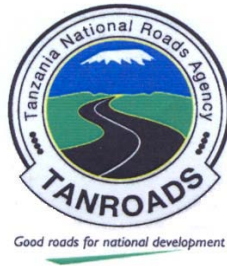


**United Republic of Tanzania**  
**Ministry of Works, Transport, and Communication**



**Tanzania National Roads Agency (TANROADS)**

Third Floor, Airtel House, Ali Hassan Mwinyi/ Kawawa Roads Junction, P. O. Box 11364,  
Dar es Salaam, Tanzania, Tel: +255 22 2926001/6, Fax: +255 22 2926011,  
E-mail: [tanroadshq@tanroads.go.tz](mailto:tanroadshq@tanroads.go.tz)

**Revised Environmental and Social Impact Assessment Report  
for the Proposed Upgrading of Nyakanazi - Kasulu –  
Manyovu Road [Kabingo – Kasulu Road Section and  
Kibondo Bypass Road (202km)] to Bitumen Standard in  
Kasulu, Kibondo, and Kakonko Districts, Kigoma Region**

**Project Location:**

Kasulu, Kibondo, and Kakonko Districts, Kigoma Region

**ESIA Review Experts:**

Eng. Phillip Jacob Mbuligwe, P. O. Box 36243,  
Dar es salaam , e-mail: [pmbuligwe@yahoo.com](mailto:pmbuligwe@yahoo.com),  
Tel: +255-787412970,

Annastella Kaijage, P. O. Box 9620, Dar es  
salaam

Tel: +255-7675038,

e-mail: [saidamwema12@gmail.com](mailto:saidamwema12@gmail.com)

**Date of submission:**

26<sup>th</sup> May 2018

## **ACKNOWLEDGMENT**

The ESIA Experts wishes to extend their appreciation to different institutions, statutory bodies, and individuals whose assistance made this assignment possible.

We wish to appreciate the assistance given to us by the project proponent, TANROADS through Regional Manager for Kigoma, Eng. Narcis S. Ngurowe, especially by providing us with useful kick off guidance to carry out this study.

We are also very grateful for the cooperation we received from the Executive Directors for Kasulu, Kibondo, and Kakonko District Councils while soliciting permission to meet and discuss matters pertaining to the project with his executives, as it made our consultation easier.



We appreciate the support we received from Mr Aloyce Mganga and Mr. Innocent Mutagwaba Christopher Msilombo (Senior Managers for Moyowosi and Kigosi Game Reserves), and Donald Silas (Kasulu District Manager for Tanzania Forestry Services Agency), as through them we were able to obtain all the available data and information pertaining to wildlife and forestry protected areas.

We are thankful to the village chairmen and executive officers for their tireless assistance, especially in organizing consultative meetings.

Lastly, the ESIA experts would like to thank all those who, in a way or another contributed their efforts to make this work successful.

## **DECLARATION**

The Review of this Environmental and Social Impact Assessment report has been done by:

<b>Name</b>	<b>Profession/ Responsibility</b>	<b>Signature</b>
<b>Eng. Phillip Jacob Mbuligwe</b>	Environmental Engineering and Sustainable Infrastructures - Responsible for Environmental and Social Impact Assessment	
<b>Anna Stella Kaijage</b>	Sociologist - Responsible for Social Impact Assessment and preparation of Resettlement Action Plan	

# TABLE OF CONTENTS

<b>ACKNOWLEDGMENT .....</b>	<b>I</b>
<b>DECLARATION .....</b>	<b>II</b>
<b>LIST ABBREVIATIONS.....</b>	<b>XIII</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>XVI</b>
<b>LIST OF FIGURES .....</b>	<b>XXXI</b>
<b>LIST OF TABLES .....</b>	<b>XXXII</b>
<b>LIST OF PHOTOS .....</b>	<b>XXXIV</b>
<b>SECTION 1: INTRODUCTION.....</b>	<b>1</b>
<b>1.1 BACKGROUND INFORMATION .....</b>	<b>1</b>
<b>1.2 OBJECTIVES OF THE ESIA STUDY .....</b>	<b>2</b>
<b>1.3 APPROACH AND METHODOLOGY .....</b>	<b>3</b>
1.3.1 Approach.....	3
1.3.2 Methodology.....	3
<b>1.7 REPORT STRUCTURE.....</b>	<b>6</b>
<b>SECTION 2: POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK .....</b>	<b>7</b>
<b>2.1 POLICIES AND STRATEGIES .....</b>	<b>7</b>
2.1.1 National Environmental Policy, 1997 .....	7
2.1.2 National Policy on HIV/AIDS, 2001.....	7
2.1.3 National Human Settlements Development Policy, 2000.....	8
2.1.4 National Land Policy, 1995 (Revised in 1997) .....	9
2.1.5 National Water Policy, 2002 .....	9
2.1.6 National Forest Policy, 1998.....	9
2.1.7 National Gender Policy, (1992), Revised in 2002 .....	10
2.1.8 National Transport Policy, 2003.....	10
2.1.9 National Strategy for Growth and Reduction of Poverty, 2003.....	10
2.1.10 Tanzania`s Property and Business Formalization Programme, 2004 .....	11
2.1.11 Energy Policy of Tanzania (1992).....	11

2.1.12 Agricultural and Livestock Policy (1997) .....	12
2.1.13 Tanzania Wildlife Policy, (2009) .....	12
2.1.14 Mineral Policy of 1998: .....	14
2.1.15 African Development Bank Groups Policy on the Environment Policy, 2004 .....	14
2.1.16 African Development Banks Involuntary Resettlement, 2003 .....	15
<b>2.2 LEGAL FRAMEWORK - ACTS .....</b>	<b>16</b>
2.2.1 The Constitution of Tanzania .....	16
2.2.2 Environmental Management Act No 20, 2004 .....	16
2.2.3 Water Resources Management Act, 2009 .....	17
2.2.4 Land Act Cap. 114 (No. 4), 2004 (amendment of Land Act 1999) .....	17
2.2.5 Village Land Act Cap. 114 (No. 5), 1999 .....	18
2.2.6 Land Acquisition Act 1967 (Revised Edition, 2002) .....	18
2.2.7 Occupational Health and safety Act No. 5 of 2003 .....	19
2.2.8 HIV and AIDS (Prevention and Control) Act, 2008 .....	20
2.2.9 Road Act No. 13, 2007 .....	20
2.2.10 Grave (Removal) Act No. 9 of 1969 (Revised Edition, 2002, Cap 72) .....	21
2.2.11 Employment and Labour Relations Act, 2004 .....	22
2.2.12 Public Health Act No 1, 2009 .....	23
2.2.13 Workers Compensation Act No 20, 2008 .....	23
2.2.14 Occupier's Liability Act No 54, 1968 .....	24
2.2.15 Forest Act No. 14, 2002 .....	24
2.2.16 Wildlife Conservation Act, 2009 .....	25
2.2.17 Explosives Act (Cap 45) No. 56, (Revised Edition 2002) .....	25
2.2.18 Land Use Planning Act No 6, 2007 .....	25
2.2.19 Mining Act No 14, 2010 .....	26
2.2.20 Antiquities Act No 22, 1964 (Revised Edition: 2002) .....	27
2.2.21 Atomic Energy Act No 7, 2003 .....	27
2.2.22 Industrial and Consumer Chemicals (Management and Control) Act, 2003 .....	27
2.2.23 Contractors Registration Act No 17, 1997 (Revised Edition 2007) .....	28
2.2.24 Engineers Registration Act No 15, 1997 (Revised Edition 2007) .....	28
2.2.25 Architects and Quantity Surveyors Act No 16, 1997 (Revised Edition 2010) .....	28
<b>2.3 LEGAL FRAMEWORK - REGULATIONS .....</b>	<b>29</b>
2.3.1 Environmental Impact Assessment and Audit Regulations, 2005 .....	29
2.3.2 Road Management Regulations, 2009 .....	29
2.3.3 Hazardous Waste Regulations, 2009 .....	29
2.3.4 Land (Compensation Claims) Regulations, 2001 .....	29
2.3.5 Land (Assessment of the Value of Land for Compensation) Regulations, 2001 .....	30
2.3.6 Mining (Safety, Occupational Health & Environment Protection) Regulations, 2010 ....	31
2.3.7 Solid Waste Regulations, 2009 .....	32
2.3.8 Atomic Energy (Protection from Ionizing Radiation) Regulations, 2004 .....	32

2.3.9 Factories (Building Operations and Works of Engineering Construction) Rules, 1985	34
2.3.10 Government Notice No. 196 of July 2013	34
2.3.11 Non-Citizens (Employment Regulations), 2015	35
<b>2.4 ENVIRONMENTAL MANAGEMENT GUIDELINES</b>	<b>35</b>
2.4.1 Environmental Assessment and Management Guidelines for Road Sector, 2011	35
2.4.2 Environmental Code of Practice for Road Works, 2008	36
2.4.3 The Road Sector Compensation and Resettlement Guidelines, 2009	36
2.4.4 Environmental Impact Assessment (EIA) procedures (March 2002)	37
2.4.5 AfDB Environmental and Social Impact Assessment Procedures	37
<b>2.5 CONVENTION, TREATIES, AND PROTOCOLS</b>	<b>37</b>
2.5.1 East African Community Treaty, 1999	37
2.5.2 Protocol on Environmental and Natural Resource Management, 2005	38
2.5.3 International Convention on Biological Diversity	40
2.5.4 The World Heritage Convention	40
2.5.5 ILO Conventions on Occupational Safety and Health	40
<b>2.6 INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK</b>	<b>41</b>
2.6.1 Government Agencies Responsible for Environmental Issues	41
2.6.2 Regional and District Administrative Structures	43
2.6.3 African Development Bank	44
<b>SECTION 3: DESCRIPTION OF PROJECT AND JUSTIFICATION</b>	<b>45</b>
<b>3.1 PROJECT BACKGROUND</b>	<b>45</b>
3.1.1 Project Justification	45
3.1.2 Project Location	46
<b>3.2 DESIGN CONCEPT</b>	<b>50</b>
<b>3.3 PROJECT ACTIVITIES, MATERIALS, WASTES, AND EQUIPMENT</b>	<b>52</b>
3.3.1 Mobilization Phase	52
3.3.2 Construction Phase	55
3.3.3 Demobilization Phase	61
3.3.4 Operation and Maintenance Phase	62
3.3.5 Project activities from Mobilization to decommissioning phase	63
3.3.6 Potential Sources of Naturally-occurring Construction Materials	64
3.3.7 Materials that will be imported	65

<b>3.4 STAFFING AND SUPPORT .....</b>	<b>66</b>
<b>3.5 REQUIRED OFF SITE INVESTMENT .....</b>	<b>66</b>
3.5.1 Power Source .....	66
3.5.2 Water Supply .....	66
2.5.3 Diversions and Access Roads .....	67
2.5.4 Other Facilities Required .....	67
<b>3.6 LAND REQUIREMENT .....</b>	<b>67</b>
<b>SECTION 4: BASELINE CONDITIONS .....</b>	<b>68</b>
<b>4.1 PROJECT BOUNDARIES .....</b>	<b>68</b>
4.1.1 Spatial Boundaries of the study area .....	68
4.1.2 Temporal Boundaries .....	68
4.1.3 Institutional Boundaries .....	68
4.1.4 Administrative Boundaries .....	69
<b>4.2 PHYSICAL ENVIRONMENT .....</b>	<b>69</b>
4.2.1 Topography .....	69
4.2.2 Climate .....	71
4.2.3 Geology and Soils .....	71
4.2.4 Water Resources and Hydrology .....	72
4.2.5 Road Side Air Quality .....	82
4.2.6 Noise and Vibrations .....	86
4.2.7 Scenic and Visual Impacts .....	86
4.2.8 Road Conditions and Safety .....	87
4.2.9 Natural Disaster .....	88
<b>4.3 HUMAN ENVIRONMENT .....</b>	<b>88</b>
4.3.1 Population .....	88
4.3.2 Gender Issues .....	89
4.3.3 Health and HIV/AIDS .....	90
<b>4.4 CULTURAL ENVIRONMENT .....</b>	<b>91</b>
4.4.1 Family Structure .....	91
4.4.2 Ethnicity .....	91
4.4.3 Religion .....	92
4.4.4 Cultural Sites .....	92
4.4.5 Archaeological, Historical or Heritage .....	92

<b>4.5 ECONOMIC ENVIRONMENT.....</b>	<b>92</b>
Source of Income for the Family Members.....	92
<b>4.6 INFRASTRUCTURE AND SOCIAL SERVICES .....</b>	<b>92</b>
4.6.1 Energy.....	92
4.6.2 Water Supply.....	93
4.6.3 Travel and Transport .....	95
4.6.4 Education Services.....	96
4.6.5 Health Services .....	97
4.6.6 Fibre Optic Cable .....	98
4.6.7 Waste Management .....	98
<b>4.7 LAND USE AND OWNERSHIP PATTERNS .....</b>	<b>98</b>
4.7.1 Land Use.....	98
4.7.2 Land Ownership and Tenure .....	99
4.7.4 Housing.....	99
<b>4.8 BIOLOGICAL ENVIRONMENT.....</b>	<b>100</b>
4.8.1 Flora .....	100
4.8.2 Fauna .....	103
4.8.3 Fish and Aquatic Habitats.....	103
4.8.4 Protected, Ecologically Sensitive Area, Rare and endangered Species .....	103
<b>4.9 ENVIRONMENTAL PROBLEMS .....</b>	<b>104</b>
4.9.1 Unreinstated borrow pits along the road.....	105
4.9.2 Farming Along and Across Water Course .....	105
4.9.3 Grazing in Wildlife and Forestry Protected Areas .....	106
4.9.4 Borrowing of Materials from Forestry Protected Areas .....	106
4.9.5 Bush fire .....	106
4.9.6 Clearing of Forest.....	106
4.9.7 High water table .....	106
<b>4.10 OTHER DEVELOPMENT PROGRAMMES.....</b>	<b>106</b>
<b>SECTION 5: PRESENTATION OF ALTERNATIVES CONSIDERED.....</b>	<b>107</b>
<b>5.1 NO GO, ZERO OR BASE (ALT0) ALTERNATIVE.....</b>	<b>107</b>
<b>5.2 DESIGN ALTERNATIVES .....</b>	<b>108</b>



## **SECTION 6: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS ..... 109**

### **6.1 INTRODUCTION..... 109**

6.1.1 Direct Impact .....	109
6.1.2 Indirect Impacts .....	109
6.1.3 Cumulative Impacts .....	110
6.1.4 Residual Impacts .....	110

### **6.2 MOBILIZATION PHASE ..... 111**

6.2.1 Creation of Employment .....	111
6.2.2 Loss of Vegetation.....	111
6.2.3 Deterioration of Scenic and Visual Quality.....	111
6.2.4 Generation of Noise and Vibrations .....	112
6.2.5 Deterioration of Ambient Air Quality by Dust .....	112
6.2.6 Risk of Road Traffic Accidents.....	112
6.2.7 Soil Erosion .....	112
6.2.8 Triggering of Child Labour .....	112

### **6.3 CONSTRUCTION PHASE..... 113**

6.3.1 Creation of Employment .....	113
6.3.2 Extraction, Processing, and Delivery of naturally-occurring Construction Materials....	113
6.3.3 General Earthworks during Road and Culverts Construction.....	116
6.3.4 Construction of Cross Drainage Structures .....	122
6.3.5 Construction of Roadside drainage Systems .....	123
6.3.6 Concrete Works and Construction of Cement-stabilized Layers.....	124
6.3.7 Construction of Road Pavement.....	125
6.3.8 Operations of a Construction Camp .....	126
6.3.9 Marital and Social Conflicts .....	127
6.3.10 Increase in unwanted Pregnancies.....	127
6.3.11 Poaching of Wildlife by Construction Workers .....	127
6.3.12 Triggering of Child Labour and School Dropout.....	127
6.3.13 Occupational Health and Safety Hazards .....	127

### **6.4 DEMOBILIZATION PHASE ..... 130**

6.4.1 Generation of Solid Wastes .....	130
6.4.2 Deterioration of Ambient air Quality .....	130
6.4.3 Loss of Employment and Economic Activities at the End of the Project .....	130

### **6.5 OPERATION AND MAINTENANCE PHASE..... 130**

6.5.1 Positive Impacts .....	130
------------------------------	-----

6.5.2 Negative Impacts.....	135
<b>6.6 CUMULATIVE IMPACTS .....</b>	<b>141</b>
6.6.1 Creation of Employment .....	141
6.6.2 Deterioration of Ambient Air Quality .....	141
6.6.3 Transportation Related Issues.....	141
6.6.4 Borrowing of Materials.....	141
6.6.5 Pollution of water courses .....	142
<b>SECTION 7: MITIGATION MEASURES.....</b>	<b>148</b>
<b>7.1 MOBILIZATION PHASE .....</b>	<b>148</b>
7.1.1 Creation of Employment .....	148
7.1.2 Loss of Vegetation.....	148
7.1.3 Deterioration of Scenic and Visual Quality.....	148
7.1.4 Generation of Noise and Vibrations.....	149
7.1.5 Deterioration of Ambient Air Quality by Dust .....	149
7.1.6 Risk of Road Traffic Accidents.....	149
7.1.6 Soil Erosion .....	149
7.1.7 Trigger of Child Labour .....	149
<b>7.2 CONSTRUCTION PHASE.....</b>	<b>150</b>
7.2.1 Creation of Employment .....	150
7.2.2 Extraction, Processing, and Delivery of naturally-occurring Construction Materials....	150
7.2.3 General Earthworks in Road and Culverts Construction.....	153
7.2.4 Construction of Cross Drainage Structures .....	159
7.2.5 Construction of Roadside drainage Systems.....	160
7.2.6 Concrete Works and Construction of Cement-stabilized Layers.....	161
7.2.7 Construction of Road Pavement.....	162
7.2.8 Operations of a Construction Camp .....	163
7.2.9 Marital and Social Conflicts .....	165
7.2.10 Increase in unwanted Pregnancies.....	165
7.2.11 Poaching of Wildlife by Construction Workers .....	165
7.2.12 Triggering of Child Labour and School Dropouts.....	165
7.2.13 Occupational Health and Safety Hazards .....	165
<b>7.3 DEMOBILIZATION PHASE .....</b>	<b>169</b>
7.3.1 Generation of Solid Wastes .....	169
7.3.2 Deterioration of Ambient air Quality .....	169
7.3.3 Loss of Employment and Economic Activities at the End of the Project .....	169

## **7.4 OPERATION AND MAINTENANCE PHASE..... 170**

7.4.1 Positive Impacts .....170

7.4.2 Negative Impacts.....171

## **SECTION 8: EXPECTED RESIDUAL EFFECTS AND ENVIRONMENTAL HAZARD MANAGEMENT ..... 174**

### **8.1 RESIDUAL IMPACTS ..... 174**

8.1.1 Generation of Noise and Vibrations .....174

8.1.2 Deterioration of Ambient Air Quality by Dust .....174

8.1.3 Deterioration of Ambient Air Quality by Bituminous Fumes .....175

8.1.4 Loss of Vegetation.....175

8.1.5 Loss of Land and other Properties.....175

8.1.6 Road Traffic Congestion.....176

8.1.7 Soil Erosion .....176

8.1.8 Surface Water and Soil Pollution .....176

8.1.9 Disruption/Destruction of Public Utilities and Services.....176

8.1.10 Accidents Involving Community Members .....177

8.1.11 Accidents on open trench or borrow pits involving Livestock and Wild Animals .....177

8.1.12 Un-met Employment Expectations .....177

8.1.13 Tension between Communities, Workers and the Project .....178

8.1.14 Transmission of STIs/HIV .....178

8.1.15 Grievance over Land and Properties Compensation .....178

8.1.16 Additional Cash Injected into Communities .....179

8.1.17 Wide Distribution of Economic Benefits .....179

8.1.18 Enhanced local experience and Employability.....179

8.1.19 Economic benefit of indirect employment opportunities.....179

8.1.20 Access to new culture and international attitudes.....180

8.1.21 Complaints procedure .....180

8.1.22 Wildlife Road Kills.....180

8.1.23 Fragmentation of Settlements and impaired safety of pedestrians .....180

### **8.2 ENVIRONMENTAL HAZARD MANAGEMENT AND CONTINGENCY PLAN..... 180**

8.2.1 Purpose and Scope .....181

8.2.2 Emergency Response Team .....181

8.2.3 Emergency Response Team during Construction .....181

8.2.4 Incident Notification .....181

8.2.5 Emergency Communication Procedure .....182

8.2.6 Emergency Response Procedure.....184

8.2.7 Emergency Preparedness .....186

<b>SECTION 9: ENVIRONMENTAL MONITORING PLAN.....</b>	<b>188</b>
<b>9.1 MONITORING PLAN.....</b>	<b>188</b>
9.1.1 Modes of Monitoring.....	188
9.1.2 Baseline Data Collection .....	188
<b>9.2 MONITORING OF ENVIRONMENTAL AND SOCIAL PARAMETERS .....</b>	<b>189</b>
<b>9.3 DETAILS ON MONITORING FOR POLLUTION OF SURFACE WATER.....</b>	<b>204</b>
<b>9.4 RESPONSIBILITIES FOR MONITORING IMPLEMENTATION OF ESMP .....</b>	<b>204</b>
<b>SECTION 10: SUMMARY OF PUBLIC CONSULTATIONS AND OPINION EXPRESSED .....</b>	<b>206</b>
<b>10.1 PROJECT STAKEHOLDERS .....</b>	<b>206</b>
<b>10.2 HOW STAKEHOLDERS WERE INVOLVED .....</b>	<b>207</b>
<b>10.4 RESULTS OF STAKEHOLDERS CONSULTATION .....</b>	<b>210</b>
10.4.1 Consultation with Statuary Bodies and Institutions .....	210
10.4.2 Consultation with Communities along the Project.....	216
<b>10.5 STAKEHOLDERS CONCERNS AND HOW THEY HAVE BEEN ADDRESSED.....</b>	<b>226</b>
<b>SECTION 11: CONCLUSION AND RECOMMENDATIONS.....</b>	<b>232</b>
<b>11.1 CONCLUSION .....</b>	<b>232</b>
<b>11.2 RECOMMENDATIONS .....</b>	<b>232</b>
11.2.1 Compensation .....	232
11.2.2 Coordination and Information Sharing .....	233
11.2.3 Acquisition of Land and Properties outside the Old 45m RoW .....	233
<b>REFERENCES.....</b>	<b>234</b>
<b>APPENDICES.....</b>	<b>- 236 -</b>
<b>APPENDIX I: PHOTOGRAPHS.....</b>	<b>- 237 -</b>

---

<b>APPENDIX II: MINUTES OF CONSULTATIVE MEETINGS .....</b>	<b>- 251 -</b>
<b>APPENDIX III: LOCATION OF THE PROJECT ROAD .....</b>	<b>- 252 -</b>

---

## LIST ABBREVIATIONS

AADT:	Annual Average Daily Count
ACD:	Allergic Contact Dermatitis
AI:	Area of Influence
AfDB:	African Development Bank
AQRB:	Architects and Quantity Surveyors Registration Board
BOQ:	Bill Of Quantities
CBD:	Convention on Biological Diversity
CoI:	Corridor of Impact
CRB:	Contractors Registration Board
DRC:	Democratic Republic of Congo
DED:	District Executive Director
DEMO:	District Environmental Management Officer
DIZ:	Direct Impact Zone
DoE:	Director of Environment
DP:	Domestic Point
DWE:	District Water Engineer
EAC:	East Africa Community
ESIA:	Environmental and Social Impact Assessment
EMA:	Environmental Management Act
ERB:	Engineers Registration Board
E & S:	Environmental and Social
ESMP:	Environmental and Social Management Plan
ESS	Environmental and Social Specialist
GHGs:	Green House Gases
H & S:	Health and Safety
HIV/AIDS:	Human Infected Virus/Acquired Immunity Deficiency Syndrome
ICD:	Irritant Contact Dermatitis
IEE:	Initial Environmental Examination
IRR:	Internal Rate of Return

LEA:	Limited Environmental Analysis
LHS:	Left Hand Side
ASL:	Above Sea Level
MCST	Ministry of Communication Science and Technology
MKURABITA	Mpango wa Kurasimisha Rasilimali na Biashara za wanyonge Tanzania
MSHA:	Mine Safety and Health Administration
MoWTC:	Ministry of Works, Communication, and Transport
NACP:	National AIDS Control Programme
NEMC:	National Environment Management Council
NEP:	National Environment Policy
NGO:	Non-Governmental Organization
NICTBB:	National ICT Broadband Backbone
NIOSH:	National Institute for Occupational Safety and Health
NO <sub>2</sub> :	Nitrogen Dioxide
NPRS:	National Poverty Reduction Strategy
OPC:	Ordinary Portland Cement
PAPs:	Project Affected Parties
PEL:	Permissible Exposure Limit
PORALG:	President’s Office Regional Administration and Local Government
PLHAs:	People Living with HIV & AIDs
PTR:	Pneumatic Tired Roller
PVC:	Poly Vinyl Chloride (hard plastic)
RAP:	Resettlement Action Plan
REDESO:	Relief for Development Society
RHS:	Right Hand Side
RoW:	Right of Way
RS-ES:	Road Sector Environment Section
SO <sub>2</sub> :	Sulphur Dioxide
STIs:	Sexually Transmitted Infections
SSESMP:	Site Specific Environmental and Social Management Plan

---

SSHSMF:	Site Specific Health and Safety Management Plan
TACAIDS:	Tanzania Commission for AIDS
TANESCO:	Tanzania Electricity Supply Company
TANROADS:	Tanzania National Roads Agency
TOC:	Take Over Certificate
TPBP:	Tanzania`s Property and Business Formalization Programme
TSS:	Total Suspended Solids
TTCL:	Tanzania Telecommunication Company Ltd
TZS:	Tanzanian Shilling (Currency)
UNEP:	United Nations Environment Programme
UNESCO:	United Nations Education, Scientific and Cultural Organization
URTI:	Upper Respiratory Tract Infection
VCT:	Voluntary Counselling and Testing
WHO-GPA:	World Health Organization Global Programme on AIDS



## EXECUTIVE SUMMARY

# Revised Environmental and Social Impact Assessment Report for the Proposed Upgrading of Nyakanazi - Kasulu – Manyovu Road [Kabingo – Kasulu Road Section and Kibondo Bypass Roads (202km)] to Bitumen Standard in Kasulu, Kibondo, and Kakonko Districts, Kigoma Region

- Project Name:** Multinational: Tanzania/ Burundi: Nyakanazi – Kasulu – Manyovu/ Rumonge – Rutunga – Bujumbura Road: Consultancy Services for Review of the Feasibility Studies and Detailed Designs
- Location:** Kasulu, Kibondo, and Kakonko Districts in Kigoma Region
- Proponent:** TANROADS, Third Floor, Airtel House, Ali Hassan Mwinyi/ Kawawa Roads Junction, P. O. Box 11364, Dar es Salaam,. Tel: +255 22 2626001/6, Fax: +255 22 2926011, E-mail: tanroadshq@tanroads.go.tz
- ESIA Experts:** (i) Eng. Phillip Jacob MBULIGWE, P. O. Box 36243, Dar es salaam, email: pmbuligwe@yahoo.com, Telephone: +255-787412970  
(ii) Annastella KAIJAGE, e-mail: saidamwema12@gmail.com, Telephone: +255-7675038

## PROJECT BACKGROUND AND JUSTIFICATION

The Government of the United Republic of Tanzania with the assistance from African Development Bank intends to upgrade the existing multinational Kasulu – Nyakanazi earth/ gravel road (202km) to bitumen standard. In addition, the government intends to construct two by pass roads at Kasulu and Kibondo.

The project is being implemented by East Africa Community (EAC) through Tanzania Roads Agency. EAC has engaged EGIS International to review the design of the road which was done in 2010 to ensure their correctness and completeness.

This document therefore presents a revised Environmental and Social Impact Assessment (ESIA) for Nyakanazi– Kasulu road section, covering only Kabingo – Kasulu road section and Kasulu and Kibondo bypass roads.

The ESIA for this road section was conducted back in 2010. The objective of this ESIA review was to exhaustively predict and forestall potential environmental and social impacts and propose mitigation measures to lessen any impacts to the environment and indigenous people in project's area of influence that may arise from rehabilitation of the road. This is to ensure that the project delivers minimum disruption to the environment.

The proposed road upgrading will:

- Facilitate more efficient transportation of agricultural products from the project area to markets in the areas of consumption
- Facilitate/ increase tourism activities within the project areas as well as adjoining areas
- Reduce maintenance costs of the road
- Reduce Vehicles Operating Costs
- Improve access to social services such as markets and health services
- Improve the management and transport of tourists to Gombe National Park, Moyowosi Game Reserve and Makere forest reserves
- Complement the on-going effort by the government to upgrade Kidahwe – Kasulu road section (50km) and Kasulu – Manyovu road sections (48km) to bitumen standard.
- Form an important link between Tanzania, Burundi, Rwanda, and DRC for imports and exports of goods

## **DESCRIPTION OF THE PROPOSED PROJECT**

The proposed project is located in Kasulu, Kibondo, and Kakonko Districts in Kigoma region in the western zone of Tanzania.

The project road for which this ESIA review is being conducted consists of the following section:

- The main Kasulu – Kibondo – Kabingo Section which starts off at Kasulu T-junction; the point where Kibondo – Kasulu road links with Kasulu – Manyovu and Kasulu – Kigoma and ends at Kabingo Village, about 50km from Nyakanazi towards Kibondo
- Kibondo bypass section, which starts off at Nduta junction (Maloregwa village), through Nduta refugee camp, Nengo village before joining the main alignment at Kilemba village.

The road upgrading will constitute widening, realignment and paving of the existing earth/gravel road surface by double Asphalt Concrete. A total of eleven (11) bridges, sixty six boc culverts, and one hundred eighty six (186) pipe culverts will be constructed. The road upgrading will also involve improving safety on various sections of the road with infringed sight distance which are prone to accidents. The road upgrading will also involve construction of lined and non-lined side ditches/drains as required.

## **PROJECT STAKEHOLDERS AND THEIR INVOLVEMENT**

### **Project Stakeholders**

The key environmental assessment and monitoring agencies in this project include the following stakeholders:

- African Development Bank – has shown interest to finance the project and therefore donor of the project
- East Africa Community
- Ministry of Works, Transport, and Communication - Road Sector Environment Section (RS-ES) under the Ministry oversees management of environment within the road sector and the preparation/implementation of ESIA required in the road sector

- Ministry of Natural Resources and Tourism
- Tanzania National Roads Agency - is responsible for the day to day management of trunk and regional roads network and will assist EAC in the implementation of the project
- National Environment Management Council - has the overall responsibility of undertaking enforcement, compliance, review and monitoring of ESIA and in this regards facilitates public participation in environmental decision making
- Vice President's Office - Minister responsible for environment - the Minister is responsible for the approval of ESIA
- Kasulu, Kasulu, and Kakonko District Councils - are responsible to promote environmental awareness in the district related to the protection of the environment and the conservation of natural resources

### **Involvement of Stakeholders**

Consultation with statutory bodies and institutions were made through direct personal interviews, while the public was consulted through public meetings which were conducted at selected villages. The main objectives of community consultations were to:

- Present the project
- Provide clear and accurate information about the project to the communities along the proposed road
- Obtain main concerns and perceptions of the population and their representatives regarding the road;
- To obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures

### **Results of Public Consultation**

Although the consulted stakeholders are in favour of the proposed project and had the following concerns:

- The project will create direct and indirect employment to the local people. During recruitment of workers, especially unskilled and semi-skilled labour, priority should be given to the local people. Job opportunities should be announced through village government to avoid child labour/ and increased school drop outs. This will ensure fairness and avoid unnecessary complaints from village because of favouritism tendency by government leaders
- Upgrading of the road will cause increased agricultural production and productivity because of improved access to better prices for agricultural inputs as well as improved access to markets and better prices agricultural produce
- Upgrading of the road will cause opening of business opportunities that are now hindered by the poor road
- Upgrading of the road will improve access to social services such as health and market services
- Upgrading of the road will improve access to forest reserve and so increase the rate of their illegal harvesting

- 
- Upgrading of the road will reduce travel time and costs to the local people
  - Road upgrading will improve administration of the project area by the government
  - Upgrading of the road will boost tourism due to reduced travel time
  - Upgrading of the road will improve management of wildlife and forestry protected area owing to improved mobility
  - Upgrading of the road will raise household income and standard of living as the number of buyers and so price of agricultural produce will increase
  - Upgrading of the road will improve ambient air quality because of reduced dust generation
  - Employment of construction workers should not be gender biased
  - Upgrading of the road will simplify transport; making it possible to transport commodities not produced outside Kigoma
  - Upgrading of the road will attract investors to invest their capital, technology and skills in Kigoma region
  - Major sources of domestic water supply to villages along the project road are pipe water from gravity schemes, boreholes with hand pumps, open traditional wells, and rivers. Some of these water supply utilities, in particular domestic points, main and distribution pipe lines, and boreholes either cross or are located very close to the road. There therefore likely to be disrupted by road construction activities. To mitigate the impact, the Contractor should work careful so as avoid damaging the utilities. Utilities that will be damaged by construction activities should be compensated by the project accordingly
  - The project road passes along Moyowosi game, Makere forest reserve and several village forestry protected areas. Under any circumstance, the Contractor should not set a camp in the wildlife and forestry protected areas and the contractor should not borrow construction materials from the protected areas without written permit from authorities entrusted to manage the protected areas.
  - The road upgrading will cause displacement and loss of public and private properties in the form of buildings and farmland along the road. Construction activities should be done in a manner that minimizes impacts to government and private properties.
  - The project should consider constructing community centres as a part of co-operate responsibility.
  - Construction activities will cause air pollution due to generation of dusts. Stone crushing plants should be located away from settlements. Other impacts will include soil erosion due to clearing of vegetation, water pollution due by sedimentation, destruction of habitats. It is recommended that district councils should involve during material source investigation.
  - Construction activities are likely to trigger child labour
  - Construction activities will increase the spread of sexually transmitted diseases such as HIV/ AIDS. To mitigate the impact, the project should plan and implement HIV alleviation interventions
-

- The project road passes along several village forest reserves. Nearly every village along the project road has a forest reserve. Widening and realignment of the road will cause clearing of trees
- Material borrow areas should be reinstated by the contractor immediately after their use by planting trees or improve to a safe state for harvesting rainwater.
- Construction activities are likely to cause accidents and occupational diseases
- Construction activities, in particular construction of fill embankments are likely to cause change in hydrological regime
- Upgrading of the road is likely to increase traffic accidents involving pedestrians and vehicles, especially at village centres because people are not familiar with road signs.
- The road project is likely to cause family instability because project workers tend to seduce local women for sex
- Communities are worried that compensation is not likely to be fair.
- Compensation exercise should be done in a participatory manner where all family members are aware of their entitlements of the affected properties in order to avoid misuse of the money and family conflicts
- Adequate time should be given for the PAPs for relocation
- There was a concern on the indecisive tendency by the government whereby people are informed of the project but the project takes very long to get implemented. This has retarded of people residing along the project as they find it difficult to improve their structures or expand their businesses. They can't also plant crops in their field. The communities are keen to know when the project will be implemented.
- Villagers requested the government to consider compensation of properties within 45m RoW
- Villagers wanted to know when the road construction will commence
- Construction activities will cause noise and air pollution which will affect people's health. Dust might bring new disease including respiratory disease
- Material borrow areas should be selected in such a way that they do not cause cracks to houses due to vibrations
- Wanted to know the timing of compensation – whether compensation will be paid after or before demolition of properties
- Influx of people during construction will overload existing social services. Of particular importance are the already stretched health facilities. In addition HIV/AIDs and diseases will be accelerated. A health centre with a testing facility and ARV should be considered as a mitigation measure.
- Construction activities will increase unplanned and early pregnancy cases, especially to school girls because their lusts they tend to date project workers.
- Villager wanted the road to be realignment in order to avoid destruction of peoples properties
- Subsequent to notice by TANROADS those owners of buildings within the RoW to demolish them, several people obeyed the notice by demolishing the buildings. Villagers

wanted such loyal people to be considered for compensation because they have been loyal to the government.

