commenced the classification of its natural forests in accordance with IUCN definitions. Consultations with Forestry Officials have confirmed that this process has not yet commenced in the Copperbelt Province where this project is taking place. Due to the level of encroachment into the project area it is unlikely that these forests would be classified as critical natural habitats and may even be degazetted. However until such time as this classification has been completed, it would not be professionally correct to make this assumption at this stage.

Regardless of whether these forests are eventually classified as critical or non-critical natural habitats, this project will not result in the significant degradation or conversion of a potential critical natural habitat. (This is because of the use of an existing wayleave, the lack of better alternatives and the very small percentage of forest being affected.)

The above two forest reserves came under the control of the Forestry Department through Cap 199 of the laws of Zambia and these two forest reserves were gazetted through S.I. 175/79 and S.I. 219/77 respectively as to be managed for present and future production, neither of them is declared as botanical reserves.

Both of these forest reserves were earlier exploited of indigenous timber for use in the copper mines to supply fuel wood, poles and sawn timber both to meet the growing needs of the mines and of the population attracted to the area by mining development.
CEC's existing wayleaves already pass through both the Luano and the Kamenza forest reserve providing a wayleave corridor of between 120m and 90m in width. There is adequate room within these wayleave corridors to accommodate the proposed 220kV transmission line. As much of this wayleave corridor has already been cleared to accommodate the existing circuits (as detailed in section 2.3) this project will only require clearance of a strip of vegetation of between 15m to 30m within the existing wayleave.

5.3 The Social – Economic Environment

According to the Central Statistics Office Census 2000, the Copperbelt Province has a population of 1 300 973 with an annual growth rate of 1.3% in the period 1990 to 2000. With a land area of 31 328 Km², it has the highest concentration of people in Zambia. Table 8 indicates the population size and average annual growth rates by districts.

Note that the two cities of Kitwe and Ndola are the most densely populated. Of interest to this project are the towns of Chililabombwe and Chingola. Chingola is relatively a large town with 177 445 people while Chililabombwe has about 85 000 people.

However it should also be noted that Chingola has one of the lowest population growth rates averaging 0.5% while Chililabombwe has an average growth rate of 2.7% per annum. The national average growth rate is 2.9%.

Table 7: Population size and average annual growth rates by Districts - Copperbelt Province

<table>
<thead>
<tr>
<th>Province</th>
<th>1990 Population</th>
<th>2000 Population</th>
<th>Average Growth (Percentage)</th>
<th>Annual Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
</tr>
<tr>
<td>Copperbelt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chililabombwe</td>
<td>33,202</td>
<td>32,016</td>
<td>65,218</td>
<td>42,813</td>
</tr>
<tr>
<td>Chingola</td>
<td>85,642</td>
<td>83,367</td>
<td>168,999</td>
<td>88,925</td>
</tr>
<tr>
<td>Kalulushi</td>
<td>35,622</td>
<td>33,975</td>
<td>69,597</td>
<td>36,791</td>
</tr>
<tr>
<td>Kitwe</td>
<td>175,812</td>
<td>173,212</td>
<td>347,024</td>
<td>192,287</td>
</tr>
<tr>
<td>Luanshya</td>
<td>74,166</td>
<td>70,649</td>
<td>144,815</td>
<td>78,202</td>
</tr>
<tr>
<td>Lufwanyama</td>
<td>26,725</td>
<td>25,020</td>
<td>51,745</td>
<td>33,244</td>
</tr>
<tr>
<td>Masaiti</td>
<td>42,309</td>
<td>42,522</td>
<td>84,831</td>
<td>49,247</td>
</tr>
</tbody>
</table>
There are 10 administrative centres in the province distributed as follows:

Cities : Ndola (Provincial Capital) and Kitwe
Municipals : Chililabombwe, Chingola, Kalulushi, Luanshya and Mufulira
Rural : Lufwanyama, Masaiti and Mpongwe

5.3.1 Population and Demographic Characteristics

Copperbelt province is situated in Lamba land. Due to the growth of the mining sector and other industrial activity the province is now inhabited by tribes from other parts of Zambia. However the predominant language that is spoken in towns is Bemba and Lamba in the rural areas. Other languages spoken include English, Nyanja, Kaonde, Lunda, Chokwe and Luvale.

Other than the availability of job opportunities influencing the population distribution, other factors that have affected the population distribution and settlement patterns include the good road and rail communication within the province. The availability of and easy access to social services has also contributed to that pattern.

Table 9 and 10 show the actual population in the two districts through which the power line will pass. The population is by ward and type of settlements.

Table 8 : Chingola - Population Distribution

<table>
<thead>
<tr>
<th>Ward/Constituency/District</th>
<th>2000 Population</th>
<th>Percent Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Households</td>
<td>Males</td>
</tr>
<tr>
<td>Kapisha</td>
<td>4406</td>
<td>11600</td>
</tr>
<tr>
<td>Kabundu</td>
<td>1509</td>
<td>5881</td>
</tr>
<tr>
<td>Kasala</td>
<td>520</td>
<td>2260</td>
</tr>
<tr>
<td>Butungwa</td>
<td>1370</td>
<td>5714</td>
</tr>
<tr>
<td>Nsansa</td>
<td>1124</td>
<td>4251</td>
</tr>
<tr>
<td>Sekela</td>
<td>769</td>
<td>2919</td>
</tr>
</tbody>
</table>

Source: CSO Census Report 2000
### Table 9: Ward/Constituency and District

<table>
<thead>
<tr>
<th>Wards Constituency and District</th>
<th>Households</th>
<th>2000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chililabombwe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kafue</td>
<td>881</td>
<td>4503</td>
</tr>
<tr>
<td>Mvula</td>
<td>388</td>
<td>2824</td>
</tr>
<tr>
<td>Mathew Nkoloma</td>
<td>578</td>
<td>4534</td>
</tr>
<tr>
<td>Silwizya</td>
<td>566</td>
<td>2669</td>
</tr>
<tr>
<td>Helen Kaunda</td>
<td>513</td>
<td>4062</td>
</tr>
<tr>
<td>James Phiri</td>
<td>968</td>
<td>6509</td>
</tr>
<tr>
<td>Chitimukulu</td>
<td>269</td>
<td>16639</td>
</tr>
<tr>
<td>Yeta</td>
<td>451</td>
<td>3279</td>
</tr>
<tr>
<td>Ngebe</td>
<td>511</td>
<td>3710</td>
</tr>
<tr>
<td>Kamima</td>
<td>390</td>
<td>2865</td>
</tr>
<tr>
<td>Nakatindi</td>
<td>12592</td>
<td>12324</td>
</tr>
<tr>
<td>Mukuka</td>
<td>1164</td>
<td>6938</td>
</tr>
<tr>
<td>Yotamu Muleya</td>
<td>428</td>
<td>2212</td>
</tr>
<tr>
<td>Joseph Mwila</td>
<td>410</td>
<td>2242</td>
</tr>
<tr>
<td>Kawama</td>
<td>764</td>
<td>3079</td>
</tr>
<tr>
<td>Chitami</td>
<td>892</td>
<td>3499</td>
</tr>
<tr>
<td>Chilimina</td>
<td>669</td>
<td>2980</td>
</tr>
<tr>
<td><strong>Chililabombwe District Total</strong></td>
<td><strong>24784</strong></td>
<td><strong>84866</strong></td>
</tr>
</tbody>
</table>

Source: CSO Census 2002
5.3.2 The Economic Sector

5.3.2.1 Mining

Copper Mining is the mainstay of the Zambian economy and is the major activity on the Copperbelt. Other than copper, other minerals that are mined include cobalt, silver, gold and some precious and semi-precious stones including emeralds.

However, in the last ten years, the industry has been on the decline particularly in the mining of copper. Though the sector was under state control it now has been privatised. The decline is largely on account of the declining copper prices on the international market as well as a decline in world demand for copper.

For instance copper production declined from about 580 000 tonnes in 1982 to well around 200 000 tonnes in 2000. Formal sector employment in the sector also declined from 55 100 in 1982 to 31 700 by 1998.

However, there is an opportunity for increased production of gemstones once the effort by government to diversify the economy away from copper to other products through a diversification programme begin to bear fruits.

Copper mining is the major activity in the two towns Chililabombwe and Chingola through which the proposed line will pass. However there is no major mining activity taking place along the proposed wayleave. It should nevertheless be noted that there is some extraction of sand some 300 metres from the Luano substation. River sand is also collected on the Kafue river and the activity seems to be seasonal. There will be very little disruption of this activity as a result of this project.

5.3.2.2 Manufacturing

The manufacturing sector was an important economic activity on the Copperbelt in the late 60s to the 80s. The sector was built around the mining activity as well as providing for the consumer needs.

However, the decline in the mining activity as well as the general decline of the Zambia economy has contributed to the collapse of the sector on the Copperbelt. The liberalisation of the economy has also contributed to the decline of the sector as most
of the manufacturing companies could not withstand the competition with foreign products, which proved cheaper and of high quality.

There are no manufacturing activities nor people affected by the decline in the manufacturing activity along the corridor of the project.

5.3.2.3 Agriculture
There is about 1,577,000 ha of agriculture land of this only 307,000 ha or just 19.5% is currently under cultivation reflecting under utilisation of the agricultural potential.

However there is some subsistence agriculture going on along the wayleave. Maize is grown mainly for consumption with a few farmers leaving a small surplus for the market. Other crops grown include cassava, groundnuts, beans and sweet potatoes. Crop production is mostly seasonal though a number of the subsistence farmers along the wayleave make use of dambos to grow vegetables and maize throughout the year.

Livestock rearing also occurs although the province is not a traditional livestock area. A number of farmers are engaged in the rearing of poultry, cattle for beef and milk, goats, sheep and pigs.

There is no livestock production along the route corridor.

5.3.2.4 Land use
Land use in the province is divided into various categories including:

- Land leased to mining activities
- Land reserved for state use (forest resource)
- Land leased for institutional, industrial commercial and residential purposes
- Land leased for agricultural purposes.

There is no commercial farming along the wayleave. Land is mainly used for forestry and subsistence farming using simple tools. In Chingola and Chililabombwe, the two towns near which the interconnector will be constructed, land is used for other purposes to include land leased to mining companies as well as for charcoal burning.
However, there are no such activities taking place along the proposed interconnector line. Land along the route is controlled by the local authorities in Chingola and Chililabombwe using the provisions of the Local Government Act No. 22 of 1991. The table below shows the general statistics of land in the two towns of Chingola and Chililabombwe (including areas outside of the project area.)

**Table 10: General Statistics about Chingola and Chililabombwe**

<table>
<thead>
<tr>
<th></th>
<th>Chingola</th>
<th>Chililabombwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population ('000)</td>
<td>177 445</td>
<td>84,866</td>
</tr>
<tr>
<td>Area in Square Km</td>
<td>1026 Km²</td>
<td>1678 Km²</td>
</tr>
<tr>
<td>Arable Land (Ha)</td>
<td>141,884</td>
<td>63996</td>
</tr>
<tr>
<td>State Land (Ha)</td>
<td>23542</td>
<td>30104</td>
</tr>
<tr>
<td>Trust Land (Ha)</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Traditional Land (Ha)</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Forest Reserves (Ha)</td>
<td>25916</td>
<td>30104</td>
</tr>
<tr>
<td>Reserve Land (Ha)</td>
<td>2374</td>
<td>Nil</td>
</tr>
</tbody>
</table>

*Ministry of Agriculture 2002*

Land use within the project area comprises both State Land and Forest Reserves only. (State Land is land under the direct control of the Commissioner of Lands.)

5.3.2.5 **Construction**

There has been some construction activities on the Copperbelt related to mine expansion and new mines being established in addition to road rehabilitation and construction and rehabilitation of some schools and health centres structures.

There are no construction activities going on or associated with the development area of the interconnection line.

5.3.2.6 **Energy**

Indeni Refinery Petroleum is located in Ndola and is the sole oil refinery in Zambia that refines crude oil into petroleum products such as petrol, diesel and Kerosene.
Electricity is provided by ZESCO and the Copperbelt Energy Corporation (CEC).

Charcoal is the major source of energy for cooking in the urban areas while wood fuel is mostly used in the rural areas.

Use of solar energy is minimal in the province though its use is being encouraged in schools and health centres.

Electricity is not being used by those households alongside the corridor. However wood fuel is extensively used along the route.

5.3.2.7 Tourism and Cultural Sites

The province has some tourism attractions which include the annual Copperbelt Commercial and Agricultural Show (Kitwe), annual Zambia International Trade Fair (Ndola), Nchanga Open Pit (Chingola), Dag Hamarskfoeld Memorial Site (Ndola), Copperbelt Museum (Ndola), Chimfunshi Chimpanzee Orphanage (Chingola), Nsobe Lodge (Masaiti), Chembe Bird Sanctuary (Kalulushi) and the Slave Tree in Ndola.

None of these tourist attractions are in the immediate vicinity of the interconnector project.

5.3.3 The Social Sector

This sector covers issues on health, education value and sanitation and housing

5.3.3.1 Health

There are 18 hospitals and 172 health centres in the province with 5,223 beds. Most of the facilities are owned by government, making it the major provider of health services. Other major providers of health services are the mines and religious organisations. There are no health centres or hospitals in the project area.

The major and leading causes of morbidity and mortality in the province are malaria, diarrhoea, HIV/AIDS and Tuberculosis. Malnutrition affects about 70% of children
under the age of 14. However, there is a high probability of people along the route getting infected with the above mentioned diseases.

5.3.3.2 Education

There are 306 primary schools and 38 secondary in the Province. These are well distributed in the Province. There are no schools located within the project area.

5.3.3.3 Water

Only about 34% of the households in the province have access to piped water while others depend on borehole/well and river/stream water. Along the route there is no piped water system and therefore the households are susceptible to consume unclean water. The Kafue river, streams and dambos are the major sources of water within the project area.

5.3.3.4 Sanitation

According to CSO Copperbelt Analytical Report, about 48.7% of households use flush toilets while 42.9% use pit latrines. Pit latrines and the bush are used for the disposal of human waste within the project area.

5.3.4 Archaeological Sites

There are several archaeological sites in the Copperbelt Province. Between Chingola and Chililabombwe about 36 sites can be found including the Luano Dambo, Luano Hot Spring, and Chililabombwe Shelter.

None of the sites are going to be affected by the construction and operation of the line.
6.0 LEGISLATION COVERING ENVIRONMENTAL PROTECTION

6.1 In Zambia

Some 28 pieces of primary legislation within Zambia in addition to a number of regional and international conventions are relevant considerations in the environmental assessment process. These include:

6.1.1 The Environmental Protection and Pollution Control Act (EPPCA)

Passed in 1990 this is the principal Act on environment in Zambia. The Act provides for the establishment of an Environment Council whose main functions constitutes the protection of the environment and control of pollution in particular so as to provide for the health and welfare of persons, animals, plants and the environment in general.

The regulative responsible for the Environmental and Social Impact Assessment is vested in the Environmental Council of Zambia (ECZ) which administers the EPPCA Act No.17 of 1990, Statutory Instrument No.28 of 1997 - The Environmental and Social Impact Assessment Regulations.

The act has been referred to during the scooping, baseline study, impact evaluation, public participation, assessment of alternatives, identification of mitigation measures in order to seek approval and proceed with the development of the project. The report has been re-written to address comments received from the World Bank.

6.1.2 Town and Country Planning Act

The Act came into force in 1962 and provides for the appointment of planning authorities whose main responsibilities are the preparation, approval and revocation of development plants. It also provides for the control of development and subdivision of land. The Act does not however apply to Trust Land and land in Reserve and Mining Areas which fall under regional plans.

The act has been referred to during the study to verify the following information:

- Land ownership
- Number of people on the land
- Extent of the farmland affected
Authorising officer at the time of obtaining land

Further demarcation of land and issuing of title deeds is done by the Local Authorities.

### 6.1.3 Water Act

The Act came into force in 1949 and provides for the control, ownership and use of water excluding that of the Zambezi, Luapula and Luangwa rivers which form borders with other countries. The Act establishes the Water Board and Regulates the use of public water including protection against pollution.

The act has been referred to during the study to ensure that impact on the quality of water during construction is minimised.

### 6.1.4 The National Parks and Wildlife Service

Passed in 1991, the Act provides for the establishment, control and management of National Parks; conservation and protection of wildlife and objects of interest in National Parks, the establishment of Game Management Areas; the licensing of hunting; control of possession of trophies and control of bush fires.

The route corridor of the project will pass through the Luano and Kamenza national forests. Measures will be taken to notify Zambia Wild Life Authority if any wild life is seen in the area, though it is unlikely to encounter any wild life. The act will also be referred to during the briefing of construction workers on wildlife conservation.

### 6.1.5 Local Government Act

The Act came into force in 1991 and provides for the establishment of Councils in districts, the functions of local authorities and the local government system. Some of these functions relate to pollution control and the protection of the environment in general.

During the study, personnel from the Local Government were consulted frequently on procedures for farmland allocation and who own the subdivided plots. They will also be notified at the time of project commencement.
6.1.6 Agricultural Lands Act

This Act was passed in 1990 and provides for the protection and alienation of land for agricultural purposes only.

The act was referred to during the study period and personnel from the Department of Lands in Ndola were consulted on farmland allocation and for obtaining information on the Provincial and District Situational Analysis regarding land use.

6.1.7 Tourism Act

Enacted in 1979, and amended in 1985, the Act provides for the control of tourism enterprises. The Act though making no direct reference to environmental protection does provide for appeals against authorisation of tourism projects which are deemed to negatively affect Zambian tourism which is basically natural resource based.

The act was referred to during the study to ensure that areas of aesthetic nature are protected during the construction and operation stages of the project.

6.1.8 National Heritage Conservation Commission Act

Enacted in 1989, the Act provides for the conservation of ancient, cultural and natural heritage, relics and other objects of aesthetic, historical, prehistorical, archaeological or scientific interest.

During the study the Director of the Copperbelt Museum was consulted for identification of cultural, historical or national monuments on the route corridor.

The act was referred to during the study to ensure that should there be any cultural, historical or national monuments discovered during construction, the Ndola National Museum will be notified.

6.1.9 Forest Act

Enacted in 1973 and repealed by the Forest Act No. 7 of 1999 (CAP 199) of the laws of Zambia. It provides for the establishment and management of National and Local forest conservation and protection of forests and trees, and licensing and sale of forest.
During the study, personnel from the Forest Department at both the provincial and district level were consulted on the status of the Forest Reserves and how CEC could work with the Forest Department during and after the project.

The act was referred to during the study period and personnel from both ZAFFICO and the Forestry Department were consulted on authorisation, compensation and utilisation of the trees to be felled during construction.

6.1.10 The Energy Regulation Act (CAP 436)

The Energy Regulation Act establishes the Energy Regulation Board and defines its functions; and provides for the licensing of undertaking for the production of energy and production or handling of certain fuels.

The Energy Regulation Act provides for the licensing by the Energy Board of a person establishing or operating undertakings. An undertaking includes that for the production, generation, transmission, distribution or supply of energy and that for the manufacture, refining, transportation, storage and supply of fuel.

The ERB has been fully consulted to include the Zambia – DRC inter-connector project on CEC transmission licence.

6.2 World Bank Legislation

6.2.1 Environmental Assessment – OP 4.01

This World Bank safeguard policy requires that projects financed by the bank are environmentally sound and sustainable. It covers impacts on:

a) Natural environment – air, water and land
b) Human health and safety
c) Social aspects – involuntary resettlement, indigenous people
d) Natural habitats
e) Pest management
f) Forestry
The ESIA was initially written with guidance from the Zambian ESIA regulation, statutory instrument No 28 of 1997 which categorises projects into those requiring an environmental Brief (first schedule) and those requiring an ESIA (second schedule). The forth schedule, lists some guidelines for conducting an ESIA as listed above.

6.2.2 Pest Management – OP 4.09

The World Bank safeguard policy requires that projects financed by the Bank:

a) Promote biological and environmental control methods over chemical pesticides

b) Pesticides to be manufactured, packed, labelled, applied, etc in accordance with WHO/FAO guidelines.

c) Sponsor prepares a pest management plan.

The Zambia-DRC route corridor will be cleared of overgrown vegetation manually annually after the rain season. No pesticide will be used.

6.2.3 Natural Habitats – OP 4.04

The World Bank safeguard policy on natural habitats supports among others:

a) Project does not significantly convert/degrade a critical habitat

b) Identification of natural habitats

c) Minimise impacts

The proposed route corridor for the Zambia-DRC interconnector was chosen after examining three alternative routes. The chosen route will pass through and involve the clearance of less natural protected forest and all clearance activities will be subject to permitting by the Forestry Departments. Existing service roads will be used throughout this area. Though the
transmission line will cross three dambos, the wetlands will not be permanently affected because:

a) All three wetlands are less than 1.0 km wide
b) Tower foundation will be suitably located
c) Few riparian trees (less than five) will be cleared at each wetland
d) Only light trucks will be allowed to across the existing curvets on streams

6.2.4 Safeguarding cultural properties – OP 4.11

To ensure that the Bank-finances projects are environmentally sound and sustainable, the Bank:

a) Avoid harm to significant, non-replicable cultural property
b) Sponsor addresses protection/management of cultural property in project area
c) Sponsor host country regulations/laws

During the scooping exercise and interviews with the local community, no cultural properties were identified.

6.2.5 Involuntary Resettlement – OP 4.12

The World Bank safeguard policy on involuntary resettlement requires that:

a) Description of project affected people
b) Avoid or minimise involuntary physical resettlement or economic displacement
c) Carry out socio-economic survey of affected people when necessary
d) Appropriate measures to deal with squatters
e) Compensation at full replacement cost for all lost assets as well as assistance with more and support during transition and restore/improve income.
Due to the changes of the wayleave entry point at Kasumbalesa border the wayleave entry point on the Zambian Side has been diverted by 1.5km east of the existing entry point. Therefore, the five housing structures initially identified for relocation on the Zambian side will not be relocated due to these changes. However, two churches along the route corridor of the project have since been relocated.

6.3 International and Regional Conventions

Zambia is also party to a number of international and regional conventions signed for addressing common environmental concerns. These include:

- Statutes for the International Union for the Conservation of Nature and Natural Resources
- Convention of Wetlands of International Importance especially as waterfowl habitat
- Convention concerning the Protection of the World Cultural and National Heritage
- Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System
- Framework Convention on Climate Change

Zambia is a signatory to the above conventions, the study referred to them to ensure that the project does not violate any international agreements on environmental protection.
7.0 SIGNIFICANT ENVIRONMENTAL IMPACTS

The environmental impacts of this project are greatly minimised due to the decision to route the transmission line within an existing wayleave and lying adjacent to an existing line of similar construction.

Equally of significance is that the project avoids the major centres of Chingola and Chililabombwe and will be constructed in an area that is sparsely populated thus avoiding any major disruption of the economic and social activities of the populations.

It should also be observed that the use of an existing wayleave will greatly minimise the visual impact of the project and requires the clearing of a substantially smaller area of land than would have been required with a new wayleave.

7.1 POSITIVE IMPACTS

7.1.1 Social Economic

7.1.1.1 Income Generation

Since power will be imported from DRC for export to the SADC region, Zambia will benefit from the foreign exchange earnings. Both CEC and ZESCO will earn additional revenue through the wheeling charges that will be paid to them.

7.1.1.2 Market Stimulation

Zambia is in the Southern Africa Power Pool and increasing the interconnector capacity will stimulate regional electricity trading within the southern African region. Furthermore, the increased capacity interconnector will provide economic benefits and accelerate the development of other power trading projects in the region. This will result in the improvement of Zambian electricity producers to sell surplus capacity into the region market. In the longer term, the ability of Zambia to develop new sources of low-cost hydropower resources should also be enhanced.

7.1.1.3 Employment Generation

Both the construction phase and the operational phases of the project will require the usage of both the skilled and unskilled labour. The project will therefore result in the generation of employment both on permanent and non-permanent basis.
Specific employment opportunities for the communities of Chililabombwe and Chingola will arise during the construction and operational phase of the project.

7.1.1.4 Positive Spill-Over Effects

The project will help enhance economic activity within the project area, and domestic crop production will increase due to the availability of a ready market to be provided by construction workers in the short run.

Since the road on the wayleave will be improved access to the market will also be improved thereby resulting in increased income earning for the people along the wayleave. Consequently the standards of living of the people may be enhanced.

7.1.1.5 Land Use

Construction of the wayleave will not stop the growing of low-level crops such as groundnuts. Clearance of land on the wayleave will provide land for subsistence agriculture.

7.1.1.6 Goods and Services

There is an expected increase in the flow of goods and services especially during the construction phase. Traders from the nearby townships in Chingola and Chililabombwe are likely to be attracted to trade in the area. An improved road structure along the wayleave may improve the flow of traffic to and from the surrounding townships.

7.1.1.7 Global Sustainability

This project will allow existing hydro-power to access the markets of southern Africa.

This will displace the use of existing thermally produced power and delay the construction of new thermal power plants. Therefore this project will cause lower levels of CO$_2$ to be produced and help to reduce effects of global warming.
7.1.1.8 Archaeological Sites

The Copperbelt Province is known to have some archaeological sites that have not been discovered by the National Heritage Commission. History has it that some of these sites are discovered during construction activities like the one being proposed. If any archaeological site is discovered, during construction of the transmission line, the Contractor will be obliged to cease work under the terms of his contract and will be required to report the discovery to the Director of the Copperbelt Museum.

7.1.2 Biophysical Positive Impacts

7.1.2.1 Vegetation clearing

Clearing vegetation along the wayleave may:

(i) be a source of land for farming and settlement for some people
(ii) be a source of wood fuel (charcoal and firewood) for some people
(iii) be a source of income for people who will extract timber and produce charcoal before final clearing of the area
(iv) provide early income to ZAFFICO before the rotation age of the compartments involved
(v) change vegetation composition which may be good for some plant and animal species. Some flora and fauna will be attracted in the cleared area
(vi) increase population of small animals such as rabbits and other herbivores that may make difficult for young trees to grow thus reducing maintenance costs
(vii) provide a fire break for ZAFFICO plantation will be widened and thus reduce crown fires from jumping from one side of the transmission line to the next
(viii) Create employment to local people

7.1.2.2 Timber and wood fuel extraction

Before the line is cleared, forest based industries in Chingola and charcoal producers in Chingola and Chililabombwe will be encouraged to extract and burn charcoal before final vegetation clearing. This is hoped to bring the following benefits:

(i) minimise wood wastage
(ii) source of income for both local people and ZAFFICO
(iii) obtain raw material at a cheaper price

7.1.2.3 Improvement of access road
The access road will be improved and maintained to allow heavy vehicles to transport construction materials. Improving the access roads will have the following benefits:

(i) Government will be able to deliver agricultural inputs to the area
(ii) Government will easily carry out extension services in the area
(iii) Government may be able to provide healthy facilities on mobile basis
(iv) traders will be able to easily go to the area to purchase agricultural crops
(v) may facilitate timber extraction.
(vi) may open up the area to those who would like to go into serious farming

7.1.2.4 Involvement of the Local People
The involvement of the local inhabitants in the project will have the following benefits:

(i) Creation of employment to the locals.
(ii) Source of income for some people.
(iii) Creation of more awareness about the project among the local people.
(iv) As a source of income thus will promote better living conditions and improve health status of the local people.

7.1.2.5 Tourism
In the project area scenic attraction as well as diverse flora may be of tourist/picnic attraction. Where the transmission line crosses the Kafue River, there are some rock outcrops, which may be a good place for photographic safaris.

7.2 NEGATIVE IMPACTS
It is during the construction phase of the project that there will be significant negative environmental impacts on the population, their activities in the project area and the flora. This phase is expected to be completed over a twelve-month period.

The operational phase of the project is expected to have minimal impacts on the environment.
7.2.1 Social Economic

7.2.1.1 Structures/Buildings

The following structures as shown in Table 11 below lie along the wayleave corridor. However due to the change of the border crossing point at Kasumbalesa, the affected structures will not be demolished nor relocated elsewhere. Almost all the structures affected are made up of wooden poles and mud and are grass thatched. Only one structure has iron roofing sheets and made up of bricks and mortar.

Table 11 Affected Individuals/Structures

<table>
<thead>
<tr>
<th>Name of Tenant</th>
<th>No. &amp; Type of Structure</th>
<th>Town</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernadette Banda (Plate 6)</td>
<td>5 houses some with Iron sheets, 1 with cement block, other grass thatched</td>
<td>Chililabombwe</td>
<td>Will not be relocated due to change of wayleave route</td>
</tr>
<tr>
<td>James Likola</td>
<td>2 grass thatched mud and pole houses, 1 grass thatched building</td>
<td>Chililabombwe</td>
<td>Affected person has Voluntarily relocated to another area</td>
</tr>
<tr>
<td>New Apostolic Church - (Plate 8)</td>
<td>1 grass thatched building</td>
<td>Chililabombwe</td>
<td>Relocation effected in 2006</td>
</tr>
<tr>
<td>African Covenant Church of Zambia (Chipangano Church)</td>
<td>1 grass thatched building</td>
<td>Chingola</td>
<td>Relocation effected 2006</td>
</tr>
</tbody>
</table>

In each case however CEC worked with the affected parties and their respective district councils to ensure that they are not worse off as a result of the project. The Department of Agriculture, the District Planning Office and the Department of Lands were also be involved in this arrangement.
7.2.1.2 Displacement of Households

The project area is neither heavily populated nor has it got households living along the corridor. The only households identified in the initial ESIA are those for Messrs Likola and Banda who will now not be relocated due to the change in the project route. The Banda's household no longer lies in the project route due to the diversion of the entry point at Kasumbalessa border but Likola remains affected even by the new route. However, two churches were identified for relocation. The two churches, the New Apostolic Church of Zambia and the African Covenant Church of Zambia in the Luano-Chipupu and Chiililabombwe areas, respectively, have since been relocated. The relocation of the two churches was done in accordance with the CEC Resettlement Action Plan (RAP) that has been developed in accordance with CEC SHE policy. The relocations were done in consultation with affected church members and in conjunction with the relevant local authorities.

7.2.1.3 Disruption of Economic Activities

The main economic activity in the area is agriculture. Most of it is subsistence agriculture. There are a few emergent farmers producing an average of 100 bags by 90kg of maize. Other crops grown include cassava, sweet potatoes and groundnuts. There will be minimal disruption in the economic activities that the local people are involved in. Where there is disruption, CEC Procedures for the payment of compensation as outlined in CEC Resettlement Action Plan will be followed.

7.2.1.4 Land Use

The construction of the transmission line will affect the various land uses as follows:-

- **ZAFFICO Plantation**: Of the 1868 hectares of ZAFFICO Plantation only 6.83 hectares has been cleared. This amounts to 0.40% of the affected plantation area.
Table 12: Volume of trees to be cut in ZAFFICO plantation

<table>
<thead>
<tr>
<th>Comp. No.</th>
<th>Year planted</th>
<th>Species</th>
<th>Gross Area (ha)</th>
<th>Area to be cut (ha)</th>
<th>No. Stems to be cut</th>
<th>Vol. to be cut (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>082</td>
<td>1981</td>
<td>Pinus kesiya</td>
<td>48.6</td>
<td>0.63</td>
<td>347</td>
<td>65.93</td>
</tr>
<tr>
<td>083</td>
<td>1981</td>
<td>Pinus kesiya</td>
<td>23.4</td>
<td>0.35</td>
<td>130</td>
<td>19.50</td>
</tr>
<tr>
<td>084</td>
<td>1981</td>
<td>Pinus kesiya</td>
<td>50.4</td>
<td>0.87</td>
<td>321</td>
<td>70.62</td>
</tr>
<tr>
<td>085</td>
<td>1981</td>
<td>Eucalyptus grandiss</td>
<td>29.0</td>
<td>0.37</td>
<td>147</td>
<td>127.89</td>
</tr>
<tr>
<td>252</td>
<td>1980</td>
<td>Pinus kesiya</td>
<td>20.96</td>
<td>0.75</td>
<td>466</td>
<td>149.12</td>
</tr>
<tr>
<td>253</td>
<td>1980</td>
<td>Pinus kesiya</td>
<td>23.39</td>
<td>0.54</td>
<td>142</td>
<td>113.74</td>
</tr>
<tr>
<td>260</td>
<td>1980</td>
<td>Pinus kesiya</td>
<td>24.99</td>
<td>0.76</td>
<td>230</td>
<td>66.70</td>
</tr>
<tr>
<td>261</td>
<td>1980</td>
<td>Pinus kesiya</td>
<td>11.0</td>
<td>0.43</td>
<td>204</td>
<td>95.68</td>
</tr>
<tr>
<td>276</td>
<td>1980</td>
<td>Pinus kesiya</td>
<td>15.72</td>
<td>0.62</td>
<td>372</td>
<td>197.16</td>
</tr>
<tr>
<td>277</td>
<td>1980</td>
<td>Pinus oocarpa</td>
<td>15.3</td>
<td>0.51</td>
<td>196</td>
<td>96.04</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>262.76</strong></td>
<td><strong>6.83</strong></td>
<td><strong>2655</strong></td>
<td><strong>1002.58</strong></td>
</tr>
</tbody>
</table>

Source: ZAFFICO 2002

The cost of pines per m³ in 2003 was K20, 000. Revenue for ZAFFICO excluding VAT is K20,051,600. Since the compartments where supposed to be cleared in 2005 and 2006, respectively, at the rotation age of 25 years, the anticipated volume would have been 1514.84 m³ and revenue K45,444,900.00. ZAFFICO, therefore, requested for the anticipated revenue of the timber at the rotation age of 25 years, i.e. K45,444,900.00.

CEC and ZAFFICO negotiated the price and disposal of trees that will be cut.

- **Farm Land:** The estimated farmland area is 8100 ha on the eastern side of the corridor. Of this area, only 68.55 ha will be claimed by the wayleave. This amounts to 0.85% of the total farmland.

- **Natural Forest:** Between 40 ha to 80 ha of natural forest will be cut or cleared. This amounts to 0.5% of the total forest reserve areas.

Table 13 shows all of the farm plots, which fall within the area of construction of the new 220kV transmission line on the eastern side of the Wayleave. It also indicates the length of time each tenant has stayed on this farmland.
CEC will request farmers to restrict farming activities during the construction period in the affected areas, though table 13 indicates type of structures and type of fruit trees that are found on the farm plots.

The details regarding the landowners within the Project area are as shown below. (Table 13)

**Table 13: Landowners and economic activities along the wayleave Corridor in Chingola and Chililabombwe**

<table>
<thead>
<tr>
<th>Name of Tenant</th>
<th>No. of Dependents</th>
<th>Total Farm Size (Ha)</th>
<th>Area of Farm Affected (Ha)</th>
<th>Type of Tenure</th>
<th>Type of Structure</th>
<th>Fruit Trees</th>
<th>Type of Crops</th>
<th>No. of yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wested Sinyangwe</td>
<td>13</td>
<td>6</td>
<td>1</td>
<td>Sitting Tenant</td>
<td>2 Grass Thatched Houses</td>
<td>4 Mango trees &amp; Bananas</td>
<td>Maize, Cassava &amp; G/nuts</td>
<td>10</td>
</tr>
<tr>
<td>Aaron Mumba</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>Sitting Tenant</td>
<td>2 Ground &amp; Poles houses with Iron sheets</td>
<td>9 Mango trees &amp; Bananas</td>
<td>Maize, beans, cassava</td>
<td>12</td>
</tr>
<tr>
<td>Mr Sichone</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Sitting Tenant</td>
<td>1 grass thatched house</td>
<td>None</td>
<td>Maize, Cassava</td>
<td>6</td>
</tr>
<tr>
<td>Nelly Nguni</td>
<td>8</td>
<td>69</td>
<td>2</td>
<td>Sitting Tenant *</td>
<td>7 Grass Thatched houses</td>
<td>Yes</td>
<td>Maize, Cassava, G/nuts</td>
<td>9</td>
</tr>
<tr>
<td>Christopher Mtonga</td>
<td>5</td>
<td>56</td>
<td>2</td>
<td>Sitting Tenant *</td>
<td>4 Grass Thatched structure</td>
<td>Yes</td>
<td>Maize Cassava</td>
<td>4</td>
</tr>
<tr>
<td>Zambia Red Cross</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>Sitting Tenant *</td>
<td>5 Grass Thatched Structures</td>
<td>Mangoes/Bananas, Sugar Cane</td>
<td>Maize</td>
<td>-</td>
</tr>
<tr>
<td>Cosmas Kayula</td>
<td>17</td>
<td>75</td>
<td>2</td>
<td>Sitting Tenant</td>
<td>2 Grass Thatched houses</td>
<td>Mangoes, Avocado, Bananas, Guavas</td>
<td>Maize Cassava</td>
<td>-</td>
</tr>
<tr>
<td>English Mphande</td>
<td>15</td>
<td>10</td>
<td>2</td>
<td>Sitting Tenant</td>
<td>2 Grass Thatched houses</td>
<td>Mangoes, Guavas, Cassava</td>
<td>Maize Cassava</td>
<td>G/nuts</td>
</tr>
<tr>
<td>Stephen Shiku</td>
<td>15</td>
<td>75</td>
<td>2</td>
<td>Sitting Tenant</td>
<td>5 Grass Thatched houses</td>
<td>Mangoes, Avocado, Bananas, Guavas</td>
<td>Maize Cassava</td>
<td>G/nuts</td>
</tr>
<tr>
<td>Winshon Menshi</td>
<td>11</td>
<td>10</td>
<td>2</td>
<td>Sitting Tenant</td>
<td>1 Grass Thatched house</td>
<td>Mangoes, Avocado</td>
<td>Mangoes, Avocado G/nuts</td>
<td>-</td>
</tr>
<tr>
<td>James Mushobwe</td>
<td>6</td>
<td>10</td>
<td>2</td>
<td>Sitting Tenant</td>
<td>2 Grass Thatched houses</td>
<td>Mangoes, Avocado</td>
<td>Maize G/nuts</td>
<td>-</td>
</tr>
<tr>
<td>Elizabeth Chachoka</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td>Sitting Tenant</td>
<td>4 Grass Thatched houses</td>
<td>Avocado, Mangoes</td>
<td>Maize G/nuts</td>
<td>-</td>
</tr>
</tbody>
</table>
7.2.1.5 Agricultural Activities

The project area is largely inhabited by subsistence farmers with a few emergent farmers. There will be minimum disruption of agricultural activity along the wayleave as most of the landowners have not developed their farms up to the proposed wayleave.

Theft of produce by construction workers may take place during the construction phase.

7.2.1.6 Health

Although malaria, pneumonia and malnutrition exist in the area, there is likelihood of increased incidence of HIV/AIDS and Tuberculosis that will mainly be as a result of the interaction between construction workers and the local communities.

7.2.2 Biophysical

Out of the negative impacts, the worst affected will be flora and fauna during and after construction. During construction up to about 9.4m$^3$ of sawable timber and approximately 20,000 to 30,000 poles (between 0-30cm dbh) was cleared from an area of between 40 ha to
80 hectares of natural forest while an area of 6.83ha of ZAFFICO Plantations with 1 002.58m³ of timber, was cleared.

Timber removal in natural forest and ZAFFICO Plantation was conducted in accordance with the Forestry Department and ZAFFICO regulations. Special clearing and timber disposal conditions in natural forests and plantations were negotiated with the Forestry Department and ZAFFICO, respectively. On farms, cutting of trees and other vegetation was negotiated with the landowners and the Forestry Department.

The impact of the sitting of a workers construction camp within the project area during the construction phase could also contribute to biophysical impact due to both the location of the camp and the activities of the additional people within the area.

Due to noise from people and machinery fauna near the wayleave will flee to other areas.

After construction and during maintenance, ecological negative impacts are expected due to the following activities:

(i) Regular inspection since access to the line will be by the access road.
(ii) When repairing the line.
(iii) When managing the vegetation along the line as management will be directed towards removing of vegetation, by slashing and manual cutting which may affect fauna.
(iv) Noise from workers and vehicles may chase away some animals and birds within the immediate surrounding.

Generally the biophysical negative impacts will be as follows:

7.2.2.1 Early cutting of ZAFFICO Plantation

ZAFFICO plantation trees that were be cut had not yet reached the rotation age of 25 years as they were planted in 1980 and 1981. This means the full growth potential of trees was not realised and the ground on which the trees were growing had not have been used to the full advantage. This is a loss in terms of volume which was supposed to be harvested at the rotation age.
7.2.2.2 Maintenance of Inspection roads

Siltation due to inadequate road maintenance along the access road may cause soil erosion and siltation down streams and may result in partial destruction of fish and other aquatic habitat.

Repairing and maintenance of the access road and bridges may lead to soil compaction, decrease water infiltration capacity, soil loss due to erosion. Water that does not get absorbed into the soil may move overland, hence result in soil erosion and siltation of streams.

7.2.2.3 Soil and Site Fertility

Forests are important in maintaining soil in its productive state, evening out the flow of rainwater, ameliorating extreme winds, evaporation, temperature and humidity conditions and minimising soil erosion.

In the project area the anticipated impact on soils may likely be:

(i) increase soil loss due to erosion as a result of forest clearing
(ii) decrease water infiltration capacity as a result of forest clearing
(iii) soil compaction – by heavy, repeated traffic as a result of vehicles which will be transporting construction materials and equipment

Furthermore, vegetation drop litter on the ground and this litter prevents raindrops from hitting the soil with too much force. Clearing the vegetation, apart from removing significant quantity of nutrients stored in the vegetation which may amount up to 28% of Potassium, 39% Phosphorous and 57% Magnesium and other nutrients from the site (Peter 1996), depletes the area with litter hence soil is compacted by rain and its absorbing capacity is reduced. Dashing rain churn bare soil into muddy suspensions. Percolation of water into the earth filters out suspended soil pore spaces in the soil, and the soil becomes sealed so that it absorbs less water than normally. Compacted soils can reduce the normal rate of infiltration by 80 –90 % (Abdulhadi, Kartawinata and Sukardjo 1981; Hamzah 1978)

So when it rains higher than normal proportion, rains run off the surface quickly, rather than being absorbed. This situation may lead to flash flooding. The soil has too little absorptive capacity and almost all the water falling down runs off quickly, rather than retained. This washes away humus and top soil which ensures high biological productivity.
Heavy traffic, which will be taking raw materials and equipment to construction sites, will definitely compact the soils along the access road causing rain water to run down the slopes. This may lead to soil erosion.

7.2.2.4 Water

Clear cutting of trees in a large track of land, decreases the water absorptive capability of the watershed and increases the proportion of the rain water in a rainstorm that runs off the surface immediately rather than being held in the ground by living tree roots.

Furthermore, forest clearing especially in a watershed area may affect the physical and chemical characteristics of the water flow out of the watershed. This in turn may have an effect on aquatic life like fish in the stream or river. As fish which require cool water rich in oxygen, may be replaced by fish able to tolerate warmer water with oxygen, as well as all the other changes associated with eutrophication.

7.2.2.5 Impact on Fauna

There are a number of animal species although not plentiful in the project area. The remaining forest vegetation is providing animals with; shelter, a variety of climbing, perching and resting sites, a continual source of food, etc.

For example, if a large number of specialised fruit trees in the project area along the route corridor are cleared this limits the capacity of the area to full fill the functions of for example frugivores (animals eating fruits). The frugivores have no choice but to migrate to more productive habitats or starve. The construction of an overhead may endanger certain bird species as a result of fatalities caused by striking the overhead lines whilst in flight.

The activities of the construction workers located in camps within the project area during the construction phase may also have an impact upon the fauna due to poaching and general interaction.

7.2.2.6 Impact on non timber forest products

Non Timber Forest Products play an important role to the surrounding community in the project area such as:
(i) Contribution to household self sufficiency
(ii) Food security
(iii) Income generation
(iv) Accumulation of savings and risk minimisation
(v) Fill seasonal and other food or income
(vi) Provide a buffer in times of hardships or emergency
(vii) Improve household income and security

The likely ecological impact of cutting of trees along the transmission corridor may result into loss of the above benefits to local community.

There are some non-wood forest products that are site specific; if sites are destroyed they also disappear.

7.2.2.7 Lack of involvement of the local people to be affected

The people living along the corridor are poor. They rely heavily on the exploitation of forest resources to survive. Without the active and continuing co-operation of these people, the project and the benefits hoped for will have less chance of success.

The project may create employment for local people, but along the transmission corridor, the cutting in of new access tracks may be viewed by farmers along the line as an opportunity for outsiders to enter or settle in the area.

7.2.2.8 Forest Fires

Forest fires opens up landscape for farming, destroys regeneration, eliminates important nutrient and components in the ecosystem, eliminates small animals and may cause loss of harvested crops and human life.

7.2.2.9 Climate

Trees have a moderating effect on climate and wind. Elimination of forests produces greater localised – amplitude climatic variation from hot to cool and making an area less habitable for some fauna species due to micro climatic variation.
7.2.2.10 Wind

Trees have a moderating effect on wind. Increasing the width of the existing way leave width by cutting down trees may increase wind velocity along the corridor.