- Experience has shown that Contractors do not care about people's health. As a result measures are not taken to mitigate dust even if water is available nearby. It was recommended that the Contractors should collaborate with village governments in implementation of the proposed mitigation measures
- People wanted to know the procedure for compensating people whose land will be used for borrowing construction materials such as gravel and stones
- Speed restraining humps should installed at every village centre and along primary schools
- Crime cases are likely to increases in the villages due to in migration by job seekers during the road construction. In addition, improved road will make it easier for robbers and bandits to commit crimes, if precaution measures are not taken.
- Community members are worried about the existing grave yards along the project road that they are likely to be removed.
- To reduce HIV infections contractors should not located camps closer to village settlements. The closer the camp to the communities the higher the interaction between the project workers and the community members and the chances of infection rate increase.
- The Contractors should be told to maintain frequent communication with village government in order to minimize conflicts between project workers with the community
- The fact that project workers will move to the project area without their spouses sex workers are likely to be attracted to the project area to sell their bodies

## DESCRIPTION OF MAJOR SIGNIFICANT IMPACTS AND MITIGATION MEASURES

Creation of Employment: Construction activities will create direct and indirect employment to the local as well as people from other places. Direct employment will be in the form of skilled labourers as well as non-skilled labourers, while indirect employment will include employment of food vendors (especially women) and other small businesses like soft drinks.

Improved ambient Air Quality: During the operation phase of the project, dust generation will be very low. The only source of deterioration of ambient air quality will be emission due to exhaust fumes from traffic.

Improved Hydrology and Drainage: Upgrading of the road, in particular construction of new side and cross drainages structures will improve the drainage of the existing road. Sedimentation of culverts and road side drains will be will be reduced due to provision control devices and cover vegetation. Water stagnation within and on roadsides will be eliminated.

Reduction of vehicle operating Costs: Upgrading of the road to bitumen standard will prevent unnecessary breakdowns of vehicles resulting from corrugations. The bitumen road will enable vehicles to travel at relatively higher, resulting into serving in mileage per litre of fuel and so reduced operating costs.

Reduced Rate of Energy Consumption: Reduced consumption of fuel due to improved road will lead to reduced rate of energy consumption (in the form of fuel) for vehicles operating on the roadway and so serving in national foreign currency spent on imported fuel.



Reduction in Travel Time and Comfort to Passengers: The bitumen road will reduce travel as vehicles will be able to travel faster. The saved travel time could be used for other productive ventures. In addition, the paved road will make travelling comfortable because of the absence of corrugations and the fact that better passenger buses will be plying the routes.

Diversification of the Local Economy: Upgrading of the project road will attract more investors in the project area. The increased investment will bring in more employment opportunities to the local people including diversification of economic activities hence, reduce dependence on agriculture only.

Improved access to social services: The improved road will enable easy access to social services like modern health facilities, market, and schools. In addition, improved road will attract technocrats to service the project area because of reliable transport.

Increased interaction of people drive for social change: The paved road will encourage people from other parts of the country to live in the area. In migrants will come with new ideas into the project area. Such opportunity will create room for social transformation for both groups, share values, and adopt new cultures and diffusion of cultural values suitable for development.

Increased investment: The paved road will attract investors to invest in agriculture and forestry sectors. The investment will have a multiplier effect on the availability of other services such as guest houses, schools and medical services.

Reduced Transport and Transportation Costs: As upgrading of the road will reduce operating costs of bus operators, the costs of transport and transportation between villages along the project road are expected to be substantially low.

Increased household income: The paved road will increase trading activities along the road, thereby increasing the income of households along the road as customers are likely to increase.

Improved Access to Market and Increased Agricultural Production and Productivity: Upgrading of the road will enable local people to find more paying markets outside the area. For this reason they can sell agricultural produce at better prices and increase household income and therefore enable them to afford other basic needs. In addition, upgrading of the road will lead to increase in agricultural production and productivity because farmers will have better access to farm inputs by the local traders.

Improved Management of Wildlife and Forestry Protected Areas: Upgrading of the road will facilitate movements, including quick response to emergencies and combating poaching and illegal harvesting of forest products from Moyowosi and Makere game reserves (that are also a wildlife habitat).

Improvement of Tourism Industry: Upgrading of this road will influence the increase in tourist activities in the road impact area, particularly in Moyowosi game reserve, Gombe National Park, and Makere forest reserve (Nyamroha hunting block).

Improved growth of vegetation due to reduced generation of Dust: Improved air quality due to reduced generation of dust (which is currently causing stunted growth of vegetation) will improve the growth of vegetation because the photosynthesis of vegetation will no longer be impaired by dust.

Improved quality of water courses along and across the Road: The quality of water courses across the road is currently polluted by dust generated by vehicular traffic. Upgrading of the road will be significantly improved water because of reduced generation of dust.

**Improved Connectivity between Tanzania-Burundi-Rwanda for import and Export of Goods:** The road upgrading will trigger economic development between Tanzania, Burundi, Rwanda, and DRC which is presently hindered by poor road network.

**Complementation of other Development Initiatives:** Upgrading of the road will augment the on-going initiatives by the government to upgrade Kidahwe – Kasulu section (50km), Nyakanazi – Kabingo section, and Kasulu – Manyovu (48km) to bitumen standard.

**Loss of Vegetation and Farmland:** This will arise from clearance of land needed for the permanent works (due widening and realignment of existing road) and for temporary use during establishment camps, borrowing of materials, construction of detours or access roads, widening realignment of the existing road, etc. To mitigate the impact, the Contractor shall avoid unnecessary clearing of vegetation, including limiting clearing of vegetation to the corridor of impact. The Contractor shall not borrow materials from forestry, and wildlife protected areas without permit from authorities entrusted to manage the protected areas. In addition, the Owners of farmlands affected by construction works shall be compensated accordingly.

**Soil erosion:** Clearing of vegetation during establishment of camp, construction of diversion and access roads and earthworks will remove and disturb top soil, leaving behind loose, but infertile soil, which is too poor to sustain good plant growth and susceptible to wind and water erosion, especially in hill sections. In addition cuts and fills will be prone to formation of gullies. The impact shall be mitigated by proper design (providing for erosion prevention measures (including grassing and planting of trees) and maintenance during the operation phase of the road.

**Deterioration of ambient air quality:** During mobilization and construction deterioration of ambient air quality will result from generation of dust due increased volume and traffic movement, construction activities (extraction, transport, and stockpiling of materials, and processing of construction materials, earthworks, etc.). Deterioration of air quality will also result from emissions of exhaust and bituminous fumes from construction equipment, and processing and application of bitumen products. The impact shall be mitigated by spraying water on diversion along active construction sites and settlements, covering trucks transporting dusty materials with tarpaulin, and equipping workers with respirators. During operation phase of the road, deterioration of ambient air quality will result from increased traffic emissions from diverted and generated traffic. Mitigation of the impact will requires effort by government to encourage proper maintenance of emission control systems, use of fuel-efficient (low carbon) vehicles, or zero carbon vehicles, and introduction of carbon taxing on diesel engine vehicles.

**Risk of Road Traffic Accidents:** During construction, increased traffic movements and speeds, especially across settlements will increase the risk of traffic accidents. Similarly, during operation increased traffic volume and speeds of the improved road is likely to increase road traffic accidents, including road kills. The impact shall be mitigated by installing speed humps and posting warning signs across and at approaches to accident black spots.

**Deterioration of Visual Scenic Quality:** Earthworks, excavation of borrow pits, clearing of vegetation, and improper disposal of wastes generated by construction activities will deteriorate visual and scenic quality. In addition, cuts of hills and borrow pits, especially if located near settlements will also deteriorate visual and scenic quality.

Dust generation by increased traffic and movement of construction equipment will also impair visual quality. The dust generated will also deteriorate scenic quality due to discolouration of vegetation and buildings along the road.



The impact due to accumulation of material and wastes shall be mitigated by having an environmental friendly waste management plan, while that due borrow pits shall be mitigated by avoidance of locating borrow pits near settlements and reinstating them immediately after their use. The impact due to dust shall be mitigated by suppressing dust generation by among others spraying water on the diversion and other work sites.

Generation of Noise and Vibrations: During construction generation of noise and vibrations will result from borrowing/ processing of materials (e.g. excavation, drilling, and blasting of rocks, crushing of stones), increased traffic volume and movement of equipment during transport of materials, earthworks (including excavation and compaction).

During the operation of the road increased traffic volume from diverted and generated traffic will increase the level of noise and vibrations.

The impact due to increased level of noise and vibrations during construction shall be mitigated by ensuring adequate maintenance of the vehicles, including proper fine tuning of engines, equipping equipment with exhaust mufflers, and avoiding construction works in settlement areas during the night. In addition, construction workers working under severe noise environment shall be equipped with ear plugs. The impact of noise and vibrations during the operation phase of the project cannot be mitigated at the project level.

Risks of accidents to animals and humans: Increased traffic volume and speeds and construction activities during construction are likely to cause accidents to workers and the local people. Unreinstated borrow pits are likely to cause accidents to animals (especially if they are located in wildlife and forestry protected area – Moyowosi game reserve and Makere forest reserve. During operation, traffic accidents, including road accidents are likely to increase due to increased traffic volume and speeds. To mitigate the impact, the Contractors shall not open borrow pits in the wildlife and forestry protected areas without formal permits from authorities entrusted to manage the protected areas. In addition, the maximum depth of borrow pits shall be 3m, all borrow pits shall be kept self-draining to prevent rainwater water ponding, borrow pits shall be reinstated immediately after completion of their use. Accidents during operation of the road shall be mitigated by posting speed limits and installing speed humps with warning signs at settlements.

Impact Related to Stone Quarrying and Crushing: Potential impacts with blasting and crushing of rocks during quarrying will include dust generation, safety (of workers due to fly rocks accidents during blasting), noise and vibrations, explosive detonation effects on people. The impact shall be mitigated by storage of explosives in accordance with the law, marking drilling, and blasting with flags, and limiting blasting between 08:00 hrs and 16:00 hrs.

Displacement and Loss of Properties: Loss of properties (structures and land) and displacement will result from land acquisition to widen and realign the existing road, borrowing of naturally occurring construction materials, and construction of camps. To mitigate the impact, owners of affected properties shall be compensated in accordance with the law.

Disruption of Public Utilities: Domestic water supply utilities consisting of pipe lines and boreholes with hand pumps and fibre optic cable (telecommunications utility) along and across the project road are likely to be disrupted during the road upgrading. To mitigate the impact, the contractors shall work carefully and closely with District Water Engineer and TTCL Manager for Kigoma to establish of locations of these utilities and work carefully to prevent their damage. In addition, service ducts shall be installed across the road to allow crossing and future extension of domestic water supply system.

**Generation of wastes:** Construction activities at the sites and the camps will generate substantial amount and types of wastes: solid wastes such as plastic containers, used tyres, metal parts, plastic and cable, batteries, and liquid wastes such as used motor oil, sanitary wastes, and medical wastes. These wastes if not treated or disposed of properly, they are likely to cause occupational health problems to workers, cause contamination of ground and water resources, and impair scenic quality. To mitigate the impacts, the Contractor shall comply with waste treatment and disposal programme provided in the environmental and management plan of this report.

**Increased Consumption of Energy and Natural Resources:** During construction, increased energy consumption will be in the form of fuel and lubricants for the operation of construction equipment. Increased pressure on natural resources will be due to increased consumption of natural resources in the form of fuel wood and charcoal. The impact shall be mitigated by limiting unnecessary idling of construction equipment and adequately tuning of engines. In addition, under any circumstance the Contractor shall not be allowed to use firewood and charcoal for boiling of bitumen, cooking, and making marker pegs.

**Resources Use Conflict:** This will result from sharing of social services, in particular water resources for domestic and construction works. The use of water in particular seasonal ones for construction works; especially during dry season when their flows are low, will reduce the quantity of water for domestic purposes, and so create conflicts between Contractors and the local communities. The impact shall be mitigated by avoiding sitting camps in the neighbourhood of village settlements and ensuring that camps are furnished with all the necessary social services to minimize interactions of the workers with the local people. In addition, the Contractor shall not use water resources that are used by the local people for domestic purposes.

**Reduction in Rivers Flows:** Abstraction of water from rivers Nyakasanda, Nyamguluma, and Mpemvi for construction works, especially during dry season when their flows are at minimum will deprive of the availability of drinking water for Nyachienda, Busunzu, and Maloregwa villages respectively because they are sources of drinking water for the local people.

**Damages to Graves:** One grave yard has been identified within the road reserve. This grave yard is likely to be damaged by construction activities. To mitigate the impact, the Contractor shall work carefully in order to avoid damages to graves. In case damages cannot be avoided, the affected graves shall be relocated by excavation to a place selected by grave owner.

**Soil and water pollution by concrete slurry, concrete, and sedimentation:** Potential sources of soil pollution are concrete and concrete slurry, fuel, and oil. Soil pollution will impair regeneration of vegetation. Sources of water pollution will consist of wet cement and concrete products, fuel, oil, sediments etc. If wet concrete product, fuel, and oil find their way into rivers they may cause serious damage. Cement contains lime which is very detrimental to plants and fishes. In addition, deposition of concrete and fine sediments into rivers will also affect fish and their habitat. Fuel and oil will reduce dissolved oxygen in rivers.

Water pollution shall be mitigated by preventing entrance of wet cement and concrete products, oil, and fuel into storm water, putting in place concrete slurry control before concreting is started, and diverting of concrete slurry by sandbags, soil, or other materials to grassed area or bare ground.

**Surface Water Flow Modification:** This will be caused by construction of fill embankments during construction of bridges and culverts as well as across flood plains, which will impede or

interfere with natural surface water flow patterns, whereby concentrating flows in the upstream, resulting into flooding, soil erosion, channel modification, and sedimentation of rivers from the vicinity of the road. To mitigate the impact culverts have been designed such that their hydraulic capacities are capable of sustaining possible peak water flows.

Modification of Water Table: While soil excavations can lower water table in the surrounding areas, embankment can raise water table by restricting water flow leading into deterioration of vegetation, increasing susceptibility to erosion, loss of water for (for drinking, agricultural use, and habitat loss. The effect of water table is anticipated across flood plains due to construction of fill embankments. To mitigate the impact, a study of boundaries of floodable zones has been used in the design of cross drainage structures to ensure that they have adequate hydraulic capacities.

Disruption of community access: Construction of road side drain will create barrier for community access to their residence and business areas. The impact shall be mitigated by providing temporary pedestrian crossing across line drain during construction and permanent ones when the road is completed.

Health problems associated with cement and its wet products: Construction activities involving the use of cement will expose workers to upper tract infection due to inhaling cement dust and skin infection due to prolonged contact with cement. Measures to mitigate the impact shall include personal protection (use of appropriate protection gear), safe handling, and storage, control of exposure to the material exposure control, and first aid measures.

Health problems associated with Hydrated Lime: The use of hydrated lime to stabilize naturally occurring materials will expose workers to following health problems: severe irritation or burning of eyes, including permanent damage, skin irritation, severe irritation of gastrointestinal tract if swallowed, severe irritation of the respiratory system if inhaled. Hydrated lime can also be carcinogenic as may contain trace amounts of crystalline silica in the form of quartz or cristobalite. Inhalation of silica can also cause a chronic lung disorder (silicosis). Measures to mitigate the impact include personal protection (use of appropriate protection gear), safe handling, and storage, control of exposure to the material exposure control, and first aid measures. Details of these are included in environmental management plan of this document

Fire and Explosion Risks: Operations of Contractor's camp and other construction activities, which will use flammable liquids (petrol, solvents, etc.) and compressed gases (e.g. oxy-acetylene gases) poses a risk of fire or explosion. To mitigate the impact safe working environment shall be exercised, by maintaining fire extinguishers within easy access of all work areas, and prohibiting smoking in hot work areas

Triggering of child Labour and School Dropouts: Availability of employment from construction activities will tempt school children to abstain from school in search of unskilled job resulting into decline in the quality of education. To mitigate the impact the Contractor shall not employ people under the age of 18 years.

Occupational Health and safety Hazards: Construction activities will expose workers to different chemical health hazards, physical health hazards, and biological health hazards. Physical hazards will include fall from height or being hit by falling object. Chemical health hazards will result from exposure of workers to hazardous construction materials, while physical health hazards will result from general work environment (noise, vibrations, manual handling, fall from height, stepping on or striking against objects, and manual handling injury, and workers being hit by excavating or crane machinery). Biological health hazard will result from drinking unsafe water

and food poisoning, and unsafe disposal of sanitary wastes. To mitigate the impacts, detailed measures have been proposed to prevent physical, chemical, and biological health hazards during construction of the road, which include work practice, personal protection, and hygiene.

Trigger of Child Labour and School Dropouts: This will result from availability of employment by construction activities. To mitigate the impact due to possible child labour and school drop outs, the Contractor shall not employ people the age of 18 years

Increased transmission of HIV/AIDS: During construction, interaction between the immigrant workers and the locals may exacerbate the spread of HIV/AIDS and other sexually transmitted infections. To mitigate the impact, the Contractors shall subcontract NGOs to prepare and implement a HIV/ AIDS awareness campaign.

Increased and unwanted pregnancies: Increased and unwanted pregnancies especially among school girls as project workers could easily entice school girls with money in return for sexual relationships. The impact cannot be mitigated at the project level.

Poaching of wild animals by Construction Workers: Construction workers are likely to be tempted to poach wild animals for meat or trading. To mitigate the impact, the supervising consultant shall create awareness among project workers not be involved in illegal hunting of wildlife.

Facilitation of Poaching and Illegal Logging: Upgrading of the road will facilitate illegal harvesting of wildlife and forestry products because of improved mobility. The impact cannot be mitigated at the project level.

Increased costs of Living: Upgrading of the road is likely to increase prices of cereal crops, which might not be affordable by for some local people. The impact cannot be mitigated at the project level.

Increased Rate of Crime: Upgrading of the road will attract advanced criminals activities as they will be able to move faster, making the life of locals in danger. The impact cannot be mitigated at the project level.

Reduced Economic Activities at the Closure of Project: Closure of the project will make trading activities induced by project activities come to halt, which will affect the livelihood of traders. The impact cannot be mitigated at the project level.

Contribution to Climate Change: Increased traffic volume from diverted and generated traffic will increase the generation of greenhouse gases, the result of which will be increased contribution of greenhouse effect. The impact cannot be mitigated at the project level.

Contribution to Depletion of Ozone Layer: Increased generation of greenhouse gases will increases contribution to depletion of ozone layer. The impact cannot be mitigated at the project level.

Reduced Span of the Road due to Climate Change: Variations of temperatures resulting from global warming are likely to cause bleeding of bitumen and premature failures of hydraulic structures due to cracking. In addition, flooding resulting from global warming may cause serious damage or overtopping of structures. To mitigate the impact, appropriate type of cutback bitumen that that sustains higher temperatures of the project area have been proposed and return period of 50 years have been considered in the design of hydraulic structures.

Wildlife Road kills: Increased traffic speeds across wildlife and forestry protected areas (Moyowosi game reserve and Makere forest reserve) is likely to cause road kills. The impact shall be mitigated by installing speed humps and posting warning signs across and at approaches to the wildlife protected areas.

Pollution of Nengo dams by sedimentation: Improper disposal of spoil or excess material along Nengo dams is likely to cause sedimentation of the dams as a result of transport of the material to the dams by runoff. To mitigate the impact the Contractor shall not be allowed to dispose of spoil or excess material along the project road, but shall do only at areas that have been approved by the engineer. In addition, a catch water drain shall be excavated on the upslope side of the road to direct runoff away from the dams.

Fragmentation of Settlements and Impaired Safety of Pedestrians: Cuts across hills if located at settlements tend to fragment the two sides of the road as they create a barrier. The impacts of cuts are increased travel time for locals to their dwellings and business areas, and increase the risk of road traffic accidents especially to pedestrians. The impact shall be mitigated by installing speed humps and warning signs.

## **ALTERNATIVES CONSIDERED**

Two alternatives have been identified as follows:

No Go, Zero, or Base Alternative: This refers to the alternative of not embarking on the proposed road rehabilitation at all. This alternative would imply that the current status quo without the proposed road construction would continue.

Design Alternatives: Design alternatives have considered pavement options in terms of sub-base, base course, and wearing course. Two pavement improvement options have been considered as follows:

- Alternative 1 (ALT1): Upgrading to AC surface, with paved shoulder, Dense Bituminous Macadam (DBM) base layer, and Cemented Material (CM) sub-base material
- Alternative 2 (ALT2): Upgrading to AC surface, with paved shoulder, Crushed Rock (CRR) base layer, and Cemented Material (C1) sub-base material

## **ENVIRONMENTAL MANAGEMENT PLAN**

Environmental and Social Management Plan (ESMP) intends to set forth “environmental and social conditions” that the project proponent shall adhere to. It aims at ensuring effective implementation of the proposed mitigation measures. The following will be responsible for implementing the ESMP:

### **TANROADS**

TANROADS will be responsible for the overall implementation, administration, and enforcement of the recommendations of the ESIA, including:

- Ensure that the ESMP provisions are included in all tender documents issued for construction work and activities on site and shall monitor/enforce that the Contractors abide by the specifications thereof
- Coordinating the implementation of the ESMP by the contractor



- Provide NEMC with reports on environmental and social compliance as part of their annual progress reports and annual environmental monitoring reports.

### **Supervising Engineer**

The supervising Consultant will be responsible for overall project management. The Consultant will be responsible for ensuring day to day implementation and compliance with the portions of ESMP. The Engineer will ensure that the Contractors provide appropriate training for their staff on ESMP.

### **Contractor**

The contractor will ensure the control and limitations of disturbance to the project site, routes, and its surrounding environment and communities during the construction cycle of the project.

Within 60 days upon notification of contract award, the contractor shall prepare and submit site specific Environmental and Social Management Plan (SSESMP) and Health and Safety Plan (SSHSM). The plan shall describe measures to be followed to protect the environment, public, local communities, workers, and ecological habitat in proximity to the project working areas.

### **National Environment Management Council**

NEMC is the main responsible agency for foreseeing development projects carried out in the United Republic of Tanzania adequately address environmental and social issues during the lifetime of the program. NEMC shall therefore:

- Periodically carry out or assign an independent evaluator to carry out compliance monitoring in cases when claim has been raised from any member of the community, Community Based Organization, or Non-Governmental Organization on the negative aspects of the project. During monitoring, District Environmental Officer shall accompany NEMC or an independent evaluator.
- Have the power to request for compliance report on ESMP and take necessary measures including fines to enforce compliance of the ESMP

## **ENVIRONMENTAL AND SOCIAL MONITORING PLAN**

Environmental and Social Monitoring Plan is an objective, periodical, reliable, and continuing process of observation and assessment of environmental changes. It is intended to ensure implementation of mitigation measures is done the way they have been proposed and in accordance with the regulations and standards. It is therefore based on monitoring indicators, which will have to be compared with targets to gauge the effectiveness of the mitigations plans.

There will be two basic forms of monitoring as follows:

Effects monitoring: This will record the consequences of activities on one or more environmental components. This will involve physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

Measurement Based Inspection: This will involve evaluation of trends in the values of environmental and social parameters systematically measured and collected, to ensure that they are within acceptable legal and technical standards. This will involve collection of samples for analysis. In this, water and air samples will be collected and analysed.

The main tools that will be used for monitoring are checklists, visual examinations, and quantitative measurements of environmental effects monitoring parameters. Written records will be kept detailing the dates that monitoring took place and the findings of the monitoring.

To ensure effective implementation of the mitigations measures, the Engineer shall deploy an Environmental and Social Specialist for regular monitoring and reporting of day to day implementation of ESMP by the Contractor. The Environmental and Social Specialist will also advise the Resident Engineer on measures to take against the Contractor in the event that the Contractor fails to comply with SSHSMP and SSESMP as well as other environmental, social, and health and safety requirements of the Contract.

## **CONCLUSION AND RECOMMENDATIONS**

Upgrading of Kasulu – Kabingo road to bitumen standard is economically and socially viable as it will enhance social and economic integration of the entire western regions of Tanzania, which currently is very difficult to exploit especially during rain seasons due to its poor road.

The project will have both positive and negative impact to the environment and the local communities along it.

Measures have been proposed to enhance impacts which are positive to the environment and the local people. For those impacts that are negative, mitigation measures have been proposed to avoid or abate them to the extent possible for the purpose of maximizing benefits of the road project and minimizing detriments of the project intervention to the communities.

The cost of implementing the proposed mitigation measures is estimated to be TZS 3,261,000,000/= (TZS Three Billion, Two hundred Sixty One Million only)

---

## LIST OF FIGURES

Figure 1: Location of the Project Road in Tanzania .....	47
Figure 2: Location of the Entire Project Road .....	48
Figure 3: Location of Moyowosi/ Kigosi Game Reserve with Respect to the Project Road .....	104



## LIST OF TABLES

Table 1: Locations of Villages along the Project Road Main Aligment .....	49
Table 2: Wastes likely to be generated During Mobilization Phase .....	53
Table 3: Materials required During Construction Phase .....	56
Table 4: Machinery & Equipment Required for Construction Works .....	57
Table 5: Wastes likely to be generated during Construction Phase .....	58
Table 6: Sources of Gravel Materials (Sub-grade and Sub-base layers).....	64
Table 7: Potential Sources of hard stone .....	64
Table 8: Potential Sources of Sand .....	65
Table 9: Potential Sources of Water for Construction Works.....	65
Table 10: Description of Topography across the Project Road .....	70
Table 11: List of Rivers across Main Alignment and Kasulu and Kibondo Bypass Roads.....	73
Table 12: Flood Plains across the Project Road and Bypass Roads.....	79
Table 13: Estimates of Amount of CO2 Currently Generated by Traffic Daily in Kg/day Based on AADT .....	84
Table 14: Typical Old Unreinstated Borrow Pits along the Project Road .....	86
Table 15: Typical Road Sections where Realignment is necessary to Improve Safety .....	87
Table 16: Water supply profile for villages along the project road .....	93
Table 17: List of Schools Located along the Main Alignent and Bypass Sections .....	96
Table 18: Significant Vegetation Cover Characteristics along the Road.....	100
Table 19: Estimtaed Areas of Trees that are Likely to Cleared along the Project Road.....	116
Table 20: Estimated Amount of CO2 Likely to be generated in Kg/day by Road Traffic by 2020 after Road Upgrading.....	138
Table 21: Environmental Impact Assessment Matrix .....	143
Table 22: Response Procedure for Emergencies .....	185
Table 23: Locations of sites where baseline data shall be collected .....	189
Table 24: Environmental and Social Monitoring Plan.....	190
Table 25: Schedule of Consultation with Statuary Bodies and Institutions during EIA Study ..	207
Table 26: Schedule of Consultative Meetings with Communities along the road .....	210
Table 27: Results of consultation with Statuary Bodies and Institutions.....	210
Table 28: Results of consultation with the Public.....	216

---

Table 29: Stakeholders’ Issues Response Form .....	226
--	-----

## LIST OF PHOTOS

Plate 1: Typical shallow Mass Movement .....	118
Plate 2: Slope stabilization of a cut embankment .....	155
Plate 3: Slope stabilization of a fill embankment.....	155
Plate 4: R.Bogwe (note the crossing type and riparian vegetation) .....	- 237 -
Plate 5: R.Ruchugi (note the use of riparian for gardening) .....	- 237 -
Plate 6: R.Ruchugi crossing (note a flood plain) .....	- 238 -
Plate 7: R.Nyaluseke – Note Riparian Vegetation and Crossing .....	- 238 -
Plate 8: Sharply curved Approach to Crossing for R.Kalenge.....	- 239 -
Plate 9: R.Nyakasanda Crossing. Note Local People Fetching Water) .....	- 239 -
Plate 10: R.Makere (Note Rocky Bank).....	- 240 -
Plate 11: Bailey Bridge Crossing for R.Makere.....	- 240 -
Plate 12: Bailey Bridge Crossing for R.Malagarasi. Note Miombo woodland Riparian Vegetation .....	- 241 -
Plate 13: R. Malagarasi:. Note riverine trees and Rocky Banks .....	- 241 -
Plate 14: R.Memvi – Note Sharply Curved approach.....	- 242 -
Plate 15: R.Keza – Note Riverine Riparian.....	- 242 -
Plate 16: A section R.Hwadzi – Note Farming Activities on the River Bed .....	- 243 -
Plate 17: Crossing for R.Bururuma. Note Type of Riparian Vegetation .....	- 243 -
Plate 18: Clay Brick Making across a Flood at Km 47+700.....	- 244 -
Plate 19: Typical Vegetation Characteristics Across R.Malagarasi Flood Plain .....	- 244 -
Plate 20: A section with High Water Table around Km 29+900 at Kasanda village.....	- 245 -
Plate 21: Typical vegetation cover along the road between Kidiana and Kanazi villages ...	- 245 -
Plate 22: Typical Miombo woodland scrubland for Nyamyusi – Road Nyakitonto Section. -	246 -
Plate 23: Eucalyptus trees along the Alignment at Mkombozi Village .....	- 246 -
Plate 24: Vegetation cover characteristics along Maloregwa – Nduta section of Kibondo bypass Section.....	- 247 -
Plate 25: Vegetation along R.Bururuma – Biturana Section of the Kibondo Bypass Road Section (note Refugee Temporary Settlements) .....	- 247 -
Plate 26: Biturana Village forest Reserve at the edge of Nduta Refugee Camp.....	- 248 -
Plate 27: Existing track for Biturana – Nengo Section of Proposed Kibondo bypass Road..	- 248 -
Plate 28: Miombo Scrubland vegetation across Nengo Prison Area .....	- 249 -

---

Plate 29: R.Nyamguluma at Km 97+200 – Note Riverine Vegetation on its upstream.....	- 249 -
Plate 30: Typical Unreinstated Borrow Pit Located in Settlement Area, 10m from the Road (Nyamyusi Village).....	- 250 -
Plate 31: Irritant Contact Dermatitis .....	- 250 -
Plate 32: Miombo woodland forest reserve between Km 129+500 – 13+000 (Rusohoko village).-	250 -

## SECTION 1: INTRODUCTION

### 1.1 BACKGROUND INFORMATION

The Government of the United Republic of Tanzania with the assistance from African Development Bank (AfDB) intends to upgrade/ construct Nyakanazi – Kasulu – Manyovu road section (291km) to bitumen Standard.

Detailed engineering design and preparation of tender documents for Kasulu – Nyakanazi road section, including Environmental and Social Impact Assessment (ESIA) were carried out by SMEC International (PYT) Limited of Australia in association with UNDI Company Ltd in 2010 and the upgrading of 50km from Nyakanazi towards Kasulu (Nyakanazi– Kabingo section) is on-going.

The project is being implemented by East Africa Community (EAC) through Tanzania Roads Agency (TANROADS). TANROADS is an Executive Agency under the Ministry of Works, Transport, and Communication; established under the Executive Agencies Act in 2000, with the duty of maintaining and developing trunk and regional road network in Tanzania Mainland

EAC has engaged EGIS International to:

- Carry out feasibility study, preliminary design, and Environmental and Social Impact Assessment for the proposed upgrading of Kasulu – Manyovu Road Section
- Review the feasibility study and Environmental and Social Impact Assessment studies and review the existing design studies for Nyakanazi – Kasulu road section, including Kasulu and Kibondo bypasses to ensure their correctness, completeness, and compliance with acceptable international standard and AfDB and National Guidelines and standards thereafter update as necessary.

The proposed road upgrading will be split into four lots (Contracts) as shown in the schedule below:

Contract No	Section	Road Section	Length	Total Contract Length
01	a	Kasulu roundabout – Manyovu: The road section starts off at Kasulu T-junction; the point where Kibondo – Kasulu road links with Kasulu – Manyovu and Kasulu – Kigoma roads and ends at Munanila village (Manyovu) roundabout	47.9	77.6
	b	Kasulu Southern Link Road: Starts off at the junction to Baraka Secondary school, along Kigoma – Kasulu road and ends at the end of Kasulu roundabout – Manyovu road section	7.9	
	c	Kasulu North Link Road: Starts off at the Kasulu T-junction; the point where Kibondo – Kasulu road links with Kasulu – Manyovu and Kasulu – Kigoma roads, and ends at Kidiana village, about 400m before R.Bogwe, along Kasulu –	8.7	

Contract No	Section	Road Section	Length	Total Contract Length
		Kibondo Road		
	d	Western Bypass Road: Starts off at Kidiamia village, about 400m before R.Bogwe and ends at the junction to Tulieni Jangwani primary school, Herujuu village, along Kasulu – Manyovu road	13.1	
02	a	Kanyani (along Kigoma - Kasulu road) – Mvugwe village: The road links with Kasulu – Kibondo road at Kidiamia village, about 150 before R.Ruchugi. Kasulu western bypass road (12.7) km forms part of this road section.	70.5	<b>70.5</b>
03		Mvugwe – Nduta Junction	59.35	<b>59.35</b>
04	a	Nduta Junction – Kabingo: The road starts of at Nduta junction, and then traverses Nduta refugees’ camps, Nengo, and then links with Kibondo – Kakonko road at Kilemba village.	62.5	<b>88.4</b>
	b	Kibondo Town Link Road	25.9	

This document therefore presents a review of an Environmental and Social Impact Assessment (ESIA) for the road sections for Contracts 3 and 4 and the majority of Contract 2 which covers the road section from Kasulu to Kabingo, which comprise the following road sections:

- Kasulu – Kidiamia Road section [Kasulu Northern Link] (8.7)
- Kanyani – Mvugwe road section (70.5km)
- Mvugwe – Nduta Junction section (59.4km))
- Nduta Junction – Kabingo (62.5km). of which part of it is Kibondo Bypass road
- Kibondo town Link Road (25.9km)

## 1.2 OBJECTIVES OF THE ESIA STUDY

The objective of this assignment was to review the ESIA report for Nyakanazi – Kasulu road section and related Environmental and Management Plan (ESMP), which was prepared in October 2010 so as to exclude Nyakanazi – Kabingo section which is being upgraded to bitumen standard.

This report therefore presents a revised ESIA report covering only Kabingo – Kasulu road section as well as Kibondo and Kasulu bypass roads. The purpose of the reviewing the ESIA was to incorporate exhaustive environmental and social considerations into the design.

The main objective of the ESIA review was to exhaustively predict and forestall potential environmental and social impacts and propose mitigation measures to lessen any impacts to the environment and indigenous people in project’s area of influence that may arise from upgrading of the road. This is to ensure that the project delivers minimum disruption to the environment and the community.

Specifically, the objectives of this study were:

- To establish exhaustive biological and physical baseline conditions of the project area,

including the proposed bypass road corridors

- To predict exhaustively any adverse (negative) and/or beneficial (positive) environmental impacts associated with the road project.
- Review and update mitigation measures and recommend ways in which proposed mitigation measures could be incorporated into the design.
- To review and update cost estimates required to cover the proposed mitigation measures
- To review and update environmental and social management and monitoring plan

### **1.3 APPROACH AND METHODOLOGY**

#### **1.3.1 Approach**

The review of ESIA has been carried out in accordance with NEMC and AfDB Environmental and Social Assessment Guidelines, Tanzania's Environmental Management Act (2004), EIA and Audit Regulations (2005), and Environmental Guidelines of the road sector.