7.2.3 Electrical

7.2.3.1 Electric and Magnetic Fields

High voltage power transmission equipment emits power frequency electric and magnetic fields. The magnitude of the electric field is a function of system voltage while the magnitude of the magnetic field strength is a function of the current carried by the equipment.

The effects of both fields are more pronounced at points where the conductors are closest to the ground.

Research findings in the USA, Sweden, Canada, France, Spain and the UK have not found any links between electrical fields and any human diseases, such as cancer as has been feared in certain circles.

In addition, research in the USA, Sweden and other countries have found no significant evidence relating the exposure of people to power frequency electric or magnetic fields. However, the National Radiological Protection Board (NRPB), which advises the British government on such matters, has published field strength guidelines on the basis of well established physiological effects of exposure. For electric fields, the guideline level for human exposure is 12000 volts per metre (V/m) and for magnetic fields it is 1600 microtesla (μT).

The proposed transmission line will result in electric stresses of approximately 4000 V/m and magnetic effect of 30 microtesla (μT), both of which are far below the regulatory levels.

7.2.3.2 Electro-Magnetic Compatibility (EMC) and the Effects on Communication Systems

Electro-magnetic compatibility is defined as "the ability of a device, unit of equipment or system to function satisfactorily in its electromagnetic environment without introducing
intolerable electromagnetic disturbances to anything in that environment". The term EMC has two complementary aspects:

- It describes the ability of electrical and electronic systems to operate without interfering with other systems.

- It also describes the ability of such systems to operate as intended within a specified electromagnetic environment.

Thus it is closely related to the environment within which the system operates. Effective EMC requires that the system is designed, manufactured and tested with regard to its predicted operational electromagnetic environment; that is, the totality of electromagnetic phenomena existing at its location. Although the term "electromagnetic" tends to suggest an emphasis on high frequency field-related phenomena, in practice the definition of EMC encompasses all frequencies and coupling paths, from DC through mains supply frequencies to radio frequencies and microwaves.

Generally, overhead lines operating at voltages over 400kV may create radio noise that may interfere with the operation of electronic equipment such as TVs, radios, computers, etc. This interference may be due to the corona effect, spark discharge or reflections. However, the design of this line and the fact that it will be a 220kV line will be such that it will emit negligible radio noise. It must be noted that present broadcast bands and data transmission frequencies are way above the British Standard 5602: 1978 recommended field strength limit on 1MHZ Radio Frequency Interference (RFI) corona noise from overhead lines of 4.5 millivolts/metre at 20 meters from the nearest high voltage conductor.
8.0 SUMMARY OF ENVIRONMENTAL IMPACTS

The very fact that the line will be used to transmit power from the DRC to the southern African power pool underscores the importance of implementing the project.

8.1 Analysis

There are positive impacts at all levels to include regional, national, provincial and local levels. At regional level the interconnector will link in with the rest of the Southern African region making it possible to realise the intentions of NEPAD. At national level the country will benefit through increased earns from the export of power to the region. Equally true is that financial bases of the companies concerned in this project namely Copperbelt Energy Corporation, SNEL and ZESCO will also be enhanced through the implementation of this project. Finally, though not the least, are the benefits that will accrue to the local communities in the project area through employment opportunities that will be created, the increased access to broader markets, use of access roads to the markets as well as possible increase in the economic activities in the area.

The chosen route does not have any major human settlements as it is sparsely populated. Though 17 households have claim to some land lying along the corridor only three could be said to have the title to land. However, the Environmental and Social Impact Assessment did take into account that whoever was allocated some land either through the Agricultural Department who are legally entitled to do so, or through the Local Council authorities or any such persons with some kind of permit have all been considered to have been affected by the construction of the line.

Notwithstanding the above, the route has been chosen in such a way that major settlements have been avoided.

Equally advantageous to the project is that the physical terrain along the corridor makes it easier for the construction of the line and hence will minimise disturbance to the environment.
Table 14 below is a summary of the expected impact of the project

**Table 14: Summary Of Expected Environmental Impacts**

<table>
<thead>
<tr>
<th>IMPACT</th>
<th>POSITIVE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Economic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income generation</td>
<td>*</td>
<td>.</td>
</tr>
<tr>
<td>Market stimulation</td>
<td>*</td>
<td>.</td>
</tr>
<tr>
<td>Employment generation</td>
<td>*</td>
<td>.</td>
</tr>
<tr>
<td>Land use</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Goods and services</td>
<td>*</td>
<td>.</td>
</tr>
<tr>
<td>Discovery of Archaeological sites</td>
<td>*</td>
<td>.</td>
</tr>
<tr>
<td><strong>Ecological</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetation clearing</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Timber wood fuel extraction</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Access road improvement</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Bush fires</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Poaching of fauna</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Landscape distortion</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td><strong>Transmission Line</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Pollution through solid and liquid waste</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio interference on communication systems</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Audible noise</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Electrical field effects on human beings, farms, animals and environment</td>
<td>.</td>
<td>*</td>
</tr>
<tr>
<td>Danger of electrocution</td>
<td>.</td>
<td>*</td>
</tr>
</tbody>
</table>

In putting up the power line, it is equally important to note the negative impacts that might arise from the construction of the line. A major negative impact will no doubt be on the clearing of the natural vegetation especially in the Kamenza Forest Reserve and the ZAFFICO Plantation. However, adoption of appropriate mitigation measures such as re-planting of trees in selected community areas as well as adoption of appropriate strategic plans for the area by Copperbelt Energy Corporation will contribute to the restoration of the flora in the area.

It should also be pointed out that the corridor does not have any major fauna due to habitat disturbance through poaching and agriculture although small game like common duicker are found.
9.0 MITIGATION MEASURES ON NEGATIVE IMPACTS

A significant impact will be on flora where it is expected that between 40 Ha to 80 hectares of natural forests will be cleared and 6.83 hectares of ZAFFICO Plantation has been cleared before the rotation age. This entails that there will be loss of habitat and biodiversity. However, adequate mitigation measures have been proposed in this report to include assistance by CEC to ZAFFICO and Forestry Department in the expansion of their tree nurseries, tree planting and patrols.

The report also recommends that trees should be cut at stump level to allow the quick recovery of the vegetation through coppicing of stumps and roots. This will help regeneration of the flora in the area reduce soil erosion and will also attract small fauna in the area.

On human settlements and the economic activities in the area, the impact will be quite low as the route avoids major settlements. After the diversion of the entry point at Kasumbalesa, there are no households to be relocated in project route. However, two churches that were identified for relocation in the initial report have since been relocated in Luano and Chililabombwe areas. All compensation and relocation activities were done in line with CEC's policies as detailed in The CEC Resettlement Action Plan (RAP).

Public health is another matter that may have serious repercussions on the social environment if not properly handled. During the construction phase of the project construction workers will unavoidably mingle with the local population and this may result in the transfer of certain diseases like HIV/AIDS into the project area. Other communicable diseases like venereal diseases and tuberculosis may also occur. Public awareness therefore including educational programmes on disease control and avoidance as well as the need for awareness will need to be undertaken. CEC will undertake to introduce such programmes both at the construction stage as well as during the operational phase.

During the construction phase, the major impacts will be noise from the digging of pylon foundations and transport vehicles and restrictions on the use of the access road by the public during certain construction stages. Procedures will be agreed with the contractors prior to the signing of construction contracts that will dictate the procedures for siting and arrangements for the operation of the construction workers camp. The arrangements will include security measures, feeding arrangements, waste management procedures and social behaviour guidelines.
Noise from digging and preparation of concrete will be for short periods only and will only affect those inhabitants nearest to the tower locations. Noise due to transport vehicles will also be for short intervals only. Camp location will have due regard to the proximity to local communities.

Restrictions on the use of the access road will be necessary mainly during the stringing phase to minimise damage to conductors as well as loss of conductors, and other construction materials. Special measures will be incorporated to minimise the need for construction traffic to operate within the dambo areas. To effect any necessary restrictions or access controls, security personnel will be necessary. Increased security personnel will inevitably improve the security situation for the farmers along the wayleave during the construction period.

During the operation phase, the line will not lead to any major negative impacts that may lead to health problems on members of the public. Due to the design and operating voltage of the line, negative electro-magnetic effects are not anticipated.

The only negative impact to note during this stage will be the restriction on farming activities within the wayleave. However, the farmland area to be affected is minimal (less than 1% of the land within farming plots covered by the farmer's plots will be affected). In addition, the improvements to be made to the existing access road as well as other extensions will improve the accessibility of all the affect farms and thus improve communication.

The constructions of this line will lead to a number of very important positive impacts.

9.1 Design and Routing

There will be no further amendments to the proposed design or structures on the route.

Routing of the new line within the area already covered by the wayleave for the existing circuit will result in the following:-

- Reduced visual impact
- Reduced clearance of the wood
- Less disruption to the inhabitants
• Lower impact on the economic activities within the project area.

In all cases along the route where there are claims to land ownership by either legal title holders or sitting tenants will be appropriately compensated for the re-location of structures or for any portion of land that will be claimed by the project. However, consultations with the local authorities and the departments of agriculture and forestry will need to be held for purposes of identifying any other suitable alternatives.

9.2 Construction Phase

During construction there will be a number of activities that will have an impact on the environment. In particular the contractor will be active during the construction and will need to transport pylons and people to the sites.

Soil erosion may also result when construction work begins. To lessen the soil erosion it is recommended that construction work should start at the end of the rain season when soils are dry. Upgrading of the wayleave road will also involve mining laterite from existing borrow pits.

During the clearance of trees within the existing wayleave the cutting of trees at the low trunk level rather than uprooting will be observed to allow the re-growth of the vegetation.

Prior to clearance, efforts will be made to temporarily scare away any fauna from the wayleave. As a mitigation measure, it would be important that the Construction Company observes conservation measures, such as discouraging activities by construction worker and carrying out conservation awareness campaigns.

For the timber that would be removed from the line clearance, CEC, ZAFFICO and Forestry Department will agree on how the timber will be disposed off through the development of a programme that is both fair and enforceable.

There is also likelihood of bush fires occurring and disrupting the construction schedule or affecting the environment. It is recommended that awareness campaigns should be made to involve the construction workers as well as the local communities.
Increasing access to the project area during the construction phase might result in increased illegal exploitation of forest resources. To discourage and monitor this scourge, CEC will undertake to have regular patrols along the route.

There will also be construction workers on site who unavoidably will associate with the local people increasing the likelihood of increasing the incidence of diseases like HIV/AIDS, tuberculosis and venereal diseases. In this regard the CEC in consultation with the Copperbelt Health Project (CHEP) will undertake awareness campaign and training programmes within the project area. The free distribution of condoms for both construction workers and the local community will also be done through CHEP. Other diseases prevention measures will also be introduced to the two parties.

The contractor should be instructed against emission of liquid wastes or leaving any waste materials on the ground. A requirement should be outlined for separate containment and careful disposal of human, metal, paper, plastic, paint, chemicals, fuels and oil waste. Care should also be taken in areas of watercourses and wetlands. If the contractor would require a landfill for waste, its location need to be selected and agreed upon by the resident engineer before the start of construction. The landfill hole should be narrow, deep and excavated from impervious soil away from drainage courses. When filled to within one metre of topsoil, it should be covered with soil, compacted and sown with grass and seedlings for regeneration of the vegetation.

Since the Wetlands are grassland areas, there should be as little destruction to the vegetation as possible. In addition to this, the pylon supports should not be constructed close to the stream banks to maintain stream bank stability.

Supervision of the observance of mitigation measures during construction should be undertaken by the Environmental Office in collaboration with the Environmental Council of Zambia which is the institution that has been mandated to monitor environmental regulations in Zambia. Attention should be directed at ensuring that compliance to the recommended mitigation measures is adhered to.
9.3 Operational Phase

Maintenance of the line should be conducted from the existing CEC wayleave road. Maintenance staff should avoid creating a motorable track by not driving under the line. This should be most important alongside the ZAFFICO plantations where creation of an additional access road would facilitate unauthorised incursions into the forest.

Public environmental education campaigns should be conducted regularly to create, among other things, awareness to the local people against climbing the pylons or sheltering near them during storms in order to avoid electrocutions. Climbing plant should be regularly cut near the base of the pylons.

9.3.1 Flora

The greatest impact is loss of flora and fauna. However, the wayleave route is next to the existing line - thus will affect flora and fauna within 45m width and 47km in length. The surrounding areas will not be seriously affected by disturbance. Some studies have shown that wayleave may not significantly change the habitat, for example it was found that flora in the wayleave was more abundant and richer in terms of plant species than adjacent areas. So vegetation clearing will not significantly contribute to habitat fragmentation so as to pronouncedly produce a negative edge effect for some plant and fauna species reducing the total area available for them.

Public consultation programs should be formulated to educate the local communities to conserve the forest resources. ZAFFICO and the Forest Department are already doing the community consultation programs and CEC should take this advantage to participate rather than start another program.

9.3.2 Fauna

Some small animals and birds tend to be commonly found and feed along the wayleave. In most cases there is substantial increase in small fauna along the wayleave. Several bird species become established because of opening up of a wayleave. They could not have been there if the opening was not there to provide perching, feeding and nesting, or the appropriate scape cover along the edge of the wayleave.
The occurrence of fatalities to birds as a result of strikes with overhead lines is a phenomenon associated mainly with large birds that are relatively unmoverable in flight. These types of birds are not to be found within the project area and CEC's data on overhead line faults confirms the fact that bird strikes on the overhead lines are a very rare event.

As the presence of a voltage gradient on an energised line provides a deterrent to birds flying towards the conductors, CEC will endeavour to energise the circuit as soon as possible following construction. Incidence of bird strikes will be closely monitored during the first year of operation and if evidence suggests that a problem exists, bird flight diverters will be fitted to the earth wire of the circuit.

9.3.3 Dambos
Dambos are critical to ensuring the long-term waterfowl population and other fauna species. However, along the wayleave, there are no big waterfowls apart from common birds, which move to woodland habitats when dambos are burnt. Public campaigns will be conducted frequently to let the people along the wayleave know the role of the dambos and the importance of early burning (May – June)

Siting of the tower structures will avoid dambos wherever possible and access and traffic management will be organised during the construction phase in a manner that minimises the need to traverse dambos.

9.3.4 Electromagnetic impacts on humans, livestock and the rest of the environment
The levels of field strengths to be created or emitted by the proposed line will be way below those recommended by the (NRPB). Therefore the line will not pose any danger to human beings, or flora or fauna.

CEC agrees that even though the risks to health are quite remote, the company will continue to monitor progress in research in this field and will take whatever necessary measures to safeguard the environment as well as the human beings along the proposed route.

9.3.5 EMC and the Effects on Communication Systems
The route proposed is not expected to cause any interference with any radios or TV's due to quality of the design of the line.

CEC's automatic fault detection and clearing systems will limit any noise resulting from any line related faults to very short periods.

Should the new line be suspected of emitting any form of noise, CEC promises to investigate the sources of any such interference and take any measures required to eliminate any such noise.

The subsequent Table 15 summarises the expected negative impacts and the mitigation measures to address these negative impacts.

**9.3.6 Decommissioning**

Though the life of copper mining in Zambia is estimated at about 30 years, the use of electric power in Zambia and the SADC region will be in demand for some unforeseeable future. Copperbelt Energy Corporation Plc would establish funds to be reserved for utilisation in reforestation projects after decommissioning.
<table>
<thead>
<tr>
<th>IMPACT CATEGORY</th>
<th>ASSOCIATED EFFECT</th>
<th>MITIGATION ACTIONS BY CEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Construction Period - Social Economic Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Use</td>
<td>Would cause loss of arable agricultural land by the community farming along the corridor</td>
<td>Would make consultations with local authorities and affected people to identify alternative agricultural land</td>
</tr>
<tr>
<td>Community Impacts</td>
<td>Demolition of up to 5 structures and displacement of 2 households and 1 church.</td>
<td>Would carry out prior consultations with affected parties to agree on the best options such as relocation of structures and compensation levels</td>
</tr>
<tr>
<td></td>
<td>Farming activities would be disrupted leading to loss of food and income</td>
<td>Would liaise with local authorities and Agricultural Extension officers and shall give affected parties enough notice to harvest and to prepare alternative areas</td>
</tr>
<tr>
<td></td>
<td>Loss of some fruit trees by some farmers along the corridor</td>
<td>Would work closely with the Forestry Department to source fruit trees from nurseries and compensate affected farmers</td>
</tr>
<tr>
<td></td>
<td>Development of some resistance by some people to be relocated to some other areas</td>
<td>Would educate affected community on the benefits of the project and would also make consultations to arrive at levels of compensation that would not leave them in a worse off situation</td>
</tr>
<tr>
<td></td>
<td>Vegetation clearing period viewed as opportunity for outsiders to enter and settle in the area</td>
<td>Would work in collaboration with local authorities and security wings to ensure patrols are conducted to drive out illegal settlers</td>
</tr>
<tr>
<td>Health Impacts</td>
<td>Likely to increase prevalence of HIV/Aids and bring in the area alien diseases</td>
<td>Would in collaboration with health authorities and NGOs conduct health education campaign to both construction workers and local community</td>
</tr>
</tbody>
</table>
### 2.0 Construction Period - Impacts on Natural Resources

<table>
<thead>
<tr>
<th>Natural Resources</th>
<th>Impact Description</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Forests</td>
<td>Deforestation due to destruction of natural vegetation</td>
<td>Permits to be obtained for all tree clearance activities. Trees would not be uprooted but cut to ground size to lessen erosion. Would work in collaboration with local authorities and security wings to ensure patrols are conducted to drive out illegal activities. Would conduct environmental awareness campaign among construction workers and it should include dangers of starting bush fires in the area. Workers would be contractually obliged to respect these provisions. The cleared wayleave would also provide positive impact as it would provide fire break to prevent fires from crossing from one side of the plantation/forest to another.</td>
</tr>
<tr>
<td></td>
<td>Project would attract potential for illegal destruction of natural forests by charcoal and timber producers</td>
<td>If construction workers start any fires, there would be destruction of soil structures, elimination of important nutrients in the ecosystem, loss of genetically superior trees and reduction of wood fuel availability. Fires would also destroy valuable plantation and chase away fauna found in the plantation.</td>
</tr>
<tr>
<td></td>
<td>If construction workers start any fires, there would be destruction of soil structures, elimination of important nutrients in the ecosystem, loss of genetically superior trees and reduction of wood fuel availability. Fires would also destroy valuable plantation and chase away fauna found in the plantation.</td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>Soil erosion and damage to ground</td>
<td>Segregation and replacement of topsoil following construction of tower foundations. Refilling of tracks created by construction vehicles. Proper reinstatement of any temporary access arrangements. Existing borrow pits/sand quarries in Chingola &amp; Chililabombwe to be used.</td>
</tr>
<tr>
<td>Borrow Pit/ Sand quarry</td>
<td>Potential to have a negative impact on the more sensitive dambo areas along the project route.</td>
<td>Would work in collaboration with forestry department to promote establishment of tree nursery projects and tree planting projects in the community. Careful tower siting and an access management plan would reduce activity in these sensitive dambo areas.</td>
</tr>
<tr>
<td>Bio-diversity and habitat</td>
<td>Would adversely affect biodiversity and habitat loss</td>
<td>Would work in collaboration with forestry department to promote establishment of tree nursery projects and tree planting projects in the community. Careful tower siting and an access management plan would reduce activity in these sensitive dambo areas.</td>
</tr>
<tr>
<td><strong>Forest Plantations</strong></td>
<td>Would lead to early harvest of forest plantation belonging to ZAFFICO</td>
<td>Would consult with the Company and establish agreed level of compensation</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Archaeological and Cultural Sites</strong></td>
<td>Would also lead to loss of some non-timber forest products</td>
<td>Would report to Director of Copperbelt museum any heritage material or cultural sites discovered while clearing the corridor and constructing tower foundations</td>
</tr>
<tr>
<td><strong>Fauna</strong></td>
<td>Clearance of vegetation would lead to reduction of fauna population in the area and may eliminate certain species of national and international intrinsic</td>
<td>Would sensitise construction workers against indiscriminate killing of living creatures (birds and animals) found in the area.</td>
</tr>
<tr>
<td><strong>Access Concerns</strong></td>
<td>Improved access roads to construction sites would bring in more people to site, a situation that might contribute to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Spread of diseases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Attraction of illegal settlement and farming</td>
<td></td>
</tr>
<tr>
<td></td>
<td>As the access road along the corridor leads to DRC, there might be an increase in smuggling between the two countries and an increase in crime level.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction of access roads may lead to environmental damage through excavation of gravel pits.</td>
<td>Would work with health workers and NGOs to conduct health education campaign among the community and construction workers.</td>
</tr>
<tr>
<td></td>
<td>Would work with local authorities and security wings to patrol the area and drive out illegal settlement.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access road grades would not exceed 12% near water bodies. Gravel pits would be excavated 100m away from river banks or steep slopes</td>
<td></td>
</tr>
<tr>
<td><strong>Water Quality</strong></td>
<td>Potential impact due to incremental impervious surfaces and storm water runoff</td>
<td>Would develop a storm water pollution prevention plan to address all construction management practices that have potential to impact upon water quality.</td>
</tr>
<tr>
<td></td>
<td>Indiscriminate disposal of waste may pollute the water</td>
<td>Identify and enforce appropriate control measures to be taken by contractors to minimise such potential impacts.</td>
</tr>
<tr>
<td>3.0</td>
<td>Construction Period - Impact of Construction Camp</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Land Issues</strong></td>
<td>Setting-up of construction camp site would require land clearance that may lead to soil erosion.</td>
<td>Would work with officers from Forestry and Archaeological Departments to identify suitable camp sites. Camp sites would also be located on soil types that are resistant to severe soil compaction.</td>
</tr>
<tr>
<td><strong>Pollution Issues</strong></td>
<td>Soil pollution from oils and other pollutants that would be stored at camp site. General Waste disposal problems.</td>
<td>Would identify appropriate control measures to be taken by contractors to minimise such potential impacts. Camps would be kept tidy at all the time. Sanitary facilities and dumpsites would be provided. This would be enforced contractually. Furthermore, construction workers would be sensitised to avoid indiscriminate burning and littering.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>4.0</th>
<th>Construction Period - Impact of Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Workers Camp</strong></td>
<td>Proximity to communities may cause noise pollution.</td>
</tr>
<tr>
<td><strong>Construction Noise</strong></td>
<td>Noise pollution to local communities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.0</th>
<th>Operation Period - Noise and Interference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audible Noise</strong></td>
<td>Not expected to generate noise that might disturb the community.</td>
</tr>
<tr>
<td><strong>Electrical Noise</strong></td>
<td>No impact expected from the project.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.0</th>
<th>Operation Period – Effects on Human Beings, Animals and Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMF effects</strong></td>
<td>No impact expected from the project.</td>
</tr>
</tbody>
</table>
| Fauna Protection (Bird Strikes) | Not anticipated based on current experience. | Line would be energised as soon as possible following construction. 
Situation would be monitored during first year and bird diverters fitted if required. |
10.0 ENVIRONMENTAL MANAGEMENT PLAN

The construction of the second Zambia-DRC interconnector as described in the previous sections has both positive and negative impacts, although the negative impacts on the whole are generally low in severity. In order to ensure that the mitigation measures identified within the Environmental and Social Impact Assessment process are implemented smoothly and in a satisfactory manner, Copperbelt Energy Corporation has proposed an Environmental Management plan to be carried out during and after the construction phase. A significant impact that was identified related to the relocation of two churches that were directly affected by the project. The two churches have since been relocated. All activities that result in the relocation of structures or compensation for the loss of farming activities will be carried out in accordance with the CEC Resettlement Action Plan.

Another significant impact that has been identified relates to the clearance of forested areas. For the felled trees from both ZAFFICO Plantation and Natural Forest, CEC plans to work with the Forest Department, ZAFFICO and the local communities in implementing reforestation programmes as detailed in Appendix 15. Cost details arising out of the implementation of Appendix 15 are not included at the present time as this plan is yet to be fully developed.

10.1 MITIGATION, MONITORING AND AUDIT PLAN

The mitigation, monitoring and audit Plan sets out a framework to ensure that the major issues outlined are addressed to minimise potential adverse environmental impacts during construction and operation phases. More detailed site specific Work Plans and Budgets will be prepared using this Environmental Management Plan (EMP) framework.

RESPONSIBLE PERSONNEL

During the construction, operation and maintenance phases, CEC through the Environmental Officer will be responsible for implementing the Environmental Management Plan (EMP) and will report to the Project Manager. Monitoring will be done on day to day basis during construction while auditing will be done annually by an independent auditor.
ENVIRONMENTAL TRAINING

All construction workers will be provided with Environmental Induction training of CEC Environmental Policy and EMP prior to commencement of work on the project. The Environmental Officer will be responsible for the training.

10.2 Design Phase

➢ Resettlement and Compensation

  **Objective**
  - To inform local communities about commencement of the project
  - To relocate the two affected churches – already implemented

  **Issues**
  - Minimise number of structures to be relocated
  - Minimise disturbance to Agricultural activities

  **Mitigation Measures**
  - Identify other alternative land for relocation of churches - **done**

  **Performance Indicators**
  - No households to be relocated; only two churches and they have already been relocated

  **Responsibility**
  - CEC Project Manager

  **Monitoring**
  - CEC

  **Auditing**
  - Independent auditor

**Total Expenditure**
- A sum of ZMK281.0 million was spent on relocation of the two churches.

➢ Vegetation Clearing

  **Objective**
  To reduce disturbance of the natural environment to a level that does not compromise environmental values
Issues
- Disturbance of ground cover vegetation
- Destruction of fauna habitat
- Movement of vehicles

Mitigation measures
- All necessary permits to be obtained
- To avoid uprooting of trees
- To stump trees at about 100mm from ground level
- To clear trees 30m from centre-line of transmission line

Performance Indicators
- To cut trees only in affected areas.

Responsibility
- CEC Project Manager working with Forestry Department

Monitoring
- CEC
- Auditing
- CEC

Actual Expenditure
- ZAFFICO ZMK25.0m
- FORESTRY ZMK228.0m

Campsite Management
Objective
To take all reasonable and practicable measures that would ensure construction workers are confined to allocated site and that site is managed to reduce impact to its surroundings.

Issues
- Appropriate management of
  - Disposal of solid waste
  - Reclamation of used oils or other polluting substances
  - Pilfering produce in adjacent farms
  - Safeguarding welfare of workers and community

Mitigation Measures
- To be located in suitable places
- Institute solid waste management
Performance Indicator
- Well Managed Camp site

Responsibility
- CEC Project Manager

Monitoring
- CEC

Audit
- CEC

Budget
- Current estimate K3.0 m

Dambo Management

Objective
To maintain dambo status quo for the transmission line corridor by producing a management and access regime during the construction phase that reduces activities within these more sensitive areas.

Issues
- Water quality
- Ground stability
- Increased flooding
- Extinction of species

Mitigation Measures
- Avoid tower foundation location near dambos
- Restrict use of bridges across dambo areas to light trucks

Performance Indicators
- Conservation of dambo aquatic life
- Minimum impact on water quality

Responsibility
CEC Project Manager
Monitoring
- CEC

Auditing
- CEC

Budget
- K 7.5 million

EMF

Objective
To minimise the impacts of electromagnetic fields (EMF)

Issues
- Perceived and potential health hazards from EMF
- Location of towers, conductors in relation to residents

Mitigation Measures
- Minimise electrical magnetic and electrical emissions

Performance Indicator
- Electric and magnetic fields emissions will be below 12000V/m and 16000μT respectively for human beings

Responsibility
- CEC Project Manager

Monitoring
- CEC

Auditing
- CEC

Budget
- Contained with Project capital costs. Annually K1 million

10.3 Construction Phase

Resettlement and Compensation

Objective
- To relocate the two affected churches - done
- Minimise disturbance to agricultural activities
Issues
- Minimise number of structures to be relocated
- Minimise disturbance to Agricultural activities

Mitigation Measures
- Award of compensation to affected parties for disturbance to their housing and farming activities

Performance Indicators
- No complaints about compensation from affected parties

Responsibility
- CEC Project Manager

Monitoring
- CEC

Auditing
- CEC/Independent auditor

Actual Expenditure
A sum of ZMK281.0 million was spent on relocation of the two churches.

Vegetation Clearing

Objective
To reduce disturbance of the natural environment to a level that does not compromise environmental values

Issues
- Disturbance of ground cover vegetation
- Destruction of fauna habitat
- Movement of vehicles

Mitigation measures
- To avoid uprooting of trees
- To stump trees at about 100mm from ground level
- To clear trees 30m from centre-line of transmission line

Performance Indicators
- To cut trees only in affected areas.

Responsibility
- CEC Project Manager and Contractor
Monitoring
• CEC

Auditing
• CEC

Budget
ZAFFICO ZMK25.0m
FORESTRY ZMK228.0m

> Fauna Protection

Objective
To minimise known and potential fauna impacts and to determine requirement of bird diverters

Issues
• Destruction of fauna habitat
• Poaching
• Bird strikes

Mitigation Measures
• Educate local communities and construction workers on wildlife conservation

Performance Indicators
• No fauna killed during construction phase

Responsibility
• CEC Project Manager and Contractor

Monitoring
• CEC

Auditing
• CEC

Budget
• K16.0m

> Dambo Management

Objective
To maintain dambo status quo for the transmission line corridor by producing a management and access regime during the construction phase that reduces activities within these more sensitive areas.
Issues
- Water quality
- Ground stability
- Increased flooding
- Extinction of species

Mitigation Measures
- Avoid tower foundation location near dambos
- Restrict use of bridges across dambo areas to light trucks

Performance Indicators
- Conservation of dambo aquatic life
- Minimum impact on water quality

Responsibility
- CEC Project Manager and Contractor

Monitoring
- CEC

Auditing
- CEC

Budget
- K 10.5 million

Construction Resources Management

Objective
To undertake all reasonable and practicable measures to minimise land disturbances

Issues
- Access roads
- Tower sites
- Soil erosion and sediment control
- Creation of stagnant water areas

Mitigation Measures
- Use of existing borrow pits and sand quarries in Chingola and Chililabombwe

Performance Indicator
- No additional land disturbances
- No additional health problems to be created

Responsibility
- CEC Project Manager/Contractor
Noise Management

**Objective**
To undertake all reasonable and practicable measures to prevent or minimise noise nuisance.

**Issues**
Noise nuisance from
- Construction vehicles and equipment

**Mitigation measures**
- Wear earmuffs
- Good maintenance of equipment and vehicles

**Performance Indicator**
- Noise levels maintained at 85dB

**Responsibility**
- Contractor

**Monitoring**
- CEC

**Auditing**
- CEC/Independent auditor

**Budget**
- K4 million during construction phase

Water Quality

**Objective**
To undertake all reasonable and practicable measures to minimise contamination of land and water

**Issues**
- Access roads
- Tower sites
- Soil erosion and sediment control

**Mitigation Measures**
- Develop a storm water pollution prevention plan to address all construction management practice

**Performance Indicator**
- No degeneration of water quality. Sample surface water quality before and during construction phase
- No release of contaminants to land and water

**Responsibility**
- CEC Project Manager/Contractor

**Monitoring**
- CEC

**Auditing**
- CEC/Independent auditor

**Budget**
- K2.0m

➤ **Air Quality**

**Objective**
To take all reasonable and practicable measures to minimise unsatisfactory air quality during construction stage.

**Issues**
Management of air emission from:
- Dust from traffic movement on access roads, construction of tower footings, vegetation clearing
- Exhaust fumes from vehicles

**Mitigation Measures**
- Use of well maintained equipment and vehicles
- Provide speed limits to access roads to minimise the potential for dust generation

**Performance Indicator**
- Monitor air quality

**Responsibility**
- CEC Project Manager and Contractor
Campsite Management

Objective
To take all reasonable and practicable measures that would ensure construction workers are confined to allocated site and that site is managed to reduce impact to its surroundings.

Issues
Appropriate management of
- Disposal of solid waste
- Reclamation of used oils or other polluting substances
- Pilfering produce in adjacent farms
- Safeguarding welfare of workers and community

Mitigation Measures
- To be located in suitable places
- Institute solid waste management

Performance Indicator
- Well Managed Camp site

Responsibility
- CEC Project Manager and Contractor

Monitoring
- CEC

Audit
- CEC

Budget
- Current estimate K9 million
Health

Objective
To undertake all reasonable and practicable measures to prevent spread of HIV/AIDS, STD to community along the corridor

Issues
• Spread of HIV/AIDS and STD
• Interaction of community and construction workers

Mitigation Measures
• NGOs and health authorities to conduct health education to local Communities and construction workers
• Distribute free condoms to construction workers and local communities

Performance Indicator
• Monitor health trends in the local community

Responsibility
• CEC Project Manager and District Management Health Boards

Monitoring
• District Health Management Boards

Auditing
• District Health Management Boards

Budget
• K 10.8m

Transport

Objective
To ensure that transportation occurs without compromise to safety and environmental management.

Issues
• Traffic volume
• Heavy vehicles
Mitigation Measures

- Use of approved and road worth vehicles
- Install sufficient road signs

Performance Indicator

- Zero road accident

Responsibility

- CEC Project Manager/Contractor

Monitoring

- CEC Project Manager/Contractor

Auditing

- CEC Safety Officer

Budget

- K2.0m

➢ Cultural Site Protection

Objective

To protect the integrity of any cultural sites discovered.

Issues

- Undiscovered cultural sites

Mitigation Measures

- Obligation on contractors to cease activities and report discovery to Director of Copperbelt Museum.

Performance Indicator

- All discovered sites to be reported

Responsibility

- CEC Project Manager/Contractor

Monitoring

- CEC Project Manager/Contractor

Auditing

- CEC Environmental Officer

Budget

- K0.5m
10.4 Operational Phase

➢ EMF

Objective
To minimise the impacts of electromagnetic fields (EMF)

Issues
- Perceived and potential health hazards from EMF

Mitigation Measures
- Minimise electrical magnetic and electrical emissions

Performance Indicator
- Electric and magnetic fields emissions will be below 12000V/m and 16000μT respectively for human beings

Responsibility
- CEC

Monitoring
- CEC

Auditing
- CEC

Budget
- Annually K1 million

➢ Vegetation Clearing

Objective
To maintain low vegetation height under the transmission lines

Issues
- Disturbance of ground cover vegetation
- Destruction of fauna habitat

Mitigation measures
- To keep vegetation height low to avoid electrical flash

Performance Indicators
- Uninterrupted power supply.

Responsibility
- CEC
Monitoring
- CEC

Auditing
- CEC

Budget
- K25.0m

 ➤ Fauna Protection

Objective
To minimise known and potential fauna impacts and to determine requirement of bird diverters

Issues
- Bird strikes

Mitigation Measures
- To install bird diverters in the event of observed frequent bird strikes

Performance Indicators
- No bird strikes during operational phase

Responsibility
- CEC

Monitoring
- CEC

Auditing
- CEC

Budget
- K2.0m

 ➤ Noise Management

Objective
To undertake all reasonable and practicable measures to prevent or minimise noise nuisance.

Issues
Noise nuisance from
- Maintenance vehicles and equipment
- Electrical discharge
Mitigation measures

- Good maintenance of equipment and vehicles

Performance Indicator

- Noise levels maintained within relevant standards

Responsibility

- CEC

Monitoring

- CEC

Auditing

- CEC

Budget

- K0.2 million during operational phase

An indicative budget for the costs of implementing this management plan (to the extent that these costs have been fully identified) is shown overleaf as Table 16. These costs will be met in full by CEC.
Table 16: Indicative Budget for the Environmental Management Plan

<table>
<thead>
<tr>
<th>Item</th>
<th>Description of cost</th>
<th>Design phase, in million Kwacha</th>
<th>Construction phase, in million Kwacha</th>
<th>Operational phase, in million Kwacha</th>
<th>Total, in million Kwacha</th>
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Notes:
(1) Cost includes initial construction phase cost and 10 years annual cost.
(2) Estimated at the current time
11 Responsibilities

During the construction, operational and maintenance phases of the project, clearly delineated responsibilities will be allocated to those parties best able to implement them.

The anticipated allocation of these responsibilities is shown below in Table 17.

Table 17: Allocation of Project Responsibilities

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<th>Design phase</th>
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<td>CEC Project Manager/ Contractor</td>
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<td>Training</td>
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<td>CEC / Contractor</td>
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REFERENCES

1. CIFOR 1996 Current Issues in Non - Timber Forest Products Research. Indonesia


5. District Situation Reports for Chililabombwe : Unpublished


15. Redford K.K. 1995 Not seeing the Animals for the trees " the animals values of wild animals in forest ecosystem.


17. Sadiku Mathew N O., "Elements of Electromagnetics" Saunders College
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<td>&quot;EMC for Product Designers,&quot; Newness</td>
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Appendix 1

Maps for the 220kV dual power line from Luano Substation to Karavia Showing New Border Crossing Point, Proposed and Alternative Line Routes
Appendix 2

Selected Plates on the Wayleave
Plate 1: Luano substation where the new transmission line will terminate.

Plate 2: An Example of illegal farming under the Transmission line
Plate 3: ZAFFICO Plantation affected by new wayleave

Plate 4: Part of the natural forest reserve to be cleared during the construction of the proposed transmission lines
Plate 5: Typical Farm house (Mr Banda's Village)

Plate 6: Part of Mr B. Banda's Agricultural products affected by the Project before change of border crossing point
Plate 7 Mr Likola’s house. The owner has voluntarily relocated to another area

Plate 8: The Church structure in Luano-Chipupu area which has been relocated
Plate 9: New Apostolic Church has been relocated
Plate 10: New Apostolic Church constructed in Chililabombwe Area
Plate 11: African Covenant (Chipangano) Church Constructed in Chingola – Luano Area
Appendix 3

Terms of Reference
APPENDIX 3: TERMS OF REFERENCE FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

STUDY OBJECTIVES
The main objective of this study is to conduct an Environmental impact Statement (EIS), focusing on the probable impacts that might arise from the proposed project.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REQUIREMENTS
The study will mainly be governed by the Environmental and Social Impact Assessment Regulations (Statutory Instrument No. 28 of 1997). This regulation governs the conduct of ESIA in Zambia, including specific provisions made under the Second Schedule of the Regulation that demand full ESIA for the construction of electrical transmission lines of 20kV capacity for distances beyond 1.0km.

Specific activities to be undertaken during the development of the ESIA are as follows:

1. Publicise the project
2. Review Environmental and other Legislation relevant to the project
3. Visit the areas along the proposed transmission route to collect data on the biophysical and socio-economic status of the area as required by the Environmental Council of Zambia.
4. Consult the following stakeholders
   - The subsistence farmers and other residents directly affected by the project
   - The general public
   - Ministries of - Tourism Environment and Natural Resources
     - Energy and Water Resources
     - Local Government
     - Agriculture, Food and Fisheries
     - Community Development
     - Home Affairs
     - Labour
   - NGO's - Citizens for a Better Environment
     - Wildlife Conservation Society
     - Copperbelt Health Education Programme (CHEP)
     - Churches
     - Charcoal Burners Association
5. Acquire letters of consent from affected institutions including:
   - Department of Forestry
   - Local Authorities in Kalulushi, Chingola and Chililabombwe
   - Zambia Railways
   - ZESCO
   - Roads Department
   - ZAFFICO
   - Energy Regulation Board

6. Analyse data collected, identify project impacts and prepare a draft Environmental and Social Impact Assessment report and discuss it with stakeholders (hold a workshop).

7. Recommend mitigation measures to alleviate impact on the environment

8. Prepare a final report taking note of the workshop recommendations

Appendix 4

Minutes of the stakeholders meeting held in Chingola on 14\textsuperscript{th} October 2002

Minutes of the stakeholders meeting held in Chililabombwe and Kasumbalesa on 26\textsuperscript{th} December 2008 to disclose the new wayleave route and receive comments from affected parties
APPENDIX 4: COPPERBELT ENERGY CORPORATION PLC
DRC- ZAMBIA INTERCONNECTOR PROJECT
PRESENTATION TO ENVIRONMENTAL STAKEHOLDERS
HELD ON MONDAY 14 OCTOBER 2002 AT PROTEA HOTEL – CHINGOLA

PRESENT – SEE ATTACHED LIST

The presentations started at 10 30hrs and was chaired by Hanson Sindowe.

Kevin Chapman who dealt with the overview of the CEC and DRC-Zambia Project; Michael Lisita who presented on the proposed route and wayleave issues; and John Kanyembo who addressed ESIA study process and expectations made presentations.

A question and answer session was held after all the presentations and the following issues were raised.

1. Question by J Mulombwa – Provincial Forestry Officer
   During the presentation an issue was raised regarding ownership of some land on the DRC line is built. It was alluded to that the line has been existence since 1956. Mr Mulombwa raised the issue that the Luano forest reserve was gazetted in 1945 and as such existed before the line was built. He made reference to the Forest Act, Section 12 cap 1999 and Section 16 clauses A, B and F

2. Question by Sara Lunda – District Forest Officer – Chililabombwe
   At a meeting held sometime back, CEC was requested to provide documentation supporting the fact that they own the 120m of land on which the power line is built. CEC has not yet responded to this request.

CEC Response
   CEC is still consulting with ZCCM Holding in an attempt to get documents relating to the issue referred to above

3. Question raised by Felix Kunda
   Reference was made to point no 6 (National Forest Reserve Areas) in the presentation on Proposed routes and wayleave issues and the following points were raised:
   - There are no beacons to demarcate the gazetted and non-gazetted land in the wayleaves.
   - In Zambia past, experience shows that, relocation takes long before it is effected. Kunda urged CEC to take the issue of relocation seriously and provide a timeframe in which it will be done so that disturbances to affected people are minimised

CEC Response
CEC intends to work with stakeholders such as the council and Agricultural department to see how best the issue of relocation can be dealt with. Support will be needed from the Chingola and Chililabombwe Districts in dealing with this issue.

4 Question by M Nasilele - Immigration

Nasilele commented that in handling of projects of this nature people concerned should follow the law. He indicated that letters of introduction may be required from the two countries to facilitate speedy immigration processes.

5 Question by J Vinya

Ms Vinya noted that the composition of the ESIA team does not include representatives from the Forestry or Environmental departments.

CEC’s Response

CEC has gone as far as identifying an institution to undertake the ESIA. It is upto this institution to make consideration of who to include in their team.

ESIA Team Response

Mr Zimba, a team member is an expert in the issues relating to forestry and environment and will adequately cover this area.

Ms Vinya still insisted that organisations handling these issues should have been involved.

CEC Response

These are still early stages and this meeting will be used as a learning phase. Other stakeholders may be incorporated into the process as the project goes on.

6 Question by A Kantumoya

Reference was made to the first two question regarding ownership of land.

In the absence of documents of ownership of wayleaves, how sure is CEC that they own the wayleaves.

CEC Response

We are in the process of establishing this ownership with ZCCM. We have wayleave numbers which are being used to get this information.

T Kampata further added that CEC has documents which gives them the grant of wayleave rights relating to wayleave assess.

7 Question by Mr Mumba – Town Clerk

Raised an issue relating to the publicity of the ESIA.
People affected are in rural areas but experience shows that publicity media used does not reach these people; documents produced from such studies are kept in places where they are not easily accessed by the affected people; language used in the documents is very technical; and documents produced are often very bulky.

Is there a way of making these documents simpler?

CEC/ESIA Response

An attempt is being made to reach as many community leaders as possible in the affected areas to make them understand what the project is all about.

An attempt is also being made to translate the documents in Bemba. These translated documents will be taken to the local communities during site visits.

Observation by Ms Vinya

Provincial and District planning officers are very important in handling matters raised during this meeting, but are not present at the meeting.

CEC Response

We may have invited them and they have not just attended the meeting. It is hoped that those that have attended the meeting can pass on the information to other stakeholders.

Comments By Alick Nyirenda – CHEP

Projects of this nature bring about certain social interactions that result in the spread of sexually transmitted and other communicable diseases. The challenge is to prevent such things happening through awareness campaigns on prevention and control of such diseases.

Malaria is also another serious disease that may impact on the project.

Mr Nyirenda indicated that CHEP is available to facilitate the process of health education

CEC Response

CEC has a programme that is addressing HIV/AIDS and malaria. CEC is willing to extend this programme to areas where its employees will be working from during the project.

Question by Anne Mukondola

Have the environmental benefits of the project been considered?

CEC Response

We are still in the process of looking at this.

CEC indicated that it will accept guidance from stakeholders in this issue and will be consulting them continuously.
An observation was made that there is need to hold discussions with ZAFFICO.

11 Question By Chama Chintu – CEC

Do all the settlers have legal documents of ownership of land?

CEC Response

This will be explored.

12 Issue raised by Mr Nkandu

Drawings indicate that there are three farms that will be affected in Chililabombwe and are gazetted. Is CEC aware of this?