During the review, the approach by Environmental experts divided project area into Direct Impact Zone (DIZ) and the Area of Influence (AI). The Direct Impact Zone is the area that will be immediately and directly affected by the actions undertaken during the construction phase and post-construction phase of the project. This area includes the site itself, underneath crust and marginal zones up to 100 metres on both sides of the centreline of the road. It also includes earmarked borrow areas (quarries, borrow sites, water abstraction sites) and their access roads, Contractors and Engineer's campsites, equipment /materials storage and processing areas. The 100-m has been chosen to accommodate/give allowance for establishment of borrows pit, contractor's campsite or materials storage yard close to the road alignment.

The DIZ was determined on the basis of the following factors:

- The distance of travel of noise, dust, vibrations and exhaust fumes from construction plants and machinery from the site boundary
- Marginal zones and developments from the site within 100 m as it is within this distance that impacts are likely to be felt.

The AI is the area beyond the DIZ where most of the environmental impacts will be induced or influenced by the project activities. It is not subject to direct contact with the site, but is directly or indirectly affected by the presence of the proposed road. Areas around sources of construction materials are also considered as areas of influence. Areas that are linked to the existing road through street and feeder roads area also considered to be the areas of influence.

#### **1.3.2 Methodology**

The Consultant's first approach in this study was to scoping exercise. Scoping is a process in the ESIA which identifies issues that are likely to be of most importance during the ESIA and eliminates those that are of little concern in order to focus the ESIA study on the significant effects and so ensure time and money are not wasted on unnecessary investigations. The scoping process was followed by detailed ESIA study which involved desk work and field surveys.

In order to identify and understand the environmental and social issues adequately, the ESIA experts used different methods in collecting qualitative and quantitative data. This included

reviewing some literatures, site observation, public consultation meetings, and face to face interviews with key informants as described hereupon.

### **1.3.2.1 Deskwork**

During the review, a number of relevant documents were collected and a detailed review of important secondary data was carried out. The documents review included the following: Environmental and Social Impact Assessment report which was prepared by SMEC International (PYT) in association with UNDI Company Ltd in October 2013, Socio-economic profiles for Kakonko, Kibondo, and Kasulu districts, relevant environmental policies, legislations, and guidelines, topographic maps, detailed engineering design report and drawings, materials report, hydraulic and hydrological report, and economic study report. During the desk review, important information was collected on project background, objectives, and design of proposed project. This gave the review consultants additional information about the project and the scope of work. Information obtained from desk review further contributed to the improvement of data collection tools.

### **1.3.2.2 Consultation**

The review was conducted in a participatory and consultative manner in order to gather information appropriate to the given ToR.

The review consultant conducted consultative meetings in sampled villages to identify additional key issues pertaining to the road project including perceptions, knowledge, and attitudes of these communities. The output of the meetings and interviews was identification of additional chief issues and impacts, which should be considered in the review of the ESIA report.

#### **Separate Meetings with village/ ward Leaders**

Brief meetings were held with local leaders including village, ward, and village officials. Discussions focused on existing socio-economic situation in the area and the need to identify clusters of people likely to be adversely affected by the project. The discussions provided an opportunity to introduce the project to the community leaders and identify key informers. The meetings were also intended to encourage community consultative approach, thus fostering a community participatory approach right from initial stages of the proposed project. The social study team had earlier met the leaders of the major settlements along the road, during the scoping exercise. These leaders were informed about the project and initial contacts were established, including telephone numbers and other address exchanges.

The checklist was provided to village executive officers to fill in the relevant secondary data available in the street offices. The data collected was analysed manually and compared with the district data to compare the trend of development in the village.

#### **Public consultation**

In the study area, the team conducted a number of consultation meetings with key stakeholders. The public meetings were attended by all villagers including women, youth, old people, and even children. Whoever was available in the village was allowed to attend. The meetings involved the following villages:

Kasulu District Council: Kidiama, Kanazi, Kitagata, Kasasa, Kalimungoma, Makere, Nyangwa, and Mvugwe



Kibondo District Council: Kuntundu, Kumkambati, Nyankwi, Busunzu, Nyaruninga, Kitahama, Kisogwe, Twabagondozi, and Kumkugwa

Kakonko District Council: Kasanda, Kewe, Nkuba, Kiziguzigu, Kiyobela, Kabingo, Ruyenzi, Kiyobela, Kakonko, Mbizi, Mganda, and Itumbiko

The stakeholders that were consulted appreciated the proposed upgrading of the road but their main concern was that affected people should be compensated.

### **Informal discussion**

Informal discussions were held with key members of the community such as old people; influential persons; women/youth group leaders; and community-based resource persons.

### **Household questionnaire**

Recruited and trained enumerators administered 200 household questionnaires to capture relevant baseline data from the project impacted communities in the project areas using well designed questionnaires. Both quantitative data and qualitative information were obtained through this tool which enriched the Socio-economic Impact Assessment report

### **Face Interviews with key informants**

Interviews were conducted with relevant local government officials as well as governmental and non-governmental institutions that are likely to be affected by the road rehabilitation. The interviews were aimed at extracting additional data and information about current environmental profile and concerns.

Again, the aim was to gather additional information with regard to current environmental and social profile as well as concerns related to possible impacts of the proposed road rehabilitation. The outputs of the interviews were identification of additional chief issues and impacts, which should be considered in the review of the ESIA report.

#### **1.3.2.3 Field Survey**

The stakeholders' interviews were followed by project field visit to observe various features located along the proposed road within the Corridor of Impact (CoI) as well as Right of Way (RoW). Observed features within the corridor of impact were documented or recorded. These included types of houses, various properties like crops, trees, drainage structures, infrastructure/utilities, and conditions of the existing road. The purpose was to get an overview of the study area to compliment information gathered during the interviews with stakeholders.

During the site visit, the reviewer took advantage of the knowledge of the local people to gather specific knowledge about the project site, such as presence and location of burial and cultural, and archaeological sites, concealed public services/utilities etc. that are likely to be affected by the road rehabilitation.

#### **1.3.2.4 Tools Used**

During the study, the experts used the following tools:

- Topographic map sheets at a scale of 1:50,000 for characterization of environmental features of concern along the project road as well as spatial analysis of the study area under ARCGIS 10.1 before being used as base maps in mapping and spatial analysis of spatial data

- Global Positioning System (GPS) instrument for locating and mapping of features of significant environmental and social interest that were encountered along the project road corridor.
- ExpantGPS software for downloading data from GPS instrument and converting to other formats for further processing.
- SPSS (Statistical Software for Social Scientist) for analysing socio-economic data

#### **1.3.2.5 Data Processing and Analysis**

Data obtained from participatory methods and tools were analysed during field work. Further analysis was made through comparison and cross-checking with relevant and dependent secondary sources within the respective study villages. The primary data from the questionnaires were analysed by using SPSS and Excel statistical software while other data were compiled manually.

### **1.7 REPORT STRUCTURE**

This report is divided into eleven Chapters, of which Section 1 introduces the report, followed by discussion of Policies, Legislation, and Institutional Frameworks that are relevant to the project in Section 2. Section 3 describes the project, including its justification. Section 3 is followed by baseline information in Section 4, whereby the existing environmental and social conditions of the project area are discussed in detail. Section 5 presents and analyses feasible alternatives that were considered to reach of the objective of the road project.

Although mitigation measures have been proposed to mitigate potential adverse impacts that would be caused by the project, not all the impacts can be fully mitigated. Residual effects will be therefore some residual effects that may arise as a consequence of the project after implementation of the mitigation measures. Section 8 discusses such residual effects and measures to management such residual effects.

Plans to manage and monitor proper implementation of the proposed mitigation measures are presented in 9.

During the ESIA study, a number of stakeholders were consulted to obtain views and opinions which should be considered in the preparation of this report. The synthesis of the views and opinions are presented in Chapter 10.

Finally Section 11 gives a conclusion and recommendations on the proposed project. The remaining part of the report presents a list of appendices, which consists of maps, photos, list of stakeholder that were consulted, including minutes of consultative meetings and Terms of Reference.

---

## **SECTION 2: POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK**

This section presents a summary and reviews of policies, strategies, legal frameworks, regulations, guidelines, and administrative frameworks which are relevant to this project. The framework has guided the consultant to ensure that analysis and recommended mitigation measures are in line with the frameworks.

### **2.1 POLICIES AND STRATEGIES**

#### **2.1.1 National Environmental Policy, 1997**

The National Environment Policy (NEP, 1997) is the main policy document governing environmental management in the country. The policy addresses environmental issues as both natural and social concerns, and adopts the key principle of sustainable development.

The policy requires EIA to be mandatory for all development projects which are likely to have significant environmental impacts. The intention is to ensure that the development projects are implemented in an economically sustainable manner while safeguarding environmental and social issues for the benefit of the present and future generations.

##### Relevance to the Project

This ESIA has been carried out to fulfil the requirement of the policy, since the proposed road project is likely to have significant adverse impacts to the environment.

#### **2.1.2 National Policy on HIV/AIDS, 2001**

The policy formulation is the result of the Government's effort with technical support from the World Health Organization Global Programme on AIDS (WHO-GPA) that led to the establishment of National HIV/AIDS Control Programme (NACP) under the Ministry of Health. One of the government strategic initiatives is to establish Tanzania Commission for AIDS (TACAIDS) under the Prime Minister's Office. The Commission provides leadership and coordination of national multi-sectorial response to the HIV/AIDS epidemic. The management functions, institutional and organizational arrangement of TACAIDS are outlined in the National Policy.

The Policy identifies HIV/AIDS as a global disaster, hence requiring concerted and unprecedented initiative at local, national, and global levels. It recognizes HIV/AIDS as an impediment to development in all sectors, in terms of social and economic development with serious and direct implication on social services and welfare. Thus, the policy recognizes the linkage between poverty and HIV/AIDS, as the poor communities of the society are very vulnerable. The following objectives of the policy are relevant to the project:

- Prevention of transmission of HIV/AIDS;
- Enhance sectorial roles through participation and financial support;
- To identify human rights abuses in HIV/AIDS and to protect People Living with HIV & AIDS (PLHAs) and everyone else in society against all forms of discrimination and social injustice

- To provide appropriate effective treatment for opportunistic infections at all levels of the health care system
- Promote and participate in research on HIV/AIDS, including dissemination of scientific information and development of HIV vaccine;
- To work closely with the Ministry the Ministry of Home Affairs, NGOs and Faith Groups in the fight against drug substance abuse that increases the risk of HIV transmission

#### Relevance to the Project

During project implementation of the project influx of people in the project area will accelerate the spread of the disease. In order to contribute towards observing the objectives of the National Policy on HIV/AIDs, the project Contractor will be required to have HIV/AIDs programme aimed at promoting awareness of HIV/AIDs among its service providers and its employees, despite that the HIV/AIDs knowledge is known to most of people.

### **2.1.3 National Human Settlements Development Policy, 2000**

The overall goal of the policy is to promote development of sustainable human settlement and to facilitate provision of adequate and affordable shelter to all people, including the poor. The policy outlines a number of objectives including the environmental protection within human settlement and protect natural ecosystem against pollution, degradation and destruction with the aim of attaining sustainable development.

The major issues in the policy include:

- Poor management of solid and liquid waste, leading into environmental deterioration
- Emission of noxious gases from vehicles and industrial activities as a major cause of air pollution in urban areas
- Encroachment into fragile and hazardous lands (river valleys, steep slopes, and marshlands leading into land degradation, pollution of water sources, etc.
- Increasing dependence on fuel wood and charcoal as a main source of energy in human settlements leading into depletion of forests, hence environmental deterioration and air pollution and
- Unauthorized sand mining in river valleys leading into environmental hazards

#### Relevance to the Project

The policy is relevant to the project since during construction of the road solid and liquid wastes will be likely to be generated. During construction, residents living in the neighbourhood of the project are likely to be affected due to deterioration of ambient air quality by smokes and dust due to increased movement of construction machinery and equipment; and vehicles. Improved accessibility to forests is likely to increase due to improved road and hence increased harvesting of trees for firewood, charcoal, and timber production. The Contractor shall ensure that:

- Wood is not used as his source of energy
- Sand is not sourced from river valleys
- Minimum distance from material borrow areas is 100m
- Erosion control measures are in place during construction

- Solid and liquid waste generated by the project are managed in accordance with legislations
- As much as practical, emissions of noxious gases are minimized.

#### **2.1.4 National Land Policy, 1995 (Revised in 1997)**

The National Land Policy recognizes the need for protecting environmentally sensitive areas. The policy emphasises on the protection of environment and natural ecosystems from pollution, degradation, and physical destruction.

In addition, the policy recognizes the importance of social services such as water, roads, energy, and solid waste management for environmental protection. Finally, the policy identifies the need for conservation and preservation of prehistoric/ historic sites and buildings.

##### Relevance to the Project

During construction different types of wastes will be generated, water utilities across and within the RoW are likely to be disrupted.

- All Contractors will have the obligation to manage wastes in accordance with Environmental and Social Management Plan.
- Disrupted water supply utilities shall be reinstated by the Contractors accordingly.

#### **2.1.5 National Water Policy, 2002**

The policy objective is to develop a comprehensive framework for sustainable management of the national water resources. In this case the policy recognizes the need to protect water sources against pollution and environmental degradation.

The policy recognizes the role of road transport system as one of the effective tool in the implementation of water resource management activities.

##### Relevance to the Project

The project road crosses substantial number of seasonal and perennial rivers. Most these rivers are sources of domestic water for the local communities along the road. Degradation of these water resources will have serious impact to the communities. During construction the Contractor will be obliged to ensure construction activities do not cause pollution of these water resources.

#### **2.1.6 National Forest Policy, 1998**

This policy demarcates and reserves in perpetuity for the benefit of the present and future inhabitants, sufficient forested land and land capable of forestation, to ensure environmental stability and maintenance of the ecological balance including atmosphere equilibrium which is vital for sustenance of all life forms, human, animal and plant. With regards to EIA, the policy calls for environmental assessment of any investment which would convert forest land to other land use or may cause potential damage to forest environment. Road construction is identified as a relevant development activity under this policy.

##### Relevance to the Project

The project road passes along substantial number of forests. Most of the villages along the project road have forest reserves. Widening and realignment of the project road is likely to cause clearing of trees from the forests along the road. Of particular interest are:

### **2.1.7 National Gender Policy, (1992), Revised in 2002**

The objective of this policy is to provide guidelines to ensure gender sensitive plans, programmes and strategies in all sectors and institutions. The policy gives emphasis on gender equality. The policy aims at establishing strategies on poverty eradication through ensuring that both women and men get access to existing resources for their development. It values the role played by both men and women in bringing about development in the society. The road sector is also highly committed to gender mainstreaming at all levels, through provision of equal opportunities to both men and women in road works and related activities.

The policy:

- Calls for equal opportunity for all to participate and implement development activities without gender bias, including sex.
- Identifies environmental degradation as one of the major factors that increase burden to women, especially in rural areas, where women walk long distances to fetch water and fuel wood.

The policy requires the project management to ensure that gender issues are given emphasis. It also requires that women and men are given equal employment opportunities in the project, whenever possible.

#### Relevance to the Project

During construction, the contractor will have the obligation to ensure that as much as possible men and women are given equal opportunities during recruitment of construction workers.

### **2.1.8 National Transport Policy, 2003**

The National Transport Policy aims at enhancing transport safety and environmental protection, through taking steps to review and update national legislation in transport operations and safety requirements.

The policy has seven objectives and goals, of which one is relevant to this project. The objective which is relevant to this project calls for sufficient emphasis on all aspect of environment protection and management at the design, development, and operation stages of transport infrastructure, to ensure sustainability.

#### Relevance to the Project

This ESIA has been carried out to fulfil the requirements of this policy.

### **2.1.9 National Strategy for Growth and Reduction of Poverty, 2003**

The National Poverty Reduction Strategy (NPRS) is a national organizing framework for putting the focus on poverty reduction on the country's development agenda. The strategy emphasis is on the growth momentum to fast track the targets of vision 2025 for high and shared growth, high quality livelihood, piece, stability and unity, good governance, high quality education, and international competitiveness.



---

Among issues of the strategy aims that are relevant to this project are:

- Development of infrastructure such as roads
- Paying attention to mainstreaming cross-cutting issues such as environment, HIV/AIDS, gender, employment, and settlement

#### Relevance to the Project

The strategy is relevant to the project as follows:

- The project is in line with the interest of the strategy - to develop transport infrastructures
- The ESIA has been carried out to meet the concerns of the strategy.
- The fact that ESIA has been conducted for this projects shows that Environmental conservation, control of the spread of HIV/AIDS, gender, employment, and resettlement are being given adequate attention.

### **2.1.10 Tanzania's Property and Business Formalization Programme, 2004**

Tanzania's Property and Business Formalization Programme (TPBP) or in Kiswahili "Mpango wa Kurasimisha Rasilimali na Biashara za wanyonge Tanzania (MKURABITA)" was founded to empower the marginalized majority in the informal sector so that they can use their properties and business assets and other opportunities in the modern market economy, and thus increase their income. Under such facilitation, they can effectively participate in the reduction of income poverty and contribute to the attainment of Medium Development Goals (MDG) targets.

Notably, both MKUKUTA and MKURABITA are interrelated economic interventions affected by the government in an effort to provide relief to the Tanzania masses of medium and lower ranks.

Among the strategies of MKURABITA are preparation and development communication systems in rural areas that will enable the coordination of formalization of properties and business assets of the programme.

#### Relevance to the Project

The proposed project is in line with the programme as it addresses one of the strategies of the programme – development of communication systems in rural areas that will enable the coordination of formalization of properties and business assets of the programme.

### **2.1.11 Energy Policy of Tanzania (1992)**

The objective of the policy is to provide input into development process through the establishment of an efficient energy production, procurement, transportation, distribution and end use in an environmentally sound manner and with due regard to gender issues.

The policy recognizes the critical role of energy in all sub-sectors of the economy, including the road sector. It underscores the importance of having sufficient supply and efficient use of energy in order to realize sustainable development and satisfy basic needs of the society.

The policy recognizes the relationship between road condition and fossil fuel consumption energy by vehicles, which is one of the important sources of energy in the country. Therefore, the policy recognizes the need to rehabilitate roads to minimize fuel consumption.

#### Relevance to the Project

The policy is relevant to this project because fossil fuel is the major source energy supply in the transport sector. A poor road condition is associated with higher consumption of fuel. Upgrading of the road will result into not only reduced fuel consumption and transportation costs but also reduced emission.

### **2.1.12 Agricultural and Livestock Policy (1997)**

The number and nature of guidelines that constitute Tanzania Agricultural and Livestock policy is complex. However, the overall aim is to promote and ensure a secure land tenure system to encourage the optimal use of land resources, and facilitate broad-based social and economic development without upsetting or endangering the ecological balance of the environment. The major theme is the conversion of land into an economic asset to which all citizens should have equal access, especially in response to the vulnerability of smallholders and livestock keepers who do not produce a surplus. The focus is therefore on the commercialization of agriculture so as to increase income levels and alleviate poverty.

On the other hand the villages are required to develop land use plans where by a certain amount of land is put aside for livestock grazing while the area for agriculture is also categorized. This is done to minimize not the conflict between farmers and livestock keepers, but also to prevent grazing in forestry or wildlife protected areas. It has also an advantage on proper land management and conservation. However, during the study it was observed that the land use plan do not exist in almost all villages. The lack of land use plan result into conflicts between different land uses as well as grazing in forestry protected areas.

#### Relevance to the Project

During field visit, a number of livestock groups were noted being grazed in forestry protected areas.

### **2.1.13 Tanzania Wildlife Policy, (2009)**

The vision of the Wildlife sector for the next 20 years conforms to the Development vision 2025 for Tanzania on sustainable environment and socio-economic transformation. Among others, the vision of the wildlife sector stipulates the following:

- Promote conservation of biological diversity
- Administer, regulate and develop wildlife resources
- Involve all stakeholders in wildlife conservation and sustainable utilization, as well as in fair equitable sharing of benefits
- Promote sustainable utilization of wildlife resources; and
- Contribute to poverty alleviation and improve the quality of Tanzania

The Wildlife Policy envisages addressing the following national challenges;

- To conserve areas with great biological diversity which are representative of the major habitats of Tanzania;
- To continue to support and where necessary, enlarge the protected area network as the core of conservation activities;
- To promote involvement of local communities participation in wildlife conservation in and outside the protected area network;



- 
- To increase foreign exchange earnings;
  - To integrate wildlife conservation with rural development;
  - To foster sustainable and legal use of wildlife resources;
  - To ensure that wildlife conservation competes with other forms of land use;
  - To enhance the recognition of the intrinsic value of wildlife to rural people; and
  - To minimize human-wildlife conflicts whenever it occurs

There is a need to synchronize and implement strategies to protect and utilize wildlife, management and development of protected areas and promotion of international cooperation. In order to address the mentioned challenges above, among others, the strategies to be undertaken include;

- Continue to establish the protected area on the basis of ecosystem planning
- Stress maintenance and development of protected area network in order to enhance biological biodiversity
- Promote conservation of wildlife and its habitat outside core area by establishing wildlife management area;
- Transfer for management of wildlife management area to local communities thus taking care of corridors, migration routes and buffer zones;
- Prevent illegal use of wildlife
- Promote the use of protected areas to provide government revenue, employment and other benefits to Tanzania;
- Create the opportunities for Tanzania to become involved in wildlife industry;
- Create an enabling environment which will ensure that legal and sustainable wildlife scheme directly benefits local communities;
- Promote greater public awareness and understanding of wildlife issues;
- Retain sufficient revenue from wildlife utilization in the protected areas for management and development purposes;
- Encourage involvement of donors to support the country to conserve wildlife resources;
- Encourage participation in implementation of relevant treaties concerned with conservation of wildlife;
- Cooperate with neighbouring countries in the conservation of trans-boundary ecosystem etc.

#### Relevance to the Project

In view of Wildlife Policy requirements, the EIA Experts ensured issues related to wildlife are fully incorporated and that all relevant stakeholders consulted to air their views and recommendations.

#### **2.1.14 Mineral Policy of 1998:**

The National Minerals Policy also addresses that the mining activities should be undertaken in a sustainable manner. Reclamation of lands after mining activities is recommended. As far as this project is concerned, mining activities is directed to quarrying activities and borrow pits.

This policy signifies the relevance to this road project whereby during consultation, communities raised their concern regarding borrow pits. Though identification of the borrow pits sites depends depending on various factors (distance, quality, types, quantity etc.), it is crucially important to involve nearby communities / leaders during the process. Equally important is the aftermath of the project construction whereby by reinstatement of the borrow pits is essential for communities' and their properties safety and security.

#### **2.1.15 African Development Bank Groups Policy on the Environment Policy, 2004**

The overall objectives of the policy are to improve the quality of life of the people of Africa by supporting an environmentally sustainable development and, preserve and enhance ecological capital and life-support systems across the continent of Africa.

The policy was developed to assess environmental constraints and opportunities that affect development objectives. It acknowledges the significant progress made in the implementation of Agenda 21 adopted at the 1992 Rio Earth Summit, the ratification of a large number of environmental conventions, agreements, and protocols and the growing use of Millennium Development Goals (MDGs) as a measure of development.

The policy recognizes the considerable constraints facing Africa, including growing poverty, and disparity in wealth distribution both nationally and regionally. A new threat of HIV/AIDS is recognized as a contributing factor to development crisis, and therefore recognizing the need to integrate social and environmental concerns into economic development policies to reduce the negative externalities, while enhancing the positive ones.

Some of the principles that have guided the development of the policy include the recognition that:

- A strong and diversified economy constitutes a just means to enhance the capacity for environmental protection;
- Environmental management tools, like environmental assessments, shall be used as a sustainability assurance rather than impact mitigation mechanism;
- Community involvement, in particular the most marginalized and vulnerable groups, including women and children, on decisions that affect them shall have to be provided for; and
- Governance structures and institutions which are more responsive to the needs and priorities of affected communities in general, and poor people and vulnerable groups in particular, shall be encouraged.

In implementing the policy, the Bank will use a set of approaches:

- Mainstream environmental sustainability considerations in all Bank's operations
- Strengthen existing environmental assessment procedures and develop new environmental management tools;

- 
- Clearly demarcate internal responsibility in implementation;
  - Improve public consultation and information disclosure mechanisms;
  - Build partnerships to address environmental issues, harmonize policies, and disseminate environmental information; and
  - Improve monitoring and evaluation of operations. In particular, the Environmental and Social Relevance to the Project

The policy addresses main challenges like;

- The need for environmental interventions to reduce poverty
- The need to maintain regional and global life support systems
- The need to work in partnership with others
- The need to further strengthen the processes and procedures for addressing environmental concerns in AfDB's own operations

#### **2.1.16 African Development Banks Involuntary Resettlement, 2003**

The Bank's involuntary resettlement policy is set within the framework of the commitment "to promote environmental and social mainstreaming as a means of fostering poverty reduction, economic development, and social well-being". The policy covers involuntary displacement and resettlement of people "when a project results in relocation or loss of shelter by the persons residing in the project area, assets being lost or livelihoods being affected".

The primary goal of the involuntary resettlement policy is "to ensure that when people must be displaced they are treated equitably, and that they share in the benefits of the project that involves their resettlement. The objectives of the policy are to ensure that the disruption of the livelihood of people in the Project's area is minimised, ensure that the displaced people receive resettlement assistance so as to improve their living standards and set up a mechanism for monitoring the performance of the resettlement programs. Most importantly, the resettlement plan (RP) should be prepared and based on a development approach that addresses issues of the livelihood and living standards of the displaced people as well as compensation for loss of assets, using a participatory approach at all stages of project design and implementation.

According to the policy, where the number of PAPs – people who would need to be displaced with a loss of assets, or access to assets or reduction in their livelihood exceeds 200, then a full replacement plan will be required as a supplement document to the Environmental and Social Impact Assessment (EIA).

##### Relevance to the Project

- The number of PAPs in this project exceeds 200
- Apart from this ESIA report, a full Resettlement Action Plan (RAP) has been prepared

---

## 2.2 LEGAL FRAMEWORK - ACTS

### 2.2.1 The Constitution of Tanzania

The Policy, legal framework to address the social dimensions, impacts, and implications of the project is based on the following articles of the Constitution of the United Republic of Tanzania of 1977:

- Article 24 (1): Subject to provisions of the relevant laws of the land, every person is entitled to own property, and has a right to the protection of his property held in accordance with law.
- Article 24 (2): It shall be unlawful for any person to be deprived of property for the purposes of nationalization or any other purposes without the authority of law which makes provision for fair and adequate compensation.

#### Relevance to the Project

Realignment of the road, borrowing of naturally occurring construction materials, and construction of camps outside the Right of Way (RoW) will cause loss of properties in terms of buildings and land. Affected people will have to be compensated because payment of compensation is both a legal and constitutional right under Article 24 of the Constitution of the United Republic of Tanzania of 1977.

### 2.2.2 Environmental Management Act No 20, 2004

The Environmental Management Act (EMA) governs environmental management issues including ESIA requirements in the country. The Act also defines environmental management tools of general scope to facilitate consistent policing and enforcement.

The following sections are relevant to this project:

- Section 6: specifies that every person has a stake and duty to safeguard and enhance the environment and inform relevant authority of any activity that may affect the environment
- Section 57: prohibits human activities within 60m from a riverbank.

#### Relevance:

There are construction activities that are likely to tempt the Contractor to have unnecessary activities near water course include borrowing of construction activities such as sand and gravel. Such activities shall not be approved by the Engineer.

- Section 81: Stipulates that any developer of a project to which EIA is required to be carried out by the law shall undertake at his own cost EIA before commencing the project.

#### Relevance:

This ESIA has been carried out to fulfil the requirement of EMA, 2004 since the project is likely to have adverse impacts to the environment and communities.

- Sections 106, 109, and 110: Prohibits polluting the environment with solid wastes, liquids, or substances containing hazardous chemical, oil, or mixture containing oil.

---

Relevance:

The Contractor will generate solid and liquid wastes as well as well as hazardous wastes that are likely to pollute the environment if not managed properly.

### **2.2.3 Water Resources Management Act, 2009**

The Act, which repeals the Water Utilization (Control and Regulation) No 42 of 1974, provides for institutional and legal frameworks for sustainable management and development of water resources, outlines principles for water resources management, and provides for the prevention and control water pollution, participation of stakeholders and the general public in the implementation of water policy.

The Following Sections of the act are relevant to this Project:

- Section 10: Vests ownership of all water in the United Republic of Tanzania
- Section 34: Prohibits anthropogenic activities within 60m from water resources

Relevance to the Project

There are likely to be attempts by the Contractor to borrow construction materials such as sand and gravel near or within water courses.

Section 39: Requires that a land owner or an occupier to take all reasonable measures to prevent water source pollution

Relevance to the Project

During construction across rivers, the contractors will have the obligation to prevent polluting water sources. For example, the Contractor shall not be allowed to site a construction camp near a water resource, open a borrow pit near a water source, or dispose of excess material on water courses.

Section 43: Requires that a permit be obtained from Water Basin Officer prior to abstraction of surface or ground water.

Relevance to the Project

The Contractor shall obtain water abstraction permit from relevant water basin authority before abstracting water from the ground or surface resources.

### **2.2.4 Land Act Cap. 114 (No. 4), 2004 (amendment of Land Act 1999)**

The act regulates land allocation including village lands. It specifies that all lands continue to be public. Land is vested in the President as Trustee for and on behalf of all the citizens of Tanzania. The act establishes three categories of land: general, village and reserved. In addition, land may be declared 'hazard land' where its development might lead to environmental damage, e.g. locations such as wetlands, mangrove swamps and coral reefs, steep lands and other areas of environmental significance or fragility.

The Act recognises customary tenure as of equal status to granted rights of occupancy, and allows livestock keepers to own pasture land either individually or in groups. Importantly the land act promotes gender equality by recognizing equal access to land ownership and use by all

citizens- men and women – and giving them equal representation on the land committees. The Acts also recognize land as a property and have value.

Section 156 of the Land Act 1999 requires compensation to be paid to any person for the use of land of which he / she is in lawful or actual occupation as a communal right of way and with respect to a way leave. These include:

- Any damage suffered in respect of trees, crops, and buildings as result of creation of way leave;
- Damage due to surveying or determining the route of that way leave.

It is the responsibility of the government department of Ministry, Local Government authority or corporate body that applied for right of way to pay compensation.

#### Relevance to the Project

All affected properties outside the existing RoW as the result of upgrading of the road project will be compensated for in accordance with the law.

### **2.2.5 Village Land Act Cap. 114 (No. 5), 1999**

The Village Land Act Cap 114 (No. 5 of 1999) confers the management and administration of village lands to Village Councils, under the approval of the Village Assemblies, although the Minister of Lands is entitled to decide on the amount of land which can be owned by a single person or commercial entity. The Act also provides for the fundamental principles of National Land Policy which are the objectives of the Village Land Act, 1999 aimed at:

- Ensuring that existing rights and recognized long standing occupation or use of land are clarified and secured by the law
- Ensuring that land is used productively and that any such use complies with the principles of sustainable development; to take into account that an interest in land has value and that value is taken into consideration in any transaction affecting that interest and
- To pay full, fair and prompt compensation to any person whose right of occupancy or recognized long-standing occupation or customary use of land is revoked or otherwise interfered with to their detriment by the State under this Act or is acquired under the Land Acquisition Act No. 47 of 1967 (RE 2002)

### **2.2.6 Land Acquisition Act 1967 (Revised Edition, 2002)**

Under the Land Acquisition Act, 1967, the President may, subject to the provisions of this Act, acquire any land for any estate or term where such land is required for any public purpose.

Land shall be deemed to be acquired for a public purpose where it is required, for example, for exclusive Government use, for general public use, for any Government scheme, for the development of agricultural land or for the provision of sites for industrial, agricultural or commercial development, social services, or housing or; where the President is satisfied that a corporation requires any land for the purposes of construction of any work which in his opinion would be of public utility or in the public interest or in the interest of the national economy, he may, with the approval, to be signified by resolution of the National Assembly and by order published in the Gazette, declare the purpose for which such land is required to be a public



purpose and upon such order being made such purpose shall be deemed to be a public purpose; or in connection with the laying out of any new city, municipality, township or minor settlement or the extension or improvement of any existing city, municipality, township or minor settlement; etc.

Upon such acquisition of any Land the President is compelled on behalf of the Government to pay in respect thereof, out of money provided for the purpose by Parliament, such compensation, as may be agreed upon or determined in accordance with the provisions of the Land Acquisition Act, 1967.

The President may also revoke a right of occupancy if in his opinion it is in public interest to do so. Accordingly, the land for which a right of occupancy has been revoked reverts back to the Government for re-allocation pursuant to the existing need (s). It should also be noted here that, though the land belong to the government some changes on the land act has taken place. Land has value to the owner; therefore any land taken from the user has to be compensated. Based on this act the villagers affected by the project are claiming that they should be compensated for the lost farms and land used for residential purposes.

#### Relevance to the Project

Although the majority of the road will follow the existing alignment, there are sections where realignment of the road and so land acquisition will be inevitable in order to improve the safety of the road. In addition, land acquisition will be necessary for borrowing of naturally occurring construction material such as sand, gravel, and hard stone.

Owners of the land who will be affected due to road realignment and material bowing shall be compensated accordingly.

### **2.2.7 Occupational Health and safety Act No. 5 of 2003**

This act sets provisions for the safety, health, and welfare of persons at work in factories and other places of work. It is also meant to provide for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; and to provide for connected matters.

Under the following sections of the act, the Contractor has the following obligations:

- Sections 11 and 13: Appoint a safety and health representative and health and safety committee for the workplace, whose functions are stated in Sections 12 and 14 of the act
- Section 15: Register the workplace (camps and quarry) with Chief Inspector of Occupational Health and Safety Agency (OSHA)
- Section 54: Provide and maintain readily accessible clean, safe, and wholesome drinking water to his workers
- Section 55: Provide and maintain clean, sufficient and suitable sanitary conveniences
- Section 58: Provide and maintain First Aid Kit, which shall be under the charge of a person who has received first aid training from recognized institution, who shall be readily available during working hours
- Section 60: carry out risk assessment whenever an activity involving the use of hazardous processes, hazardous equipment, or hazardous chemical substances has to be carried out

- Section 62: equip workers with effective and appropriate Personal Protective Equipment (PPE)
- Section 68: Provide and maintain sufficient and suitable means of eye flushing system for workers
- Section 70: Restrict the extent to which workers may be exposed to ionizing and non-ionizing radiations in the course of their employment
- Section 74: Provide Materials Safety Data Sheet (MSDS) in respect of hazardous chemicals containing detailed essential information regarding their identity, supplier, class, hazards, safety precautions, and emergency procedures.

Relevance to the Project:

The Contractor shall comply with all the above requirements of the law.