CEC Response

We are aware of these farms and we will be discussing with the farm owners.

13 Comment By Acting DA

There is need to include local personnel in districts on the ESIA team technical committees

CEC Response

As project progresses there will be contributions sought from various stakeholders

14 Question by Mr Lunda – Councillor

Should people on the farms that will be affected by the project continue with their farming activities during the 2002/2003 farming season?

If the council fails to find alternative land for affected people, will they be compensated?

CEC response

Farmers who grow ordinary crops will not be affected. But people will be informed well in advance regarding when they will be affected. CEC will initiate talks with farmers who grow crops that take long to grow

Where there is need for compensation, this will be looked into seriously. There may be need to understand what the future plans for the farmers are.

15 Question by Wesley Silungwe – Ministry of Education

Are there any education institutions that are affected by the project?

CEC Response
There are no education institutions affected.

But it's important for education to understand what is happening because they will play a key role in disseminating the information to other people.

Compiled by: F. Kasongo
Environmental Officer
CEC
Kitwe

LIST OF PARTICIPANTS – CHINGOLA MEETING, 14TH OCTOBER 2002

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<td>Immigration (Chingola)</td>
</tr>
<tr>
<td>37</td>
<td>Abel Chishimba</td>
<td>Chililabombwe Municipal Council</td>
</tr>
<tr>
<td>38</td>
<td>Musonda R Mumpa</td>
<td>Chililabombwe Municipal Council</td>
</tr>
<tr>
<td>39</td>
<td>John Mulombwa</td>
<td>Forestry Department – Ndola</td>
</tr>
<tr>
<td>40</td>
<td>Muloshi Dr</td>
<td>DHMT – Chililabombwe</td>
</tr>
<tr>
<td>41</td>
<td>Litwayi J</td>
<td>Zambia Police – Chingola</td>
</tr>
<tr>
<td>42</td>
<td>Libompani S K</td>
<td>Zambia Police – Chingola</td>
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<td>43</td>
<td>Nyimu A K</td>
<td>Zambia Police – Chingola</td>
</tr>
<tr>
<td>44</td>
<td>Kasongo F</td>
<td>CEC – (Kitwe)</td>
</tr>
</tbody>
</table>
Appendix 5

List of People Contacted
## Appendix 5: List of People Contacted

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/11/02</td>
<td>Sarah C Lundu</td>
<td>Forest Department, Chililambomwe</td>
</tr>
<tr>
<td>15/11/02</td>
<td>M Mungandi Mwenti</td>
<td>Ministry of Agriculture, Chililambombwe</td>
</tr>
<tr>
<td>15/11/02</td>
<td>George Nkandu</td>
<td>Ministry of Agriculture, Chililambombwe</td>
</tr>
<tr>
<td>15/11/02</td>
<td>Musonda Mumba</td>
<td>Chililambwe Municipal Council</td>
</tr>
<tr>
<td>15/11/02</td>
<td>E Banda</td>
<td>Chililambwe Municipal Council</td>
</tr>
<tr>
<td>18/11/02</td>
<td>Aaron Kantumoya</td>
<td>Forestry Department, Chingola</td>
</tr>
<tr>
<td>18/11/02</td>
<td>Phillip Simbule</td>
<td>Ministry of Agriculture, Chingola</td>
</tr>
<tr>
<td>18/11/02</td>
<td>Darius Hangolushe</td>
<td>Forest Department, Chingola</td>
</tr>
<tr>
<td>18/11/02</td>
<td>Davis Siwale</td>
<td>Ministry of Agriculture, Chingola</td>
</tr>
<tr>
<td>18/11/02</td>
<td>Francis Chanda</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Henry Matimuna</td>
<td>Ministry of Agriculture, Ndola</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Eric Chisanga</td>
<td>ZAFFICO - Ndola</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Stanford M Siachoona</td>
<td>Copperbelt Museum, Ndola</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Sindila George</td>
<td>Ministry of Lands, Ndola</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Wankie Musengu</td>
<td>Ministry of Lands, Ndola</td>
</tr>
<tr>
<td>28/11/02</td>
<td>Shadrek Mwangalaba</td>
<td>Ministry of Agriculture – Ndola</td>
</tr>
<tr>
<td>16/12/02</td>
<td>C Singo</td>
<td>ZAFFICO – Ndola</td>
</tr>
<tr>
<td>16/12/02</td>
<td>Patrick Makungu</td>
<td>Ministry of Agriculture, Ndola</td>
</tr>
<tr>
<td>16/12/02</td>
<td>Mr Christopher Mutembo</td>
<td>Cabinet Officer, Ndola</td>
</tr>
<tr>
<td>16/12/02</td>
<td>Mpokosu Esnert</td>
<td>Cabinet Officer, Ndola</td>
</tr>
<tr>
<td>16/12/02</td>
<td>Chupa Timothy</td>
<td>Forest Department, Ndola</td>
</tr>
<tr>
<td>30/12/02</td>
<td>Willie Phiri</td>
<td>Chililambwe Municipal Council</td>
</tr>
</tbody>
</table>
Appendix 6

Advertisements placed in the Newspapers in 2002 and in 2008 respectively
ANNOUNCEMENT OF THE COMMENCEMENT OF AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED UPGRADE OF THE 220kV INTERCONNECTOR BETWEEN ZAMBIA AND THE DEMOCRATIC REPUBLIC OF CONGO

In accordance with CEC's statutory responsibilities as prescribed in the Environmental and Social Impact Assessment Regulations (Statutory Instrument No 28 of 1997) of the Environmental Protection and Pollution Control Act (Act no 12 of 1990), and CEC's internal environmental policy, the following project outline has been produced. The project outline is being disseminated to inform and seek the views of those parties that may be affected by this project.

CEC, with the assistance of the Institute of Environmental Management, is about to embark upon an Environmental and Social Impact Assessment (ESIA) for a project to upgrade CEC's 220kV electricity transmission interconnector with the DRC. The purpose of the ESIA is to identify the impact that the project will have upon the environment and to identify measures than can be implemented to reduce any negative impacts that may arise. CEC is seeking to contact all stakeholders and persons that may be affected by this project to ensure that they can participate in the ESIA process.

Project Overview:

The upgrade of the 220kV regional interconnector between Zambia and the DRC ("the Project") is a joint initiative between Copperbelt Energy Corporation plc (CEC) and the state-owned utility company of the DRC, Societe Nationale D'Electricite (SNEL). The project will result in an increased capacity of the existing electricity interconnector and provide regional economic benefits by enabling surplus low-cost electricity from the DRC to access the electricity markets of the southern African region.
The upgrade project includes the construction of a new 220kV line between Luano situated on the outskirts of Chingola (Zambia) and Karavia situated on the outskirts of Lubumbashi (DRC). The existing 220kV line will also be refurbished as part of the project. It is hoped that construction activities will commence around mid 2003 and project commissioning will take place during 2004. The route length of the interconnector in Zambia will be about 47km and is indicated on the map below.

**Public Information:**

It is therefore for the information of the general public and the stakeholders along the existing wayleave that no settlement or construction activities should be undertaken along the prescribed area as detailed on the map overleaf. Whilst the farming of seasonal crops during the 2002/2003 farming season will not be affected by this project, no planting of seasonal crops during the 2003/2004 farming season should be undertaken within the prescribed area without first consulting CEC. Furthermore, anyone considering planting long-term crops such as oranges, bananas and coffee etc. adjacent to the prescribed area should first consult with CEC.

To obtain more details concerning this project please contact:-

Mr Hanson Sindowe
Business Development Director
**Copperbelt Energy Corporation plc**
23rd Avenue, Nkana East
PO Box 20819
Kitwe
Zambia
Tel: 02 244 555
Fax: 02 244 040
ANNOUNCEMENT OF THE CHANGE OF TRANSMISSION LINE BORDER CROSSING POINT & WAYLEAVE SECTION COVERING THE LAST 3KM BEFORE THE ZAMBIA-DRC KASUMBALESA BORDER ON THE ZAMBIAN SIDE FOR THE PROPOSED 220kV ZAMBIA-DRC INTERCONNECTOR PROJECT

ANNOUNCEMENT OF THE CHANGE OF WAYLEAVE ROUTE ENTRY POINT AT KASUMBALESA BORDER FOR THE PROPOSED UPGRADE OF THE 220kV INTERCONNECTOR PROJECT BETWEEN ZAMBIA AND THE DEMOCRATIC REPUBLIC OF CONGO

In compliance with the Environmental Impact Assessment Regulations (Statutory Instrument No 28 of 1997) of the Environmental Protection and Pollution Control Act (EPPCA No 12 of 1990) and the CEC internal environmental policy, the following outline has been produced to notify members of the public on the change of the new transmission line border-crossing-point and wayleave section covering the last 3km before the route entry point at Kasumbalesa border for the proposed Zambia-DRC Kasumbalesa border on the Zambian side for the proposed 220kV Zambia-DRC Intersecond Inter-connector Project. This outline of the new project route is being disseminated to inform and seek comments from those parties that may be affected by this change.

In the Project Description and the Environmental & Social Impact Assessment (ESIA) documents submitted to the Environmental Council of Zambia (ECZ) in 2003, Copperbelt Energy Corporation PLC (CEC) laid down its intentions to jointly, with a Democratic Republic of Congo national electricity utility, Société Nationale d'Electricité (SNEL), to develop a 220kV power line aimed at enhancing the capacity of the existing electricity interconnection between Zambia and the Democratic Republic of Congo (DRC) from 210MW to 500MW.

Project Overview:

The upgrading of the 220kV regional Interconnector between Zambia and the DRC ("the project") is a joint initiative between CEC and the state owned electricity utility company of the DRC (SNEL). The project will result in an increased capacity of the existing electricity Interconnector and provide regional economic benefits by enabling surpluses to access the electricity markets of the Southern African region.

The upgrade project will include the construction of a new 220kV line between Luano situated on the outskirts of Chingola (Zambia) and Karavia on the outskirts of Lubumbashi (DRC). It is hoped that the construction activities will commence during the early part of 2009 and project commissioning will take place during 2010.

To avoid large scale resettlements in Kasumbalesa on the DRC side, the transmission line border-crossing entry point at Kasumbalesa border, has had to be shifted about 1.5km east of the existing border-crossover entry point. The consequence of this change is that on the Zambian side, a part of the transmission line stretching not more than 3 km will have to be built in a new wayleave area as indicated on the map.

[insert map indicating new entry point]
CEC has surveyed the new wayleave route and not found any major issue along the new 3.0 km wayleave stretch. Interested parties are therefore requested to send written submissions to the undersigned not later than 23 November 2008.

The survey conducted by CEC along the new wayleave route indicates that there are no major environmental or social issues along this 3 km wayleave stretch. In this regard, interested parties, who may have any issues of concern in this area, are kindly requested to send written submissions to the undersigned not later than 2123 November 2008.

ForTo obtain more details concerning this project please contact:

Mr Roland Lwiindi
Commercial Director
Copperbelt Energy Corporation Plc
23rd Avenue, Nkana East
P.O Box 20819
Kitwe
Zambia

Telephone: 0212 244 017062
Fax No 0212 244206
E-mail lwwindir@cec.com.zm
Appendix 7

Sample of the fliers written in Bemba and English
ICHISHIBISHO CHAKUTANTIKA INTAMBO SHAMALAITI MUMULONGO WACHIBILI UKUSUNTINKANYA ICHALO CHESU ICHA ZAMBIA NE CHALO CHA DEMOCRATIC REPUBLIC OF CONGO

A kampani ketwa Copperbelt Energy Corporation Plc akakwatila ama ofeshi yakalamba mu Kitwe, kaleishibishako abekala chalo bonse abo uyu mulimo ukumine ukuti;

Mu mwaka uyu uleisa uwa 2003, ako kampani Kali no kwamba umulimo wa kutantika intambo shamalaiti yalya ayamulilo uu kali mumulongo wachibili uukafuma ku Luano mwi Boma ly a Chingola. Ishi ntambo shikapita no mwi Boma Ly a Chililabombwe nokufika naku Kasumbalesa kumupaka wa chalo cha Zambia necha Democratic Republic of Congo.

Ishi ntambo shamalaiti shikalundapo pa maka yamalaiti twkwata muno Zambia. Ichi chikalenga nokutwala pantanshi ubunonshi bwa chalo chesu icha Zambia ne fyalo nafirnbi ifyo twapakana nafyo muno Africa.


Ukukonka nefikomo ifichingililia ifilengwa na Lesa, ifyalembwa nobuteko bwa calo ca Zambia, ako kampani ka CEC nakapela akabungwe kapesukulu likalamba ilya "Copperbelt University", aketwa "Institute of Environmental Management" umulimo wakufwailisha nokulanshanya nabantu bamu ma Boma ya Chingola na Chililabombwe, pafyo uyu mulimo wakupisha intambo sha malaiti ukumine abantu bonse makamaka abekashi abo abasangwa munchende shapelwa no buteko ku kampani, umo intambo shamalaiti shikapita.

Ukukonka nefyo ukutampa kwa uyu mulimo kutantikwe, akampani ka CEC kaleishibishako abantu bonse abasangwa mu nhende umukapita intambo shamalaiti ukuti takuli ukulima ifisabo ifili ngefi mupepi na muncende mukapita intambo shamalaiti; Amachungwa, Inkonde, Tute nangu ifisabo fyonse ifishisombolwa bwangu.
Kabili akampani nakalesha ukukula amakule ayali yonse muncende shapelew na Buteko kukanpani umwakupisha intambo shamalaiti.

Nganamukwata amepusho pali ifi fyonse ifilembelwe pali ili pepala, namukwata insambu shakuleta nangu ukutuma amepusho yonse pa mbokoshi ili pesamba.

Mr. Hanson Sindowe  
Business Development Director  
*Copperbelt Energy Corporation Plc*  
23rd, Avenue, Nkana East  
P.O Box 20819  
Kitwe  
ZAMBIA  
Tel: 02 244 555  
Fax: 02 244 040
ANNOUNCEMENT OF THE COMMENCEMENT OF AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED UPGRADE OF THE 220kV INTERCONNECTOR BETWEEN ZAMBIA AND THE DEMOCRATIC REPUBLIC OF CONGO

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To obtain more details concerning this project please contact:-

Mr Hanson Sindowe  
Business Development Director  
**Copperbelt Energy Corporation plc**  
23rd Avenue, Nkana East  
PO Box 20819  
Kitwe 
Tel: 02 244 555  
Zambia Fax: 02 244 040
Appendix 8

Sample of the Questionnaire
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Name of Tenant</strong></td>
<td></td>
</tr>
<tr>
<td><strong>2. Occupation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>3. Number of Children/Dependants</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4. Number of occupants at Household</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5. Name of settlement</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6. Name of Councilor</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7. Is there a school in the area?</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>8. If so how many of the children/dependants attend school?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>9. Is there a Health Centre in the area?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>10. If the answer is no, to 9 above, where do residents get their treatment?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>11. Is the land on which you are settled yours?</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>12. If so, who gave it to you?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>13. How long have you stayed on the plot?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>14. Are there any documents or letters of offer including title deeds to prove the ownership of the Plot?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>15. Indicate the size in hectares:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>16. If you do not have the documents or letters, what are you doing to legalise possession of the plot?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>17. Are there any buildings/structures on the plot?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>18. If so how many?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>19. What is the estimated value?</strong></td>
<td></td>
</tr>
</tbody>
</table>

**AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE ZAMBIA - CONGO DR 220kV INTERCONNECTION INE**

**QUESTIONNAIRE**

**Town:** ___________________________ **Serial No.:** ________________

1. Name of Tenant ___________________________ **sex** □ M □ F
2. Occupation: ___________________________
3. Number of Children/Dependants: ___________
4. Number of occupants at Household: ___________
5. Name of settlement: ___________________________
6. Name of Councilor: ___________________________
7. Is there a school in the area? Yes □ No □
8. If so how many of the children/dependants attend school? ___________
9. Is there a Health Centre in the area? ___________________________
10. If the answer is no, to 9 above, where do residents get their treatment? ___________________________
11. Is the land on which you are settled yours? Yes □ No □
12. If so, who gave it to you? ___________________________
13. How long have you stayed on the plot? ___________________________
14. Are there any documents or letters of offer including title deeds to prove the ownership of the plot? ___________________________
15. Indicate the size in hectares: ___________________________
16. If you do not have the documents or letters, what are you doing to legalise possession of the plot? ___________________________
17. Are there any buildings/structures on the plot? ___________________________
18. If so how many? ___________________________
19. What is the estimated value? ___________________________
Zambia - DRC 220kV Interconnector - Environmental and Social Impact Assessment Report [Zambian section]

20. Are there any fruit trees on the plot?-----------------------------------------------
21. If so how many?---------------------------------------------------------------------
22. Do you grow any crops on your plot? Yes ☐ No ☐
23. If so what type of crops do you grow?-----------------------------------------------
24. Indicate the quantities per year-----------------------------------------------------
25. Indicate how much of your produce is sold and how much is consumed?-------------------

END
Appendix 9

Minutes of the Consultative Meeting - Chingola, 28\textsuperscript{th} January 2003
COPPERBELT ENERGY CORPORATION PLC

DRC- ZAMBIA INTERCONNECTOR PROJECT

ENVIRONMENTAL STAKEHOLDERS CONSULTATIVE MEETING

HELD ON TUESDAY 28 JANUARY 2003 AT PROTEA HOTEL – CHINGOLA

ATTENDANCE – See attached list of the people who attended the meeting

AGENDA – The agenda attached, was presented and the meeting proceeded accordingly

The meeting started at 10:40hrs and was chaired by Kevin Chapman.

Kevin Chapman welcomed all participants to the meeting and explained the objectives of the meeting as:

1. To present to interested parties an overview of the Project to ensure that the public understood the Project clearly
2. To present to interested and affected parties the findings arising from the ESIA studies conducted by the environmental consultants hired by CEC
3. To present proposed mitigation measures that address adverse environmental impacts likely to arise from the Project
4. To gather any other additional concerns, comments and questions from interested and affected parties before the consultants produce the final draft of the ESIA study
5. To produce a record of the meeting.

PRESENTATION

- Mr. Kevin Chapman presented the Project overview
- Mr. Kanyembo J J presented the Environmental and Social Impact Assessment Regulation and process
- Mr. Banjili J M presented report of the Engineering issues identified
- Mr. Chilipamushi D presented the report of the Social-economic issues identified
- Mr. Zimba S C presented the report of the Forestry issues identified
- Mr. H Sindowe Chaired the question and answer session

A QUESTION AND ANSWER SESSION CHAIRED BY MR. H SINDOWE WAS HELD AFTER ALL THE PRESENTATIONS AND THE FOLLOWING ISSUES WERE RAISED.

1.0 Enerst Kuuka – Association Secretary of the Charcoal producers and Traders Association

Q: Has CEC considered involving Charcoal producers and Traders in clearing of the bush during construction phase of the Project?
CEC's Response

CEC will try as much as possible to ensure community participation in the Project though in some case CEC shall use heavy equipment to clear the bush to expedite the work.

2  Mark Mutengo – Deputy Mayor - Chingola

Q: Will the Project pass through any land under Chingola District Council?

Q: How will Chingola District Council benefit from the Project and how much will it benefit Zambia and who is funding the Project?

CEC's Response

Consultations are going on with Local Authorities, including Chingola District Council to establish the land affected by the Project. The Project will bring economic benefits to both Zambia and the region. Community benefits will include road improvement, job creation, provide wood during bush clearing.

3.0  John Mulombwa – Provincial Forestry Officer

Mr. Mulombwa expressed concern regarding the number of trees to be affected in the National Forest in both Chingola and Chililabombwe areas, and advised that provisions of the Forestry Act sections 3, 8, 12 and 16 clause b should be taken on board during tree clearing. He also advised that Charcoal producers and Traders Association should also observe section 3 of the Forest Act.

CEC Response

CEC will make further consultations and will ensure that it complies with all regulations prior to the implementation of the Project. The process of interaction with all Local Authorities and regulators will be encouraged.

4.0  Phillip Simbule – District Agricultural Coordinator, Chingola

Q. Mr. Simbule acknowledged that the presentation was well researched and that it reflected coverage of most of the important areas. He commended the experts for the job well done. He further urged CEC to ensure that the one to one consultations to be tabled with affected parties should ensure that all parties are pleased with the outcome.
5.0 Brian Mwanza – Environmental Officer, ECZ

Q. Mr. Mwanza wanted to know if similar consultation were being conducted to grassroots people affected in a manner and language conducive to them so that they could also comment and contribute.

CEC’s Response

Environmental Consultants conducted a one to one consultation with affected parties to explain all issues related to the Project. Local communities will further be sensitized and involved as much as possible. The Local leadership such as Councilors and Chairmen has been identified and consultations with them will be ongoing throughout Project implementation.

6.0 Jairous Sichone – Farmer, Chingola

Q: Will affected farmers be compensated?

CEC Response

A one to one consultation will be conducted with affected farmers to determine the level of compensation involved.

7.0 Felix Chileshe – Acting Principal Forestry Research Officer, Kitwe

Q: will the physical and chemical analysis of soil in affected land be conducted?

Q: If CEC intends to support Projects such as development of tree nurseries, what will be the modalities of accessing funds from CEC for such Projects?

CEC Response

Soil analysis will be conducted for areas where it will be recommended that analysis is inevitable.

CEC will definitely support community Projects such as development of tree nurseries. Modalities will be worked out.

8.0 Richard Banda - Training Officer, Zambia Forestry College Kitwe

Mr. Banda advised that during Project implementation, CEC should follow all Articles pertaining to the disposal of wool to avoid conflicts among stakeholders

CEC Response

CEC will make further consultations and will ensure that it complies with all regulations prior to the implementation of the Project.
9.0 Christopher Mtonga – Farmer, Chingola

Q: What measures will CEC put in place to ensure that security to food stuff in the farming areas affected by the Project is provided. He sited an example, where in May 2002 workers that camped in the area for wayleave clearing began to steal maize and cassava.

CEC Response

The issue of security is very much recognized throughout Project life. CEC will ensure that all workers to be involved in the Project are fed and provided with the expected Code of conduct.

At the end of the question and answer session, Mr. Sindowe thanked all participants for the overwhelming response. He concluded that it was CEC’s basic principle that no single member of the community will be worse off as a result of this Project.

There being no any other business, the meeting was closed at 13:20 hours.

LIST OF PARTICIPANTS – CHINGOLA MEETING, 28TH JANUARY 2003

<table>
<thead>
<tr>
<th>S/No.</th>
<th>NAME</th>
<th>DESIGNATION/ORGANISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Julius J. Kanyembo</td>
<td>Director - Institute of Environmental Management, Copperbelt University</td>
</tr>
<tr>
<td>2.</td>
<td>Davidson Chilipamushi</td>
<td>IEM</td>
</tr>
<tr>
<td>3.</td>
<td>Samson C. Zimba</td>
<td>IEM</td>
</tr>
<tr>
<td>4.</td>
<td>Jones M. Bangili</td>
<td>IEM</td>
</tr>
<tr>
<td>5.</td>
<td>Munkondya Moses</td>
<td>KCM</td>
</tr>
<tr>
<td>6.</td>
<td>Mualali Nasilele</td>
<td>Immigration</td>
</tr>
<tr>
<td>7.</td>
<td>Green M. Nguni</td>
<td>Zambia Police</td>
</tr>
<tr>
<td>8.</td>
<td>Kaoma Chishimbe</td>
<td>Security Head - CEC</td>
</tr>
<tr>
<td>9.</td>
<td>Labbie Lubonde</td>
<td>KCM</td>
</tr>
<tr>
<td>10.</td>
<td>Jairus H. Sichone</td>
<td>Luano Farms</td>
</tr>
<tr>
<td>11.</td>
<td>Nelly Nguni</td>
<td>Luano Farms</td>
</tr>
<tr>
<td>12.</td>
<td>Christopher Mtonga</td>
<td>Luano Farms</td>
</tr>
<tr>
<td>13.</td>
<td>Mark Mutengo</td>
<td>Deputy Mayor - Chingola</td>
</tr>
<tr>
<td>S/No.</td>
<td>NAME</td>
<td>DESIGNATION/ORGANISATION</td>
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<tr>
<td>15.</td>
<td>Richard Banda</td>
<td>Training Officer - Zambia Forestry College</td>
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<td>16.</td>
<td>John Mulombwa</td>
<td>Provincial Forestry Officer</td>
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<td>17.</td>
<td>Felix Chileshe</td>
<td>A/Principal Forest Research Officer</td>
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<tr>
<td>18.</td>
<td>Roland Lwiindi</td>
<td>CEC - Business Development Manager</td>
</tr>
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<td>19.</td>
<td>Nsontakiwa Billy</td>
<td>ZESCO - Regional Manager</td>
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<tr>
<td>20.</td>
<td>Phillip Simbule</td>
<td>Direct Agriculture Coordinator Ministry of Agriculture and Cooperatives</td>
</tr>
<tr>
<td>21.</td>
<td>Allan Nambala</td>
<td>District Admin. Officer</td>
</tr>
<tr>
<td>22.</td>
<td>Martha Mukondula</td>
<td>District Information Officer Zambia Information Services</td>
</tr>
<tr>
<td>23.</td>
<td>Tennyson Nyirongo</td>
<td>Senior Labour Officer Labour Department</td>
</tr>
<tr>
<td>24.</td>
<td>Mwewa Bright Chikwanda</td>
<td>Citizens for a Better Environment</td>
</tr>
<tr>
<td>25.</td>
<td>Davies L. Siwale</td>
<td>Technical Officer - Ministry of Agriculture and Cooperatives</td>
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<tr>
<td>26.</td>
<td>John Champeoyba</td>
<td>Deputy Director, Engineering, Chingola Council</td>
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<td>27.</td>
<td>Theresa Liswaniso-Kampata</td>
<td>Assistant Legal Counsel - CEC</td>
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<td>28.</td>
<td>Annie W. Mukondola</td>
<td>Copperbelt Association for Clean Environment</td>
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<td>29.</td>
<td>Bwalya Mpange</td>
<td>Citizens for a Better Environment</td>
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<td>30.</td>
<td>Hanson Sindowe</td>
<td>CEC</td>
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<td>31.</td>
<td>Brian J. Mwanza</td>
<td>Environmental Council of Zambia</td>
</tr>
<tr>
<td>32.</td>
<td>Chilufya Justine</td>
<td>FODEP</td>
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<tr>
<td>33.</td>
<td>Obby M. Kafunda</td>
<td>Environmental Council of Zambia</td>
</tr>
<tr>
<td>34.</td>
<td>Aaron Kantumoya</td>
<td>DFO - Forestry</td>
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<tr>
<td>35.</td>
<td>Oliver Chilemo</td>
<td>Plantation Superintendent - ZAFFICO Ltd</td>
</tr>
<tr>
<td>36.</td>
<td>Cosmas Nshinge</td>
<td>Plantation Manager - ZAFFICO Ltd</td>
</tr>
<tr>
<td>37.</td>
<td>Ernest M. Kunka</td>
<td>Charcoal Producer and Trader - Chingola Forestry</td>
</tr>
</tbody>
</table>
Agenda

1. Registration
2. Chairman's Opening Remarks
3. Project Overview
4. Environmental and Social Impact Assessment Regulation and Process
5. Report of the Engineering Expert
8. Question and Answer Session
9. Chairman's Closing Remarks
Appendix 10

Minutes of the Consultative Meeting - Chililabombwe, 29th January 2003
APPENDIX 10:
COPPERBELT ENERGY CORPORATION PLC

DRC-ZAMBIA INTERCONNECTOR PROJECT

ENVIRONMENTAL STAKEHOLDERS CONSULTATIVE MEETING

HELD ON WEDNESDAY 29 JANUARY 2003 IN THE CHILLABOMBWE DISTRICT COUNCIL CHAMBER FROM 10:30 TO 13:00 HOURS

ATTENDANCE – See attached list of the people who attended the meeting

AGENDA – The agenda attached, was presented and the meeting proceeded accordingly

The meeting started at 10:30hrs and was chaired by H Sindowe.

Kevin Chapman welcomed all participants to the meeting and explained the objectives of the meeting as:

1. To present to interested parties an overview of the Project to ensure that the public understood the Project clearly
2. To present to interested and affected parties the findings arising from the ESIA studies conducted by the environmental consultants hired by CEC
3. To present proposed mitigation measures that address adverse environmental impacts likely to arise from the Project
4. To gather any other additional concerns, comments and questions from interested and affected parties before the consultants produce the final draft of the ESIA study
5. To produce a record of the meeting.

PRESENTATION

- Mr. Kevin Chapman presented the Project overview
- Mr. Kanyembo J J presented the Environmental and Social Impact Assessment Regulation and process
- Mr. Banjili J M presented report of the Engineering issues identified
- Mr. Chilipamushi D presented the report of the Social-economic issues identified
- Mr. Zimba S C presented the report of the Forestry issues identified
- Mr. H Sindowe Chaired the question and answer session

A question and answer session chaired by Mr. H Sindowe was held after all the presentations and the following issues were raised.

1. Martin Matindo – Environmental Officer, KCM Konkola

Q: Is this the Project that ZESCO was supposed to undertake sometime ago? I recall attending a meeting like this but organised by ZESCO
CEC’s Response
The Project is similar but for some reason the ZESCO project fell through

2 William Kafita – District Agricultural Coordinators Office

Q: Can farmers use combine harvesters to harvest crops under the power lines?

CEC’s Response

It is dangerous to conduct farming under the power lines using any machinery and no person has been allowed to do so.

3 Chileshe Menshi – Farmer in Kamenza area

Q: What is the total farming area affected by the Project?

Q: If compensation will be involved, why cant you apply a uniform compensation instead of calling affected farmers one by one?

CEC Response

The amount of encroachment into the CEC wayleave by each farm affected is different. The type of farming activities to be affected is also different. It has also been observed that some farmers have never conducted any farming activities in the wayleave corridor and that some farmers are there illegally. Therefore there is need for a one to one consultation to be conducted to establish the level of compensation for each farmer affected.

4 William Lloyd Junior – Ward Development Chairman

Mr. Lloyd proposed that a community liaison committee be formed that could be working with CEC to ensure that representation is fair.

5 Denson Chisunka – District Administrator, Chililabombwe

Mr. Chisunka made an observation that when relocation is involved, it creates a big problem to the affected families, and it is usually met with resistance making practical implementation difficult. He proposed that a lot of people be involved such as Councilors, District Agricultural committee, Church leaders, Members of Parliament e.t.c. He also observed that there is need to consider the timing for the Project implementation (i.e. consider not to implement at the wrong time). He suggested that critical issues should be analysed in liaison with his office.

CEC’s Response
CEC will try as much as possible to involve and consult people in leadership at all levels to resolve critical issues

6 Miriam Chiyabi – Immigration Officer

Q: What measures of security has CEC put in place to ensure that people from neighboring country do not sneak into the country illegally?

CEC Response

CEC will work with Security wings such as police, Immigration Department and will also work with the District Administrators office to curb this.

7 James Litwayi – Police Officer, Chililabombwe

Q: What security measures will you put in place to protect the persons that will be involved in the Project?

CEC Response

There will be need to consult Police Officers and seek guidance from them on how this will work.

8 A K Chishimba – Mayor Chililabombwe

Mr. Chishimba expressed concern regarding affected farmers who do not have title deeds. He said that some of them may have lived on the farms with the full knowledge of the Council and yet they have not yet obtained the title deeds and it will not be fair if they are not considered in the consultation for compensation.

CEC Response

Even people without title deeds will be compensated although we are aware that they have no title deeds for the land occupied.

9 Augustine Phiri – Chief Sub-editor, ZANA Chililabombwe

Q: How may people will be recruited during the Project? People in Chililabombwe will not take it kindly if you overlook them during the recruitment exercise.

CEC Response

CEC will ensure that local people in Chililabombwe are involved as much as possible.

10 M C Kakoma – Councilor

Q: When will this Project start so that we can advise people and make them to be prepared for this Project.
CEC Response

Construction work is likely to begin in the middle of 2003. The District Administrator's Office and the proposed liaison committee will also be advised.

11 William Lloyd Junior – Ward Development Chairman

Could retired Electrical Engineers living in Chililabombwe community be considered for employment when construction begins?

CEC Response

They will be considered as long as they possess skills required.

12 Moses Kaumba – Forest Extension Assistant

Q: Trees to be felled will attract Charcoal Producers and Traders close to the National forest area and when the trees are finished they are likely to cut more illegally. What measures will you put in place to prevent this from happening?

CEC Response

CEC will work closely with Local Authorities and security to ensure that this does not happen.

At the end of the question and answer session, Mr. Sindowe thanked all participants for the overwhelming response. He concluded that it was CEC's basic principle that no single member of the community will be worse off as a result of this Project.

There being no any other business, the meeting was closed at 13:00 hours.
### LIST OF PARTICIPANTS – CHILILABOMBWE MEETING, 29TH JANUARY 2003

<table>
<thead>
<tr>
<th>S/No.</th>
<th>NAME/POSITION</th>
<th>DESIGNATION/ORGANISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Michael Lisita</td>
<td>Chief D’ Man</td>
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<td>2.</td>
<td>Malama K.</td>
<td>Buildings Officer</td>
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<td>3.</td>
<td>Martin Matindo</td>
<td>KCM - Konkola Mine</td>
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<td>4.</td>
<td>Theresa M. Liswaiso-Kampata</td>
<td>Assistant Legal Counsel - CEC</td>
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<td>5.</td>
<td>Samson C. Zimba</td>
<td>IEM</td>
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<td>6.</td>
<td>Jones M. Bangili</td>
<td>IEM</td>
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<td>7.</td>
<td>Julius J. Kanyembo</td>
<td>Director - IEM - CBU</td>
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<td>8.</td>
<td>Hanson Sindowe</td>
<td>Director HS/Dev.</td>
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<td>10.</td>
<td>Moses Kaumba</td>
<td>Forest Extension Assistant</td>
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<td>12.</td>
<td>William Kafita</td>
<td>DACO/Agriculture</td>
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<td>13.</td>
<td>Mirriam Chiyabi</td>
<td>Immigration</td>
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<td>14.</td>
<td>James Litwayi</td>
<td>Police</td>
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<td>15.</td>
<td>Augustine Phiri</td>
<td>Chief Sub-Editor, ZANA</td>
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<td>16.</td>
<td>Chileshe Menshi</td>
<td>Farmer</td>
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<td>17.</td>
<td>Katontoka Paul</td>
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<td>18.</td>
<td>Pearson H. Mussa</td>
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<td>19.</td>
<td>Cosmas K. Mwansa</td>
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<tr>
<td>20.</td>
<td>Bernadette Chilufya</td>
<td>Farmer</td>
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<td>21.</td>
<td>Mushibwe J.</td>
<td>Farmer</td>
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<td>22.</td>
<td>English Mpande</td>
<td>Farmer</td>
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<td>23.</td>
<td>Elizabeth Chatioka</td>
<td>Farmer</td>
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<td>24.</td>
<td>John U. Mumbelunga</td>
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<td>25.</td>
<td>Roland Lwiindi</td>
<td>Business Dev. Manager - CEC</td>
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<td>George Nkandu</td>
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<tr>
<td>30.</td>
<td>Francis Kasongo</td>
<td>Environmental Officer - CEC</td>
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<tr>
<td>31.</td>
<td>Michael K. Zulu</td>
<td>Manager - Planning DHMT</td>
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<td>32.</td>
<td>Stephen Shiku</td>
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<td>33.</td>
<td>Laban Kapelembe</td>
<td>Farmer</td>
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<td>34.</td>
<td>Job Zuze</td>
<td>Farmer</td>
</tr>
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<td>35.</td>
<td>Martin Shilinta</td>
<td>Farmer</td>
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<td>36.</td>
<td>Up Simwinga</td>
<td>Farmer</td>
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<td>37.</td>
<td>N.S. Bunda</td>
<td>Councillor - Kakoso</td>
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<tr>
<td>38.</td>
<td>M.C. Kakoma</td>
<td>Anoya Zulu Councillor</td>
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<tr>
<td>39.</td>
<td>A.K. Chishimba</td>
<td>Mayor - Chililabombwe Municipal Council</td>
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<td>40.</td>
<td>Misheck Chihemo</td>
<td>Anoya Zulu</td>
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<tr>
<td>41.</td>
<td>David Benoit</td>
<td>Anoya Zulu</td>
</tr>
<tr>
<td>42.</td>
<td>Samuel Mukonde</td>
<td>Anoya Zulu</td>
</tr>
</tbody>
</table>
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Appendix 11

Some Tree Species and Their Uses Found along the Corridor
## Appendix 11: Some Tree Species and their uses found along the route corridor

<table>
<thead>
<tr>
<th>Tree Name</th>
<th>Latin Name</th>
<th>Local Name (Bemba)</th>
<th>Some possible Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brachystegia longifolia</td>
<td>Muombo/Musambwa</td>
<td>Used for mining timbers, tool handles for temporal construction work</td>
<td></td>
</tr>
<tr>
<td>Brachystegia mycrophylla</td>
<td>Mmweleka/Kalimba</td>
<td>Mining timber, flooring and railway sleepers.</td>
<td></td>
</tr>
<tr>
<td>Brachystegia floribunda</td>
<td>Musompa/Chifwanga</td>
<td>Mining timbers, tool handles, Charcoal. Cattle can browse the leaves.</td>
<td></td>
</tr>
<tr>
<td>Brachytegia boehmii</td>
<td>Ngansa, Musompa</td>
<td>For baskets and fish traps, treatment of diarrhoea, cures dizzy spells</td>
<td></td>
</tr>
<tr>
<td>Julbernardia paniculata</td>
<td>Mutondo</td>
<td>Mining timbers, tool handles, hut poles, firewood and charcoal. Cattle browse leaves. It is a suitable species for edible caterpillars (Finkubala). Valuable tree for bee keeping, etc</td>
<td></td>
</tr>
<tr>
<td>Isoberlinia angolensis</td>
<td>Mutobo</td>
<td>Suitable for building and furniture, hosts to several types of edible caterpillars. Medicinal. such as mouth wash to relieve toothache or clean ulcers.</td>
<td></td>
</tr>
<tr>
<td>Parinari curatefolia</td>
<td>Mpundu</td>
<td>Edibility of the fresh and kernel of fruits. Canoes and mortars, house building, charcoal, dye,</td>
<td></td>
</tr>
<tr>
<td>Uapaca kirkian</td>
<td>Musuku</td>
<td>Fruit tasty and can be made into jam. Bee tree</td>
<td></td>
</tr>
<tr>
<td>Uapaca pilosa</td>
<td>Mukonkola</td>
<td>Makes good building poles as it is resistant to fungi; termites and borers. Medicinal</td>
<td></td>
</tr>
<tr>
<td>Combretum molle</td>
<td>Mulama/Kaunda</td>
<td>Browsed by cattle and elephants. Yellow and red dyes, exuded gum / leaves for</td>
<td></td>
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<tr>
<td>Plant Name</td>
<td>Common Name</td>
<td>Uses and Magical Uses</td>
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<td></td>
</tr>
<tr>
<td>Diospyros batocana</td>
<td>Muntufita</td>
<td>Timber for combs, spoons, cooking sticks, tool handles. Amulets against snake bite.</td>
<td></td>
</tr>
<tr>
<td>Strychnos coeculoides</td>
<td>Kasongole</td>
<td>Tasty fruits, spoons, tool handles, various magical uses ranging from wear as a hunting charm to the extraction of &quot;bullets&quot; fired from a magic gun. Treatment of disorders of the male organs.</td>
<td></td>
</tr>
<tr>
<td>Strychnos innocua</td>
<td>Mulungi</td>
<td>Leaves eaten by livestock, tasty fruit and can be used to make marmalade. Can treat dysentery or make drops</td>
<td></td>
</tr>
<tr>
<td>Lanea discolor</td>
<td>Nakabumbu</td>
<td>Fruits relished by monkeys and birds. Roots, bark and leaves for various medicinal uses from curing of boils and fits to stomach upsets. Roots are sappy and full of water and can be used to quench the thirst.</td>
<td></td>
</tr>
<tr>
<td>Erythrophleum africanum</td>
<td>Kayimbi</td>
<td>Excellent charcoal, furniture, house poles, mining timbers and sleepers</td>
<td></td>
</tr>
<tr>
<td>Albizia adianthifolia</td>
<td>Kapetansofo</td>
<td>Foliage browsed by cattle, various medicinal uses e.g. expulsion of goblins.</td>
<td></td>
</tr>
<tr>
<td>Albizia antunesiana</td>
<td>Musase</td>
<td>Good honey flow. Can be browsed by cattle, can be used as soap. Bark; roots and leaves can prevent ulcers, cough and colds.</td>
<td></td>
</tr>
<tr>
<td>Albizia versicolor</td>
<td>Musasengoma</td>
<td>Soap, Inhalation of fumes from burning roots may cure incipient madness.</td>
<td></td>
</tr>
<tr>
<td>Syzygium guineense</td>
<td>Mufinsa</td>
<td>For tanning leather, Vinegar can be produced from the fruits. Bee tree with ample honey flow.</td>
<td></td>
</tr>
<tr>
<td>Vitex doniana</td>
<td>Mufutu/Muchinda</td>
<td>For various traditional medicine. Leaves browsed by cattle. Bee tree.</td>
<td></td>
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<tr>
<td>Species</td>
<td>Common Name</td>
<td>Uses</td>
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<tr>
<td>Anisophyilea boehmii</td>
<td>Mufungo</td>
<td>Canoes, Snake bites bark mouthwash or enema</td>
<td></td>
</tr>
<tr>
<td>Baphia bequaerti</td>
<td>Mumbubu</td>
<td>Browsed by cattle</td>
<td></td>
</tr>
<tr>
<td>Monotes africanum</td>
<td>Chimpampa</td>
<td>Bee tree with good honey flow</td>
<td></td>
</tr>
<tr>
<td>Pericorpsis angolensis</td>
<td>Muombo/Musamba</td>
<td>Turning and curving, Good firewood and charcoal. Browsed by cattle. Treatment of headaches. A stream of bath is said to drive troublesome spirits.</td>
<td></td>
</tr>
<tr>
<td>Pterocarpus angolensis</td>
<td>Mmweleka/Kalimba</td>
<td>Good timber tree. Tannin mixed with castor can produce paint. Bark and resin used as fish poison. Medicinal uses.</td>
<td></td>
</tr>
<tr>
<td>Mimosops zeyheri</td>
<td>Musompa/Chifwanga</td>
<td>Tasty fruit. Cure delirium.</td>
<td></td>
</tr>
<tr>
<td>Swartica Madagascariensis</td>
<td>Ndale</td>
<td>Fish poisoning, Various medicinal uses.</td>
<td></td>
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</tbody>
</table>
Appendix 12

Some Animal Species Which Used to be Found along the Corridor
Appendix 12: Some animals species which used to be found along the corridor

<table>
<thead>
<tr>
<th>Latin name</th>
<th>English name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loxonta africana</td>
<td>Elephant</td>
</tr>
<tr>
<td>Phacochoerus aethiopicus</td>
<td>Warthog</td>
</tr>
<tr>
<td>Potamochoerus porcus</td>
<td>Bush pig</td>
</tr>
<tr>
<td>Alcelaphus lichtensteinii</td>
<td>Hartebeest</td>
</tr>
<tr>
<td>Sylvicapra grimmia</td>
<td>Common duiker</td>
</tr>
<tr>
<td>Oreotragus oreotragus</td>
<td>Klipspringer</td>
</tr>
<tr>
<td>Kobus defassa</td>
<td>Singing water buck</td>
</tr>
<tr>
<td>Aepyceros melampus</td>
<td>Impala</td>
</tr>
<tr>
<td>Hippotragus equines</td>
<td>Roan antelope</td>
</tr>
<tr>
<td>Hippotragus niger</td>
<td>Sable antelop</td>
</tr>
<tr>
<td>Tragelaphus scripyus</td>
<td>Bush buck</td>
</tr>
<tr>
<td>Taurotragus oryx</td>
<td>Eland</td>
</tr>
<tr>
<td>Syncerus caffer</td>
<td>Buffalo</td>
</tr>
<tr>
<td>Diceros bicornis</td>
<td>Black rhinoceros</td>
</tr>
<tr>
<td>Galogo crassicaudatus</td>
<td>Bush baby</td>
</tr>
<tr>
<td>Papio cynocephalus</td>
<td>Yellow baboon</td>
</tr>
<tr>
<td>Canis adustrus</td>
<td>Side strip jackal</td>
</tr>
<tr>
<td>Ictonyx striatus</td>
<td>African stunk</td>
</tr>
<tr>
<td>Poecilogate albinucha</td>
<td>African striped weasel</td>
</tr>
<tr>
<td>Mellivora capensis</td>
<td>Honey badger</td>
</tr>
<tr>
<td>Lycaon pictus</td>
<td>Wild dog</td>
</tr>
<tr>
<td>Viverra civetta</td>
<td>Civet</td>
</tr>
<tr>
<td>Genetta genetta</td>
<td>Small spotted genet or Hinton’s genet</td>
</tr>
<tr>
<td>Herpestes ichneumon</td>
<td>Large grey mongoose</td>
</tr>
<tr>
<td>Helogate parvula</td>
<td>Dwarf mongoose</td>
</tr>
<tr>
<td>Mungosmungo</td>
<td>Banded mongoose</td>
</tr>
<tr>
<td>Ichneumia albicauda</td>
<td>White tailed mongoose</td>
</tr>
<tr>
<td>Crocuta crocuta</td>
<td>Spotted hyena</td>
</tr>
<tr>
<td>Felis lybica</td>
<td>African wild cat</td>
</tr>
<tr>
<td>Felis serval</td>
<td>Serval</td>
</tr>
<tr>
<td>Felis caracal</td>
<td>Red lynx</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Panthera pardus</td>
<td>Leopard</td>
</tr>
<tr>
<td>Pathera leo</td>
<td>Lion</td>
</tr>
<tr>
<td>Acinonyx jubatus</td>
<td>Cheetah</td>
</tr>
</tbody>
</table>
Appendix 13