### **2.2.8 HIV and AIDS (Prevention and Control) Act, 2008**

According to the Act, it is the duty of every person, institution and organization living, registered, or operating in Tanzania to (among others):

- Promote public awareness on causes, modes of transmission, consequences and control of HIV and AIDS
- Reduce
  - The spread of HIV and AIDS
  - Prevalence of STIS in the populations
  - Adverse effects of HIV and AIDS

The Act also gives the duty to employers and private sectors to

- Integrate or prioritize HIV and AIDS in their proceedings and public appearances
- Advocate against stigma and discrimination of people living with HIV and AIDS

Relevance to the Project:

During the project implementation from mobilization, construction to decommission the contractor, on behalf of the project proponent will be obligated to do the following:

- Promotes public awareness on causes, modes of transmission, consequences and control of HIV and AIDS
- Develop and implement the programme to prevent and control the spread of HIV/AIDS and STIs

### **2.2.9 Road Act No. 13, 2007**

This Act, which repeals the Highway Act Cap 167, provides for road financing, development, maintenance, management and other related matters on finance, offences, penalties and recovery. The Act classifies and declares the project road to be a public road thus listing it under the first schedule of Trunk Roads as T1, in trunk and regional roads ordinance. Also relevant clauses to the project are included under Parts IV, V and VII of the act covering aspects such as,

- Execution of the road works



- Road safety
- Restriction on the use of roads
- Serving notice to holders of land to be affected by the road and matters related to compensation under section 36,
- Regulation on maximum weight, speed and dimensions under section 42.

The following sections are relevant to the proposed road project:

- Section 16: states that "where it becomes necessary for the Road Authority to acquire a land owned by any person.....the owner of such land should be entitled for compensation for any development on such land in accordance with the Land Acquisition Act, Land Act, Village Land Act and any other written laws".

Relevance: The Act and its regulations changed the road reserve of regional and trunk roads from 45m (stipulated in Highway Ordinance, Cap 167) to 60 m (between 22.5m and 30m from the centreline of the existing road). This implies that all the affected properties which are located between 45m and 60m are entitled for compensation. In addition any land acquired outside the current RoW shall also be compensated in accordance with the law.

- Section 29: Specifies that the road reserve is exclusive for the use of the road, development and expansion or any related activities. According to the Act, the road authority may permit any person or authority to temporarily place public utilities such as lighting, telegraph, adverts, telephone, electric supplies and posts, drains, sewers, and mains only in such cases where such use do not hinder any future use of the road reserve by the road authority.

Relevance: Among the public utilities that are located within the road reserve are power lines, water supply pipe lines, and domestic points. Such utilities are likely to be affected by the project.

- Section 30: Stipulates that road authority is responsible for the protection of environment.

Relevance: During implementation as well as operation of the road, all possible measures shall be taken to avoid or abate devastation of the environment. In addition, the design of the road will ensure safety measures such as provision of zebra crossing are taken into considerations.

During upgrading and operation of the road, the Employer and Contractors will observe all the requirements of this act in order to have smooth execution of its activities

- Section 33: The road authority shall ensure the safety of road users during the design, construction, maintenance, and operation of a public road by providing sidewalks, overhead bridges, zebra crossings and other matters related thereto.

## **2.2.10 Grave (Removal) Act No. 9 of 1969 (Revised Edition, 2002, Cap 72)**

The Act gives the right to the Minister responsible for lands to cause a grave and any other dead body buried on a land which is required for public purpose to be relocated. The Act requires the Minister to serve the persons interested with a notice of his intention to do so.

The Act requires that removal, transportation and re-instatement of a grave or dead body, be carried out with due regard to the views of the persons interested and the religious susceptibilities of the members of the religious community to which the person belonged whose grave or dead body it is.

Before the removal of the graves the Act provides for the manner in which the grave has to be removed in terms of serving notices of grave removal intention to respective persons or a religious body.

The Act states that compensation payable under graves removal shall be limited to the reasonable expenses incurred in the removal, transportation, reinstatement and re-interment of the grave or dead body and any placatory or expiatory rites or other ceremony accompanying such removal and re-interment

In certain circumstance, removal of grave can be undertaken by a person interested. In such a case, the interested person shall be compensated, for expenses incurred in the removal, transportation, reinstatement and re-interment of the grave or dead body and any placatory or expiatory rites or other ceremony accompanying such removal and re-interment.

#### Relevance to the Project

One grave yard has been within the RoW. Before commencement of construction all graves located within the corridor of impact shall be relocated in accordance with the law.

### **2.2.11 Employment and Labour Relations Act, 2004**

The following sections of the act are relevant to this project:

- Section 5: prohibits employment of children under the age of fourteen years. A child at the age of 14 year and above may only be employed for light works, which are not likely to cause harm to the child's health and development, and does not prejudice the child's attendance at school, participation in vocational orientation or training programmes approved by the competent authority or the child's capacity to benefit from the instruction received. The act also prohibits employment of a child under the age of eighteen years in any work site where work conditions may be considered hazardous.

Relevance: The road construction is likely to trigger employment of children under 18.

- Sections 14, 15, and 45 of the act require that an employer provides to his employee with the following:
  - i) A written employment Contract (Section 14) in a language known to the employee (Section 14), stating their rights
  - ii) A written statement of particulars, stating among others remunerations (Section 15)
  - iii) Specifies working hours of 45 hours per week (Section 19)

Relevance: The Contractor shall ensure that all his workers have written employment contracts in a language known to the employee and that the employees are paid overtime in accordance with law when working outside working hours.

- Section 6 of Third Schedule: Requires the Contractor to arrange and incur costs for the burial of his employees in the event of their death.

Relevance: In the event that a construction worker is involved in a fatal occupational accident, the Contractor shall arrange and incur costs for the burial of the employee.

## 2.2.12 Public Health Act No 1, 2009

This act provides for the promotion, preservation, maintenance of public health with a view to ensuring the provisions of comprehensive, functional, and sustainable public health services to the general public and to provide for other related matters.

Section 30 of the act requires any occupier or owner of any premises to keep his premises free from breeding sites of mosquitoes, other disease vectors, vermin, and other diseases causative agents

Relevance: The Contractor shall keep both the construction camp free from breeding sites of mosquitoes as well as other diseases vectors. On regular basis, or as directed by the Engineer, the Contract shall fumigate the camps' houses as well as their surroundings.

## 2.2.13 Workers Compensation Act No 20, 2008

This is an act to provide for compensation to employees for disablement or death caused by or resulting from injuries or diseases sustained or contracted in the course of employment, to establish the fund for administration and regulation of workers compensation and to provide for related matter.

The following objectives of the act are relevant to this project:

- i) Provide adequate and equitable compensation for employees who suffer occupational injuries or contract occupational diseases arising out of, and in the course of their employment and in case of death, for their dependants
- ii) Provide for rehabilitation of employees who have suffered occupational injuries or contracted occupational diseases in order to assist in restoring their health, independence and participation in society
- iii) Provide for a framework for effective, prompt, empathetic consideration, settlement, and payment of compensation benefits to employees and their dependants.
- iv) Give effect to international obligations with respect to worker's compensation and
- v) Promote prevention of accidents and occupational diseases

The following sections of the Act are relevant to this project:

Section 19: Where an employee has an accident resulting into employee's disablement or death, the employee or dependants of the employee shall subject to this Act be entitled for compensation provided by this Act.

Section 22: Where an employee contracts a disease set out in the Third Schedule of the Act, or any other disease, and the disease has arisen out of, and in the course of employee's employment, the employee shall, subject to the provision of this Act, be entitled to the compensation.

Section 23: When an employee who has contracted an occupational disease set out in the Third Schedule of this Act was employed in any work involved in the handling of or exposure to any agent mentioned in the Schedule in respect of that disease, it shall be presumed, unless contrary is proved that the disease arose out of, and in the course of the employee's employment.

Section 33: An employee or any other person on behalf of the employee shall, as soon as possible after an accident has occurred, give written or verbal notice of the accident to the

employer and he may also give notice of the accident to the Director General in a prescribed form.

Section 35: An employee or trade union, on behalf of the employee, as soon as possible, after the occurrence of an occupational disease shall give a written notice to his employer or to the employer where the employee was last employed

Sections 36 through 41: Provides for procures that has to be followed for claiming for compensation

Relevance: The road construction workers will be exposed to risks of not only occupational injuries and diseases, but also to fatal accidents.

#### **2.2.14 Occupier' s Liability Act No 54, 1968**

The Act determines the care that an occupier is required to show toward persons entering on the premises in respect of dangers to them, or to their property on the premises, or to the property on the premises of persons who have not themselves entered on the premises, that are due to the state of the premises, or to anything done or omitted to be done on the premises, and for which the occupier is responsible by law.

The Act stipulates that an occupier of premises owes a duty to take that care that in all the circumstances of the case is reasonable to see that a person, and the person's property, on the premises, and property on the premises of a person, whether or not that person personally enters on the premises, will be reasonably safe in using the premises.

The duty of care applies in relation to the

- (a) Condition of the premises,
- (b) Activities on the premises, or
- (c) Conduct of third parties on the premises.

Nevertheless, an occupier has no duty of care to a person in respect of risks willingly assumed by that person other than a duty not to

- (a) Create a danger with intent to do harm to the person or damage to the person's property,
- (b) Act with reckless disregard to the safety of the person or the integrity of the person's property.

#### **2.2.15 Forest Act No. 14, 2002**

This Act deals with the protection of forests and forest products in forest reserves and the restrictions and prohibitions in forest reserves. Any contravention of the restrictions and prohibition is considered an offence under this act and subject to enforcement. The act 2002 requires that for any development including mining development, road construction and construction of building within a Forest Reserve, Private Forest or Sensitive Forest, the proponent must prepare an Environmental Impact Assessment for submission to the Director of Forestry. The law also requires licences or permits for certain activities undertaken within the national or local forest reserves, such as felling or removing trees, harvesting forest produce, entering a forest reserve for the purpose of tourism or camping, mining activities, occupation or residence within the reserve, cultivation, erecting any structures.

The Act enables local government authorities, including village governments to have power over some forests that are within their areas of jurisdiction.

Relevance: The project road borders a number of forestry protected areas. The Contractor shall not be allowed to enter the protected areas for any purpose, including borrowing of construction materials without the permit of authorities entrusted to manage the protected areas. This ESIA has been conducted to comply with this law among others.

## **2.2.16 Wildlife Conservation Act, 2009**

The Act was enacted to make better utilization provisions for conservation, management, protect, and sustainable utilization of wildlife and wildlife products.

Relevance to the Project:

The project road borders two wildlife protected areas. The Contractor shall not be allowed to enter the protected areas for any purpose, including borrowing of construction materials without the permit of authorities entrusted to manage the protected areas.

## **2.2.17 Explosives Act (Cap 45) No. 56, (Revised Edition 2002)**

The act provides rules for the control of manufacture, import, export, purchase, sale, possession, and use of explosives. The act is relevant to this project because the Contractor will use explosives for blasting of rocks. The following sections are relevant to this project:

- Section 28: Species how explosives and detonators have to be stored.

Relevance: The Contractor shall store explosives and detonators in accordance with Section 28 of the act.

- Section 32: Requires that a licence from Commissioner of Mines is obtained before one starts using a magazine

Relevance: The Contractor shall construct a magazine for storing all explosives and before using the magazine, the Contractor shall obtain a licence from the Commissioner of Mines

- Section 38(1): Specifies that explosives should only be used by a holder of blasting certificate issued by the Commissioner of Mines.
- Section 40: Specifies that blasting and supervision of blasting should only be done by a holder of blasting certificate

Relevance: The Contractor shall ensure that blasting and supervision of blasting is done by a holder of blasting certificate from Commissioner of Mines.

## **2.2.18 Land Use Planning Act No 6, 2007**

Under the provisions of the Town and Country Planning Ordinance also the President is empowered to acquire any land for project of public interest. The 1956 ordinance after its revision in 1961, states:

- Section 45(1): where it appears to the President that it is necessary to acquire any land within a planning area for the scheme applicable thereto and agreement for the acquisition thereof between the Local Authority and the owner of such land cannot be

reached, the President may acquire such land under any law relating to the compulsory acquisition of land.

- Section 45(2): without prejudice to the generality of the provision of subsection (1) of section 45, the power of the President hereunder shall extend to the acquisition of land which has not been developed in accordance with the scheme applicable thereto which, in his opinion, it is necessary to acquire in order to secure its good development or the proper, orderly and continuous development of a planning area or any part of it or the good development of neighbouring land.
- Section 45(3): without prejudice to the provisions of any law relating to the compulsory acquisition of land, the purposes for which land may be acquired under the provisions of this ordinance shall be deemed to be the public purposes.
- Under section 50 (ii) the value of any land within a Planning Area shall, for the purposes of determining the amount of compensation payable, be deemed to be the value of such land on the material date together with the value of any development carried out thereafter with planning consent.
- Section 52, on compensation for injury caused by scheme, allows that any person whose land is affected by any scheme and suffers loss thereof, or whose mining rights or forestry rights are rendered abortive by operation of a scheme shall upon proper claim be entitled to recover as compensation from the local government authority the amount by which his land is decreased in value in so far as it was reasonably incurred, the amount of abortive expenditure or the loss or injury suffered. Under Section 56(1), a claim for compensation shall be made by serving upon the local government authority a notice stating the grounds of claim and amount thereof, within six months from date of emergence of such scheme provision or as it may be specified in the scheme.

Relevance: Since the corridor of RoW will be extended from existing 45m to 60m, a corridor of 7.5 m on both sides of the road will have to be acquired in accordance with the law. In addition land acquisition will result from realignment of the existing road.

### **2.2.19 Mining Act No 14, 2010**

The following Sections are relevant to this project:

- Section 52: This section describes the obligations of a holder of a mining license. The following obligations are relevant to this project:
- Demarcate and keep demarcated in the prescribed manner the mining area
- Take all appropriate measures for the protection of the environment in accordance with the Environment Management Act
- Implement the proposed plan for relocation, resettlement of, and payment of compensation to people within the mining areas in accordance with the Land Act;
- Section 54: Application for primary Mining License

Prior to commencing of extracting of materials from any borrow pit or quarry, the Contractor shall be required to obtain a Primary Mining license from Zonal Mines Officer.



### 2.2.20 Antiquities Act No 22, 1964 (Revised Edition: 2002)

This is an Act to provide for the preservation and protection of sites and articles of paleontological, archaeological, historical, or natural interest and for matters connected therewith and incidental thereto.

The following Sections are applicable to this project:

- Section 4: Prohibits the excavation of any monument, or any search for relics in monument which is a place of ordinary habitation or occupation without the consent of the owner
- Section 5: Prohibits doing the following to a monument or a protected object declared as such by the Minister or included in a list published by the Commissioner or to any place, site or structure which he knows or has reasonable cause to believe to be a monument:
  - To destroy, injure, or deface the same or make any alteration, addition or repair thereof
  - Alter the course of cultivation so as to affect to its detrimental any part thereof of paleontological, archaeological, historical or natural interest
- Section 8: Relics discovered in Tanzania to be the property of the Republic.

Relevance: Every relic discovered in Tanzania, whether before or after the appointed day, other than a relic properly included in the list delivered to, and signed by the Commissioner

- Section 10: Discovery and excavation

Relevance: The relevant part is one which stipulates that any person who, discovers a relic or monument, or any object or site which may reasonably be supposed to be a relic or monument in Tanzania, otherwise than in the course of a search or excavation, shall forthwith report to the same to an administrative officer, the Commissioner, the Conservator or the Curator of the Museum.

### 2.2.21 Atomic Energy Act No 7, 2003

The following sections are relevant to the proposed road project:

- Sections 11, 17, and 20: Prohibits the possession, use, exportation, store, or transport an ionizing radiation source unless licenced and registered to do so by the Commissioner of Atomic Energy Commission.
- Section 15: Prohibits employment or cause a person who is not a qualified expert to operate a nuclear apparatus.

Relevance: The Contractor(s) is likely to use a nuclear gauge for measuring filed densities and moisture content of materials. To be able to use the nuclear gauge, the Contractor shall obtain a licence to own and use the gauge from the Commissioner of Atomic Energy Commission and shall also ensure that operators of the gauge are trained in accordance with the law.

### 3.2.22 Industrial and Consumer Chemicals (Management and Control) Act, 2003

The act provides for the management and control of the production, importation, transportation, exportation, storage, dealing, and disposal of chemicals and for matters connected therewith.

- Section 29: Requires a certificate be obtained before one imports a chemical.

Several chemicals such as bitumen products, concrete additives, etc. are likely to be imported by the Contractors.

- Section 43: Prohibits importation of chemical wastes in the country

The Contractors shall comply with all the above requirements of the law

### **2.2.23 Contractors Registration Act No 17, 1997 (Revised Edition 2007)**

The Act provides for the registration of Contractors and establishes a Board to regulate the conduct of Contractors in Tanzania and for related matters. The act requires that every Contractor be registered with Contractors Registration Board (CRB) before undertaking any construction; installation, erection or alteration works.

All the Contractors as well as their sub-Contractors who will be involved in the project execution shall be registered with CRB.

All the Contractors shall equally abide by all the requirements of this Act in terms of supporting the activities of the board during inspection of any site for road construction, installation works for the purpose of verifying and ensuring that the works are being undertaken by registered contractors; and that the works comply with all governing regulations and laws of the country; the body responsible for regulating the conduct of contractors in Tanzania.

### **2.2.24 Engineers Registration Act No 15, 1997 (Revised Edition 2007)**

This is an act which formed the Engineers Registration Board, a statutory body with the responsibility of monitoring and regulating engineering activities and the conduct of engineers and engineering consulting firms in Tanzania through registration of engineers and engineering consulting firms. Under the law, it is illegal for an engineer or an engineering firm to practice Engineering profession if not registered with the board. The board has also been given legal powers and has the obligation to withdraw the right to practice from registered engineers if found guilty of professional misconduct or professional incompetence.

Relevance: During construction of the road, every worker either from the Contractor(s) or Engineer(s) side who will carry out the duties of an Engineer as required by the Contract shall be registered with ERB. In addition, the Engineer and his staff who will carry the duties of engineers shall be registered with ERB.

### **2.2.25 Architects and Quantity Surveyors Act No 16, 1997 (Revised Edition 2010)**

This act provides for establishment of the Board of Architects and Quantity Surveyors responsible for registering and regulating the conduct of the Architects, Quantity Surveyors and Architectural and Quantity Surveyors Consulting Firms.

The Act requires that any person who carries out duties of a Quantity Surveyor be registered with the Architect and Quantity Surveyors Registration Board (AQRB).

During construction of the road, every worker either from the Contractor(s) or Engineer(s) side who will carry out the duties of Quantity Surveyor shall be registered AQRB.

Relevance: The road project proponent shall comply with the requirements of this act and shall assist the board during inspections of the project works.



---

## **2.3 LEGAL FRAMEWORK - REGULATIONS**

### **2.3.1 Environmental Impact Assessment and Audit Regulations, 2005**

Environmental Impact Assessment and Audit Regulations provide rules relative to the procedures for and carrying out of environmental impact studies and environmental audits as provided for under the Environmental Management Act (2004).

They prohibit the carrying out of projects without an environmental impact assessment required under the Environmental Management Act and define the contents and form of an environmental impact assessment and the basic principles of an environmental audit. A developer shall apply for an environmental impact assessment certificate in the form as prescribed by these Regulations. The final decision on an environmental impact assessment shall be taken by the Minister. The Regulations also provide for public hearings in relation with environmental impact assessments and appeal against decisions of the Minister.

Relevance: This ESIA has been carried out in accordance with the regulations.

### **2.3.2 Road Management Regulations, 2009**

The following sections are relevant to the proposed road project:

Section 28(a): Specifies that the road reserve width for trunk and regional roads as sixty metres, consisting of thirty metres from either side of the centre of roadway for carriage way roads.

Relevance: The road proposed to be upgraded is classified as a trunk road and therefore will have a road reserve width of 60 m.

### **2.3.3 Hazardous Waste Regulations, 2009**

The regulations are made under Environmental Management Act No. 20 of 2009. According to Section 16 of the regulations, a licence issued by Director of Environment (NEMC) is required before one is allowed to dispose of hazardous wastes.

Relevance: The Contractor shall dispose of all hazardous wastes, in particular waste oil, used batteries, and plastic bottles through a company with NEMC certified permit.

### **2.3.4 Land (Compensation Claims) Regulations, 2001**

This regulation is made under the Land Act No 4 of 1999. The regulations provide the basis for eligibility for compensation. It sets out the rights and entitlement for the one claiming compensation.

According to the regulation, the following are eligible for compensation/ resettlement:

- Holder of right of occupancy (Section 22 of the Land Act of 1999);
- Urban or peri-urban land acquired by the President under Section 60 of the Land Act, 1999.

Sub-section 2 of Section 9 applies to all applications or claims for compensation against government or Local Government authority, public body, or institution. According to Section 10(1), compensation at the option of the Government shall take the form of a combination or any of the following:

- 
- Monetary compensation
  - Plot of land of comparable quality, extent and productive potential to the land lost;
  - A building or buildings of comparable quality, extent and use comparable to the building or buildings lost
  - Plants and seedlings
  - Regular supplies of grain and other basic foodstuffs for a specified time.

Relevance: For this project, compensation of affected properties will be in monetary terms

### **2.3.5 Land (Assessment of the Value of Land for Compensation) Regulations, 2001**

The Land Regulations were made under section 179 of the Land Act 1999, and provide all specific forms required for Management and Administration, Granted Right of Occupancy, Mortgage, Lease, Easement, Co-occupancy and others including compensation forms (Forms 69 and 70).

These regulations set out criteria for the assessment of compensation of land. The basis for assessment of the value of any land and un-exhausted improvement shall be the market value of such land. The market value is arrived at by the use of comparative method proved by actual recent, sales of similar properties or by use of income approach or replacement cost method, in case the property is of special nature and not saleable. The assessment is done is done by Qualified Valuer and verified by the Chief Valuer of the Government or his/ her representative

In addition, compensation issues include the following opportunity cost which is based on the following:

- The Market Value of the Real Property
- Disturbance allowance
- Transport allowance
- Loss of profits /income or accommodation
- Cost of acquiring or getting an equivalent land
- Any other immediate costs, loss or capital expenditure incurred to the development of the subject land and
- Interest at market rate

#### **Accommodation allowance**

Accommodation allowance is estimated by assessing the market rent of the building and multiplying it by thirty-six months.

#### **Loss of profit**

Loss of profit is estimated by assessing the net monthly profit of the business carried out on the land (evidenced by audited account where necessary and applicable) and multiplying by thirty-six months.

---

### **Disturbance allowance**

Disturbance allowance is calculated by multiplying value of the land by average percentage rate of interest offered by commercial banks on fixed deposits for twelve months at the time of loss of interest in land.

### **Transport allowance**

Transport allowance is determined by taking actual costs of transporting twelve tons of luggage by rail or road (which ever cheaper) within twenty kilometres from the point of displacement. No payment shall be made for transport allowance, accommodation allowance, and loss of profit for unoccupied land at the date of loss of interest on land.

### **Interest**

Interest is determined by average percentage rate of interest offered by commercial banks on fixed deposits and will be recoverable until such compensation is paid (Sub-section 3 of Section 13). The following procedures outlined in Section 6 of the regulation shall apply:

- Publication of notice by Commissioner for lands on public notice board;
- Notification of the occupier of the land;
- Submission of claims for compensation by occupier;
- Physical appearance of occupier on specified date, time and place where assessment is to be made
- Valuation for compensation by Commissioner or the authorized officer
- Preparation of compensation schedule and submission of the schedule with claim for compensation to the Compensation Fund.
- Verification and acceptance of rejection of payment by the Fund within not more than 30 days from the date of receipt of claim.

If the person does not agree with the amount or method of payment or dissatisfied with time taken to pay compensation he /she may apply to the High Court. The high court shall determine the amount and method of payment and make any additional costs and inconveniences incurred.

To comply with the requirements of the law:

- Prompt compensation shall be paid for acquired land or damaged properties.
- The project shall involve a Qualified Valuation Officer and follow all procedures as outlined in The Land (Compensation Claims) Regulations (2001) and The Land (Assessment of Value for Compensation) Regulations (2001)

Relevance: The project proponent shall make use of these current Land Acts of 1999 for payment of compensation

### **2.3.6 Mining (Safety, Occupational Health & Environment Protection) Regulations, 2010**

The Mining (Safety, Occupational Health and Environment Protection) Regulations, 2010 were established under the Mining Act No 14, 2010.

The following Sections are relevant to the project:

- Part III: General Safety Procedures
- Part IV (Reclamation Requirements, Rehabilitation Bond and Mine Closure)
- Part IV: Emergency Preparedness
- Part X: Mine Accidents, Incidences and Enquiries
- Part XIV: Reclamation Requirements, Rehabilitation Bond and Mine Closure
- Solid Waste Regulations, 2009

### 2.3.7 Solid Waste Regulations, 2009

The following sections are relevant to this project:

- Section 17: Prohibits the following hazardous substance to be deposited in receptacles: asbestos or asbestos-containing material, explosives, fireworks, firearms, batteries, hot ashes, flammable liquid, highly flammable materials, infectious material, pressurised containers (other than a pressurised container commonly used for containing domestic products such as fly spray, hair spray and similar materials), or radio-active material
- Section 35: The Contractor has the duty to ensure that before placing any solid wastes into receptacles plastic materials are separated from non-plastic materials

Relevance: Hazardous material, waste oil, medical wastes, plastic bottles and bags shall be separated from other wastes and disposed of through a company with appropriate permit from NEMC.

### 2.3.8 Atomic Energy (Protection from Ionizing Radiation) Regulations, 2004

The regulations specify the minimum requirements for protection of people against exposure to ionizing radiation and for the safety and security of radiation sources, hereinafter referred to radiation safety, protection and security

The following sections are relevant to this project:

- Section 16: Requires any person intending to engage in a practice or possess a radiation source shall apply for a licence/ registration to the Commission for an authorization.
- Section 17: Requires a permit to import, export or transport any apparatus, article, plant, installation or other material or substance which is a source or intended to be used for the purposes of an undertaking involving the emission of radiation
- Section 19: Holder of a licence shall bear the responsibility for establishing and implementing the technical and organizational measures that are needed for ensuring protection and safety for the practices and sources for which they are authorized.
- Section 28: Requires every user of ionizing radiation equipment shall to appoint a qualified expert employed by him to be a Radiation Safety Officer in relation to his undertaking. The duties of the radiation Safety Officer shall be to:
  - i) Advise the user appointing him in all matters pertaining to the protection of workers, patients, the public and the environment from ionizing radiation

- 
- ii) Advise the user regarding formulation, the observance and enforcement of local rules for the protection of workers, patients, the public and the environment from ionizing radiation;
  - iii) Advise and liaise with the Commission regarding the implementation of radiation protection measures at his work place
  - iv) Assist the Commission in the enforcement of the provisions of this regulation in relation to the undertaking in respect of which he is appointed
  - v) Assist the licensee in keeping all records of the practice as prescribed in these Regulations.
  - Section 32: Specifies that licensees and employers of workers who are engaged in activities that involve or could involve occupational exposure are responsible for the protection of the said workers against any occupational exposure which is not excluded from these Regulations
  - Section 40: Employers and licensees shall maintain records of exposure for each worker for whom assessment of occupational exposure is required. Such worker exposure records shall include information on:
    - i) The general nature of the work resulting in exposure, the doses and intakes at or above the relevant recording levels and the data upon which the dose assessments are based;
    - ii) The periods of employment with different employers, if any, and the corresponding doses and intakes in each period of employment
    - iii) The doses or intakes due to emergency interventions or accidents, which shall be distinguished from doses and intakes received during work in normal conditions.
  - Section 52: Licensees is responsible to protect the public from exposure to ionizing radiation delivered by a practice or source for which they are responsible.
  - Section 60: Registrants or Licensees is responsible for the safety and security of the sources under their responsibility, from the moment of their acquisition throughout their entire operational life and up to their final disposal.
  - Section 61: Licensees shall ensure that the following relevant requirements with regards to storage of radiation sources are met:
    - i) When not in use radiation sources is kept in a place of storage assigned for this purpose only, bearing the appropriate warning symbol
    - ii) The place of storage shall be adequately shielded such that at the outside surface of its walls or containment the radiation dose shall not exceed 0.01 mSv per hour, and shall be chosen so as to minimize risks from fire or flood
    - iii) The place of storage shall be inspected regularly and checked for possible contamination;
    - iv) The place of storage shall be sited and designed so as to ensure that both during storage and in the course of transfer of radiation sources to and from the store, the sources do not give excessive exposure to any person
    - v) All radiation sources shall be clearly labelled, giving information on their activity and nature (physical form)
  - Section 72: Licensees shall ensure that the following relevant requirements with regard to transport of radioactive materials are met:
-

- i) The Radiation Safety Officer shall be responsible for the precautions to be taken in the movement of radioactive materials from one area to another within the establishment
- ii) Radioactive materials shall be transported within the licensed premises only in containers provided for the purpose and should properly be labelled. Such containers shall be designed to provide adequate protection for all persons during loading, transport and unloading
- Section 73: Transport of radioactive source shall be subject to a licence issued by the Commission for that purpose

Relevance: The Contractor is likely to use nuclear gauges (containing radioactive material) for measuring densities of compacted materials and moisture content. The Contractor shall comply with all the above requirements of the law.

### **2.3.9 Factories (Building Operations and Works of Engineering Construction) Rules, 1985**

These rules were made under Section 55 of Factory Ordinance (Cap 297), 1950 and made available under Government Notice 18. The following sections of the rules apply to this project:

- Section 123: Protection of workers against excessive noise level
- Section 124: Prohibits subjecting workers to unnecessary strenuous working position and movement
- Section 126: Obligation of employer to provide appropriate PPE to his workers
- Section 127: Avail suitable and sufficient fire-fighting equipment and materials
- Section 129: Requires the Contractor to:
  - i) Provide for his workers shelter and accommodation for interruption of work during bad weather, clothing and for taking meals
  - ii) Provide for workers clean and safe wholesome adequate drinking water at convenient point, clearly marked “DRINKING WATER”
- Section 131: Obligation of the Contractor to provide for his workers sanitary facilities
- Section 134: Obligation of the Contractor to avail first aid facility at every work site
- Section 135: when number of workers exceeds 250, the Contractor is obliged to provide and maintain in a good order and clean condition at or near the site of operation or work and conveniently easily accessible a properly constructed and suitable a first-aid room. The first aid room shall be used only for the intended that purpose of treatment or rest.
- Section 136: Provide adequate number of trained and qualified first aiders for rendering the service to workers.

Relevance: The Contractor shall comply with all the above requirements of the law

### **2.3.10 Government Notice No. 196 of July 2013**

Government notice No 196 of July 2014 specifies a minimum wage of TZS 12,500/days or TZS 325,000/month (5 days per week) for construction workers.

Relevance: This will be the minimum wage the Contractor shall pay to workers of the project.



### 2.3.11 Non-Citizens (Employment Regulations), 2015

This act regulates and realigns the legal regime for employment and engagement in other occupations by non-citizens in Mainland Tanzania and provide for related matters.

The following sections are relevant to the project:

Section 9(1): A non-citizen shall not engage in any occupation for reward, profit or non-profit unless he:

- (a) Has a valid work permit that allows that person to engage in the occupation specified in the valid work permit or
- (b) Is the holder of a valid certificate of exception issued to him under this act

Section 9(2): A person shall not employ, engage or cause to be employed or engaged in any occupation a non-citizen unless

- (a) The non-citizen has a valid work permit that allows that person to be employed in the occupation specified in the valid work permit or
- (b) The non-citizen has a valid certificate of exception issued to him under this act

Relevance: The Contractor or supervising consultant shall ensure that all his non-citizen employees have valid work permits or certificate of exceptions.

## 2.4 ENVIRONMENTAL MANAGEMENT GUIDELINES

### 2.4.1 Environmental Assessment and Management Guidelines for Road Sector, 2011

The road sector guideline has been prepared to address environmental issues in all projects that fall under the road sector. The guidelines have been established according to Environmental Management Act of 2004. It underscore the need to incorporate environmental and social issues into road projects from planning stage through, design, construction, up to operation and maintenance stage.

The guidelines outline the procedures for carrying out EA and Management for road construction projects and provide an institutional and legal framework for environmental management in the road sector. Thus, the guidelines outline the administrative and legal procedures that should be followed by project proponents.

Unlike the national guidelines the road sector guidelines categorizes projects into major and non-major impact projects. The guideline classifies EA studies into three types:

- Initial Environmental Examination (IEE)
- Limited Environmental Analysis (LEA)
- Environmental Impact Assessment (EIA) – Phase1 and Phase 2

The road sector guideline outlines resettlement plan and compensation procedures. It recognizes the considerable impacts of road infrastructure on human settlement and local community properties, including adjacent land use.



---

## 2.4.2 Environmental Code of Practice for Road Works, 2008

The Environmental Code of Practice for Road Works has been prepared to guide the intervention of road engineers, Contractors, and environmental specialist, and technicians during the planning, design, construction, and operation phases, so that direct adverse environmental impacts of the project can be avoided or minimized.

These mitigation measures should in most cases be integrated in the technical specifications and bill of quantities to ensure that the road contractor can include them in the construction costs so as to achieve sustainable environmental protection

The objective of purpose Environmental Code is to:

- Establish specific environmental criteria for road works in Tanzania
- Provide technical assistance
- Ensure general understanding of environmental impacts and define environmental criteria to minimise such impacts
- Ensure that road engineers and technicians can find solutions for any problems arising during road constructions or maintenance activities
- Facilitate the preparation of environmental assessment for road development projects

### Relevance to the Project:

These guidelines were closely followed while preparing this ESIA report.

## 2.4.3 The Road Sector Compensation and Resettlement Guidelines, 2009

The Road Sector Compensation and Resettlement Guidelines were developed by The Ministry of Works in 2009. The purpose of these guidelines is to provide a consistent approach on compensation and resettlement procedures and practices in the road sector. The guidelines are intended to guide the user in the preparation of a Compensation and Resettlement Action Plan (RAP) prior to commencement of construction works.

The objectives of the guidelines are:

- To create awareness on compensation and resettlement issues among the various road agencies and other stakeholders
- To ensure transparency in the compensation and resettlement process
- To clarify respective roles and obligations of each responsible institutions
- To provide technical guidance
- To clarify reporting requirements
- To ensure information flow and public participation
- To provide logical methodology for compensation and resettlement in the road sector

### Relevance to the Project:

The preparation of RAP has been undertaken in accordance with, among others The Road Sector Compensation and Resettlement Guidelines.

## **2.4.4 Environmental Impact Assessment (EIA) procedures (March 2002)**

The National Environment Management Council (NEMC) developed EIA guidelines and procedures using information from international agencies (NORAD, DANIDA, ODA, ADB, World Bank) and checklists from United Nations Environment Programme (UNEP). The guidelines are contained in five volumes:

- Vol. 1: Procedures and General Information on EIA
- Vol. 2: Screening and Scoping Guidelines
- Vol. 3: Report Writing Guidelines and Requirements
- Vol. 4: Review and Monitoring Guidelines
- Vol. 5: General Checklist of Environmental Characteristics

### Relevance to the Project:

These guidelines were closely followed while preparing Environmental and Social Impact Assessment for this project.

## **2.4.5 AfDB Environmental and Social Impact Assessment Procedures**

The main purpose of the Environmental and Social Assessment Procedures (ESAP) is to improve decision-making and project results in order to ensure that Bank-financed projects, plans and programs are environmentally and socially sustainable as well as in line with Bank's policies and guidelines. The ESAP intend to replace the actual procedures and integrate all crosscutting considerations into the new assessment process.

### Relevance to the Project:

The ESAP describes the various steps to be followed in carrying out Environmental and Social Impact Assessment to mainstream crosscutting issues along the project cycle, from programming to post-evaluation

This study has been undertaken in accordance with the AfDB – Environmental and Social Impact Assessment Procedures.