Some Grasses/Sedges Found along the Route Corridor
## Appendix 13  Some Grasses, Sedges and their uses found along the corridor

<table>
<thead>
<tr>
<th>Latin</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acrocer macrum</em></td>
<td>Very palatable hay and pasture grass</td>
</tr>
<tr>
<td><em>Andropogon amplectens</em></td>
<td>Suitable as a graze when young</td>
</tr>
<tr>
<td><em>Andropogon gayanus</em></td>
<td>Leafy and palatable when young</td>
</tr>
<tr>
<td><em>Brachiaria brizantha</em></td>
<td>Good quality for grazing</td>
</tr>
<tr>
<td><em>Brachiaria serrifolia</em></td>
<td>Annual grass suitable for grazing</td>
</tr>
<tr>
<td><em>Chloris gayana</em></td>
<td>Palatable grass with good management provides excellent pasture</td>
</tr>
<tr>
<td><em>Chloris virgata</em></td>
<td>Very palatable grass for grazing</td>
</tr>
<tr>
<td><em>Cynodon dactrion</em></td>
<td>Very valuable pasture grass. Useful for soil conservation. Useful as a lawn grass</td>
</tr>
<tr>
<td><em>Dactyloctenium aegyptium</em></td>
<td>A leafy and palatable grass well grazed</td>
</tr>
<tr>
<td><em>Dichntium papinosum</em></td>
<td>Leafy, thin stemd, palatable tussock grass for grazing</td>
</tr>
<tr>
<td><em>Digitaria acuminatissima</em></td>
<td>Palatable and well grazed by livestock</td>
</tr>
<tr>
<td><em>Digitaria setivaiva</em></td>
<td>Very palatable grass which is well grazed by cattle</td>
</tr>
<tr>
<td><em>Digitaria milanjiana</em></td>
<td>Leafy grass well grazed</td>
</tr>
<tr>
<td><em>Digitaria ternata</em></td>
<td>Palatable and grazed by livestock</td>
</tr>
<tr>
<td><em>Echinochloa colanum</em></td>
<td>Leafy soft stemmed palatable and useful grazing grass</td>
</tr>
<tr>
<td><em>Echinochloa holubii</em></td>
<td>Leafy soft stemmed palatable and useful grazing grass</td>
</tr>
<tr>
<td><em>Echinochloa pyamidalis</em></td>
<td>Very palatable and valuable pasture grass</td>
</tr>
<tr>
<td><em>Echinochloa stagnina</em></td>
<td>Very succulent and valuable fodder</td>
</tr>
<tr>
<td><em>Eleusine corocana (finger millet)</em></td>
<td>Highly consumed as food by human</td>
</tr>
<tr>
<td><em>Eleusine indica</em></td>
<td>Used as livestock and lawn grass</td>
</tr>
<tr>
<td><em>Enteropogon macrostachyus</em></td>
<td>Leafy and palatable when young</td>
</tr>
<tr>
<td><em>Heropogon contortus spear</em></td>
<td>Provides reasonable grazing when young. Useful in</td>
</tr>
<tr>
<td>Grass Name</td>
<td>Characteristics</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><em>Hyperhrhania filipendula</em></td>
<td>Preparing soil erosion</td>
</tr>
<tr>
<td>(thatch grass)</td>
<td>Traditionally important in thatching house roofs</td>
</tr>
<tr>
<td><em>Panicum coloratum</em></td>
<td>Very useful pasture. Some varieties useful for cultivate pasture</td>
</tr>
<tr>
<td><em>Panicum maximum guinea grass</em></td>
<td>Very palatable and valuable pasture</td>
</tr>
<tr>
<td><em>Panicum mekeri</em></td>
<td>Fairly succulent leafy and appears to be pasture grass</td>
</tr>
<tr>
<td><em>Panicum meyeranum</em></td>
<td>Useful grazing grass, leafy and palatable</td>
</tr>
<tr>
<td><em>Panicum repens</em></td>
<td>Palatable and useful grazing grass</td>
</tr>
<tr>
<td><em>Panicum sabaibidum</em></td>
<td>Succulent and very palatable grass</td>
</tr>
<tr>
<td><em>Panicum sulynertonii</em></td>
<td>A leafy pasture grass</td>
</tr>
<tr>
<td><em>Paspalidium platyrrhachis</em></td>
<td>A palatable and well grazed grass</td>
</tr>
<tr>
<td><em>Paspalum commersonii</em></td>
<td>Palatable and good grazing grass</td>
</tr>
<tr>
<td><em>Paspalum polystachyum</em></td>
<td>Succulent, leafy grass, pasture</td>
</tr>
<tr>
<td><em>Pennisetum polystachyon</em></td>
<td>Succulent, nutritious and palatable while young. Widely used as cultivated</td>
</tr>
<tr>
<td><em>(elephant grass)</em></td>
<td>fodder for grazing and silage mulching and soil conservation</td>
</tr>
<tr>
<td><em>Piptostachya inamoena</em></td>
<td>Provides reasonable early grazing</td>
</tr>
<tr>
<td><em>Sporobolus marginatus</em></td>
<td>Well grazed by cattle. Indicator species for saline soil conditions</td>
</tr>
<tr>
<td><em>Sporobolus pilamidolis</em></td>
<td>The grass is very good as a traditional broom</td>
</tr>
</tbody>
</table>
Appendix 14

Some Bird Species Found in the Area
**Appendix 14: Some birds species found along the corridor**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Local Name</th>
<th>Latin</th>
<th>Feeding Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lizard Buzzard</td>
<td>Akabemba</td>
<td>Kaupifalco monogrammicus</td>
<td>Found in woodland and farm land. Catches prey on the ground. Eats small animals such as grasshoppers</td>
</tr>
<tr>
<td>Heuglin's Robin</td>
<td></td>
<td>Cossypha heuglini</td>
<td>Habitat; thick vegetation such as beside rivers and in thickets. Usually in thick vegetation where it feed on the ground. Eats insects</td>
</tr>
<tr>
<td>Meyer's parrot</td>
<td>Mulongwe</td>
<td>Poicephalus meyeri</td>
<td>Woodlands, and fields. Eats grain and other seed. Breeds in holes in trees.</td>
</tr>
<tr>
<td>Green pigeon</td>
<td>Inkondokondo</td>
<td>Treron Australis</td>
<td>Any woodland where fruit trees are found, especially ficus tree (Mukuyu)</td>
</tr>
<tr>
<td>Emerald spotted Wood</td>
<td>Akatutwa</td>
<td>Turtur chalcospiles</td>
<td>Woodlands and thickets. Feeds on the ground. Eats seeds</td>
</tr>
<tr>
<td>Cape Turtle Dove</td>
<td>Akapele</td>
<td>Streptopelia capicola</td>
<td>Woodlands especially in areas away from rivers. Also on farms. Feeding on the ground. Eats mainly seed</td>
</tr>
<tr>
<td>Senegal coucal</td>
<td>Mukuta</td>
<td>Centropus senegalensis</td>
<td>Found in bushes, thickets, reeds along the river/stream</td>
</tr>
<tr>
<td>Red Chested Cuckoo</td>
<td></td>
<td>Caculus solitarius</td>
<td>Habitat; mainly in evergreen forest along rivers. Sometimes in Miombo. High perched. Feeds on caterpillars.</td>
</tr>
<tr>
<td>Pied kingfisher</td>
<td></td>
<td>Ceryle rudis</td>
<td>Habitat; open water, dams, lakes, rivers. Perches on</td>
</tr>
<tr>
<td>Common Name</td>
<td>Local Name</td>
<td>Latin</td>
<td>Feeding Habit</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
<td>------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Yellow bellied sunbird</td>
<td></td>
<td><em>Nectarinia venusta</em></td>
<td>Habitat; grass, bushes and low dense vegetation, often near streams. Eats mainly nectar which it takes from flowers with long curved bill. Also eats insects and spiders.</td>
</tr>
<tr>
<td>Helmeted guineafow</td>
<td>Ikanga</td>
<td><em>Numida meleagris</em></td>
<td>In woodlands, fields. Feeds on seed and insects.</td>
</tr>
<tr>
<td>Lilac breasted Roller</td>
<td></td>
<td><em>Coracia caudata</em></td>
<td>Found mainly in grass land with few trees, farms and besides roads. Remains perched for a long time. Flies down to pick insects. Feeds on caterpillars, snails, frogs and small snakes. Makes its nest in a hole in a tree.</td>
</tr>
<tr>
<td>Black winged Red Bishop</td>
<td>Chibebe</td>
<td><em>Euplectes haraeaceus</em></td>
<td>Habitat tall grass, Maize field. Eats seeds mainly.</td>
</tr>
</tbody>
</table>
Appendix 15

Zambia-DRC Wood Harvesting, Tree Nurseries Establishment and Tree Planting Plan
Appendix 15: Zambia–DRC Wood Harvesting, Tree Nurseries Establishment And Tree Planting Plan

1.0 INTRODUCTION

Copperbelt Energy Corporation (CEC) Plc. Intends to upgrade the capacity of its existing regional inter - connector by constructing a second 220kV transmission line from Luano substation in Zambia to Democratic Republic of Congo (DRC) frontier in order to increase access by members of Southern African Power Pool to surplus hydro – power resources in DRC. The line is to be constructed along the existing circuit and will involve clearing a width of 45 m covering a distance of 45 Km.

In the affected area, the vegetation covering 90% of the area is single story, deciduous, commonly known as miombo which is mixed woodland of Brachystegia, Isoberlinia, Jubernardia and Marquesia species.

People along the corridor use indigenous trees in different ways such as charcoal and firewood are widely used as cooking fuel in the area. Majority of urban population in Chingola and Chililabombwe use charcoal for cooking and heating while the rural population mainly use firewood. In the two districts making and selling of charcoal is an important economic activity.

Other uses of trees from the forests are furniture making and for construction materials while bamboo is used in the manufacture of baskets, chairs and mats. The other products obtained from the forests are mushrooms, medicine, fibre, fruits, caterpillars, etc (Table 1)
### Forest products collected in the area

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Major collector</th>
<th>Major Users</th>
<th>Product sold</th>
<th>Product consumed</th>
<th>Place sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uapaca kirkiana - Fruits</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Parinari curatallfolia - fruits</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Syzygium guineense - fruits</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Anisophylea boehmii - fruit</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Strychnos cocculoides - fruits</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Landolphia kirkia - fruits</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Mushroom</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Bushmeat</td>
<td>Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Rynchosta species - roots</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Medicine</td>
<td>Females/Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Poles, Bamboos, roundwood</td>
<td>Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Grass</td>
<td>Females/Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Firewood</td>
<td>Females/Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Charcoal</td>
<td>Males</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Caterpillar</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Other insects</td>
<td>Females</td>
<td>Females/Males</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Honey</td>
<td>Males</td>
<td>Females/Male</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
<tr>
<td>Timber</td>
<td>Industries</td>
<td>Industries</td>
<td>![x]</td>
<td></td>
<td>Chingola/Chiliabombwe</td>
</tr>
</tbody>
</table>

**Key:**
- ![x] Products sold
- ![x] Products consumed

About 124 ha of indigenous forests will be cut from which it is expected that about 13 000 m³ sawable timber, 9 million poles, over 4 000 cords of wood for charcoal making and about 7 000 bamboos will be obtained apart from other forest products. From ZAFFICO plantation 6.83 ha will be cleared and this will involve felling of about 1000 m³ of plantation timber.
CEC is committed to seeing that the timber felled and other forest products do not go to waste and above all that what is cleared is replaced through supporting community tree planting and establishment of tree nurseries.

It is CEC's aim that Forest Act No. 7 of 1999 and other related legislations will be fully observed during the construction and operation phases. The company is to work in close collaboration with all stakeholders and to work towards accruement of benefits by the local communities.

1.1 Objectives of the plan

The objective of the plan is to make full use of clear felled trees both in natural and plantation forests and to give support to awareness campaigns and community tree planting programmes.

Specific objectives are:

- Identification of stakeholders
- Conducting awareness campaigns on the role of forests and the need for tree planting
- Identification of markets for the forest products to be cleared along the corridor.
- Conducting Participatory Rural Appraisal (PRA) among the local communities
- To train communities and other interested parties in basic nursery management skills
- To support local communities in the establishment of village tree nurseries
- To train communities in the collection and handling of seeds from indigenous and exotic trees
- To train communities in the propagation of fruit, fuel wood and timber tree species.

2.0 IDENTIFICATION OF STAKEHOLDERS AND CUSTOMERS

The main markets for timber and charcoal could be the mines especially in Chililabombwe. Choate (1974) estimated that copper mines where consuming 40 000 m³ of timber and 62 000 large poles annually, while charcoal consumption was at 4 500 tonnes per year.

Generally the demand for forest produce are largely for small poles for building, wood fuel and Non Timber Forest products as in Table 1 above.
While the bulk of plantation produce sold up to the present consists of saw logs, particle wood, transmission poles (electrical and telephone)

It is important therefore that CEC in consultation with the Forestry department and ZAFFICO to identify the would be customers in Chingola and Chililabombwe in advance of the clearing (charcoal producers, saw millers, etc). Some customers such as charcoal producers in Chingola are already identified. The effort of customer identification should continue.

Terms Of Reference (fees, quotas, date to start, in which portion of the area to cut and not to cut, how the produce will be converted, extracted, transported, etc.) are to be given to the customers and explained to them in advance.

3.0 CONDUCTING AWARENESS CAMPAIGNS AND NEEDS ASSESSMENT

Awareness campaigns about the proposed project to continue. Furthermore, campaigns to make people aware about the availability of the wood which will be cleared along the corridor, the role of trees, the need for community based nurseries, tree planting, the type of support CEC will give, etc be embarked on very vigorously before, during construction phase and operation phase.

Needs assessment (PRA) be conducted to identify what type of trees the local people would like to have in their nurseries and plant

4.0 WOOD HARVESTING PLAN

4.1 Clearing of the route

Route clearing will be done by CEC employees under the direction of the Forestry Department in case of natural forests and ZAFFICO in case of plantation. About 13 000 m³ of sawable timber of various species above 30cm diameter breast height (Dbh₁₃m) will be cut from natural forest and 1000 m³ will be from ZAFFICO plantation with an average dbh₁₃m of about 30cm.

Before clearing commences identified customers for sawable timber by CEC and Forestry Department will be called in to salvage the commercial timber for their use. Unless otherwise
customers will be locally based (Chingola and Chililabombwe). Since CEC will have already paid to the Forestry Department and ZAFFICO, cutting of timber by the local millers is to be negotiated by CEC, Forestry Department and ZAFFICO. This applies to charcoal producers too.

Charcoal producers locally based will move in the area while clearing of the route is being done by CEC employees. CEC employees will pile the cleared trees along the sides and this is the wood to be converted to charcoal.

5.0 TRAIN COMMUNITIES IN BASIC NURSERY MANAGEMENT AND TREE PLANTING SKILLS

Training of local communities and charcoal producers in nursery establishment and tree planting techniques is to be embarked on after transmission line construction phase. This is to allow the local people who will be engaged in construction work by CEC to be available.

The Council to be at hand for organization and political support, Forestry department and ZAFFICO to be at had for training.

Simple training manuals in seed collection, nursery establishment and tree planting to be developed by Forestry department and ZAFFICO. Indigenous knowledge is vital here.

6.0 MATERIALS, TOOLS AND EQUIPMENT

Where possible local knowledge and tools be utilized. However, the following materials, tools and equipment may be required. This is to be determined after PRA exercise:

- Shovels
- Wheel barrows
- Watering cans
- Fertilizer
- Polythene pots
Seed (both exotic and indigenous trees).

Seed to be locally collected.

7.0 EXPENDITURE

It should be realized that the nurseries to be established should be simple and set up in away that villages can continue to manage own their own even if CEC support is withdrawn. So initial capital investment should not be like commercial nurseries.

Villagers to contribute in form of labour, there should be no permanent worker but villagers to organize themselves on who is to maintain the nursery during which period.

The full budget for training in nursery techniques will be as follows:

\[
\begin{array}{l}
\text{ZK'm} \\
\text{Nursery establishment} & 0.98 \\
\text{Land preparation} & 24.5 \\
\text{Plantation maintenance} & 14.7 \\
\text{Total} & 40.1 \\
\end{array}
\]

8.0 COMMENT

Tree planting activities are usually synchronized with the agricultural calendar. Therefore, in order for tree planting project to succeed seedlings in the nursery should have been ready for transplanting by the beginning of the rain season.
Appendix 16

CEC Environmental Management Procedure EM/012 Compensation and Resettlement Procedures for Transmission Line Development
Appendix 16: CEC Environmental Management Procedure EM/012
Compensation and Resettlement Procedures for Transmission Line Development

Copperbelt Energy Corporation Plc.

ENVIRONMENTAL MANAGEMENT PROCEDURE

| TITLE: | COMPENSATION & RESETTLEMENT PROCEDURE FOR TRANSMISSION LINE DEVELOPMENTS |
| IDENTIFICATION: | EM/012 |
| ISSUE: 2.0 | DATE: 8 Feb 2003 |
| STATUS: Issued |

CEC Environmental Policy Statement:

Copperbelt Energy Corporation plc (CEC) recognises the business benefits that good environmental stewardship brings to the Company, staff, shareholders and the Country as a whole. It is the policy of CEC to integrate environmental protection into our existing and future business operations. We are committed to implementing good environmental practices, continual improvement in environmental performance and to manage our activities in a manner consistent with our environmental obligations both legal and moral.

1.0 Purpose

The purpose of this Environmental Management Procedure is to provide a set of basic guidelines to determine the approach that should be adopted when assessing the payment of compensation to those affected by the development of new transmission lines by CEC.

2.0 Objectives

The objective of the Procedure is to ensure that consistent, fair and equitable treatment is given to all parties who may be affected through a requirement by CEC to use land for the construction and operation of transmission lines. This Procedure covers situations where the land may need to be permanently used to permit the construction of structures and access roads etc. as well as for temporary loss of land usage during the construction phase of a new asset. The principles for the treatment of persons required to be resettled are also covered by this Procedure.

3.0 Procedure Details

3.1 DOMAIN OF PROCEDURE APPLICATION

The activities that commonly entail compensation and resettlement are transmission programs that require land usage for substations and access roads, and access to the wayleaves (i.e. rights of way) of various sizes to implement the construction of any line at various voltage levels.
CEC's Procedure and the Electricity Act direct that, in order to construct any infrastructure where access on or through various properties is required, consent shall be sought from the various landowners. CEC therefore seeks the agreement of the owners or occupiers of land needed.

Where mutual agreement cannot be reached at a proposed site or along a proposed alignment, CEC explores alternative sites or alignments to the fullest extent possible. The Company resorts to the Land Acquisition Act (LAA) and the Electricity Act (EA) only in those rare cases where alternative locations or alignments are not possible, even though the investment cost may be higher than that of the original location or alignment.

Infrastructure such as substations and maintenance roads may require access to land and in some cases, land acquisition. In these instances the Company would resort to the LAA and the EA only when the landowner refuses access and no alternative routing or location is feasible, even if costs are somewhat higher.

The CEC practice of negotiating with landowners instead of directly and immediately using its legal power has several important consequences. Land acquisition is minimised, any compensation due is usually at full replacement value, and adverse effects are usually limited to reconstructing small numbers of homes and businesses on new plots nearby that are provided, at CEC's request, by local officials in both rural and urban areas. Importantly, CEC land acquisition practice seldom, if ever, affects the livelihoods of displaced persons (DPs), and where it does (e.g., shifting shops and stores), CEC compensates for lost income proportionate to the impact of the activities.

In summary, CEC procedure emphasises minimisation of permanent and temporary land acquisition, negotiation with DPs, payment of compensation at full, undepreciated replacement value with additional considerations, and avoidance of undertakings that affect DP livelihoods. As such, CEC involuntary resettlement mostly involves resiting homes and businesses short distances, without serious consequence for DP livelihoods.

3.2 GOVERNING PRINCIPLES AND OBJECTIVES FOR RESETTLEMENT

The objective of CEC resettlement procedure is to ensure that the fewest people possible are affected by company undertakings, and that those who are affected do not suffer adverse consequences without full and fair compensation. An important governing principle of this objective is to avoid involuntary resettlement wherever feasible, and, when not, to minimise it, exploring all viable alternative project alternatives. For this reason, as a matter of both procedure and practice, CEC examines, and incorporates into its planning, the probable extent of impact on local populations. Then, when privately owned or occupied land must be used, the Company reviews the impact of the proposed undertaking (e.g., substation, transmission line) and revises the siting or alignment of any infrastructure to avoid populations to the fullest extent possible.

When involuntary resettlement is unavoidable, CEC strives, as a matter of principle and practice, to limit the extent of individual, family, and community impact. Transmission lines usually occupy only a narrow strip across farms, and expressly avoid both existing structures and areas of future farm development. Similarly, in peri-urban and urban areas, CEC explicitly limits to the fullest extent possible the adverse consequences to housing and other structures. The Company strives not to affect displaced persons’ livelihoods and incomes. Moreover, for households CEC seeks not only to relocate displaced persons as near as possible to their existing residence, but also pays full, undepreciated replacement value for all assets affected, so that DPs can improve their housing and other structures. In all cases as appropriate, CEC reserves the right to provide alternative housing to a
standard that is slightly better that the property being affected and within the immediate vicinity as an alternative to the payment of compensation.