## **2.5 CONVENTION, TREATIES, AND PROTOCOLS**

### **2.5.1 East African Community Treaty, 1999**

The Republic of Uganda, the United Republic of Kenya, and the United Republic Tanzania signed the treaty for the establishment of the East Africa Community on the 30<sup>th</sup> of November, 1999.

The following articles of the East African Community, of which Tanzania is a member, are relevant to this project:

- Article 5: The promotion of sustainable utilization of the natural resources of the Partner States and the taking of measures that would effectively protect the natural environment of the Partner States

- Article 112: Integrate environmental management and conservation measures in all developmental activities such as trade, transport, agriculture, industrial development, mining, and tourism in the Community.

Relevance to the project:

The project proponent shall comply with all the above articles.

## **2.5.2 Protocol on Environmental and Natural Resource Management, 2005**

The East Africa Community Protocol on Environmental and natural Resource Management govern the Partner States in their cooperation in the management of environment and natural resources over areas within their jurisdiction including trans-boundary environment and natural resources.

The following articles are relevant to this project:

- Article 4 - Principles: Requires that Partner States manage the environmental and natural resources in the community in accordance with the following principles:
  - i) Principle of sustainable development
  - ii) The principle of public participation in the development of policies, plans, processes and activities
  - iii) The principle of strategic environmental assessment and environmental impact assessment of projects, policies and activities
- Article 8 – Sustainable Development: The Partner States are required to ensure that conservation and management of environmental and natural resources are treated an integral part of national and local development plans. They are also obliged to ensure that consideration is given to environmental factors in the formulation of all development plans

Relevance to the Project:

This ESIA is being carried out to fill the requirement of the article

- Article 13 – Management of Water Resources: Relevant item in this article is the one that gives the obligation of each Partner State to protect and conserve the water resources and their ecosystem in the community through protecting and the water quality, preventing the introduction of alien species into the water resources, and protecting and conserving biological diversity in the water resources

Relevance to the Project:

During construction the road, especially across rivers as well as where the contractors have to abstract water from the rivers for construction purpose, the contractors shall ensure that water resources (rivers and irrigation channels) are protected from pollution.

- Article 21 – Soil and Land Use Management: The partner states are required to:
  - i) Control loss of surface soils and vegetation cover caused by poor and inappropriate land use
  - ii) Regulate the inflow and application of agro-chemicals to water bodies

- iii) Ensure that all forms of land use, including but not limited to public works, urban centres, mining and disposal of wastes, do not result in land degradation and pollution
- iv) Take measures to control fires, forest exploitation, land clearing for cultivation, overgrazing by domestic and wild animals

Relevance to the Project:

- As much as it is practical, construction activities, in particular clearing works, construction in steep slopes, and development of borrow areas will ensure erosion control measures are in place
- During construction, the Contractor shall not be allowed to use firewood as a source of energy
- Treatment of wastes by burning shall be done in a controlled manner
- The Contractor shall not be allowed to dispose of concrete wastes or slurry on water courses
- Article 28 - Management of Chemicals: The Partner States are obliged to take all necessary measures to ensure environmentally sound management of chemicals

Relevance to the Project:

During construction of the proposed road the contractor shall ensure chemicals such as concrete additives; paints, fuel, lubricants, concrete, etc. are handled in a manner that there are no leakages to the ground or water resources.

- Article 29 - Management of Wastes and Hazardous Wastes: The article requires that Partner States take measures to minimize and ensure segregation of wastes at source points up to final disposal

Relevance to the Project:

During construction of the proposed road the contractor shall use methods and technologies that minimize the amount of wastes generated. They shall also prevent leakages of wastes until disposed of at designed point.

- Article 30 – Pollution Control and Management: The article requires that Partner States take all reasonable measures in the event of occurrence or discovery of oil spill or other oily residues or mixtures into the environment for the purpose of preventing damage to the environment. The Partner States shall also be required to adopt measures for the safe handling, use, transportation and storage of toxic chemicals and hazardous substances

Relevance to the Project:

During construction, as much as possible, the contractors shall prevent leakages of hazardous materials during transport, handling, use, and storage of chemical so that they do pollute water and land resource

- Article 31 - Environmental Impact Assessment and Audits: The articles requires that an environmental Impact assessment be carried out for a trans-boundary activities and projects that are likely to have significant adverse environmental impacts

Relevance to the Project:

This ESIA has been carried out to fulfil the requirement of the article

### 2.5.3 International Convention on Biological Diversity

Tanzania signed the Convention on Biological Diversity (CBD) on June 1992 and has prepared a Country Study on Biodiversity, which describes the state of biodiversity in Tanzania, forces affecting it and proposes measures to ensure conservation and use of these resources in judicious ways. The report stresses the need to ensure proper biodiversity conservation measures are taken before any development is undertaken (UNEP, 1998).

#### Relevance to the Project:

The project road passes along a number of forestry and wildlife protected areas. The wildlife and forestry protected areas are essential for biodiversity conservation, providing habitat and protection from hunting for threatened and endangered species. They were formed to respond to Convention on Biological Diversity.

### 2.5.4 The World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) was adopted by the United Nations Education, Scientific and Cultural Organization (UNESCO) General Conference at its 17<sup>th</sup> session in Paris on 16 November 1972. The Convention came into force in 1975. UNESCO encourages the identification, protection, and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. By regarding heritage as both cultural and natural, the Convention demonstrates the dynamic relationship between people and with nature and stresses “the fundamental need to preserve the balance between the two” ([www.whc.unesco.org](http://www.whc.unesco.org)). By agreeing to set aside such areas the States Parties thus agree to take all the necessary measures to preserve the resources for the good of human kind in the world and also agree that world heritage sites belong to all the people of the world irrespective of the territories on which they are located.

#### Relevance to the Project:

The road is located along a number of forests protected areas, a game reserve, and a hunting block that are habitats of wildlife. The Contractor shall not be allowed to enter the protected areas for any purpose, including borrowing of construction materials without the permit of authorities entrusted to manage the protected areas.

### 2.5.5 ILO Conventions on Occupational Safety and Health

The ILO Homework conventions Article 4 (1996) speaks about protection of workers in the field of occupational, safety and health. Article 8 is about prohibition of certain substances at work places for safety and health purposes. It asks for measures to protect workers from the risks related to chemical, physical and biological agents at work (Convention, No. 155 of 1981). The convention also speaks about the need to protect the working environment for example air pollution, noise and vibration (Convention No. 148 of, 1977).

TANROADS and East African Community are committed to ensuring that the policies and legislations discussed above are adhered to. To do so TANROADS shall ensure that the requirement by the Contractor to comply with legislations is included in all tender documents (in particular **General Conditions of Contract**) issued for construction work and activities on site and shall monitor/enforce that the Contractors abides by the specifications thereof.

---

## **2.6 INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK**

### **2.6.1 Government Agencies Responsible for Environmental Issues**

The administrative and institutional arrangements for environmental management for all sectors in Tanzania are stipulated in the Environmental Management Act No. 20 of 2004. There are seven (7) institutions mentioned by the act, of which the Minister Responsible for Environment is the overall in-charge for administration of all matters related to the environment. The legal institutions for environmental management in the country include:

#### **2.6.1.1 National Environmental Advisory Committee**

The EMA 2004 stipulates the obligations of the National Environmental Advisory committee as to advice the minister responsible for environment or any sector ministry on all matters regarding the environment. In this particular development project, the national advisory committee has to recommend to the minister or sector ministry on the protection and management of the environment based on the ESIA report. It further review and advise the minister on any environmental standards, guidelines and regulations pertinent to the environmental protection.

#### **2.6.1.2 Minister Responsible for Environment**

The Minister responsible for Environment, VP Office is the overall responsible for all matters relating to environment, responsible for all policy matters necessary for the promotion, protection, and sustainable management of Environment in Tanzania.

#### **2.6.1.3 Director of Environment**

The Director of Environment coordinates various environmental management activities being undertaken by other agencies and promotes the integration of environment consideration into policies, plans and programmes, strategies and projects.

#### **2.6.1.4 National Environment Management Council (NEMC)**

EMA 2004 gives National Environment Management Council (NEMC) the overall responsibility for undertaking the enforcement, compliance, review and monitoring of Environmental Impact Assessment and in this regard facilitates public participation in environmental decision-making. NEMC is responsible for screening and reviewing big investments and projects of the national significance.

#### **2.6.1.5 Sector Ministries**

Sector ministries, in this case the environmental section in the Ministry of Works through TANROADS is responsible for the following duties as far as the project is concerned,

- Coordinate the activities related to the environment within the ministry, PMO,
- To ensure that environmental concerns are integrated into the ministry or in a department of development planning and project implementation in a way this protects the environment,
- To prepare and coordinate the implementation of environmental action plan at the national and local levels and
- To ensure that sectorial standards are environmentally sound, and the like.



The Ministry of Lands and Human Settlements Development will be responsible for coordinating all activities related to valuation, compensation, and resettlement procedures.

### **Department of Works: Safety and Environment Division**

The Sector Environment Sections in the Department of Works under which TANROADS falls, is responsible for ensuring: Compliance by the Department with the requirements of the Environmental Management Act (2004) and ensuring all environmental matters are implemented and reports to the Director of Environment. It is also responsible for liaising with the Director of Environment and NEMC on matters involving environment.

The Department of Works has four main sections as follows: Transport Infrastructure, Transport Policy and Planning, Technical Services, and Safety and Environment.

Since Department of Works has a main stake in the road sector, the ministry formulates policy, sets standards and specification; define the long term strategic plans; monitors and controls application of the regulations; and participates in the management of the executive agencies. In the Ministry, environment falls under Safety and Environment section.

Under the Safety and Environment section there is a Safety and Environment Unit (SEU) responsible for implementation of environmental management matters in the road sector. For environmental assessment of road projects, the SEU:

- Prepares strategic environmental assessment (SEA)
- Screens application form to determine the level of environmental assessment
- Assesses and comments on environmental assessment
- Advises the ministry for approval of environmental assessment reports
- Participates in ESIA review in collaboration with NEMC
- Controls the implementation of environmental management plan (ESMP)
- Promotes public environmental awareness
- Assist in the development and implementation of the environmental management system
- Advises the ministry on all environmental issues related to road construction, upgrading, and maintenance and operation

### **Ministry of Works, Transport, and Communication and TANROADS: Transport Sector**

Under the present structure, the transport sector is under the Ministry Works, Transport and Communication (MWTC), and PORALG. The MWTC is responsible for the overall policy and planning for the transport sector including the road sector. The development and management of road sector is divided between MWTC and PORALG. The MWTC is responsible for the overall policy of development and management of the trunk and regional roads and PORALG is responsible for the development and management of district, urban and feeder-road network.

Under MWTC comes TANROADS, which was established under Executive Agencies Act 1997. It is responsible for maintenance and development of the trunk and regional roads. TANROADS procures and manages contracts for design, maintenance, emergency repairs, spot improvements, upgrading, upgrading, and construction of its roads. TANROADS is also responsible for improving road safety and reducing the negative environmental impacts of its road network.



TANROADS is further divided into 21 regions. Each regional office ensures adequate procurement and administers the roads and bridges maintenance and development works, and supervises its consultants and contractors. Under the new act, EMA 2004, environment responsibilities have been delegated to Sectorial Ministries. The MWTC did set up its Road Sector – Environmental Section which oversees management of the environment within the road sector.

## **2.6.2 Regional and District Administrative Structures**

The Regional Administration Act No. 9 of 1997 provides for Regional Commissioners to oversee Regional Secretariats, with District Commissioners directly supervising the District Councils. Local authorities oversee the local planning processes, including establishing local environmental policies.

The National Environmental Policy establishes a policy committee on environment at regional level chaired by the Regional Commissioner, mirrored by environmental committees' at all lower levels, i.e. at the district, division, ward and village or "mtaa" councils.

At Local Government level, an Environmental Management Officer should be designated or appointed by each City, Municipal, District or Town Council. In each City or Municipality or District, Environmental Committees should be established in order to promote and enhance sustainable management of the Environment.

The Village Development Committee is responsible for proper management of the environment in their respective areas. The District Council designates for each administrative area as township, ward, village, "mtaa", "hamlet" an Environmental Management Officer to coordinate all functions and activities related to protection of environment in their area.

### **2.6.2.1 Regional Secretariat**

The Regional Secretariat, which is headed by Regional Environmental Management Expert, is responsible for coordination of all environmental management programmes in their respective regions and in liaison with the Director of Environment. The Regional Environmental Management Expert is responsible for:

- Advising the local authorities on matters relating to the implementation of and enforcement of environmental by-laws/Act
- Creating a link between the region and director of environment and the director general of the council (NEMC)

### **2.6.2.2 Local Government Authorities (City, Municipal, District, Township, Ward, Village, sub-village "Mtaa", "Hamlet")**

The environmental management officer under the local government authority is responsible for promoting environmental awareness in the respective area on the protection of the environment and conservation of natural resources. Furthermore, he is the one to prepare, review, and approve the EIA for local investments.

Under the Environmental Management Act (2004), the City, Municipal, District and Town Councils are headed by Environmental Inspectors who are responsible for environmental matters. The functions of the inspectors are to:

- Ensure enforcement of the Environmental Management Act in their respective areas,

- 
- Advise the Environmental management Committee on all environmental matters,
  - Promote awareness in their areas on the protection of the environment and conservation of natural resources,
  - Collect and manage information on the environment and the utilization of natural resources,
  - Prepare periodic reports on the state of the local environment,
  - Monitor the preparation, review and approval of EIA's for all local investors
  - Review by-laws on environmental management and on sector specific activities related to the environment,
  - Report to the DoE and the Director General of the NEMC on the implementation of the Environmental Management Act,
  - Perform other functions as may be assigned by the local government authority from time to time.

All of the above institutions are responsible for the environmental management of the project and their link to this project are specified in functions as enumerated in the respective sections above.

### **2.6.3 African Development Bank**

African Development Bank (AfDB) is the financing agency of this project.

AfDB acknowledges that to sustain economic growth in Africa, there is an urgent need to preserve and enhance the ecological capital that enriches such growth.

Among the criteria that a project has to meet before it is funded is to have minimum impacts to the environmental and the communities. To verify this Environmental and Socials Impact Assessment has to be carried out in accordance with AfDB Guidelines.

## SECTION 3: DESCRIPTION OF PROJECT AND JUSTIFICATION

### 3.1 PROJECT BACKGROUND

#### 3.1.1 Project Justification

The project road passes through areas with potential for variety of economic opportunities in particular agriculture. Crops grown include among others coffee, bananas, cotton, maize, beans, palm oil, and cassava. The road also provides transportation route for the agricultural and mining produce to and from great Lakes country in particular the eastern Democratic Republic of Congo. Other products include mercantile from Kigoma and Kasulu centres, rice, ground nuts, coconuts, salt, oranges, simsim, pineapples, apples, pears, etc. from western regions of Tanzania regions to Bujumbura

The local communities in the project area face numerous difficulties in finding markets for their produces due to lack of reliable and efficient transportation system. As a result prices that are offered by traders for local products and produces are far much lower because of the lack of competition among the traders and transporters because of poor road condition.

Although the existing road is passable during the dry seasons, some of its sections become impassable during rain seasons, which hinder transportation of goods and passengers. The road improvement is part of the Government strategy to develop its road network to support socio-economic development of the Country

Recently, the road had been deteriorating at an alarming rate despite huge amount of money injected for its routine and sometimes periodic maintenances. This is due to high traffic traversing this road most of which carry agricultural produces like coffee and staple crops (beans, bananas, pea nuts different types of fruits) from Kigoma to Kasulu, the fast economically growing districts to other neighbouring districts namely Ngara, Biharamulo, Muleba, Bukoba, Bukombe and Kahama and to other far districts namely Chato, Geita and Mwanza city. Apart from heavy traffic, this road is the only linkage between Kigoma region and Kagera region through Lusahunga- Biharamulo road and Ngara through Lusahunga – Rusumo road. The upgrading of the Kasulu - Manyovu road to bitumen standard will therefore increase the interconnectivity of these isolated districts to other districts and probably improve the social and economic interaction between the people of Kigoma region and others parts of Tanzania. It will also connect neighbouring country of Burundi to Tanzania. It will improve trading between these neighbouring countries of East Africa community.

The costs of maintaining the existing gravel road are high as it requires recurrent gravelling and grading. In addition, frequent break downs of vehicles are results of the poor road surface.

Upgrading of this road coupled with the upgrading of the Kasulu – Manyovu (48km) will facilitate efficient transportation of people and agricultural products between Tanzania and Burundi as the road provides a shorter link between Tanzania and Burundi trough the central corridor.

Upgrading of the road therefore:

- i) Facilitate more efficient transportation of agricultural products from the project area to markets in the areas of consumption

- ii) Facilitate/ increase tourism activities within the project areas as well as adjoining areas
- iii) Reduce maintenance costs of the road
- iv) Reduce Vehicles Operating Costs
- v) Improve access to social services such as markets and health services

In addition, upgrading of the road will complement the on-going effort by the government to upgrade Nyakanazi – Kabingo section (50km) and Kasulu – Manyovu (48m) to bitumen standard.

### 3.1.2 Project Location

The project road is located in Kasulu, Kibondo, and Kakonko Districts, Kigoma Region in the western part of Tanzania. Kasulu, Kibondo, and Kakonko are among the six (6) districts of Kigoma Region. Others are Buhigwe, Uvinza, and Kigoma.

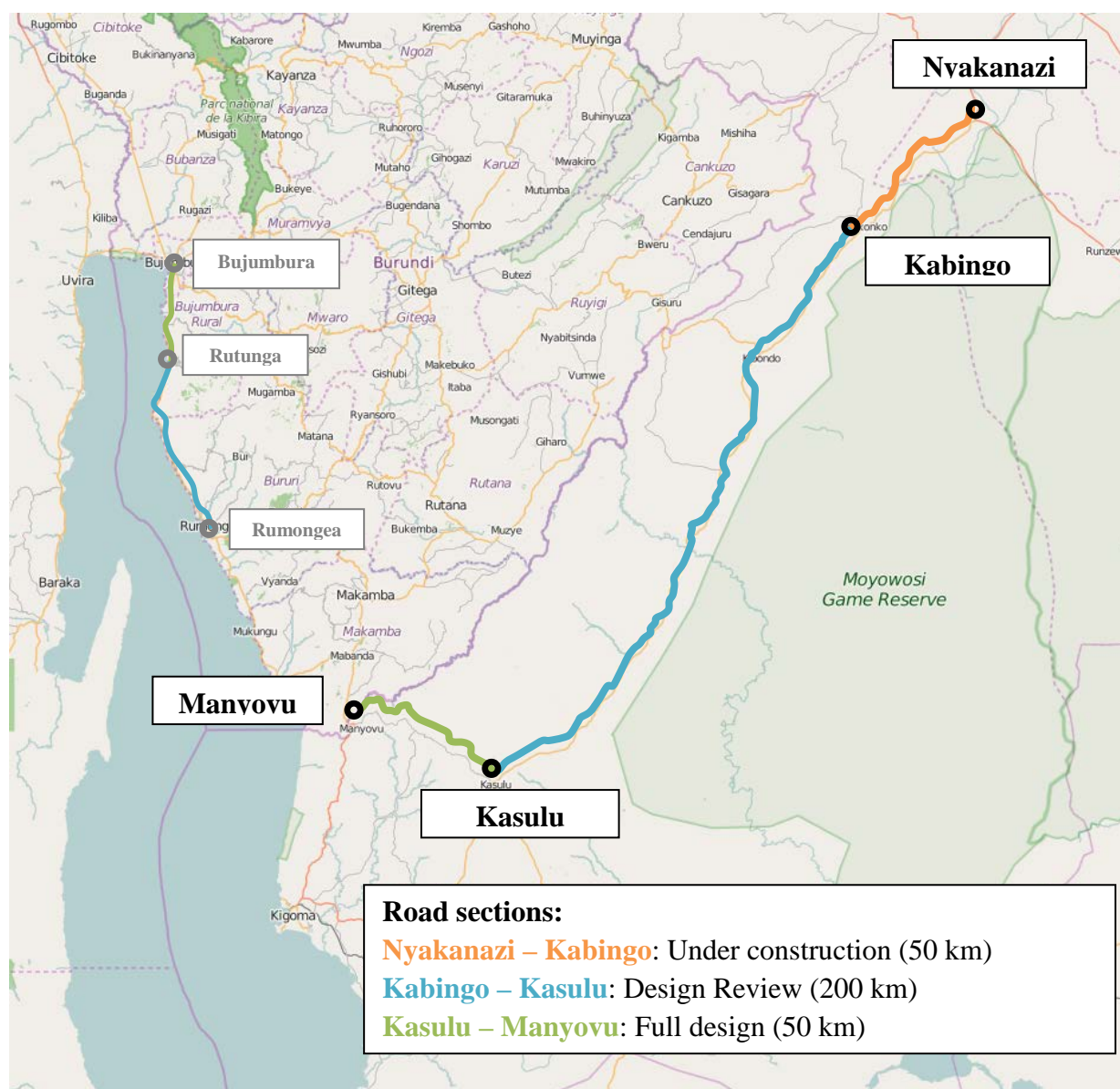
Kasulu District is bordered to the north by Burundi, to the east by Kibondo District, to the south by Uvinza District, to the west by Kigoma District, and northwest by Buhigwe District, while Kakonko is bordered to the north by Kagera Region, to the east by Geita Region, to the south by Kibondo District, and to the west by Burundi. The location of the project area in Tanzania is shown by Figure 1, while the location of the project area with respect to Kigoma is shown by Figure 2.

Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo –  
Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard



Figure 1: Location of the Project Road in Tanzania





**Figure 2: Location of the Entire Project Road**

As noted earlier, the proposed project road comprises of three road sections as follows:

- Kasulu – Kidiama Road section [Kasulu Northern Link] (8.7)
- Kanyani – Mvugwe road section (70.5km)
- Mvugwe – Nduta Junction section (59.4km))
- Nduta Junction – Kabingo (62.5km). of which part of it is Kibondo Bypass road
- Kibondo town Link Road (25.9km)

### **Kasulu – Kibondo – Kabingo Main Road Section**

This consists of the existing road which starts off at Kasulu T-junction; the point where Kibondo – Kasulu road links with Kasulu – Manyovu and Kasulu – Kigoma and ends at Kabingo Village, about 50km from Nyakanazi towards Kibondo.

The main road alignment traverses at least twenty seven (27) villages that are listed in Table 1. The location of the main road alignment is shown by Figure 1b through Figure 18b in Appendix III. The following table lists villages through which the main road alignment passes.

Throughout the discussion in this revised ESIA report for this road section, the reference of distance measurements (chainage convention) to any point along the main road alignment is made from the T-junction connecting Kibondo – Kasulu road, Kasulu – Manyovu road, and Kasulu – Kigoma road.

The chainages are presented as Km A+bbb, of which the first number (A) represents the distance in Km, while the second number (bbb) represents the distance in metres. Km A+bbb therefore refer to the chainage at the distance of A.bbb Km.

**Table 1: Locations of Villages along the Project Road Main Alignment**

No.	Village	District	Location at village Centre
1.	Kidiana	Kasulu	Km 6+500
2.	Kanazi	Kasulu	Km 14+900
3.	Nyamyusi	Kasulu	Km 19+200
4.	Nyakitonto	Kasulu	Km 22+700
5.	Mugombe	Kasulu	Km 26+600
6.	Nyachienda	Kasulu	Km 36+500
7.	Kitagata	Kasulu	Km 40+500
8.	Kalimungoma	Kasulu	Km 51+300
9.	Nyangwa	Kasulu	Km 51+800 LHS
10.	Makere	Kasulu	Km 51+800 RHS
11.	Nyamidaho	Kasulu	Km 57+300
12.	Mvugwe	Kasulu	Km 62+900
13.	Nyalulanga	Kibondo	Km 85+700
14.	Busunzu B	Kibondo	Km 91+900
15.	Busunzu A	Kibondo	Km 95+800
16.	Kisogwe	Kibondo	Km 101+100
17.	Kifura	Kibondo	Km 111+100
18.	Kumshindwi	Kibondo	Km 118+200
19.	Maloregwa	Kibondo	Km 123+400
20.	Rusohoko	Kibondo	Km 132+600
21.	Kitahana	Kibondo	Km 134+600
22.	Kumwambu	Kibondo	Km 140+300
23.	Mabanda junction	Kibondo	Km 143+600
24.	Twabagondozi	Kibondo	
25.	Kilemba/ Kumkugwa	Kibondo	Km 151+800
21.	Kazilamihunda	Kibondo	Km 168+000
22.	Keza	Kakonko	Km 169+400
23.	Nkuba	Kakonko	Km 170+100
24.	Kasanda	Kakonko	Km 172+400
25.	Kewe	Kakonko	Km 174+100
26.	Kiyobela	Kakonko	Km 180+900 RHS
27.	Kabingo	Kakonko	Km 180+900 LHS

**Source:** Environment Expert Field Survey and Interview with Local Communities



## Kibondo Bypass Road

Kibondo bypass road traverses five (5) villages namely Maloregwa, Nduta, Biturana, Nengo, and Kilemba/ Kumkugwa) and the majority of the proposed bypass road is non-existent. The bypass road starts off at Maloregwa village (refer to Table 1 and Figure 19b); a junction to Nduta refugee camp, on the Right Hand Side (RHS) along Kasulu – Kibondo road. From the start the proposed bypass follows more or less the existing Maloregwa – Nduta refugee access road alignment, towards north-eastern direction up just after R.Bururuma crossing, (refer to Table 11 and Figure 20b) which is located within the refugee camp. Just past the river, the alignment diverts to a non-existent section, on the northern direction (LHS) across miombo woodland forest, which is also located within the refugee camp. The bypass then passes alongside offices for Relief for Development Society (REDESO). The alignment then turns to north-eastern direct (RHS), traverses alongside Refugee Camp Commander administration Office, which is located within miombo woodland with large trees. The alignment then crosses refugee residential camp, which is currently occupied by Burundian refugees. Past the refugee camp the alignment turns to the northern direction (LHS) to join an existing Nduta refugee camp – Nengo village track, which is passable by light vehicles (figure 20b). The alignment follows the track up to Lutended Hill (Figure 1b). Past Lutende Hill, the alignment diverts to the RHS across a non-existent section characterised by miombo woodland forest, before crossing Twabagondozi – Nengo – Kumwasha road section (Figure 21b). The alignment then crosses Nengo Prison land, then alongside Kakangaga Muslim secondary school, before crossing Kibondo – Kilalagona road. The proposed bypass road then intersects Kasulu – Kibondo – Nyakanazi road section at Kilemba village, about 600m before crossing R.Kilemba (refer to Table 11), which located about 3.2 before Kilemba village centre (or 3.3km past Twabagondozi village centre) [refer to Table 1]. Notably, from Lutended Hill up to end of the bypass, the alignment traverses a non-existent section.

The reference point for Kibondo bypass road is located at Maloregwa village (refer to Table 1); a junction to Nduta refugee camp, along Kasulu – Kibondo road.

### 3.2 DESIGN CONCEPT

The road upgrading will constitute Widening, realignment and paving of the existing Kasulu – Kabingo Road, including Kasulu and Kibondo Town Link Roads and construction of the non-existent Kibondo bypass Road (27.9km) by Asphalt Concrete (AC) for both carriageway and shoulders

New cross drainage structures will be constructed to replace the existing structures as they are hydraulically inadequate. In addition, new hydraulic structures will be constructed for the non-existent bypass section. A total of eleven bridges, eighty four (84) box culverts, and three hundred twenty two (322) pipe culverts will be constructed.

The road upgrading will also involve improving of safety on various sections of the road with infringed sight distance (sharp horizontal and vertical curves), which are prone to accidents. Improvement of the road will also involve introducing a number of safety features such as climbing lanes, non-motorised lane, service roads in town sections, and widening of shoulders in town sections.

Because of steepness and length, a total of twenty one climbing lanes have been proposed at the following road sections:

Kasulu – Mvugwe Road Section

Start	End	Length	Side
84+596	85+077	481	LHS
85+077	86+289	1212	RHS

**Mvugwe to Nduta Junction Road Section**

Start	End	Length	Side
153+803	154+794	990.74	LHS
155+886	159+154	3267.75	LHS
158+917	159+623	705.18	RHS
174+842	175+500	657.65	LHS
179+610	181+750	2140.11	RHS

**Nduta Junction to Kabingo Road Section:**

Start	End	Length	Side
196+930.00	198+980.00	2050.00	LHS
200+290.00	201+440.00	1150.00	LHS
202+220.00	203+310.00	1090.00	LHS
210+955.00	212+105.00	1150.00	LHS
214+405.00	215+770.00	1365.00	LHS
219+995.00	221+180.00	1185.00	LHS
227+555.00	228+830.00	1275.00	LHS
233+680.00	234+680.00	1000.00	LHS
245+210.00	246+215.00	1005.00	LHS
204+805.00	203+300.00	1505.00	RHS
216+170.00	215+255.00	915.00	RHS
229+350.00	228+370.00	980.00	RHS
235+155.00	234+530.00	625.00	RHS
240+110.00	237+980.00	2130.00	RHS

On average, in rural road sections the proposed road will have double carriageways of 7.0m width, and 2.0m wide shoulders. The road upgrading will also involve construction of lined and non-lined side ditches/drains as required.

All box culverts will be 7.0 wide and will have 2.0m protected foot path (with guard rails) on both sides of the bridge. With exceptions of bypasses and a few sections, the proposed road will almost follow the existing alignment.

In addition, the design has incorporated the following safety aspects:

General Accident Situation	Designed Countermeasure
Pedestrian/vehicle conflicts	<ul style="list-style-type: none"> <li>• Pedestrian/vehicle segregation (sidewalks or wide shoulders)</li> <li>• Raised pedestrian crossings</li> <li>• Speed control/Traffic calming measures</li> </ul>
Vehicular Loss of control	<ul style="list-style-type: none"> <li>• Road markings</li> <li>• Delineation</li> <li>• Speed controls</li> <li>• Guardrails</li> </ul>

Darkness	<ul style="list-style-type: none"> <li>• Reflective signs</li> <li>• Reflective road markings</li> <li>• Delineation</li> </ul>
Poor visibility	<ul style="list-style-type: none"> <li>• Improve sightlines</li> <li>• Realignment</li> <li>• Conspicuity</li> </ul>
Poor driving behaviour/ lane discipline	<ul style="list-style-type: none"> <li>• Road markings</li> <li>• Enforcement/Awareness</li> </ul>
Collision with roadside obstacles	<ul style="list-style-type: none"> <li>• Better delineation</li> <li>• Guardrails</li> </ul>
Skidding	<ul style="list-style-type: none"> <li>• Appropriate surface texture</li> </ul>
Turning movements	<ul style="list-style-type: none"> <li>• Turn prohibition</li> <li>• Channelization / right turn lane</li> <li>• Acceleration / deceleration lanes</li> </ul>
Light / heavy vehicle conflicts	<ul style="list-style-type: none"> <li>• bus bays / lay by</li> <li>• Manageable gradients</li> <li>• Climbing lanes</li> </ul>
Parked vehicles	<ul style="list-style-type: none"> <li>• Parking controls</li> <li>• Parking provision</li> </ul>
Roadside Stalls	<ul style="list-style-type: none"> <li>• Service roads</li> <li>• Wide shoulders</li> </ul>

### 3.3 PROJECT ACTIVITIES, MATERIALS, WASTES, AND EQUIPMENT

Upgrading of the road will entail the following main activities:

#### 3.3.1 Mobilization Phase

##### 3.3.1.1 Activities during Mobilization Phase

The mobilization phase of the project, which is estimated to take about 6 months, will entail the following activities:

- Land acquisition for the construction of camps and materials borrow sites. Land acquisition will involve compensation of land.
- Establishment of construction of camps (Contractors' and Engineer's camps), which shall include among others residential houses and site offices, workshops (mechanical, carpentry, steel workshops), material and equipment storage areas, materials processing yards (e.g. concrete pre-cast yard, concrete batch plant, asphalt facility), including sanitation facilities. The following activities will be involved during establishment of the camp:
  - a) Clearing of camp construction site
  - b) Excavation works for foundation
  - c) Construction of a foundation: concrete or/and block works
  - d) Construction of timber sub – structure
  - e) Roofing works
  - f) Construction of sanitation facilities

- g) Installation of electrical infrastructure
- h) Installation of water and wastewater infrastructure
- i) Construction of fence for campsites
- Identification of naturally-occurring material borrow sites (sand, fill, gravel borrow and quarry sites), including land acquisition of land for the sites
- Identification of sources of water for domestic and construction works
- Transport and assembling of construction plants and equipment to the construction site
- Transport of fuel and construction materials from sources to the construction site

Notably, acquisition of land for sitting the campsite and sources of construction materials will precede mobilization of equipment and construction of the camp.

### 3.3.1.2 Materials required during Mobilization Phase

The following materials will be required during mobilization phase of the project:

- Cement, sand, and aggregates for block and concrete works
- Water for general construction works and dust abatement
- Timber, galvanised iron sheets, paints, nails, etc. for roofing and fencing works
- Electrical works: conduits, cables, fittings
- Plumbing works: Poly Vinyl Chloride (PVC) and Galvanised Steel (GS) pipes, fittings
- Fuel for the operation of construction machines and equipment
- Fencing wire and poles for fencing off the camps from the neighbourhood

Cement, galvanised iron sheets, nails, fence wire, electrical and plumbing utilities will mainly be obtained from either Dar es Salaam or Tanga, while sand, aggregates, and timber will be obtained locally.

### 3.3.1.3 Equipment Required During Mobilization Phase

The major equipment which will be required during mobilization phase of the project will include:

- Bull dozers/motor graders, excavators for site clearing, excavation, and grading of the camp construction site
- Light duty vehicles and trucks for the transport of construction materials, small machines and staff
- Water pumps, block making machines, stationery concrete mixers and trans mixers, etc. for making of blocks and concrete mixes for concrete works
- Electric power generator(s)

### 3.3.1.4 Wastes Generated During Mobilization Phase

Mobilization phase of the project will generate the wastes shown in Table 2 below.

**Table 2: Wastes likely to be generated During Mobilization Phase**

Aspect	Solid Waste	Liquid Waste	Gaseous Waste
Site clearing and excavation	Earth, green cutting	None	Generation of air pollutants (dust)

Aspect	Solid Waste	Liquid Waste	Gaseous Waste
Construction of foundation(s): block/concrete works	Concrete, blocks, hessian cement bags	Water slurry, wash-down water	None
Construction of the main structure	Cement bags, mortar, steel reinforcements, nails, timber, iron sheet wastes, etc.	Concrete slurry	Paint
Installation of electrical infrastructure	conduit pipes, cables	None	None
Installation of water infrastructure	PVC and GS pipes	None	None
Labour force	Plastic bottles/ bags, food wastes	Sanitary wastes	None
Servicing of construction equipment	Used batteries, used tyres, used metals parts, used oil and fuel filters, empty oil drums	Waste oil	None

### 3.3.1.5 Treatment and Disposal of Wastes Generated During Mobilization Phase

The treatment methods for the wastes generated during mobilization phase shall be based on re-using, re-cycling, burying, or burning, and on site treatment.

- During site clearing, top soil and green cutting shall disposed of in old borrow pits or other areas approved by the Engineer
- Concrete and cement blocks wastes shall be disposed of in borrow pits during their reinstatement as approved by the Engineer.
- Metal wastes such as GS pipes, nails, reinforcement bars, and used equipment parts shall be disposed of by recycling. They will be collected and stored; until enough quantities are obtained before being disposed of by the Contractor to steel rolling factories in Dar es Salaam through NEMC approved metal scrap disposing companies. The metal scraps disposing companies shall be approved by the Engineer.
- Degradable materials such as paper cement bags and paper boxes shall be treated on site by either controlled burning.
- Non degradable wastes such as plastic, PVC pipes, and plastic bottles shall be collected and transported and given freely to plastic factories in Dar-es-salaam where they will be recycled.
- Used batteries, empty metals drums, used oil filters shall be disposed of through NEMC approved disposing companies as described in sub-section 2.3.2.5
- Temporary pit latrines shall be constructed at active mobilization sites (camp sites) for the disposal of sanitary wastes.

### 3.3.2 Construction Phase

#### 3.3.2.1 Construction Activities

The project will be split divided into three lots which will be constructed by three independent Contractors. The construction phase of the project, which is estimates to take 24 month for each of the three lots and will encompass following major activities:

- Earth works to facilitate widening and re-alignment of the road. Earth works will entail the following activities:
  - a) Clearing and grubbing (clearing of vegetation, including trees (only trees within the road prism shall be removed)
  - b) Removal of top soils
  - c) River dredging
  - d) Cutting and filling
  - e) Road widening and re-alignment and compaction
  - f) Excavation to facilitate construction storm water drainage system such as side drains and cross drains (culverts), etc.
- Construction of detours and diversions and construction of access roads to sources of naturally-occurring construction materials
- Demolition of buildings within the RoW
- Demolition/ dismantling of the existing hydraulic structures (culverts)
- Collection and disposal of dredges, spoilt, demolition materials from the existing road and its furniture, buildings, and excavated earth materials
- Extraction of naturally-occurring construction materials. This will include:
  - a) Excavation and transport of natural sand, gravel, and sub-base materials to construction sites.
  - b) Stone quarrying (including blasting), crushing and transport of crushed aggregates to construction sites
  - c) Transport and handling of fuel, lubricants etc. from their sources to the project site
- Fabrications and installation of pipe culverts
- Construction of box culverts and road side drains. Construction of culverts will involve such activities as excavation, cutting, bending, and fixing of re-bars, concrete works, and protection works
- Filling and reshaping the road section to sub-grade level
- Abstraction of water from surface and underground sources for the treatment and compaction of different road layers as well as mitigation of generation of dust
- Laying of C1 cement-stabilized sub-base pavement layers, including compaction and curing with water
- Laying of CRR (Crushed Rock) pavement layer, including compaction and slashing
- Heating of bitumen

- Priming of CRR pavement layer with hot bitumen
- Pre-coating of stone chippings with bitumen
- Spraying of hot bitumen on CRR pavement layer
- Spreading of different two layers of chippings on the bitumen sprayed on CRR layer

### 3.3.2.2 Materials Required During Construction Phase

During the project construction, the following materials (Table 3) will be required:

**Table 3: Materials required During Construction Phase**

No	Material	Usage	Source
1.	Ordinary Portland Cement (OPC) and Pozzollana Portland Cement (PPC)	Production of mortar, laying of C1 and C2 pavement, construction of structural works (culverts), production of asphalt concrete	Dar es salaam, Tanga, Mbeya
2.	Sand	Production of mortar and general concrete works	Stone crusher dust and sand pits (to be established by Contractors)
3.	Crushed aggregate	Concrete works (Structural works), construction of drainage systems, production of chippings for production of Asphalt Concrete	Table 7
4.	Steel reinforcement bars	Reinforced concrete works (construction of drainage structures	Dar /imported
5.	Steel shutters and form works	Concrete works	Dar
6.	Soft timber	Production of timber formworks and shutters	Locally
7.	Nails	Nails for fixing timber form works	Dar es salaam/imported
8.	Hard stone	Construction and protection of drainage structures, production of base course material, production chippings for surfacing	Table 7
9.	Gabion boxes and mattresses	Protection works	Imported
11.	Natural gravel	For C1 pavement layers	Borrow pits (Table 6)
12.	Earth fill material	Sub-grade layers	Borrow pits (Table 6)
13.	Different grades of bitumen	Priming and production of laying of Asphalt Concrete	Imported
14.	Thermoplastic paints	Road marking and metal marking paints for sign board marking	Dar/ imported
15.	Geo-textile fabrics	The soil stabilization, drainage, and erosion control	Imported
16.	Water	Drinking, concrete works, spraying during compaction and curing of C1 pavement layers, laying of CRR pavement layer, dust suppression	Rivers
17.	Concrete admixtures	For different treatments of concrete	Imported
18.	Different grades of lubricants (oil and grease)	Lubrication of construction equipment	Dar
19.	Diesel and gasoline fuel	Operation of construction machines and equipment	Dar
20.	Assorted spare parts	Repair of equipment and operation of mechanical workshop etc.	Dar/ imported



No	Material	Usage	Source
	and consumables		

The quantities of gravel, sand, cement that will be required are as follows:

The quantity of water that will be required cannot be determined now because other determining factors such as optimum moisture content of soil are not known at the moment

Lubricants, fuels, bitumen, concrete, and paints are among hazardous and toxic substances that will be used during the construction phase of the road. Lubricants, fuels, bitumen, and concrete present a threat to the quality of surface and ground water as well as soil in the event of accidental spillage or leakage.

### 3.3.2.3 Equipment Required During Construction Phase

The construction phase of the project road will require a wide range of construction machines, machinery and equipment, as well as vehicles and trucks for transport of staff and construction materials. The following table (Table 4) gives the basic machinery, equipment, and vehicles that will be used during construction phase.

**Table 4: Machinery & Equipment Required for Construction Works**

No	Machinery/equipment	Activity for which it is required
<b>Construction Equipment: Type and Characteristics</b>		
1.	Backhoe excavator	General earth works, e.g. excavation of drains and river dredging
2.	Bull dozer with ripper	General earth works
3.	Wheeled loader	General earth works and transport of concrete
4.	Motor grader	General grading works, including earth works
5.	Vibrating/sheep foot roller compactor	Compaction works
6.	Vibrating steel drum roller compactor	Compaction works
7.	Tandem roller compactor: 8 – 10 ton	Compaction works
8.	Pneumatic Tired Roller (PTR) compactor	Compaction works
9.	Hydraulic hammer	Piling works
10.	Truck mounted crane	Lifting of construction materials e.g. pre-cast culverts
11.	Asphalt plant	Production of asphalt plant
<b>Construction Machines</b>		
1.	Concrete batching plant	Preparation of concrete (batch concrete mixing)
2.	Pug mill	Mixing of cement-stabilized sub-base material
3.	Concrete truck mixer (trans mixer))	Concrete mixing
4.	Concrete mixer	Concrete mixing
5.	Stationery bitumen heater	Heating of bitumen
6.	Bitumen distributor/ sprayer	Distribution of bitumen
7.	Mechanical broom	Cleaning of road surface
8.	Single jaw crusher:	
9.	Stone crushing plant with associated screens	Production of chipping (aggregates) from hard stones)
10.	Quarry dump trucks	Transport of stones and aggregates
11.	Dump trucks	Transport of construction materials and wastes
12.	Power bloom and blower	Blowing of surfaces before paving
13.	Equipment for geotechnical investigations	Geotechnical investigation works
14.	Concrete vibrator and poker	Vibrating concrete
15.	Dewatering pump	Dewatering to allow for waterless construction
16.	Air compressor and wagon drill	To create pressurised air during drilling and cleaning during road surfacing etc.
17.	All essential supporting units such as	Repair and maintenance of machinery and equipment

No	Machinery/equipment	Activity for which it is required
	electric power generators, mobile workshop, tyre repair shops, welding facilities, services trucks, low-bed trailer (low-loader) units etc.	
<b>Transport Facilities</b>		
1.	Light duty vehicles	Transport of light construction materials, stationery machines, and staff
2.	Water and fuel tankers	Dewatering of earth surfaces to attain effective compaction, minimizing generation of dust, and transport of fuel

### 3.3.2.4 Wastes Generated During Construction Phase

The wastes generated during construction phase of the project will result from operation of construction campsite, machinery, and equipment maintenance, batch plant operations, road construction, concreting activities, and construction of structures. The wastes which will be generated during construction phase of the project are shown in Table 5.

**Table 5: Wastes likely to be generated during Construction Phase**

Aspect	Solid Waste	Liquid Waste	Gaseous Waste	Hazardous Waste
<b>Operations of Campsite</b>				
	Paper	Sanitary waste	-	-
	Litter	-	-	-
	Toner, cartridges	-	-	-
	Paper litter	Sanitary waste	-	-
	Plastic bottles/bags	-	-	-
	Aluminium cans	-	-	-
	Food wastes	-		
				Biohazard wastes (medical wastes) including swabs, dressings, syringes, needles, pharmaceutical product packing materials
<b>Machinery and equipment Maintenance</b>				
	Plastic and glass (containers), used tyre, metal (used parts), plastic and cable parts, used lead-acid batteries,	Waste oil and grease, battery acid (dilute sulphuric acid)	Refrigerant/ air conditioning gas, Emission of greenhouse gases and air pollutants (hydrogen gas etc.)	Gases that are compressed, liquefied, or dissolved under pressure may be hazardous. Flammable liquids including oil, grease and petroleum compounds are also hazardous
	-	Lubricant, coolants (radiator fluid), hydraulic fluid, waste water)	-	-

Aspect	Solid Waste	Liquid Waste	Gaseous Waste	Hazardous Waste
<b>Earth Works and demolition</b>				
	Green cutting, dredges, top soil	-	-	-
	Demolition wastes (earth, concrete, timber, iron sheets)	-	-	-
<b>Road Construction</b>				
	Earth, sand, dredges, aggregates, stones	Wastewater	Emission of air pollutants	-
	Bitumen	Bitumen, oil	-	-
	Bitumen containers (drums)	-	-	-
	Cement packing (hessian or paper bags)	-	-	-
	Metal cans	Paints (road marking etc.	Emission of air pollutants	
<b>Batch Plant Operations</b>				
	Concrete additives, additives empty drums, concrete waste	Concrete wastewater slurry	Emissions of greenhouse gases and air pollutants	-
<b>Concreting activities and Bitumen Surfacing</b>				
	Concrete, cement bags	Curing compounds/water slurry	Emission of greenhouse gases and air pollutants	-
	-	Wash-down water	-	-
	Bitumen		Bituminous air emissions	
<b>Construction of drainage cross structures</b>				
	Concrete	Wastewater		
	Steel	-	-	-
	Earth	-	-	-
	Metals (nails, reinforcements)	-	-	-
<b>Surfacing with bitumen</b>				
	Empty bitumen drums, bitumen contaminated soil	Bitumen		

### 3.3.2.5 Treatment and Disposal of Wastes Generated During Construction Phase

The treatment methods for the wastes generated during construction phase will depend on whether they are degradable, non-degradable, hazardous, or non-hazardous. Depending on the nature of the wastes, the wastes will either be re-used, re-cycles, buried, or burnt.

- Green cutting and top soil shall be stockpiled for site reinstatement and top soiling of cleared areas to promote vegetation. Excess top soil shall be spoiled in borrow pits in areas approved by the Engineer.

- Metal wastes such as iron sheet, nails, metal cans, reinforcement bars, and used machine parts shall be disposed of through NEMC certified metal scrap collectors who will transport them to steel foundry factories in Dar es Salaam for recycling.
- Used oil filters (with metallic housing) will be hot drained, then disposed of through NEMC certified companies who will transport them to Dar es Salaam for recycling.
- Used lead-acid batteries shall be collected and transported to Yuasa battery factories in Dar es Salaam for recycling by a NEMC certified waste collectors
- Motor oil (engine, transmission, and hydraulic oils) have value even after it has been drained from equipment, as it be recycled, and turned into fuel oil or used as a raw material for the refining and petrochemical industries. The oil can be reprocessed and used in furnaces for heat or in power plants. It can also be sent to a refinery that specializes in processing used oil and re-refined into lubricating base oils that can be used to formulate engine oils meeting API (American Petroleum Institute) specifications. Since we do not have used oil collection centres in Tanzania, the contractor should enter into an agreement with its supplier of lubricants or any NEMC certified company to collect oil to be used in steel rolling furnaces in Dar es Salaam.
- Sanitary wastewater at camps shall be disposed of by the use of water closets, septic tanks, and soak away pits, while at active construction sites will be disposed of by the use of mobile toilets or pit latrines
- Non degradable wastes such as plastic bottles shall be collected and transported to Dar es Salaam through NEMC certified waste collectors for recycling by plastic recycling factories (used to make plastic bags).
- Biodegradable wastes such as cement paper bags and paper box will either be treated by controlled burnt or burying on site
- Non-bio gradable wastes such as hessian bags will be treated on site by controlled burning.
- Before demolition buildings along the road, owners of the properties shall be allowed to salvage valuable materials such roofing iron, windows, doors, and timber. Non-degradable demolition materials such as cement blocks and clay bricks will be collected so that they are used to fill pits and quarries during their reinstatement. The contractor shall add soil to any area backfilled with blocks to fill large voids and top prevent future settlement. The backfilled areas should be capped with at least 60 cm of soil, contoured to match the surrounding grade, covered with top soil, and if necessary re-vegetated.
- Empty bitumen drums shall be disposed of through NEMC certified companies who will transport them to steel smelting factories in Dar es Salaam for recycling.
- Excess bitumen (though rare to happen) will be returned to the containers (drums) for future use
- Excess concrete will be used as bottom materials during reinstatement of pits and quarries as described in Sub-Section 2.3.1.5
- Food wastes shall be treated by composting
- Inert or readily bio degradable materials from the construction camp will be used to fill quarries and pits
- Used tyres shall be disposed of through NEMC certified companies

- The Contractor shall either construct an incinerator at the camp for the incineration of medical wastes or shall transport the medical wastes to a hospital with an incinerator facility for incineration.

### **3.3.3 Demobilization Phase**

#### **3.3.3.1 Demobilization Activities**

After completion of road construction, Engineer's camps shall be reverted to the TANROADS who will decide on their future use. However, Contractors' camps shall be closed out. The main activities during demobilization phase, which will take 1 year, will engross the following:

- Collection and disposal of storage facilities such as pallets, packing, boxes
- Collection and disposal of construction materials and wastes such as waste oil, sewage, solid wastes (plastics, wood, metal, papers, etc.) at the workshop, site office etc. to authorized dumpsite
- Disassembling and transport of construction machines, machinery and equipment
- Removal of temporary infrastructure, installations and equipment from the campsite
- Rehabilitation/landscaping of the campsite to the original condition by shaping and grading
- Handing over of permanent structures and facilities in the campsite to TANROADS who will decide its future use
- Restoration of material borrows areas to safer condition.

#### **3.3.3.2 Materials required During Demobilization Phase**

Materials required during demobilization phase will include fuel for the operation of equipment, soils and tree seedlings for reinstatement of borrow pits and campsite. During this phase, labour, water, and energy will also be required.

#### **3.3.3.3 Equipment Required During Demobilization Phase**

The equipment required during demobilization phase will include vehicles and trucks for transport of wastes, graders and bull dozers and front loaders for the landscaping the campsite surroundings.

#### **3.3.3.4 Wastes Generated During Demobilization Phase**

The following wastes will be generated during demobilization phase of the project:

- Hazardous waste such as used lubricants (oil and grease), used lead-acid batteries, empty bitumen drums, rejected bitumen, empty plastic bottles, etc.
- Empty barrels and tins
- Plastic and paper packing
- Used equipment parts

#### **3.3.3.5 Treatment and Disposal of Wastes Generated During Demobilization Phase**

The wastes generated during demobilization will be treated or disposed as phase will be treated or disposed described in sub-sections 2.3.1.5 and 2.3.2.5.

### 3.3.4 Operation and Maintenance Phase

#### 3.3.4.1 Operation and Maintenance Activities

The maintenance activities of the project road will pertain to the road pavement and its embankments, hydraulic and drainage structures and road furniture and where necessary, re-surfacing/patching. The main activities during maintenance phase will entail the following:

- Installation of damaged or stolen signboards.
- Road re-marking with thermo-plastic paint
- Maintenance of damaged road sections, which will include such activities as:
  - Transport of construction materials from their sources to the construction sites
  - Sealing of cracks and patching of pot holes
  - Routine de-silting and clearing of debris from road side and cross drains
  - Repair and replacement of road furniture (side and cross drains)
  - Proper disposal of wastes from road-maintenance activities
  - Maintenance of grass covers on road sides and management to reduce pollutant concentrations in runoff.
  - Road side grass slashing
- Storage and management of maintenance materials and equipment.
- Awareness rising on proper road use and road environment management to the communities.
- Monitoring and evaluation of road performance and management

Other activities will include design/ planning of and implementation of HIV and AIDS awareness campaigns. This activity will span from mobilization to decommissioning phases.

#### 3.4.4.2 Materials Required During Operation and Maintenance Phase

The following materials will be required during operation phase of the maintenance phase of the project:

- Thermoplastic paints for road marking
- Sign boards to replace damaged or stolen ones
- Bitumen for repair of pot holes/patching
- Crushed aggregates, cement, and sand for repairs of potholes and drainages structures

#### 3.4.4.3 Equipment Required During Operation and Maintenance Phase

The main equipment which will be required during maintenance phase of the project will be:

- Pneumatic/hydraulic demolishing machine
- Air compressor
- Roller compactor for compaction
- Concrete-bitumen processing plant
- Back hoe loader for de-silting of side drains and a during spot resurfacing

#### **3.4.4.4 Wastes Generation during Operation and Maintenance Phase**

The wastes generated during operation and maintenance phase of the project will mainly consist of litter, silt, and construction material wastes and will be disposed as described in sub-sections 2.3.1.5 and 2.3.2.5

### **3.3.5 Project activities from Mobilization to decommissioning phase**

#### **3.3.5.1 HIV/AIDS/STIs Awareness Campaign:**

Campaign to be undertaken during mobilization, construction and decommission phases amongst workers for the duration of the contract shall include the display AIDS/'STIs awareness posters in all buildings frequented by workers employed on contract, where such buildings fall under the control of the contractor. AIDS/STIs awareness shall be included in the orientation process of all workers to be employed on the contract. Sexual abuse and exploitation of children shall also form part of this campaign.

#### **3.3.5.2 AIDS Prevention Campaign**

As part of the contract the Contractor shall be required to make condoms available to all workers. This activity shall be carried out during mobilization, construction, and decommission phases of the contract.

#### **3.3.5.3 HIV/AIDS/STIs Training**

Training will be conducted as per HIV/AIDS policy at work place by a qualified Contractor's staff or organization. This activity will be undertaken during the construction phase.

#### **3.3.5.4 Employment of Local Staff that is gender sensitive**

Gender mainstreaming awareness will target both individuals and local communities.

Activities to be undertaken during mobilization and construction phases

- Provision of information to women on potential employment opportunities in the road works especially for neighbouring communities
- Organizing meetings with women groups
- Employ women as much as possible. Sections that women are competitive include traffic control, store keeping, landscaping, surfacing, top soiling and variety of labour-intensive tasks and control and circulation of traffic
- Awareness creation on gender sensitivity at camp sites, constructions sites and roads including the use of gender sensitive language in all road works
- Preparation of gender disaggregated data for various activities
- Promotional billboards to raise awareness and integration of gender issues during road construction
- Training for various categories of workers: drivers, operators, supervisors, inspectors, top management team on gender mainstreaming and sensitivity etc.



### 3.3.6 Potential Sources of Naturally-occurring Construction Materials

Borrow pits are sites where stones, sand, gravel or other granular soils will be extracted for the road construction. The term “pit” is used when granular material is extracted. The term “quarry” is used where consolidated rock is removed.

#### 3.3.6.1 Sources of Gravel Materials

Several borrow sites for fill, sub-grade, base, and sub-base materials have been identified along and off the existing road alignment. The following table (Table 6) lists locations of the identified sources, together with estimated quantities.

The vegetation around the existing borrow sites is generally characterised by grassland and scattered miombo woodland.

The survey noted that borrowing of gravels from existing borrow sites have involved clearing of a significant number of trees and no re-instatement has been done after their uses.

It is worth to note that the identified borrow areas in Table 6 are only for information to the Contractor. The Contractor is therefore not bound to use the identified borrow areas.

**Table 6: Sources of Gravel Materials (Sub-grade and Sub-base layers)**

No	Name	Chainage (Km)	Off set (m)	Direction	Estimated Quantity (m <sup>3</sup> )
1.	BP1	2+900	400	RHS	45,000
2.	BP2	35+500	off-road	RHS	40,000
3.	BP3	68+600	450	RHS	50,000
4.	BP4	76+060	500	LHS	35,000
5.	BP5	109+700	off-road	LHS	50,000
6.	BP6	137+600	off-road	RHS	40,000
7.	BP7	168+300	100	LHS	40,000
8.	BP8	192+100	1100	RHS	40,000
9.	BP8	223+200	100	RHS	35,000
10.	BP9	252+400	off-road	LHS	50,000
11.	BP10	288+100	off-road	LHS	30,000

Source: Adapted from Materials Report of this Project

#### 3.3.6.2 Hard stone and aggregates for Road Surfacing from Crushed Rock

Suitable sources of rocks for concrete mix, base, and Asphalt Concrete have been identified at four locations are indicated in Table 7 below.

**Table 7: Potential Sources of hard stone**

Quarry No	Chainage	Offset (m)	Remarks
Q1	16+100	5km LHS	Mugamba Hill, south of Kalela Village, accessible
Q2	46+500	3km LHS	Bugaga Hill, difficult access & no overburden
Q3	57+400	3km LHS	Ngala Hill, limited access
Q4	82+300	4km LHS	Zazi Hill, limited access, mostly big boulders
Q5	286+100	1km LHS	Kakonko Hill, accessible & no overburden
Q6	On Burundi Road	0.2Km RHS	13.8km from Nyakanazi junction, accessible & no overburden

Source: Adapted from Materials Report of this Project

### 3.3.6.3 Sand

Suitable sand sources are reported to be scarce in the vicinity of the project area. Most of the sources visited have sands which are highly silty and very fine. The only sources which are suitable for construction works and widely used in the area were those found at the locations listed in Table 8 below. It may therefore be necessary to produce sand as a by-product from the production of crushed stone road base and surfacing aggregate.

**Table 8: Potential Sources of Sand**

No	Location	Source Name	Remark
1.	273+400	Myowosi River Sand	River Sand
2.	Kigoma	Bugera Sand Pit	Pit sand, Kigoma town
3.	Kigoma	Kagongo Sand Pit	Pit sand, 1.5km at Ujiji and 3.7km RHS

Source: Adapted from Materials Report of the Project

### 3.3.6.4 Water

Among the many rivers crossing the route (Table 9), samples were collected from free flowing permanent sources and tested during the centreline soil survey and the feasibility study period and the results indicate that the waters are acceptable for use in both concrete and other construction works.

**Table 9: Potential Sources of Water for Construction Works**

No.	Location (km)	Name of the River
1.	4+100	Kidahwe
2.	7+300	Mkuti
3.	11+100	Ruiche
4.	31+400	Kasengezi
5.	37+500	Muzie
6.	80+000	Ngalangara
7.	101+800	Ruchigi
8.	113+300	Makere
9.	147+100	Malagarasi
10.	193+900	Pemji
11.	273+400	Moyowosi

### 3.3.7 Materials that will be imported

The following materials shall be obtained from outside the project area.

- Cement
- Reinforcement bars
- Concrete admixtures
- Timber
- Steel form works and shutters
- Gabions boxes and mattresses for construction and protection of drainage structures
- Paints
- Geo-textile fabrics

- Spare parts
- Bitumen

### **3.4 STAFFING AND SUPPORT**

At minimum, the following staff will be required:

- Engineers for general supervising of construction works: Will be obtained both locally in Tanzania and outside Tanzania
- Surveyors: Most of these will be obtained locally in Tanzania
- Technicians for supervision of artisans: These will be obtained from within Tanzania and outside Tanzania
- Other skilled labourers: Artisans specialized in woodwork, steel fixing, concrete works, metal work, operators, and drivers for operations of construction machinery, equipment, heavy duty trucks and light duty vehicles, and construction machines, and support staff such as accountants etc.). These expected to be obtained from within Tanzania
- Unskilled labourers that will be required for general works which do not required specialised skills. It is anticipated that most of the unskilled labourers will come from within the project area.

Their exact number cannot be established now by the Consultant. However, based on Consultant's experience of past projects of similar size, three Contractors will need around 500 (inclusive of expatriates).

### **3.5 REQUIRED OFF SITE INVESTMENT**

The following off site facilities will be required during implementation of the project:

#### **3.5.1 Power Source**

The fact that the majority of the villages along the project road are not connected to TANESCO National power grid and the fact that it is not recommended to locate construction camps at village centres, will necessitate Contractors to install dedicated diesel driven generators to supply power to the camps and for the operation of electrically-operated equipment at work sites.

#### **3.5.2 Water Supply**

Water will be required for construction activities such as concrete works, earthworks, laying of some of the pavement layers, dust suppression, as well as for domestic purposes at the camps. Water for construction works will be obtained from rivers and boreholes. Domestic water will be pumped directly from boreholes to storage tanks before being distributed by pipelines. Water for construction works will be pumped from rivers and dams and delivered to work sites by water tankers. The main sources of water are described in subsections 2.3.6.4 and 4.2.4. The amount of water required during construction of the project is yet to be established.

### 2.5.3 Diversions and Access Roads

Diversion roads will be created to divert traffic away from active construction sites, especially during construction of cross drainage structures. Access roads will be constructed to construction materials borrow sites which are located off the main alignment.

### 2.5.4 Other Facilities Required

Other infrastructures that will be required during construction include:

- Fuel storage tanks. The tanks will have to be placed on secondary containment basins to catch any possible spills or leak. Underground fuel storage tanks shall not be allowed as it will be difficult to manage or control possible leak.
- Storage facilities for construction materials (cement, bitumen, paints, steel, timber etc.)
- Mechanical workshop for repair and maintenance of construction machinery, equipment, and vehicles.
- Accommodation and offices for the Contractors and Engineer's key and support staff. The housing will be furnished with all necessary services such as water and sanitation facilities. Since the Contractors are not contractually obliged to provide housing for his staff, it cannot be established now whether the Contractor will construct a labour camp. Otherwise, the rest of the staff will be required to rent houses in the neighbourhood of the camps.

## 3.6 LAND REQUIREMENT

When it is considered that the proposed project road is classified as a trunk (with a road reserve of 60m, which will almost follow the existing alignment, the total land area of land that will be required for road rehabilitation is approximately 1,338 hectares. In addition, the project will require about 5 hectares of land for the construction of camps for each of the lot (a total of 15 hectares). Other places that will be affected, whose areas cannot be determined now, will include material borrow areas (borrow pit, sand pit, water boreholes, and quarry sites), as well as detours and access roads. Nonetheless, such area will only be occupied by the project during its construction phase.

## SECTION 4: BASELINE CONDITIONS

### 4.1 PROJECT BOUNDARIES

#### 4.1.1 Spatial Boundaries of the study area

The study area was mainly confined to the RoW, potential sources of naturally-occurring construction materials (water, gravel, hard stone, fill materials, sand) and their access roads, camps, diversions and detours and the area immediately after the RoW (100m on both sides). The 100m has been chosen to accommodate/give allowance for establishment of borrow pit, contractor's campsite or materials storage yard close to the road alignment. The DIZ was determined on the basis of the following factors:

- The distance of travel of noise, vibrations, dust, and exhaust fumes from construction plants and machinery from the site boundary
- Marginal zones and developments from the site within 100 m as it is within this distance that impacts are likely to be felt

The study has also considered the area beyond the DIZ (AI) where most of the environmental impacts will be induced or influenced by the project activities. It is not subject to direct contact with the site, but is directly or indirectly affected by the presence of the proposed road. Areas around sources of construction materials are also considered as areas of influence. Villages that are linked to the existing road through village roads can be considered to be the AI

#### 4.1.2 Temporal Boundaries

The temporal boundaries of the project consist of the durations for mobilization, construction, and demobilisation phases of the project. In addition, the temporal boundaries are the design periods of the road and its components (road pavement, bridges etc.). The following are the estimated temporal boundaries of the project:

Phase	Time
Mobilization period:	6 months
Construction period:	24 months
Demobilization period:	1 year (inclusive of defect liability period)
Design life of the road pavement:	20 years
Design return period for pipe culverts:	25 years
Design return period for box culverts:	50 years
Design return period for bridges:	100 yrs.

#### 4.1.3 Institutional Boundaries

The road project falls under the Ministry of Works. The project is being implemented by TANROADS, which has the primary function of maintaining and developing the road network of Tanzania.

When it comes to fulfilment of other legal frameworks, then comes Vice Presidents office with the following institutions:

- Division of Environment who coordinates environmental management activities like coordination of environmental policy and issuing environmental clearance or EIA approvals.
- National Environment Management Council – coordinates Environmental Impact Assessments, Monitoring and Auditing
- Kasulu, Kibondo, and Kakonko Districts through which the project road passes there are institutional bodies, which includes the following: District Executive Directors their teams of experts in various fields - engineering, water, health, community development, natural resources, environment, land, property valuation etc.
- At lower levels comes Ward Development Committee and finally at the Community or village level comes Village council with all the village leaders etc.
- Ministry of Natural Resources and Tourism through the management (TFS) of Makere North and South Forest Reserves
- Ministry of Natural Resources and Tourism through the Management of Moyowosi Game Reserve

These are the institutional boundaries of the road project that the consultant liaised with.

#### **4.1.4 Administrative Boundaries**

Administratively, the project road is located in Kasulu, Kibondo, and Kakonko Districts and the road traverses fourteen wards namely Kasulu urban, Murufiti, Kigondo, Ruhita, Nyamyusi, Nyakitonto, Kitagata, Nyamidaho (Kasulu District), Rugongowe, Busagara, Kibondo urban (Kibondo District) and Misezeno, Kasanda, Kakonko (Kakonko District).

### **4.2 PHYSICAL ENVIRONMENT**

#### **4.2.1 Topography**

The topography of the main project road alignment is generally characterised by undulating to nearly flatland, rolling, and undulating to rolling terrain which are dissected by both perennial and seasonal rivers. Elevations of the project road vary from 1,140 – 1,420m Above Sea Level (ASL).

Starting from Kasulu at 1,290m ASL, the project road descend and ascend gradually through hilly and flat terrain up to Kibondo town at an altitude of 1,460 m ASL where the road start passing in a series of hills to Kakonko a distance of 45km from Kibondo.

Along the Kasulu – Kibondo section, major drainage systems such as Makere and Malagarasi rivers are provided with permanent bridges. There are several other smaller but significant drainage systems, which cross the road and are bridged also with permanent concrete bridges.

Most of the drainages across Kibondo – Kakonko section are smaller and seasonal. Only one drainage i.e. R. Nyanzuki is perennial. The rest are seasonal drainages.

The following table (Table 10) describes the topography, including elevations variations for different sections of the road as one travels from Kasulu (Kidiama) towards Kakonko (Kabingo).

**Table 10: Description of Topography across the Project Road**

No.	Project Section	Description of Topography	Variations of Elevations ASL in meters
<b>Kasulu – Kibondo - Kabingo</b>			
1.	06+500 – 14+900 (Kidiana – Kanazi)	Undulating topography with gentle to nearly flat terrain and with shallow slopes). It is dissected by two rivers. It is not naturally well drained.	1,260–1,280
2.	14+900 – 19+200 (Kanazi – Nyamyusi)	Undulating to rolling topography with steep to gentle slopes. Steep slopes are found at areas adjoining rivers.	1,280 - 1,260
3.	19+200 – 22+700 (Nyamyusi – Nyakitonto)	Undulating to rolling topography with gentle to steep slopes	1,260 - 1,360
4.	22+700 – 26+600 (Nyakitonto – Mugombe)	Rolling topography with steep slopes	1,360 - 1,280
5.	26+600 – 36+500 Mugombe - Nyachienda	Undulating to rolling topography to nearly flatland topography with gentle to mild slopes	1,280 – 1,240
5.	36+500 – 40+500 (Nyachienda – Kitagata)	Rolling topography with steep slopes	1,240 – 1,240
6.	40+500 – 51+800 (Kitagata – Makere)	Undulating to rolling topography, with fairly gentle slopes excepts at areas adjoin water courses (rivers)	1,240 - 1,200
7.	51+800 – 57+300 (Makere – Nyamidaho)	Undulating to nearly flatland, with gentle slopes	1,200 -1,180
8.	57+300 – 85+700 (Nyamidaho – Nyalulanga)	Undulating to nearly flatland, with gentle slopes	1,180-1300
9.	85+700 – 91+900 (Nyalulanga – Busunzu B)	Undulating to nearly flatland, with gentle slopes	1,140 – 1,160
10.	91+900 – 95+800 (Busunzu B – Busunzu A)	Progressive rise in elevation. Slopes are rather steep.	1,160 - ,1240
11.	95+800 – 101+100 (Busunzu A - Kisogwe)	Undulating topography for short section, then progressively climbing to Km 98+000, where changes to rolling topography.	1,240 - 1,340
12.	101+100 – 111+100 (Kisogwe– Kifura)	Rolling topography with mild slopes	1,340 – 1,360
13.	111+100 – 118+200 (Kifura – Kumshindwi)	Undulating to rolling topography with generally gentle slopes.	1,360 – 1,320
14.	118+200 – 123+400 (Kumshindwi – Maloregwa)	Undulating to rolling topography with gentle slopes, but with fewer sections with relatively steep slopes	1,320 – 1,240
15.	Maloregwa – Rusohoko (123+400 – 132+600)	Pressive climbing with moderate to steep slopes	
16.	Rusohoko – Kitahana (132+600 – 134+600)	Rolling topography with rather steep slopes, with sharp curves	
17.	Kitahana – Kumwambu	Rolling topography with rather steep slopes	
18.	Kumwambu – Kibondo	Rolling topography with rather steep slopes	
19.	Kibondo – Twabagondozi	Rolling topography with rather steep slopes	
20.	Twabagondozi – Kilemba	Rolling topography with rather steep slopes	
21.	151+800 – 168+000	Rolling to undulating topography with	1,350 – 1,320



No.	Project Section	Description of Topography	Variations of Elevations ASL in meters
	Kilemba/ Kumkugwa - Kazilamihunda	generally gentle slopes, except at areas adjoining rivers	
22.	168+000 – 172+400 Kazilamihunda - Kasanda	Rolling to undulating topography with gentle to steep slopes.	1,320 – 1,300
23.	172+400 – 180+900 Kasanda – Kabingo/ Kiyobela	Mostly undulating, with only a short section with rolling topography .Slopes are gentle, except sections that adjoin water courses.	1,300 – 1,260
<b>Kibondo Bypass Section</b>			
1.	0+000 – 8+400 (Maloregwa – R.Bururuma)	Undulating to nearly flatland with shallow slopes	1,240 – 1,220
2.	R.Bururuma – Refugee settlements	Gradually ascending with moderate slopes	1,220 – 1,300
3.	Refugee settlements – Biturana – Nengo prison	Undulating to rolling topography, with steep to mild slopes	1,300 – 1,420
4.	Refugee settlements – Nengo prison – Kilalagona road crossing	Undulating topography	1,420 - 1,260
5.	Kilalagona road crossing – Kibondo – Main alignment section intersection (Kilemba)	Undulating topography	1,360 – 1,340

**Source:** Consultant's Field Survey and Consultation with Local People

## 4.2.2 Climate

The climate of the project area is characterised by tropical climate and experiences a single long wet season occurring between the months of October and April with heavy rains mainly from December to March. The driest months are June, July, and August. Kasulu receives 1190mm, while Kibondo and Kakonko receives the highest annual precipitation with 1420

Temperatures are generally stable throughout the year. Kasulu has maximum temperature of 31<sup>0</sup> C – 22<sup>0</sup> C and mean minimum annual temperature of 12<sup>0</sup> C – 16<sup>0</sup> C while the end section of the project road i.e. from Kibondo to Kakonko temperatures are also generally stable throughout the year with maximum temperature of 27<sup>0</sup> C – 21<sup>0</sup> C and mean minimum annual temperature of 12<sup>0</sup> C – 14<sup>0</sup> C.