CEC conceives of resettlement activities in a sustainable developmental framework. Displaced persons are always consulted, and provided opportunities to participate in the planning and implementing of these programs, and the Company is willing to put special programs in place when necessary. When business livelihoods and incomes are unavoidably affected, CEC strives to assist the enterprise to re-establish itself in or near its original location and provides compensation for lost business proportionate to the impact of our activities.

Since all people are not alike and do not have similar circumstances, CEC pays particular attention to the needs of vulnerable groups among the displaced, especially those below the poverty line, the elderly, children, and the handicapped. Where the Company cannot itself provide the special assistance needed by these groups, the Company may engage a qualified agency to provide such services.

This Procedure applies to all components of any project regardless of the source of financing. It also applies to other activities resulting in involuntary resettlement that are (a) directly and significantly related to the project, (b) necessary to achieve its objectives as set forth in the project documents; and (c) carried out, or planned to be carried out, contemporaneously with the project. Moreover, whenever national laws, Company procedure or donor policies are at variance, the highest standard will be applied because all other relevant laws and policies are thereby fully complied with.

3.3 PROCESS FOR PREPARING AND APPROVING RESETTLEMENT PLANS

CEC retains full responsibility for preparing and approving resettlement plans although it may use consultants, as required.

Once an undertaking has been decided upon and CEC has identified the area affected, CEC undertakes a census of the people who will be affected by the activity. The census notes, first, the nature of the impact (i.e., house, business, land, and livelihood). For houses, the census includes the number of structures on each plot, their materials, and condition; other immovable assets (e.g., fruit trees, and boreholes); and notes the number of people in each household. For businesses, the census covers: the size and type of structure; estimated monthly profits; and, number of employees and their wage rate. For farms, the census notes the type of tenure, soil quality land and its use, and any improvements (i.e., boreholes). CEC also ascertains the ownership or occupancy of any vacant plots by inquiring in the community about individuals who are not present at the time of the census. Generally speaking, CEC undertakings do not adversely affect other employment and livelihood, but in such a case, the census would cover other pertinent matters necessary for planning income restoration activities.

On the basis of this information, CEC undertakes to prepare a cost estimate for the structures and assets, including land that is affected. The cost estimate explicitly includes supplementary payments such as inconvenience premium, house improvement payment, moving costs and lost profit. Where there is no income restoration program necessary, the compensation program constitutes a major component of the resettlement plan, which is approved by CEC.

At the same time, CEC may arrange with local authorities to provide an alternative plot for each family and business to be relocated. In rural areas, replacement plots are arranged by the village headman at the request of CEC and in consultation with the DPs. CEC may work with the local authorities to ensure that the new plots are at least as well serviced as the homes and businesses taken.
3.4 ESTIMATED POPULATION DISPLACEMENT, BY CATEGORY

CEC undertakings require, at most, limited areas for substations, transmission lines and access and maintenance roads. CEC seeks first to minimise displacement by utilising vacant government land or unencumbered private land. When other involuntary action is required, the number of people impacted is relatively small, and the extent of the impact, is, in almost all instances, limited to shifting the structures to a nearby plot acceptable to the DPs. Because livelihoods (apart from some shops and businesses) are not affected, the categorisation of displaced population is limited, at this time, to structures lost and farmland affected. Should livelihoods other than shops and businesses be affected, the estimation of population displacement, by category, would be expanded to detail such instances.

3.5 ELIGIBILITY CRITERIA

CEC espouses the principle of compensation and assistance in proportion to the extent of impact. Specifically, CEC pays for land and assets affected permanently (e.g., substations, pylon footprints, maintenance roads) and rents land or structures affected temporarily (e.g., construction roads, and maintenance activities). In each instance, the value is established and negotiated by CEC or its intermediary agent with the owner or occupier. Land and assets taken permanently are appraised at full market value; land taken temporarily is valued for the production foregone or market rental value, as applicable, for the period the land is required by CEC.

Further, CEC recognises formal and potential legal rights to land, including customary and traditional rights as defined in the laws of Zambia. All such legal owners and titleholders of land are eligible for prompt, full compensation for the assets taken (e.g., structures, land, trees), and, where necessary, support after displacement and/or development assistance to restore income earning capabilities, in proportion to the extent of impact. Renters and lessees, who do not own the assets affected, nonetheless qualify as legal occupants who are eligible for assistance both to find new homes and assets (e.g., arable land, businesses) and for moving expenses, which include any associated costs such as connection fees for public utilities.

Persons who have no recognisable legal right or claim to the land that they are occupying may be provided resettlement assistance in lieu of compensation for the land they occupy, and other assistance, as necessary, to achieve the objectives of sustainable development. As a matter of principle, and of practical necessity to avoid opportunistic encroachment, CEC will conduct a baseline census (and, if required for economic rehabilitation, a socio-economic census) to determine the number and tenure status of each DP in the area under consideration for either permanent or temporary acquisition. The date of cut-off for eligibility is determined by the date of the census. CEC may, at its discretion, issue identification cards to DPs in order to certify their status in each subproject. Those persons without formal or informal tenurial (including tenants) status at the time of the cut-off date will be considered opportunistic encroachers, and will not be entitled to assistance under the CEC program.

In that context, CEC espouses the principle that compensation and assistance is in proportion to the extent of the impact, taking into account the possible special needs of vulnerable populations. Put simply, the Company will pay open market value for all land taken permanently, pay appropriate rent for all land taken temporarily (e.g., construction access roads), and may pay an appropriate fee for any restriction of use rights.
3.6 LEGAL FRAMEWORK

Although land acquisition by CEC is usually through mutual negotiation and agreement, the land taking is involuntary because the Company can resort, when necessary, to the Land Acquisition Act Cap 189 (LAA) and the Electricity Act Cap 433 (EA) of 1995 (Part III, Acquisition of Land and Rights Over Land) and any other applicable legislation as introduced or amended from time to time. Further, CEC procedure parallels the requirements of the LAA, with notification, valuation, negotiation, and compensation.

3.7 VALUATION METHODS

CEC undertakes to estimate the value of land, structures and other immovable assets that may be affected using appropriate information and agents as may be necessary.

Land is valued at open market value, as determined by current market sales, taking into account various relevant factors such as soil type, irrigation and other infrastructure, and accessibility.

Structures and other improvements are valued at both depreciated replacement cost and full, undepreciated compensation value; as a matter of procedure and practice, CEC pays the full undepreciated compensation value for all assets taken in proportion to the impact of our activities. Full, undepreciated compensation value is established by analysing current construction costs relative to design, materials employed, workmanship, and final finish without any deduction for depreciation or repairs. Depreciated replacement cost is arrived at by analysing current construction costs relative to design, materials employed, workmanship and final finish of the subject properties. In line with the principles of ‘equivalent reinstatement’, a deduction is taken if the premises to be taken require repair. The deduction for repairs is made in accordance with the principle that the reinstated property should as far as possible be equal to the property being reinstated. The concept of ‘replacement cost’ is variously referred to as “market value,” “depreciated replacement cost,” “open market value,” or “gross current replacement cost.” CEC reserves the right to provide alternative accommodation to a slightly better standard than the properties being affected as an alternative to the payment of compensation.

A supplement “to enable the affected people to build slightly better houses than what they are currently living in” is added to the estimated value of replacement value for each structure. The supplement, termed compensation value, is arrived at by analysing current construction cost relative to design, materials employed, workmanship and final finish of slightly better houses, using average costs. For this purpose a slightly better house means:

- Better Traditional House: A house built of burnt mud block walls, rendered externally and plastered internally; earth-compacted floors; grass thatch roof on timber members; timber doors and windows in timber frames.
- Better Conventional House: A house similar in design and size to that taken, built of concrete block walls, rendered externally and plastered internally; solid concrete floors with screed finish; gable roof of corrugated tin on timber members; soft board ceiling; skeleton core flush doors in steel frames; glazed windows in steel frames; electricity, water and sewerage disposal facilities.

To this undepreciated replacement value of property, CEC adds an inconvenience premium to cover the disturbance due to the uncertainty of tenure created by notice. While every DP receives an inconvenience premium, the amount varies with the particular needs of the individual in order to...
provide needed assistance to vulnerable groups. CEC makes the necessary arrangements for relocation, which is separate from the compensation value and inconvenience premium but is paid with them as an overall sum. And, the Company may arrange with local authorities for alternative plots with appropriate public utilities and services.

All other assets affected may also be compensated in a manner that is proportionate to the impact of CEC's activities. Trees that must be removed from the wayleave are one common asset or improvement found on property. Each tree is separately valued by species (e.g., banana, papaw, guava, lemon, mango), age or maturity, and productive value. The compensation rates are established by the Ministry of Agriculture or any other appropriate agency. Compensation is established in the following manner: for timber trees, the value of the lumber in situ establishes the value; for fruit trees, the value of the crop from each tree for the period from acquisition until the replacement tree attains the level of production of the tree removed. Standing crops are another common asset that may be taken, usually temporarily for construction roads, borrow pits, and such like but possibly, on a one-time basis, along with the land on which they stand. In these instances, the valuation is established as the value of the produce that would be harvested from the area affected. The value of the produce or crop, in turn, is set as the market value midway between peak market prices and seasonal low market prices. Other improvements (e.g., borehole, water tank) are valued at undepreciated replacement rates, and may be replaced in kind.

Similarly, for businesses, CEC compensates for the undepreciated replacement value of all structures, plus a consideration for inconvenience. In addition, CEC adds supplementary payments for lost profits in addition to the moving costs and any administrative transfer fees and costs.

3.8 ORGANISATIONAL PROCEDURES FOR DELIVERY OF ENTITLEMENTS

Once the Company and the displaced person agree upon compensation and other assistance, CEC effects payment to the DPs directly. All payments shall be appropriately recorded.

3.9 IMPLEMENTATION PROCESS

CEC expressly links the resettlement implementation process to the civil works. No project unit will initiate construction until CEC has certified that all of the DPs have received the agreed upon compensation and other assistance, and the land or access to it lies free of claim with CEC.

If in the course of implementation, any additional resettlement or income restoration activities prove to be necessary, CEC will consult with the local communities on the alignment of the transmission lines and access roads or the location of the substation (or the area for any expansion). On the basis of these discussions and consultations, CEC will define a compensation and resettlement plan that will be submitted to the financing agency, if any, for approval. In such an instance, CEC will also ensure that all agree-upon resettlement activities are completed before initiating those improvements in the electrical supply system.

Further, when necessary, CEC may contract an experienced consultant or local non-governmental organisation to assist with the resettlement process. Such agencies can provide particular assistance in explaining valuation and other procedures to DP's and in sensitising DPs to the appropriate use of compensation funds, and any penalties they might incur legally from the abuse of these funds.

3.10 GRIEVANCE REDRESS MECHANISMS
CEC procedure is to resolve all grievances as quickly and amicably as possible, to the mutual consent of both parties. In the normal course of the process, CEC negotiates with the DP to reach agreement. If negotiations are difficult, CEC may ask the local officials to assist with the discussions.

Because CEC undertakings usually entail limited displacement, it is not usually necessary to establish local grievance committees in order to reconcile DP expectations with CEC requirements. Should such committees prove necessary in a particular instance, CEC will establish such a committee, composed of two DPs (one male, one female), one representative of an NGO selected by the DPs, one local officer responsible for land planning or allocation, and one land acquisition officer.

If CEC cannot resite or realign the proposed infrastructure and the DP grievance cannot be resolved at the local level, the DP has recourse at any time to the judicial system for resolution of the matter. The LAA allows for compensation of damage during the valuation process (Part II, Section 4 [2]). Subsequently, if agreement on compensation cannot be reached within six weeks of publication of the notification in the Gazette, the aggrieved interested party may institute proceedings in Court (Part III, Section 11). Whenever the dispute is formally lodged with the courts, the Court's decision (or the Supreme Court's, in the case of appeal) is final (Part II, Section 14).

Under the EA, any inability to agree on the alignment between the company and the owner may be referred to the Minister for resolution. In that instance, the Minister "shall fix the amount of compensation which shall be paid to such owner or such person by the operator" (Part III, 15 [4]).

3.11 CONSULTATION AND PARTICIPATION

CEC is committed, indeed legally mandated, to consult meaningfully with displaced persons in order to reach mutual agreement on the value of assets taken and other assistance to be provided. To this end, CEC will distribute a copy of this procedure to all DPs and include it in any Environmental and Social Impact Assessment reports.

In addition to public disclosure of CEC's resettlement procedure, the Company, as good practice, meets individually with families prior to displacement to discuss the optimal siting of infrastructure and alignment of transmission lines. After assessing each property, CEC or its contracted intermediary agent meets again with the displaced family to agree upon the compensation. At the same time, and if necessary, CEC consults with the local authorities to identify alternative house sites that are acceptable to the displaced persons. CEC may also arrange with these authorities for the servicing of the resettlement area.

In the instance of difficult negotiations, CEC may ask the local officials to assist with the discussions. DPs who remain dissatisfied have the right to raise their issues directly with CEC, and, in the instance of continuing dissatisfaction, to take their case to court for resolution.

As mentioned above, because CEC undertakings usually entail limited displacement, it is not usually necessary to establish local grievance committees in order to reconcile DP expectations with CEC requirements. Should such committees prove necessary in a particular instance, CEC will establish such a committee, composed of two DPs (one male, one female), one representative of an NGO selected by the DPs, one local officer responsible for land planning or allocation, and one land acquisition officer.

3.12 MONITORING
CEC closely monitors the entire land usage and resettlement process and carries out the baseline survey of families, enterprises and assets to be affected. CEC records all negotiations with DPs, and is present when compensation payments are made. (A record of each payment, signed by both the affected person and the CEC representative, is kept at project headquarters.) CEC also tracks, where necessary, the acquisition of alternative land for displaced families, to assure the timely availability of plots and, especially in urban and peri-urban areas, houses.

In the instance that land usage entails economic rehabilitation, CEC will implement the requisite monitoring system to track income restoration. CEC may do this directly or through contract with an organisation or agency with the requisite experience.
Appendix 17

APPLICATION FOR PROJECT RE-REGISTRATION
ZAMBIA-DRC 220kV POWER LINE INTERCONNECTION PROJECT

RE-REGISTRATION OF CEC’S READINESS & INTENTIONS TO PROCEED WITH TRANSMISSION LINE CONSTRUCTION

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1 BACKGROUND

In the Project Description and Environmental Impact Assessment (EIA) documents submitted to the Environmental Council of Zambia (ECZ) in 2003, Copperbelt Energy Corporation (CEC) laid down its intentions to jointly, with a Congolese national electricity utility, Société Nationale d'Electricité (SNEL), develop a 220kV power line aimed at expanding the capacity of the existing electricity interconnection between Zambia and the Democratic Republic of Congo (DRC) from 210MW to 500MW.

During the same year (2003), the Environmental Council of Zambia (ECZ) gave regulatory consent for CEC to proceed with project implementation following submission of a comprehensive Environmental Impact Assessment (EIA) referred to above.

In the subsequent years, compensation and resettlement of all parties affected as well some aspects of ground preparation activities relating to the project were carried out though major construction activities have lagged behind earlier anticipated timescales. In recognition of the length of time that has elapsed from the time the EIA was approved and based on the requirement to re-register the intentions to progress the development of a project in compliance with the Environmental Impact Assessment Regulations, Statutory Instrument 28 of 1997 of the Environmental Protection and Pollution Control Act of 1990, CEC has prepared and wishes to submit this document to the ECZ for the following purposes:

a) Update the ECZ on the current status of the project
b) Restate the increasingly important benefits that this project bestows not only on Zambia but on other members of the Southern African Power Pool (SAPP) as well
c) Re-register CEC’s readiness and intentions to continue project implementation and fully realise the project within the next couple of years
d) Seek ECZ’s confirmation that CEC can proceed with project implementation as long as the conditions set out in ECZ decision letter of 18th July 2003 are strictly adhered to by CEC

2 CURRENT STATUS OF THE PROJECT

2.1 Project Financing

As has been stated in other environmental documents that have been submitted to the ECZ in the past regarding this project, financing arrangements for the project are such that the DRC side of the project is being financed through a World Bank (WB) loan while the Zambian side of the project will be financed through debt financing by CEC.

The current delay in the commencement of the mainstream construction activities is in part due to protracted processes involved in securing the World Bank funds on the DRC side. However, SNEL and the World Bank have now reported achievement of financial closure and are ready to commence construction activities on their side.

CEC, on its part, has also moved to secure necessary debt financing from a commercial bank and has commenced internal preparatory work which should see main construction activities begin within the first quarter of 2009, which time will coincide with the commencement of similar activities on the DRC side.

2.2 Status of the Proposed Line Route

On the basis of the EIA that was approved by ECZ in 2003, CEC fully undertook all identified compensation and resettlement of all parties involved. In October 2008, CEC carried out a comprehensive assessment of the approved line route. Consequently, CEC wishes to draw the
attention of the ECZ to the fact that ground conditions along the proposed wayleave remain materially the same as at the time of approval of EIA in 2003. In this regard a joint team of ECZ and CEC environmental experts undertook a joint site verification visit on 21 October 2008.

Furthermore, it is CEC’s intention to bring the following to the attention of the ECZ. Results of an EIA study on the DRC side have dictated that the transmission line crossing point on the Zambia-DRC border be re-located to a new point. The effect of this change is that, on the Zambian side, a part of the transmission line stretching not more than 3km will have to be built in an area that was not originally covered in the EIA approved by ECZ in 2003. CEC has since commenced a process to prepare an addendum to the EIA and it is hoped this document will be submitted to the ECZ within the course of November 2008.

2.3 Anticipated Implementation Programme
CEC and SNEL, the electricity utility in the DRC, with indirect participation of the World Bank are currently finalising project related agreements. This process is expected to be completed by the end of November 2008. During this same period CEC shall be carrying out a procurement process to identify a suitable contractor to undertake the project. Award of the construction contract is expected in January 2009 and shortly thereafter construction work, scheduled for completion in 2010, should commence.

3 PROJECT BENEFITS

As noted in the documents that were submitted to ECZ in 2003, the power networks of the Republic of Zambia and the Democratic Republic of Congo are at present electrically connected through a 220kV transmission line, which spans from Luano substation located near Chingola on the Zambian side to Karavia substation located on the outskirts of Lubumbashi on the DRC side. This transmission interconnection was built in 1956 and since then it has been used to meet power requirements for both Zambia (during draught and emergencies) and other countries to the south of Zambia mainly Zimbabwe and South Africa. The capacity of the present single line interconnection is 210MW, and it is normally utilised at full capacity to facilitate power exports from DRC through Zambia to Zimbabwe and South Africa.

Since Zambia’s requirements for power from DRC take precedence over those of other countries, this interconnection will increasingly continue to be important in enhancing the security of electricity supplies as the demand of electricity in Zambia continues to grow very fast. With the current power situation, where Zambia finds itself with a constrained available generation due to rehabilitation works being carried out by Zesco and the high load growth the country is experiencing, power through this line from the DRC would find ready use within Zambia. Apart from this benefit, ZESCO and CEC accrue potentially significant revenue by wheeling power through their respective networks to other SAPP utilities.

The demand for power from the DRC by countries south of Zambia has reached a point where the interconnection capacity between DRC and Zambia has become a constraint to further exports by DRC. Consequently the Copperbelt Energy Corporation PLC (CEC) of Zambia and Société Nationale d’Electricité (SNEL) of the Democratic Republic of Congo (DRC) intend to de-bottleneck the interconnection by building a second 220kV transmission line from Luano substation to Karavia substation. The construction of this second DRC-Zambia transmission line will increase the amount of power that can be exported by SNEL to Zambia, and through Zambia to SADC countries south of Zambia to 500MW. This will not only enhance the security of electricity supplies in Zambia, but will also result in a pro rata increase in the potential wheeling revenue earned by Zesco and CEC through International power export transactions.
4 RE-REGISTRATION OF INTENTIONS TO COMMENCE CONSTRUCTION ACTIVITIES

The foregoing highlights the current status of the project as well as numerous benefits of the project not only to Zambia but to the entire SADC region as well. CEC, therefore, wishes to notify the ECZ of its readiness and intentions to commence construction activities leading to the completion of the project by the end of 2010. CEC also kindly seeks a confirmation from the ECZ that it can proceed with project implementation as long as all conditions stipulated in the decision letter of 18th July 2003 are strictly adhered to by CEC.
Dear Sir

ZAMBIA-DRC 220kV POWER LINE INTERCONNECTION PROJECT: RE-REGISTRATION OF CEC’S READINESS & INTENTIONS TO PROCEED WITH TRANSMISSION LINE CONSTRUCTION

In its decision letter dated 18 July 2003, the Environmental Council of Zambia (ECZ) gave regulatory consent for Copperbelt Energy Corporation (CEC) to proceed with implementation of the above mentioned project. In the subsequent years, CEC undertook compensation and resettlement of all parties affected as well some aspects of ground preparation activities relating to the project. However, mainstream project construction activities have lagged behind earlier anticipated timescales, partly due to delays in concluding financing arrangements between SNEL, the electricity utility on the Democratic Republic of Congo (DRC) and the World Bank, the financiers for the DRC element of the project. These financing arrangements have now been concluded and both SNEL and CEC are now ready to proceed with project implementation.

In recognition of the length of time that has elapsed from the time the EIA was approved in 2003 and based on the requirement to re-register intentions to progress the development of a project in compliance with the Environmental Impact Assessment Regulations, Statutory Instrument 28 of 1997 of the Environmental Protection and Pollution Control Act of 1990, CEC wishes to submit to the ECZ, the Re-registration Document, attached herewith, for the following purposes:

- To update the ECZ on the current status of the Zambia-DRC 220kV Power Line Interconnection Project
- To re-register CEC’s readiness and intentions to proceed with project construction
- To seek a confirmation from the ECZ that CEC can proceed with project implementation as long as conditions set out in the ECZ decision letter of 18th July 2003 are strictly adhered to by CEC

We note the project site visit undertaken by a joint team of ECZ and CEC environmental experts on 21 October 2008. As a consequence of this site visit, we believe the ECZ shares CEC’s view that conditions on the ground remain substantially in compliance with the ECZ decision letter of 18 July 2003 and therefore, project implementation should proceed without delay.

The Zambia-DRC 220kV Power Line Interconnection Project is a cross-border project being undertaken jointly by CEC (on the Zambian side) and a utility called SNEL (on the DRC side) for the purpose of enhancing the capacity of the existing Interconnection between the two countries from 210MW to 500MW.

We trust ECZ’s confirmation that CEC can proceed with project implementation will be forthcoming as soon as possible.

Yours faithfully,

Neil Croucher
Managing Director