## 4.2.3 Geology and Soils

The project area lies within the Pre-Cambrian area under laid by ancient metamorphic rocks of upper basement complex. The rock comprises of sandstone, quartzite, *phyllite*, and *sericite*. The chemical changes in the parent rocks, which are rich in iron and aluminium-oxides, have resulted into the formation of laterite, which is wide spread throughout the project area.

The most common form of laterite existing in the areas is a concretionary nodule in red lateritic clay soils as well as the indurate massive and tough layer commonly known as hardpan.

The soil for of the project area is classified as Rhodic Ferrasols. The soil is a deeply weathered, re soil of the humid tropic. The soils have diffuse horizon boundaries, a clay assemblage dominated by low activity clays (mainly kaolinite), and high content of sesquioxides. It is characterised by low

---

natural fertility and tendency to fix nitrate. It is suitable for a wide range of crops but require maintenance of organic matter and periodic limiting.

## **4.2.4 Water Resources and Hydrology**

### **4.2.4.1 Surface Water and Hydrology**

The project road traverses a total of thirty two (32) rivers, of which 50 per cent are perennial rivers. Of the two bypass roads, only Kibondo bypass road has a perennial river across it. The following table (Table 11) describes main river and drainage systems that cross the main road alignment and bypass roads. Apart from the rivers discussed in Table 11, the main project alignment passes along natural pond at Km 52+600, Nyakibaya village. The pond is located about 150m on the RHS of the road.

**Table 11: List of Rivers across Main Alignment and Kasulu and Kibondo Bypass Roads**

No.	River/ Stream	Chainage	Village	Brief Environmental Profile
<b>Kasulu – Kibondo – Kabingo Mani Section</b>				
1.	R.Bogwe	Km 7+200	Kidiama	Perennial river characterised by miombo shrubs and a few mango trees on its downstream and shrubs riparian and acacia trees on its downstream riparian. It's downstream riparian is used for vegetable gardening. Its crossing is constructed of single lane bridge with neither pedestrian walkways nor guardrails. The soil of its banks appears stable against erosion (Plate 4)
2.	R.Ruchugi	Km 8+700	Kidiama	It is a perennial river which crosses a flood plain (Plate 6) and is characterised by elephant grass and few elephant grass on its upstream riparian and elephant grass and shrubs on its downstream riparian. Both its upstream and downstream riparians are used for vegetable gardening (Plate 5). Its crossing is constructed of a series of 2 single lane bridges and 2 relief culverts, but with neither guardrail nor pedestrian walkways.
3.	R.Ngaragara	Km 17+500	Nyamyusi	Perennial river characterised by riverine trees ( <i>syzgium cardatum</i> ) on both its upstream and downstream riparians. Its crossing is constructed of two lanes bridge but with neither guardrails nor pedestrian walkways. Both approaches road to the bridge have impaired (poor) sight distances because they have steep slopes. The soil of its banks appears fairly stable against erosion
4.	R.Nyaluseke	Km 18+100	Nyamyusi	Perennial river characterised by grassland with a few acacia and riverine trees on both its upstream and downstream riparians (Plate 7). Its crossing is constructed of two lane bridge but with neither guardrails nor pedestrian walkways. Its soil appears fairly stable against erosion.
5.	R.Magaba	Km 20+200	Nyamyusi	Perennial river characterised by riverine trees on both its upstream and downstream riparians. Its crossing is constructed of two lane bridge but with neither guardrails nor pedestrian walkways. The soil of its banks appears stable against erosion
6.	R.Chai	Km 23+700	Nyakitonto	It is a seasonal river which crosses a flood plain and is characterised by elephant grass on the upstream riparian and elephant grass with avocado and peacock flower trees on the downstream riparian. Its crossing is constructed of single lane bridge but with neither guardrails nor pedestrian walkways.
7.	R.Kalenge	Km 24+750	Nyakitonto	It is a perennial river which crosses a flood plain and is characterised by elephant grass on the upstream riparian and elephant grass with a few acacia and mango trees on the downstream riparian. Its crossing is constructed of 2 single lane bridges but with neither guardrails nor pedestrian walkways. Its soil appears stable against erosion. The approach road from Kasulu side is sharply curved which presents traffic safety concern (Plate 8).
8.	R.Nyakasanda	Km 37+500	Nyachienda	It is a perennial which crosses a flood plain and characterised by elephant grass on both the upstream and downstream riparians (Plate 9). Its crossing is constructed of a single lane concrete pipe culvert with neither guardrails nor pedestrian walkways. It appears that the hydraulic capacity of the culvert is inadequate because during rainy season the culvert overtops. Its soil appears stable against erosion. The

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	River/ Stream	Chainage	Village	Brief Environmental Profile
				river is a source of domestic water for the local people at Nyachienda village.
9.	R.Makere	Km 50+500	Nyangwa/ Lalimungoma/ Makere	It is a perennial which is characterised by miombo shrubs and a few yellow cassia and riverine trees on both the upstream and downstream riparians. Its crossing is constructed of a single lane bailey bridge with neither guardrails nor pedestrian walkways (Plate 11). The banks appear stable against erosion because of their rocky nature (Plate 10).
10.	R.Nyamuganza	Km 58+300	Nyamidaho	It is a perennial which is characterised by grassland on the upstream and riverine trees on downstream riparians. Its crossing is constructed of 2 double lane Armco culverts with neither guardrails nor pedestrian walkways.
11.	R.Malagarasi tributary	Km 83+000	Nyamidaho	It is a seasonal river which crosses a flood plain and characterised by miombo woodland trees and riverine trees on both its upstream and downstream riparians. The crossing is constructed of a 2 lane bridge with guard rails, but without a pedestrian walkway. Its soil is characterised by black cotton soil.
12.	R.Malagarasi tributary	Km 83+400	Nyamidaho	It is a seasonal river which crosses a flood plain and characterised by grassland on both its upstream and downstream riparians. The crossing is constructed of a single lane bridge with guard rails, but without a pedestrian walkway. Its soil is characterised by black cotton soil.
13.	R.Malagarasi5(ma in)	Km 83+800	Nyamidaho/Mvugwe	It is a perennial river which crosses a flood plain and characterised by riverine trees on both its upstream and downstream riparians. The crossing is constructed of a single lane bailey bridge with guard rails, but without a pedestrian walkway (Plate 12). Its banks appear stable against erosion because of its rocky nature (Plate 13). The river marks the border for Kasulu and Kibondo.
14.	R.Vumbwe	Km 92+700	Busunzu B	It is a seasonal river which is characterised by mango trees on its upstream riparian and guava and yellow cassia trees on its downstream riparian. Its crossing is constructed of 2 lane box culvert, without guard rail and pedestrian walkway. The culver is heavily silted
15.	R.Nyamguluma	Km 97+400	Busunzu A	It is a perennial river which is characterised by riverine trees on both its upstream and downstream riparians (Plate 29). Its crossing is constructed of 2 lane box culvert, without guard rail and pedestrian walkway. The approach road to the bridge from Kakonko side is sharply curved. It is one of the sources of domestic water for the local people. Its upstream is part of Busunzu village forest reserve.
16.	R.Nyambilembi	Km 100+700	Kisogwe	It is a perennial river which is characterised by riverine trees on its upstream riparian and grassland on its downstream riparian. Its crossing is constructed of 2 lane Armco culvert without guard rail and pedestrian walkway. Its downstream riparian is used for gardening
17.	R.Nyabwai	Km 102+500	Kisogwe	It is a perennial river which crosses a flood plain and characterised by grassland on its upstream and riverine trees on its downstream riparian. Its crossing is constructed of a 2 lane pipe culverts with guard rails, but without a pedestrian walkway. Both its upstream and downstream are used for gardening.
18.	R.Mkugwa	Km 105+600	Kisogwe/ Kifura	It is a perennial river which crosses a flood plain and characterised by riverine trees ( <i>sygium cardatum</i> ) on its upstream and grassland on its downstream riparian. Its crossing is constructed of a 2 lane Armco culvert. The approach road to the bridge from Kakonko side is sharply curved. Both its upstream and

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	River/ Stream	Chainage	Village	Brief Environmental Profile
				downstream are used for gardening. The river marks the border for Kisogwe and Kifura villages
19.	R.Kasanda	Km 110+800	Kifura	It is a seasonal river which is characterised by yellow cassia trees on both its upstream and downstream riparians. Its crossing is constructed of a 2 lane concrete pipe culvert.
20.	R.Nyentamba	Km 112+500	Kifura	It is a seasonal river which crosses a flood plain and characterised by grassland and a few miombo woodland on its upstream and downstream riparians. Its crossing is constructed of a 2 lane Armco culvert. Both its upstream and downstream are used for gardening. The culvert is heavily silted by over 75%. Marks the border for Kumshindwi and Malolegwa villages
21.	R.Mpemvi	Km 123+100	Kumshidwi/ Malolegwa	It is a seasonal river which is characterised by elephant grassland both on its upstream and downstream riparians (Plate 14). Its crossing is constructed of a single lane bridge with neither guard rail nor walkway for pedestrians. Its hydraulic capacity appears inadequate because of overtopping during peak rainy season (April – interview with local people). The river marks the border for Kumshidwi and Malolegwa. The river is also a source of domestic water for Maloregwa local people.
21.	R.Kahanga	Km 135+900		Seasonal river characterised by pines, Cyprus, and fig trees on its upstream riparian and acaicia and avocado trees on the downstream. The downstream riparian is used for farming
22.	Unnaned river	Km 136+300		It is a perennial river, across a flood plain which is characterised by scrubland both on the upstream and downstream riparians. Its riparians are used for farming
23.	Unnaned river	Km 136+400		It is a perennial river across a flood plain, which is characterised by grassland both on the upstream and downstream riparians. Its riparians are used for farming. The rivers
24.	R.Kabwigwa	Km 140+900		It is a perennial river which is characterised by acacia trees ion the upstream and banana plants on the downstream. The downstream riparian is used for farming. It crossing is constructed of two Armco culverts.
25.	R.Kilemba	Km 148+600	Kilemba	It is a seasonal river which is characterised by grassland both on its upstream and downstream riparians. Its crossing is constructed of a single lane Armco culvert, with neither guard rail nor walkway for pedestrians. It's downstream riparian is used for gardening.
26.	R.Kanembwa	Km 155+400	Kilemba/ Kazilamihunda	It is a perennial river which is characterised by grassland on its upstream riparian and riverine trees on its downstream riparian. Its crossing is constructed of a 2 lane Armco culvert, but with neither guard rail nor walkway for pedestrians. Both its upstream and downstream are used for gardening. Both approach roads to the water crossing are sharply curved. Kakonko side approach road has steep slope, which may call for cut. Marks the border for Kilemba (Kibondo) and Kazilamihunda (Kakonko).
27.	R.Nyanzuki	Km 162+700	Kazilamihunda	It is a perennial river which is characterised by elephant grassland on both upstream and downstream riparians. Its crossing is constructed of a 2 lane Armco culvert, but with neither guard rail nor walkway for pedestrians. Both its upstream and downstream are used for gardening.
28.	R.Kazilamihunda	Km 165+300	Kazilamihunda	It is a seasonal river which is characterised by elephant grassland on both upstream and downstream riparians. Its crossing is constructed of a 2 lane concrete pipe culvert, but with neither guard rail nor

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	River/ Stream	Chainage	Village	Brief Environmental Profile
				walkway for pedestrians. Both its upstream and downstream are used for gardening.
29.	R.Keza	Km 168+800	Kazilamihunda/ Keza	It is a seasonal river which is characterised by riverine on both upstream and downstream riparians (Plate 15). Its crossing is constructed of a 2 lane concrete pipe culvert, but with neither guard rail nor walkway for pedestrians. Its upstream is used for gardening. The river marks the border for Kazilamihunda and Keza villages.
30.	R.Kilalanguruwe	Km 170+800	Nkuba/ Kasanda	Its crossing is constructed of a 2 lane bridge, but with neither guard rail nor walkway for pedestrians.
30.	R.Mhadzi	Km 176+200	Kiyobela/Kabingo	It is a seasonal river which is characterised by elephant grass on both upstream and downstream riparians. Its crossing is constructed of a 2 lane Armco pipe culvert, but with neither guard rail nor walkway for pedestrians. Its riparians are used for gardening and paddy farming. The river marks the border for Nkuba and Kasanda villages
<b>Kibondo Bypass Road</b>				
1.	R.Bururuma tributary	Km 8+700	Nduta	Perennial river characterised by miombo woodland on both its upstream and downstream riparians. Its crossing is constructed of a single lane bailey bridge with neither guardrail nor pedestrian walkways. The soil of its banks appears stable against erosion (Plate 17)
2.	Nengo prison natural dams	Not established	Nengo	The road travrses along a number of dams which are located at Nengo prison area. Most of the dams store wter nearly all year around
3.	Unnamed river.	Not established	Nengo	It perennial river which is characrised by a few riverine trees. Its riparian is used for gardening by the local people.

**Source:** Environmental Expert's survey and interview with local communities

#### 4.2.4.2 Ground Water Resources

Groundwater is abundant throughout along the project road. This is evidenced by the presence of many fig trees along the project road. Notably, groundwater table is very shallow. This is also evidenced by the fact that the project road traverses many flood plains and that shallow wells are major sources of domestic water for villages as indicated by description of domestic sources under Table 16.

#### 4.2.4.3 Surface and Ground Water Quality

Data on the quality of domestic water supply was not available to the consultant during the study. However, the quality groundwater supply from shallow wells and boreholes that have been drilled through district water authorities can be guaranteed. The quality of water supply from open shallow traditional wells and surface water from rivers cannot be guaranteed as they are prone to pollution by anthropogenic activities, including agricultural nutrients and faecal matter.

#### 4.2.4.4 Flood Plains

A floodplain is flat or nearly flat land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge, mainly during rainy season. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current.

It is the natural place for a river to dissipate its energy. Meanders are formed over the floodplain to slow down the flow of water and when the channel is at capacity the water spills over the floodplain where it is temporarily stored. In terms of flood management the upper part of the floodplain (piedmont zone) is crucial as this is where the flood water control starts. Artificial canalisation of the river here will have a major impact on wider flooding. This is the basis of sustainable flood management.

Floodplains can support particularly rich ecosystems, both in quantity and diversity. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly; however the surge of new growth endures for some time. This makes floodplains particularly valuable for agriculture.

The vegetation pattern of the flood plain responds to water flow and the duration of flooding. Moving from relatively high ground within the flood plain to the river edge, one experiences the following plant communities:

- Sparsely distributed mosaics of flood plain trees and shrubs.
- Dry grassland
- Wet prairies occupying the less saturated soils, and
- Aquatic plant communities occupying the saturated soils (very close to rivers).

The fauna of the flood plain is mostly different species of local birds, which reside in the trees and frogs as aquatic creatures. The flood plain vegetation play important roles in filtering sediments and nutrients, stabilization of river banks, provide habitat and food for stream organisms, and, by shading streams.



The project road runs through flat terrain in major stretches with rolling terrain at few locations, making road vulnerable to floods. The project road traverses fourteen (14) floodplains as described in Table 12 below.

In addition to the flood plain the traverses a section with high water table around Km 29+900, near the junction to Kagera Nkande Game Reserve. Despite the fact that this study was conducted during dry season, water seepage was noted from along the edge of the road (Plate 20).

**Table 12: Flood Plains across the Project Road and Bypass Roads**

No .	Location (Chainage)	Name of Floodplain	Village	Adjoining rivers/ streams	Flood Plain Characteristics/ Land use
<b>Kasulu – Kibondo – Kabingo Main Alignment</b>					
1.	Km 07+800	Ruchugi	Kidiama	R.Ruchugi	Elephant grass and few riverine trees on its upstream riparian and elephant grass and shrubs on its downstream riparian. Both its upstream and downstream riparians are used for vegetable gardening (Plate 5)
2.	Km 21+200	Unnamed	Nyamyusi/ Nyakitonto		Grassland with miombo woodland trees
3.	Km 23+700	Unnamed	Nyakitonto	R.Chai	Elephant grass on the upstream riparian and elephant grass with avocado and peacock flower trees on the downstream riparian
3.	Km 24+750	Unnamed	Nyakitonto	R.Kalenge	Elephant grass on the upstream riparian and elephant grass with a few acacia and mango trees on the downstream riparian. Its soil appears stable against erosion.
4.	Km 37+500	Unnamed	Nyachienda	R.Nyakasanda	Elephant grass on both the upstream and downstream riparians. Its soil appears stable against erosion (Plate 9). The flood plain is a source of domestic water for Nyachienda village community. During rainy season this section is passable with lots of difficulties because of road overtopping
5.	Km 46+400	Unnamed	Kalimungoma	Unnamed stream	About 200m long and characterised by grassland on both sides
6.	Km 47+700	Unnamed	Kulimungoma	Unnamed	Grassland on both sides. The flood plain is used for making burnt clay bricks (Plate 18)
7.	Km 83+400	Unnamed	Nyamidaho	R.Malagarasi	Riverine and miombo woodland tree vegetation (Plate 19). Riverine trees get less dense as one move away from the river. Its soil is characterised by black cotton soil.
8.	Km 100+400	Unnamed	Kisogwe	R.Nyamilembi	Riverine trees on its upstream riparian and grassland on its downstream riparian. Its downstream riparian is used for gardening
9.	Km 102+500	Unnamed	Kisogwe	R.Nyabwai	Grassland on its upstream and riverine trees on its downstream riparian. Both upstream and downstream riparians are used for gardening.

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No .	Location (Chainage)	Name of Floodplain	Village	Adjoining rivers/ streams	Flood Plain Characteristics/ Land use
10.	Km 105+600	Unnamed	Kisogwe/Kifura	R.Mkugwa	Riverine trees ( <i>syzigium cardatum</i> ) on its upstream and grassland on its downstream riparian
11.	Km 110+600	Unnamed	Kifura	Unnamed	
12.	Km 112+500	Unnamed	Kifura	R.Nyaentamba	Grassland and a few miombo woodland on its upstream and downstream riparians
13.	Km 113+300	Unnamed	Kifura	Unnamed	Grassland with a few scattered miombo woodland trees
14.	Km 123+100	Unnamed	Maloregwa	R.Memvi	Elephant grassland both on its upstream and downstream riparians. During rainy season this section is passable with difficulties because the road overtop. Its hydraulic capacity appears inadequate because of overtopping during peak rainy season (April – interview with local people). The river marks the border for Kumshidwi and Malolegwa
15.	Km 136+300	Unnamed	Kumwambu	Unnamed	The flood is used for banana farming
16.	Km 136+400	Unnamed	Kumwambu	Unnamed	The flood is used for banana farming
17.	Km 140+900	Unnamed	Kumwambu	R.Kabwigwa	R.Kabwigwa
18.	Km 155+400		Kazilamihunda	R.Kanembwa	Grassland on its upstream riparian and riverine trees on its downstream riparian. Both its upstream and downstream riparians are used for gardening
19.	Km 167+300		Kazilamihunda	Kazilamihunda	
<b>Kibondo Bypass Section</b>					
1.	Km 8+700	Unnamed	Nduta	R.Bururuma	Located across Kibondo bypass section
2.	Not established	Nengo	Nengo	It perennial river which is characterised by a few riverine trees. Its riparian is used for gardening by the local people.	

**Source:** Consultant’s Survey and interview with local people

#### 4.2.5 Road Side Air Quality

The typical air pollutants from road transportation sources are Carbon Monoxide (CO), Nitrogen Dioxide (NO<sub>2</sub>), Sulphur Dioxide (SO<sub>2</sub>) and volatile compounds; and particulate matters (dust).

The amount of dust generated is determined primarily by the volume of traffic using the unpaved road as well as the speed, weight, and number of wheels of the vehicle. The abrasive resistance of the road surface material and the amount of fines (earth road likely to generate more dust than gravel road) whether in the initial road surface material mix are also important contributing factors. The season variation of the project area, reflecting variations in temperature, humidity, and rainfall is also a contributing factor affecting the dust generation.

Obviously, during wet season, the time during which this study was carried out the amount of dust generated is low, since the rainfall disperses dust and maintains air quality.

During dry season, despite the low traffic volume, the amount of dust generated was considerable high, to the extent of impairing vision of motorists using the road. Crops and vegetation near the road is covered with the airborne dust. The generated dust particles can affect the growth the crops and other vegetation along the project road. Dust abrading leaf surfaces, dust blocking stomata (clogging of pores) of plants, dust increasing the amount of absorbed incident radiation. These are just a number of different impacts dust can have on vegetation and plants. But overall, the effects seem to be a reduction in photosynthetic abilities, the result of which can be stunting their growth due to shading effect, and clogging of the plant's pores.

To pedestrians, other road users, and residents living along the unpaved earth project road, the traffic-generated dust penetrates their homes causing a nuisance and health problems such as hay fever and allergies. Fine particles resulting from traffic actions can be washed off during precipitation events and carried into nearby streams increasing their respective particulate loading. For motorists using the unpaved roads the traffic-generated dust reduces visibility and cause driving hazards.

Despite the fact data the level of emission from traffic along the roads was not available during the study, considering the low traffic volume on the project road and the fact that settlement areas are open (which facilitates pollutant's dilution/dispersion); ambient air quality has been projected to be insignificantly affected by vehicular emissions.

Presently the main road alignment receives higher emission than the existing part of Kibondo bypass road (Maloregwa - Nduta refugee camp section) because of its higher traffic volume. Nevertheless, emissions diminish as one move away from the urban area. However, Maloregwa – Nduta refugee section experiences higher level of pollution due to particulate matter because it is not paved.

Similarly the settlement areas (Kidiama and Mkombozi) of the non-existent section of proposed Kasulu bypass has the lowest level of emission and pollution due to particulate matter because there is almost no traffic along this section.

This study has tried to estimate current daily traffic emission, particularly Carbon Dioxide based on the current traffic volume counts – Annual Average Daily Count (AADT), which is defined a measure used primarily in transportation planning and transportation engineering. Traditionally, it is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. AADT is a useful and simple measurement of how busy the road is.

One of the primary determinants of CO<sub>2</sub> emissions from mobile sources is the amount of carbon in the fuel. Carbon content varies, but typically we use average carbon content values to estimate CO<sub>2</sub> emissions. Based on United States Environmental Protection Agency, a gallon (3.8 litres) of gasoline gives a carbon content value of 2,421 grams, which produces 8,877g of CO<sub>2</sub>. (The carbon content is multiplied by the ratio of the molecular weight of CO<sub>2</sub> to the molecular weight of carbon: 44/12), while diesel produces 2,778 grams of CO<sub>2</sub>.

The Intergovernmental Panel on Climate Change (IPCC) guidelines for calculating emissions inventories require that an oxidation factor be applied to the carbon content to account for a small portion of the fuel that is not oxidized into CO<sub>2</sub>. For all oil and oil products, the oxidation factor used is 0.99 (99 per cent of the carbon in the fuel is eventually oxidized, while 1 per cent remains un-oxidized).

Therefore:

CO<sub>2</sub> emissions from a gallon of gasoline = 2,421 grams x 0.99 x (44/12) = 8,788 grams = 8.8 kg/gallon = 2.3 Kg/litre of gasoline.

CO<sub>2</sub> emissions from a gallon of diesel = 2,778 grams x 0.99 x (44/12) = 10,084 grams = 10.1 kg/gallon = 2.7 Kg/litre of diesel

The following table (Table 13) summarizes computations of the amount of carbon dioxide which is the currently generated daily by traffic based on AADT.

It is therefore noted from the table that the current amount of CO<sub>2</sub> emission is estimated to be 75 tons/year.

**Table 13: Estimates of Amount of CO<sub>2</sub> Currently Generated by Traffic Daily in Kg/day Based on AADT**

No.	Type of vehicle	No of vehicles [a]	Type of fuel	Average fuel consumption (Km/litre) [b]	Estimate of Fuel consumption in 223km = (223/b) x a [c]	Amount of CO <sub>2</sub> Currently generated in kg: [c] X [d] where d= 2.3 (for gasoline engines) and 2.7 (for diesel engines)
1.	Motor cycle	372	Gasoline	20	4,147.8	9,540
2.	Medium car/ Station wagon	121	Gasoline	9	2,998.1	6,896
3.	4WD vehicle	118	Diesel	8	3,289.3	8,881
4.	Pickup	44	Diesel	8	1,226.5	3,312
5.	Daladala	22	Diesel	8	613.3	1,656
6.	Medium bus (30 – 35 passengers)	16	Diesel	6	594.7	1,606
7.	Large bus (40 seater capacity)	15	Diesel	2	1,672.5	4,516
8.	Light Truck (LGV) – Rigid 2-axles (3-6 tons)	16	Diesel	5	713.6	1,927
9.	Medium Truck (MGV) –	21	Diesel	2	2,341.5	6,322



**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Type of vehicle	No of vehicles [a]	Type of fuel	Average fuel consumption (Km/litre) [b]	Estimate of Fuel consumption in 223km = (223/b) x a [c]	Amount of CO <sub>2</sub> Currently generated in kg: [c] X [d] where d= 2.3 (for gasoline engines) and 2.7 (for diesel engines)
	Rigid 2-axles (7-10 tons)					
10	Heavy Truck (Rigid 3 or 4 axles), typically 12-15 tons capacity,	22	Diesel	2	2,453.0	6,623
11.	Articulated Truck (4 -7 axles), typically 25-32 tons capacity,	32	Diesel	1.5	4,757	12,844
<b>Total Current daily emissions of CO2 (Kg)</b>						<b>64,123</b>

## 4.2.6 Noise and Vibrations

Despite the fact that data on noise pollution of the project area was not available during the time of conducting the study, it goes without saying that like air emission, the level of noise and vibrations due to traffic is dependent on the volume of traffic, speed, and the type of pavement.

The main road alignment section has the highest level of noise and vibrations since it has the highest traffic volume. Similarly, the traffic accessible sections of Kasulu and Kibondo bypass roads have the lowest level of noise and vibrations because of their low traffic volume.

## 4.2.7 Scenic and Visual Impacts

The most common sources of deterioration of scenic and visual and qualities along roads are caused by the presence of unreinstated Borrow Pits (BPs) and stockpiles of construction materials leftovers. The survey noted several unreinstated material BPs along the project road. Some of these pits are located very close to the road, creating an eye sore to by passers. Some of these unreinstated borrow pits are located in settlement areas and so poses serious danger to children residing in its neighbourhood as they are likely to be drowned if the borrow pits are filled with rain water. Some of these borrow pits are located as close as 10m from the centreline of the road. These BPs pose safety concern to traffic, especially in the event of traffic accident.

The following table (Table 14) describe typical examples of old unreinstated borrow pits, located very close to the project road:

**Table 14: Typical Old Unreinstated Borrow Pits along the Project Road**

No.	Location	Village	Remarks
1.	06+800	Kidiama	Unreinstated BP, 8m LHS
2.	06+900	Kidiama	Unreinstated BP, 15m LHS
3.	08+100	Kidiama	Unreinstated BP, 10m both sides of the road
4.	09+400	Kidiama	Unreinstated BP, 20m LHS
5.	12+600	Kanazi	Unreinstated BP, 50m LHS
6.	16+200	Nyamyusi	Unreinstated BP, 5m, RHS
7.	16+400	Nyamyusi	Unreinstated BP 14m, RHS
8.	16+700	Nyamyusi	Unreinstated BP 20m, RHS
9.	19+000	Nyamyusi	Deep unreinstated BP, 10m LHS in settlements area (Plate 30)
10.	21+000	Nyakitonto	Unreinstated BP, 15m both sides of the road
11.	23+100	Nyakitonto	Unreinstated BP, 10m, RHS.
12.	32+200	Mugombe	Unreinstated BP, 10m, RHS
13.	32+300	Mugombe	Unreinstated BP, 8m, LHS
14.	32+700	Mugombe	Unreinstated BP, 50, RHS
15.	47+100	Kalimungoma	A series of unreinstated BPs, 50m on RHS
16.	55+800	Makere	Unreinstated BP, 10, LHS
17.	60+300	Nyamidaho	Unreinstated BP, 15m on both sides
18.	60+400	Nyamidaho	Unreinstated BP, 50m, RHS
19.	60+600	Nyamidaho	Two unreinstated BP, 20m RHS
20.	64+800	Mvugwe	Unreinstated BP, 20m, RHS
21.	67+700	Mvugwe	Unreinstated BP, 15m, LHS

No.	Location	Village	Remarks
22.	70+100	Mvugwe	Unreinstated BP, 10m, RHS located in the forest reserve
23.	73+600	Mvugwe	Unreinstated BP, 20m, RHS located in the forest reserve
24.	78+800	Mvugwe	Unreinstated BP, 15, RHS located in the forest reserve
25.	79+400	Mvugwe	Unreinstated BP, 30, RHS located in the forest reserve
26.	80+800	Mvugwe	Unreinstated BP, 30, RHS located in the forest reserve
27.	84+500	Mvugwe	Unreinstated BP, 50, RHS located in the forest reserve
28.	91+000	Busunzu B	Unreinstated BP, 8m, LHS
29.	105+100	Kisogwe	Unreinstated BP, 20, LHS located in village forest reserve
30.	121+200	Maloregwa	Unreinstated BP, 50, RHS
31.	156+400	Kazilamihunda	Two unreinstated BP, 15m, both sides
32.	156+800	Kazilamihunda	Unreinstated BP, 20, RHS
33.	158+500	Kazilamihunda	Unreinstated BP, 15m, LHS
34.	161+300	Kazilamihunda	Unreinstated BP, 10m, LHS
35.	163+500	Kazilamihunda	Unreinstated BP, 60m, RHS
36.	166+900	Kazilamihunda	Unreinstated BP, 15m, RHS located in settlements area
37.	175+000	Nkuba	Unreinstated BP, 25m, RHS
38.	180+800	Kiyobela/ Kabingo	

Source: Consultant's Survey

#### 4.2.8 Road Conditions and Safety

The geometry of the existing gravel road is such that it is narrow and in a number of sections it has infringed sight distances because of sharp horizontal curves (sharp corners). Some approach roads to hydraulic structures (culverts and bridges) are curved and so presents safety concern. For safety reasons, horizontal re-alignment will be necessary in such road sections in order to improve design speed as well as sight distance. The following table (Table 15) describes typical road sections where the road is prone to accidents because of infringed sight distances and where realignment will be necessary.

**Table 15: Typical Road Sections where Realignment is necessary to Improve Safety**

No	Road Section	Geometrical Change	Reason for Geometrical change
1.	8+500 Kidiana	Realignment to LHS	To reduce sharp horizontal curve
2.	16+700 - Kanazi	Realignment to LHS	To reduce sharp horizontal curve
3.	Km 17+500	Cut or fill	Both approach roads to the bridge for R.Ngaraga are sharply curved
4.	21+400 -		
5.	22+000		Blind horizontal curve
6.	22+500 Nyakitonto		
7.	Km 24+750	Realignment to LHS	Kasulu side approach road to the bridge for R.Ngaraga is sharply curved

No	Road Section	Geometrical Change	Reason for Geometrical change
8.	Km 29+700 – near junction to Kagera game reserve		To reduce sharp horizontal curve
9.	Km 31+000 - Mugombe		
10.	Km 31+300 - Mugombe		
11.	Km 33+200 - Mugombe		
12.	Km 69+100 - Mvugwe		
13.	Km 90+600		To reduce a series of sharp horizontal curves, with steep slopes
14.	Km 97+400		Kakonko side approach road to the bridge for R.Nyamguluma is sharply curved
15.	Km 105+600		Kakonko side approach road to the bridge for R.Mkugwa is sharply curved
16.	Km 155+400	Cut/fill and realignment	Both approach roads to the bridge for R.Kanembwa are sharply curved and with steep slope

**Source:** Environmental Expert's Field Survey

## 4.2.9 Natural Disaster

There is no known natural disaster in the project area.

## 4.3 HUMAN ENVIRONMENT

### 4.3.1 Population

#### Kasulu District

According to 2012 population and housing census, Kasulu had a total population of 634,038 comprising of 306,789 males (48.4%) and 327,249 females (51.6%). Its population growth rate was 2.4% per annum. The current population density is 57 people per km<sup>2</sup> while average household size each 5.7 people.

#### Kibondo District

According to 2012 national Population and housing census report, Kibondo District had a population of 261,331 of which 124,518 males and 136,813 are females. The average population growth rate per annum is 2.7%. 37.3% of total populations is a working population. The average family size is 5 persons and the life expectancy is set at an average of 52 years.

#### Kakonko District

According to 2012 population and housing census, Kakonko District had a total population of 167,555 comprising of 81,417 males (48.6%) and 86,138 females (51.4%), with annual population

growth rate of 2,4% and average household size of 5 people. 86.6 of the population relies on agriculture as their major source of income.

#### 4.3.2 Gender Issues

In general communities and societies within the road impact area are based on a patriarchal relationship. This implies that authority is vested in the male as a head of household. Traditionally in most of the study area women do not own land and are not entitled to own land and therefore do not have inheritance rights over land and livestock. Additionally, women within this traditional setup are denied the right to own basic property. However, changes are being initiated at different levels. In all village governments women participate (in both development and political activities) and the participation of women in the community level activities have been reported as being far much better and effective compared to men. The youth participate in most of the social and economic activities but within the communities their social status is low. There also appears to be gender role differentiation among the youth, young women are given limited opportunities compared to young men who for example are much more mobile in looking for economic opportunities outside their villages. In almost all villages, position of elders is ranked highly in social sense but they lack economic opportunities and are often supported by their children or close relatives. In village and community level meetings women participate and are equally involved in the discussions, though tend to shy off, with little contribution to the discussions

The division of labour in the family and in the communities is based on gender and age. Most of the domestic chores are undertaken by women in addition to other activities such as farming and small business. Cooking, child rearing and other domestic chores such as washing clothes and cleaning houses are the major household activities on which women spend most of their time more than 8 is spent on these activities. Rural woman may rest only for 4 to 6 hours a day. Women in urban areas have more time for resting and relaxation comparing to rural women in Tanzania if not for all African countries. Limited differentiation exists in terms of the division of labour in the families and households among the different ethnic groups in the study area.

Most of villages within the road corridor have formed women groups mainly for economic purposes. The rest have not formed the groups but some are in the process of doing so. Most of the villages which have already formed women groups have on average of two groups. The membership to these groups is small but nonetheless this represents efforts that are being made to bring to the forefront gender issues in the social and economic spheres. Some of the groups are mixed with both male and female membership. A number of these groups receive credits from SACCOS, TASAF and district councils. The groups are often formed around a specific development issue such as economic, environmental, health etc. Others are formed around religious institutions especially the church (women and Choir groups are common) which apart from their religious activities are also involved in social activities. Among major challenges that affect the efficient management of these groups included limited capacities and skills to manage such groups, lack of motivation, access to credit facilities and generally low levels of education of the members.

In the project area, women are involved in several development activities and therefore play both production and reproduction roles. Women are involved in most agricultural work which includes production activities, processing, and marketing. Apart from playing the reproductive role women also bear the burden of taking care of the children, the old, the sick members of the families. . Among domestic chores that are normally unpaid include fetching water, collection of firewood, food preparation etc. As observed previously because of the nature and structure of the family relationships women's contribution especially at the family level is not given social recognition it deserves. This explains to a large extent the increasing levels of poverty among women and their

low status. Women in the area are also constrained in terms of access to credit facilities, productive resources, education, training opportunities, and appropriate technologies to simplify their work (e.g. heavy work load), skills, and knowledge etc. Women have been mobilized to form economic groups. Women groups get loans for economic enterprises are being supervised by the district Community department.. Additionally, a number of civil societies have been formed to address gender issues and increase women participation in various development activities.

Women participation in the road works within the road impact area was not reported in any village. The road construction will have a potential for the increase of women and family incomes in a number of ways. The culture of the people along the study area does not prohibit women from participating in the road construction although the extent of their involvement is limited because of their roles in domestic sphere and activities. Nonetheless both women and men who have no access to formal employment will accumulation of capital for future investment, employed during the construction phase and later during the maintenance phase. This in itself will increase family and individual level incomes. During road construction women and others will also establish small scale business such as food vendor services popularly known as Mama Lishe. This again will lead to increases in the incomes of women and families in general and elevate women status in the community. The involvement of the local population including women will lead to capacity building in terms of new skills. Previous studies show that participation of women in leadership is limited due to lack of confidence and skills.

Accessibility to social services in the project area is relatively good, as almost all the villages have a primary school or two depending on the population of the village. Every ward has a secondary school; therefore children are not working long distances to reach education facilities. The accessibility to medical services is equally good, not every village has a medical facility, but the services are available to the nearby villages in case the village does not have one, none of the affected village work than seven kilometres to reach medical facilities.

Regarding transport, there are many small and minibuses operating along the road throughout the day. Therefore movement from one point to the other is very easy. “Bodaboda” are operating along the road as well as big buses operate from Kigoma to Kasulu, Kibondo to Kakonko to Dares salaam.

Accessibility to water services is also not bad; in the project area there many surface water sources such as rivers and springs which are used by women to get domestic water.

### **4.3.3 Health and HIV/AIDS**

#### **Kasulu District**

HIV infection rate has decreased from 2% in 2005 to 1.3% in year 2014. This is a positive improvement but still more efforts are highly needed to increase efficient service especially in this sector.

Major programmes include: Quarterly training for all council staff; sensitizations in meetings and using traditional dance groups; free condom distribution, voluntary testing and counselling; provision of ARVs at the district hospital. The use of peer groups is an effective avenue for the dissemination of information and messages.

#### **Kibondo District**

Based on 2011, 2012, and 2013 statistics, the prevalence rate in Kibondo District was 2.7%, 3.3%, and 3.2% respectively.

## **Kakonko District**

Kakonko Districts has Voluntary Counselling and Testing (VCT) centres that are located at Nyanzige, Kakonko, Kasanda na Gwanumpu health centres. Aidha the District offers mobile CTC services at 6 centres that are located at Nyagwijima, Kiduduye, Bukirilo, Muhange, Kabare and Nyabibuye. At present a total of 318 people living with HIV receive the service in the District.

Statics show that the prevalence rates in 2008, 2012, 2013, 2014, and 2015 were 3%, 3.4%, 2.4%, 1.7%, and 3.3% respectively

### **HIV/AIDS Programmes and Activities within the Immediate Road Impacted Area**

Within the immediate road impact area a number of HIV/AIDS activities are undertaken. In most of the villages these activities include information, Education and Communication (IEC) and behaviours Change Communication (BCC) activities: posters, brochures, seminars, counselling and meetings. Education and information regarding HIV/AIDS is also provided in most of the schools. HIV/AIDS committees at village and sub-village levels have been formed. It was observed that HIV/AIDS is a standing agenda item in all village meetings. In most of the villages although statistics on the prevalence of the disease is lacking yet there is a recognition that the disease is of major health concern.

It was reported that the major means of creating awareness on the disease is through village meetings. In some villages, groups have been formed to provide HIV/AIDS information these groups included traditional dance groups, church (youth groups) and peer groups. In most villages condoms are available and condom use was reported to be on the increase.

Major challenges that were reported in the war against HIV/AIDS in the immediate road impact area include: alcoholism, lack of knowledge on how to use condoms, limited information on HIV/AIDS and culture, norms and traditions that increase the probability of involvement in unprotected sex.

Data at village levels revealed that most of the HIV/AIDS activities implemented in the road impact areas were undertaken outside the road sector and by a variety of other stakeholders. However, it is worth noting that these activities and programmes could not be efficiently implemented without upgrading of this road. Therefore the road can positively affect the flow of HIV/AIDS information and provision of services such as access to clinics for testing.

## **4.4 CULTURAL ENVIRONMENT**

### **4.4.1 Family Structure**

The typical family system in the road impact area is both nuclear and extended families which are traditionally male-headed but matrilineal in structure.

### **4.4.2 Ethnicity**

There are several tribes along the road with more or less similar and shared cultural traditions and customs as well as spoken languages. Ethnic groups include Waha, Wasubi, Washubi Wanyambo, Wahaya, Wasukuma, Wajaluo, and Wajita. The major ones are the Wahangaza, Wanyambo, Wahaya, Waha, and Wasubi. Waha are the majority among all tribes and even the majority of people speak Kiha and Kiswahili, which is the national language. Due to close relationship and



interaction and cooperation existing among tribes, there are minimal cultural differences despite the existing tribal diversity in the project area.

#### **4.4.3 Religion**

Christianity and Islamic are the major religious groups found in the project areas. Under the Christianity, there are dominant denominations namely Evangelical Lutheran Church of Tanzania (ELCT), Roman Catholic, and Anglican. The followers of these religious groups and respective denominations cooperate and participate in different ( both informal and formal) socio-economic and development activities and villages leaders reported that religious contributed to maintain harmony and peace in their project areas and are also useful to channel information to people.

#### **4.4.4 Cultural Sites**

The only cultural sites close to the road which was noted during the study is a graveyard. One graveyard was identified to be within the project road RoW. The graveyard is located at Km 61+000, RHS (Mvugwe village), within the RoW.

#### **4.4.5 Archaeological, Historical or Heritage**

There are no known archaeological, historical or heritage site along the project road.

### **4.5 ECONOMIC ENVIRONMENT**

#### **Source of Income for the Family Members**

The main livelihood occupations in the area include Agriculture (26.8%), livestock keeping (16.3%), and petty trading (18.3%) Formal employment was only found in 16.2% of the household respondents. The study results shows that (86%) of affected people are involved in small scale farming.

### **4.6 INFRASTRUCTURE AND SOCIAL SERVICES**

#### **4.6.1 Energy**

The main source of energy for cooking in the project area is firewood (48.6%). This is followed by those who use charcoal (28.9%). 18.3 percent reported to use both charcoal and firewood. Only 2.8 percent of the respondents use gas as the main source of cooking. Only 1.4 percent said they use electricity for cooking. Dependency on these sources of energy is/will affect the existence of forest in the project area, as trees are/ will be cut to make charcoal and firewood. To have sustainable environment, people should be encouraged to establish wood lots at a household level to serve the existing of forests in the project area.

The study investigated the source of light used by households in the project area. It was revealed that kerosene is the most used source of lighting houses at night, as 53% of the surveyed households reported to use kerosene. Solar energy is the second source of energy, 25% reported to use this source, the rest 22% are connected to the national grid and they use electricity.

## 4.6.2 Water Supply

The main sources of domestic water supply for villages along the project road are pipe water from gravity (springs) schemes, pumped schemes (boreholes with storage tanks and distribution pipe network), borehole with hand pumps, improved shallow wells, open (unprotected) shallow wells, and rivers.

During the interview with Water Engineer for districts through which the road traverses, the consultant noted that at several domestic points water pipe lines either cross or run close to the project road. In addition, domestic points or bore holes with pumps are close to the road to the effect that construction activities of the road are likely to disrupt them.

Traditional wells is the main source of water used by most villagers along the route as 32.4% reported to use that sources, this is followed by those who use protected communal pumps (16,2%) on sites, the third source of water is shallow wells (14.1%). Only 10 households reported to have house connection was services. Rain water, communal pumps off sites, surface water and buying water from vendors are also the alternative water sources used by communities.

Regarding the amount of water consumed per households the study found out that most of the households (40.1 %) reported to consume less than one bucket of water a day. This is followed by those households (32.4%) who said they use between one to two buckets of water per day. Only 16.9% of the interviewed households use three to four buckets of water per day. Only 15 households out of 142 reported to use more than 4 buckets of water per day. The use of less water of the household is an indication of poor hygiene and scarcity of water in the project area

The following table (Table 16) describes domestic water supply profile for villages along the project road.

**Table 16: Water supply profile for villages along the project road**

No.	Village	Source of Water Supply	Remarks
<b>Project Road Main Alignment</b>			
1.	Kidiama	Pipe water from gravity scheme with sources at Mgandazi, Nyasha, and Nyandala villages	<ul style="list-style-type: none"> <li>Some distribution pipe lines cross the project road and the proposed bypass road.</li> <li>Domestic Points (DPs) are close to the road</li> <li>Km 5+600: DP located 12 RHS</li> <li>Km 5+700: 4" Gate valve located 8m RHS and pipe crossing</li> <li>Km 6+000: DP located 13m RHS</li> </ul>
2.	Kanazi	Pipe water from gravity scheme	<ul style="list-style-type: none"> <li>A main pipe line supply to Mbondo MATI crosses the project road.</li> <li>Some DPs are located near the road</li> </ul>
3.	Nyamyusi	Pipe water from gravity scheme with a source at Nyakabano B. The supplies water to Nyakitonto and Mugombe villages as well.	Main pipe line to storage tank cross the project road
4.	Nyakitonto	Same source as Nyamyusi village	<ul style="list-style-type: none"> <li>Main pipe line cross the project road and some</li> <li>DPs are close to the road, e.g. Km 23+100 DP located 10m LHS</li> </ul>
5.	Mugombe	Same source as Nyamyusi village.	<ul style="list-style-type: none"> <li>Some of distribution lines cross the project road</li> <li>Km 26+300: DP located 13m RHS</li> </ul>

No.	Village	Source of Water Supply	Remarks
			• Km 26+600: DP located 20m RHS
6.	Nyachienda	Pipe water from gravity scheme with a source at Lulengela village.	Some of the distribution pipe lines cross the project road
7.	Kitagata	Same source as Nyachienda village.	Some of the distribution pipe lines cross the project road
8.	Kalimungoma	Open traditional wells and rivers	None
9.	Nyangwa	Open traditional wells and rivers	
10.	Makere	<ul style="list-style-type: none"> <li>• Pumping scheme – a borehole with distribution network.</li> <li>• Improved shallow wells</li> </ul>	Some of the shallow wells are located close to the road
11.	Nyamidaho	Two shallow wells	The shallow wells are located near the road
12.	Mvugwe	Two shallow wells	Located on the LHS near the road
13.	Nyalulunga	Open traditional wells and rivers	
14.	Busunzu A & B	<ul style="list-style-type: none"> <li>• Pumping scheme with a storage tank</li> <li>• Open shallow wells</li> </ul>	Distribution lines cross project road
15.	Kisogwe	Open traditional wells and rivers	
16.	Kifura	Open traditional wells and rivers	
17.	Kumshindwi	Open traditional wells and rivers	
18.	Maloregwa	Open traditional wells and rivers	
19.	Lusohoko	Open traditional wells and rivers and boreholes with pump	
20.	Kumwambu	Open traditional wells and rivers and boreholes with pump	A borehole with handpump at Km 135+800 is located 16m on the LHS of the road
21.	Kitahana	Open traditional wells and rivers and boreholes with pump	
22.	Kibondo	Pipe water	
23.	Kilemba/ Kumkugwa	Open traditional and rivers	
24.	Kazilamihunda	Pipe water from gravity scheme and R.Kazilamihunda.	Distribution pipe lines cross the project road at
25.	Keza		
26.	Nkuba	Stream and open traditional wells	
27.	Kasanda	Borehole with hand pump, existing pipe water system (but currently not operational) and R.Mhadzi	

No.	Village	Source of Water Supply	Remarks
28.	Kewe		
30.	Kiyobela/ Kabingo	Pipe water from a gravity scheme.	<ul style="list-style-type: none"> <li>• Some DPs are located close to the road</li> <li>• Km 180+600: DP located 15m on the RHS</li> </ul>

**Source of Data:** Consultant’s Survey and Consultation with Local People

### 4.6.3 Travel and Transport

#### Kasulu District

##### Roads Infrastructure

The District has a total road network of 656.4km of which 334.8 kms are trunk roads, 143.1 kms feeder roads, 53.9 km urban roads all are roads in accordance to the road act of 2007 while 96.7 km are feeder roads and 27.9km are urban roads not in act, 2007 respectively. Of the named roads kilometers, they either constructed by gravel or by earth. This means that 88.8 km are gravel constructed and are in good condition while 35.9 km gravel are in fair condition and 1.55km are poor. The situation indicates that 274.25 km are earth roads in good condition, 206.95 km fair condition and 50.75 km are poor respectively. There is tarmac road from kasulu and Buhigwe junction just 1 km to Mlimani District Hospital of by which the construction has completed. If comparison is made between total kilometers of gravel roads (126.25 km) to total kilometers of earth roads (531.95km) one may admit that there is need to put more effort on constructing gravel roads and not earth roads, however, this will mean to increase the budget on road fund.

The District aims to have a quality roads network which will be passable through out the year. In order to achieve such objective all roads will have to be constructed by at least Murom materials. The district has a great demand of tarmac roads since no even a single street tarmac road despite that KASULU District is now having a status to be Town Council.

##### Air Transport

Kasulu has 2 air strips located at Kimobwa at the outskirt of Kasulu town and at Shunga village out of these airstrips only Kimobwa which is located at Kasulu town is graveled.

Kimobwa airstrip reserved for passengers and cargo plane that are chartered by Government, UNHCR and humanitarian organizations that were operating in the area. The air strip is well maintained by Tanzania Airport Authority

##### Communication Net Work

Generally communication network in the District has been improved over the past few years. All mobile companies operates in the District, these includes, VODACOM, TTCL, TIGO and AirTEL. Internet service providers are few like Kasulu Teachers training college, Anglican Church Internet café and 2 private internet cafes have facilities for internet provision. The community is provided with information through various media including radio KWIZERA, TBC, ITV, Star TV, EATV, CNN, BBC and print media from IPP media and other publishers. No any headquarter at Kasulu or station for the above media.

## Kibondo District

### Road Network

The road network in Kibondo District comprises of 575.4Km of roads surface. Of this, 75km is made up of trunk roads, 90Km are comprised of regional roads, 83.4Km are District roads, 100 Community roads and 227Km are feeder roads. Roads generally are passable throughout the year however during the rainy seasons these roads are traversed with some difficulty

### Air Transport

Kibondo District has two air strips that have a capacity for planes that are as large as ten tonnes *Hercules* transporter. The Kibondo airstrips reserved for passenger and cargo plane are chartered by UNHCR and humanitarian organizations that operating in the area. The air strips are well maintained. One airstrip is located at Minyinya in Bunyambo ward and other one is located in Moyowosi Game Reserve which is under management of Wildlife Division – Ministry of Natural Resource and Tourism.

## Kakonko District

The District has a total road network of 420 km of which 42km are trunk roads, 124km are regional roads, 209km are feeder roads, and 112kkm are community roads. 53.9 km are urban roads all are roads

### 4.6.4 Education Services

Regarding the level of education reached by the family members, 'the figure below summarizes the information. It shows that 40.8% of the interviewed house members have primary school education. 23 % have attained secondary school, while 21.8 have never been to formal education, , therefore cannot read or write. The rest 13.3% attended technical and University colleges. It can be concluded that the level of education in the project area is relatively good. The good status of education is the result of the Tanzanian policy which requires every village to have one or two primary school based on the size of the village. The policy also requires that every ward should have a secondary school; this has helped the children to access secondary and primary school in their vicinities

The following table (Table 17) list schools that are located along the project road

**Table 17: List of Schools Located along the Main Alignent and Bypass Sections**

No	Chainage	Name of Black Spot	Village
<b>Main Road Alignment</b>			
1.	Km 4+600 LHS	Nyarumanga Primary school	Kidiama
2.	Km 14+900	Kanazi primary school	Kanazi
3.	Km 20+500 RHS	Magaba secondary school	Nyakitonto
4.	Km 24+100 RHS	Nyakitonto primary school	Nyakitonto
5.	Km 24+100 LHS	Murabanga primary school	Nyakitonto
6.	Km 26+800 LHS	Mugombe primary school	Mugombe
7.	Km 36+500	Nyachienda primary school	Nyachienda
8.	Km 50+500 LHS	Makere secondary school	Makere

No	Chainage	Name of Black Spot	Village
9.	Km 50+900LHS	Makere primary school	Makere
10.	Km 62+600 LHS	Mvugwe primary school	Mvugwe
11.	Km 93+900	Misezi secondary school	Busunzu A
12.	Km 94+400	Busunzu primary school	Busunzu A
13.	Km 101+100	Kisogwe primary school	Kisogwe
14.	Km 108+500 RHS	Moyowosi secondary school	Kifura
15.	Km 111+300 LHS	Busagara primary school	Kifura
16.	Km 118+400LHS	Kumshindwi primary school	Kumshindwi
17.	Km 123+600 LHS	Maloregwa primary school	Maloregwa
18.	Km 132+500 RHS	Rusohoko primary school	Rusohoko
19.	Km 133+400 LHS	Rubanga secondary school	Rusohoko
20.	Km 135+900 RHS	Kasebuzi primary school	Kitahana
21.	Km 141+600	Kabwigwa primary school	Kibwigwa
22.	Km 167+900 RHS	Juhudi primary school	Kazilamihunda
23.	Km 170+100 LHS	Keza primary school	Nkuba
24.	Km 172+100 RHS	Kasanda primary school	Kasanda
25.	Km 174+100 RHS	Tumaini primary school	Kewe
26.	Km 180+300 LHS	Kabingo primary school	Kabingo
<b>Kibondo Bypass Section</b>			
1.	Not established	Kakangaga Muslim secondary school	Kilemba

**Source:** ESIA expert field Survey and Consultation with local people

#### 4.6.5 Health Services

##### Kasulu District

The District has 2 Hospitals these are Kabanga referral hospital which is owned by a faith based organization (Roman Catholic) and Mlimani district hospital under government both situated at Kasulu town, 8 Health Centres 1 owned by private, 7 by government/public and 46 of which 41 owned by public and 5 Dispensaries by private sectors.

The presence of this services in rural and urban has decreased the Mother to Child mortality rate from 116/100,000 to 56/100,000 in year 2005 and 2010 respectively. HIV infection has decreased from 2% in 2005 to 1.3% in year 2014. This is a positive improvement but still more efforts are highly needed to increase efficient service especially in this sector. Infant Mortality Rate in the district is 5/1,000 and Mother Mortality Rate is 58/100,000 for the year 2013. If healthy facilities and service delivery will be improved IMR and MMR will decline sharply

##### Kibondo Distric

The District has only one Hospital, three Health Centers and thirty five Dispensaries that are owned by governmental, one dispensary which is owned by Parastatal and one dispensary which is owned by Faith based Organization



---

## **Kakonko District**

The District does not have a hospital but 3 health centres and 25 dispensaries. The three health centres and 20 dispensaries are owned by the District Council, while two of the dispensaries are owned by Tanzania People's Defence Force (TPDF) and National Service (JWTZ), while the three remaining dispensaries are owned by faith based organizations.

### **4.6.6 Fibre Optic Cable**

A Fibre Optic Cable is part of National Fibre Optic Cable network named as National ICT Broadband Backbone (NICTBB). The Backbone is managed and operated by the Tanzania Telecommunications Company Ltd (TTCL) on behalf of the government, through the Ministry of Transport, Communications, and Works

The cable runs on the RHS of the project road. The field survey noted that the Fibre Optic Cable has generally been laid along the project road, about 25m on the RHS of the project road. However in some sections the cable has been laid rather shallow to the ground surface. In some section is as shallow as 20cm from the surface.

### **4.6.7 Waste Management**

#### **4.6.8.1 Solid Waste Management**

Like other parts of Tanzania, solid waste management is one of the environmental problems in the project area. Plastic bags were seen scattered every in the villages and in town. The investigation was done on how these wastes are managed. 43% of the interviewed household bury their wastes and 39% said the wastes are thrown in the farm (unsorted based on types) the remaining 18% of the interviewed household burn the wastes

#### **4.6.8.2 Liquid waste Handling and Treatment Systems**

Pit latrine is the most affordable and used facility for sanitation as 73% of the interviewed households use this facility. 20% of the interviewed people said they use septic tanks, while the remaining 7% have no any sanitation facility. Those who do not have sanitation facility they use neighbours facility or help themselves in bushes. The use of bushes results into contamination of surface water sources during the rainy season as the dirty drain into rivers and springs

It was revealed that malaria is threatening people's life in then project area as it was reported that 66.2 of the interviewed households had one member suffered from malaria in the past one week before the survey.

The second most prevalence disease was diarrhoea (16.9%) followed by skin rash (21%). This is due to poor sanitation and inadequate use of water in many households. Skin rash is followed by HIV/AIDS and TB with only 2% and 1% respectively.

## **4.7 LAND USE AND OWNERSHIP PATTERNS**

### **4.7.1 Land Use**

There are six main types of land use along the project corridor. These are protected (forestry or wildlife) land use, followed by agricultural land use; and a small percentage of land is used for



residential as well as infrastructure such as roads, social services like schools, medical facilities and etc.

Land use categories within the road impact area can be divided into five categories:

- (i) Forestry or wildlife-forestry protected area land use. The details of these protected areas are shown under sub-sections 4.8.1 and 4.8.4
- (ii) Unprotected forest land
- (iii) Settlement (residential and institutional) land use
- (iv) Agricultural (farmland) land use
- (v) Transport corridor land use
- (vi) Water bodies

Settlements areas are concentrated at village centres discussed in Table 1. There is however no clear distinction between settlement and agriculture land use because settlements are found within farmland. Commonly grown crops include maize, beans, banana, cassava, rice, coffee, tobacco, cotton, ginger, and sunflower, sorghum/millet, ground nuts, and sweet potato.

#### 4.7.2 Land Ownership and Tenure

There are diversified land tenure systems in the project area. Majority got land through inheritance from parents. The in migrants bought land from those who have extra for disposal. Very few people were allocated land from the village government. Majority of the villages along the route do not have land use plans and this has contributed to the problem of encroaching in the RoW.

There are three main types of land use along the project corridor. The big part of the area is used for farming; followed by grazing and a small percentage of land is used for residential settlements as well as infrastructure such as roads including social services like schools, medical facilities and etc.

The respondents however claimed that, all land they acquired is cultivated/ developed and no land is left without development. This is because soils and climatic condition are favourable. Crops grown include banana, maize, coffee, and beans.

However, it should be noted that in this region land is not yet a problem compared with other regions in Tanzania. Men have more access to land than women as boys are favoured to inherit parents land compared to women. With time and education on women's right the situation is changing women can also access land through inheritance and those who have money can buy land.

#### 4.7.4 Housing

It was observed that most of the structures that are found within the RoW are made up of good materials. 86% of the affected properties are roofed with iron sheets which are expensive materials. Only 13.4 % are thatched. More than eighty four percent of houses are made by burnt bricks and 5.4% of houses walls are made of concrete blocks, only 10.3% of the houses walls are made of mud bricks with plaster. Concerning floor materials, 88.3% of the structures are made of earth. 10.2% concrete and 1.5% tiles.

## 4.8 BIOLOGICAL ENVIRONMENT

### 4.8.1 Flora

The flora along the project road is characterised by varied mosaics of shade trees, and street strip trees in settlements areas, grassland, acacia woodland, and closed and open miombo woodland, and scrublands in the outskirts of villages. Street strip trees consist of exotic trees, mainly *Cassia siamea* (Blackwood cassia or yellow cassia) [mjohoro in Kiswahili], *Cassia siamea* (Blackwood cassia or yellow cassia) [mjohoro in Kiswahili], eucalyptus, *Grevillea robusta* *Flacourtia indica* (governor's plum), and fruit trees mainly mango and avocado.

The following table (Table 18) describes significant vegetation cover along the main alignment of the project road as well Kasulu and Kibondo bypass Roads. Note this description does not include vegetation cover along water courses. Characteristics vegetation along water courses is described separately under sub-section 4.2.4.1.

**Table 18: Significant Vegetation Cover Characteristics along the Road**

No.	Road Section Village	Vegetation Characteristics
<b>Main Alignment Section</b>		
1.	Kidiana - Kanazi	Miombo scrubland, mango with a but scattered mango and acacia trees (Plate 21)
2.	Kanazi - Nyamyusi	Mango, eucalyptus, grevillea trees around settlements
3.	Nyamyusi - Nyakitonto	Km 19+200 – 20+200: Miombo scrubland along both sides of the road, within RoW (Plate 22)
4.	Nyakitonto - Mugombe	<ul style="list-style-type: none"> <li>Exotic strip trees at settlements consisting of eucalyptus, yellow cassia, grevillea, mango, and peacock flower</li> <li>Km 25+100 - 27+000 (Mugombe): large eucalyptus trees along both sides of the road</li> </ul>
5.	Mugombe - Nyachienda	<ul style="list-style-type: none"> <li>Km 28+200 – 34+800: undeveloped land, mostly farmland, without settlements on both sides. Vegetation consist of mainly miombo scrubland</li> <li>Vegetation at settlements consist of yellow cassia, mango, and peacock flower trees</li> </ul>
6.	Nyachienda - Kitagata	<ul style="list-style-type: none"> <li>Km 37+300 – 39+100: undeveloped land with miombo woodland vegetation</li> <li>Exotic strip and shade tree vegetation at settlements</li> </ul>
7.	Kitagata - Makere	<ul style="list-style-type: none"> <li>Exotic strip trees at settlements</li> <li>Km 42+100 – 49+400: miombo woodland vegetation on both side of the road</li> </ul>
8.	Makere - Nyamidaho	<ul style="list-style-type: none"> <li>Shade tree consisting of yellow cassia at Makere settlement then miombo woodland on the outskirts</li> <li>Km 52+00 – 56+400: miombo woodland vegetation on both sides of the road, within RoW</li> </ul>
9.	Nyamidaho - Mvugwe	<ul style="list-style-type: none"> <li>Exotic strip tree vegetation along the road, at settlements</li> <li>Km 59+300 – 61+200: miombo woodland vegetation on both sides of the road</li> </ul>
10.	Mvugwe – R.Malagarasi	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation consisting of mainly yellow cassia trees</li> <li>Km 64+700 – 65+300: miombo woodland vegetation on both sides of the road, within RoW</li> <li>Km 65+300 – 80+800: undeveloped land with miombo woodland vegetation.</li> <li>Km 80+800 – 83+800: miombo woodland forest on both sides of the road</li> <li>Km 83+800 – 89+100 RHS (Mvugwe – Nyalulanga): Muyowosi game reserve with miombo woodland forest. This section borders the road project borders the game reserve for a stretch of about 7km</li> <li>Km 84+000 - 85+500 LHS: miombo woodland forest</li> </ul>
11.	Nyalulanga – Busunzu B	<ul style="list-style-type: none"> <li>Undeveloped land with miombo woodland vegetation</li> <li>Km 89+100 – 91+100: regenerating miombo woodland vegetation on both sides of the road</li> </ul>

No.	Road Section Village	Vegetation Characteristics
		<ul style="list-style-type: none"> <li>Km 91+100 – 91+500: Agricultural land with farmland, with mango, and banana crops</li> <li>Km 91+500 – 91+600: private miombo woodland forest, 12m on the LHS of the road</li> </ul>
12.	Busunzu B - Busunzu	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation at settlements consisting of mango, yellow cassia, acacia, avocado, eucalyptus</li> </ul>
13.	Busunzu - Kisogwe	<ul style="list-style-type: none"> <li>Exotic strip tree vegetation at settlements, with a few, but scattered miombo woodland trees consisting of mainly acacia</li> <li>Km 97+200 – 100+600: miombo woodland forest on both sides of the road</li> </ul>
14.	Kisogwe - Kifura	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation consisting of yellow cassia, mango at settlements areas and miombo woodland in the outskirts of villages</li> <li>Km 105+600 – 107+500: Miombo woodland on both sides of the road</li> <li>Km 107+500 – 109+400: miombo woodland forest both sides of the road</li> </ul>
15.	Kifura - Kumshindwi	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation consisting of mango, yellow cassia, and eucalyptus at settlements areas and miombo woodland tree vegetation</li> </ul>
16.	Kumshindwi - Maloregwa	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation consisting of mango and yellow cassia</li> <li>Km 123+700 – 124+600: Miombo woodland trees within RoW on both sides of the road</li> </ul>
17.	Maloregwa - Rusohoko	<ul style="list-style-type: none"> <li>Km 123</li> <li>Miombo scrubland with scattered large trees</li> <li>Km 125+200 – 129+500: miombo woodland on both sides of the road</li> <li>Km 129+500 – 131+000 (4 acres): Miombo woodland forest reserve on both sides of the road. The forest is located about 4m from edge of the road (Plate 32)</li> <li>131+000 - : Street strip and tree crops vegetation consisting of grevillea, eucalyptus, yellow cassia, avocado,</li> </ul>
18.	Lusohoko - Kitahana	<ul style="list-style-type: none"> <li>Street strip and tree crops vegetation consisting of grevillea, eucalyptus, yellow cassia, cyprus,</li> <li>Km 133+800 LHS: Strip of large eucalyptus trees</li> </ul>
19.	Kitahana - Kumwambu	<ul style="list-style-type: none"> <li>Street strip and tree crops vegetation consisting of grevillea, eucalyptus, yellow cassia, avocado</li> <li>Km 140+200 – 140+500 LHS: a strip of very large eucalyptus trees</li> </ul>
20.	Kumwambu - Twabagondozi	Strip trees consisting of yellow cassia, eucalyptus, cyprus
21.	Twabagondozi - Kilemba	<ul style="list-style-type: none"> <li>Miombo scrubland on both sides of the road</li> <li>Km 146+200 – 148+200: Miombo woodland on both side of the road</li> <li>Km 148+400 – 149+400: open agricultural land</li> <li>Km 149+400 – 150+600: Grassland with scattered miombo woodland trees</li> <li>Km 150+600 – 151+200: Miombo woodland with most of trees are regenerating</li> </ul>
22.	Kilemba - Kazilamihunda	<ul style="list-style-type: none"> <li>Exotic strip and shade tree vegetation consisting of yellow cassia</li> <li>Km 151+800 – 153+300: Miombo scrubland adjacent to the road on both sides</li> <li>Km 153+300 – 153+900: miombo wood with a few scattered large trees on both sides</li> <li>Km 153+900 – 161+700: miombo woodland with substantial number of large trees of both sides</li> <li>Km 168+100 – 168+800; miombo woodland with small regenerating trees. Most of large trees have been cleared.</li> </ul>
23.	Kazilamihunda - Kasanda	<ul style="list-style-type: none"> <li>Km 168+800 – 169+900: miombo woodland, with small regenerating trees. Most large trees have been cleared.</li> </ul>
24.	Kasanda - Kabingo	<ul style="list-style-type: none"> <li>Km 173+000 – 173+200: Exotic strip and shade tree vegetation consisting of eucalyptus (RHS), grevillea (LHS)</li> <li>Km 173+700 – 174+000: miombo scrubland on both sides of the road</li> <li>Km 174+000 – 176+200: miombo woodland forest on both sides of the road</li> </ul>

No.	Road Section Village	Vegetation Characteristics
		<ul style="list-style-type: none"> <li>Km 176+200 – 176+600: Miombo scrubland on both sides</li> <li>Km 176+600 – 177+900: miombo woodland on both sides of the road</li> <li>Km 177+900 – 178+400: Miombo scrubland on both sides ob both sides of the road</li> </ul>
<b>Kibondo Bypass Section</b>		
1.	Km 0+000 – 8+400 (Maloregwa Junction – Nduta Camp Entrance) – existing road	<ul style="list-style-type: none"> <li>A few miombo woodland trees scattred at Maloregwa settlement</li> <li>Km 0+600 – 7+600: miombo woodland, with substantial number of large trees on both sides of the road (Plate 24)</li> </ul>
2.	Km 8+400 – 8+800 (R.Bururuma – Administration office for Nduta Camp)	<ul style="list-style-type: none"> <li>Large miombo woodland with large trees (Plate 17).</li> </ul>
3.	R.Bururuma – Administration office for Nduta Camp (non-existent section)	<ul style="list-style-type: none"> <li>Miombo wood, with large trees, within Nduta refugee’s camp. The refugee camp is situated on miombo woodland forest with large trees (Plate 25)</li> </ul>
4.	Nduta Refugee camp - Biturana	<ul style="list-style-type: none"> <li>Miombo woodland with large trees.</li> <li>At the edge of the camp towards Biturana village, the alignment traverses along Biturana village forest reserve. The forest is characterised by large miombo woodland forest (Plate 26)</li> <li>Existing road alignment characterised by miombo woodland forest, which is part of Biturana village forest reserve (Plate 27)</li> </ul>
5.	Biturana – Nengo Prison	<ul style="list-style-type: none"> <li>Miombo woodland. Vegetation changes to miombo scrubland as one approaches Nengo hill, whose soil is characterised by stoniness</li> <li>Before crossing Twabagondozi – Nengo – Kumwasha road, the alignment diverts away from the track towards north-eastern direction through a non-existent area characterised by miombo woodland forest. The alignment then traverses Nengo prison land, which is characterised by stony soil and miombo scrubland (Plate 28).</li> <li>After prison traverses through miombo scrubland</li> <li>through miombo woodland forest the From Nengo prison the road traverse an area with miombo scrubland</li> </ul>
6.	Nengo Prison – Kibondo – Kilalagona Rd	<ul style="list-style-type: none"> <li>Miombo woodland</li> <li>Passes nearby Kakangaga Muslim secondary school then across eucalyptus trees</li> </ul>
7.	Kibondo – Kilalagona Rd – Kibondo – Nyakanazi Rd	Miombo woodland forest, with most of the large trees having been cleared

**Source of Data:** Consultant’s field survey and Consulation with Local People

The importance of the green vegetation along the road underlies in the fact that it creates not only micro climate, but also reduces air and noise pollution as well as addresses the global warming problem. Vegetation creates micro climate by correcting summer over heating due to its screening effect through shading, reflection of solar radiation, and absorption of solar energy, and convective exchanges. Vegetation also creates habitats for fauna, in particular wildlife

Vegetation is able to reduce from air carbon monoxide, lead, dust and other air pollutants by absorbing them. Vegetation also serves to sequester carbon, which gives a major contribution to greenhouse gases. Vegetation controls surface run offs and so reduce soil erosion to adjacent lands. Other important roles vegetation play are creating aesthetics, property value appreciation.

## 4.8.2 Fauna

The project road traverses four wildlife protected areas and several forest protected areas; and some of them are habitats of wildlife. Common terrestrial wild animals include lion, elephants, leopards, statunga (antelope), hyena, zebra, wild dog, giraffe, hartebeest, topi, and antelope (various species). Other wild animals include buffalo, warthog, bush pig, and various species of birds and different species of reptiles. Also included are different species of birds such as wattle crane, shoe bill – stock. Aquatic wild animals found in the game reserves include crocodile and hippopotamus. Other fauna in the project area include livestock. The wildlife areas are discussed in sub-section 4.8.4.

## 4.8.3 Fish and Aquatic Habitats

The rivers discussed earlier in sub-section 4.2.4.1 are the aquatic habitat along the project road. The main fauna on the rivers are different species of fishes and frogs.

## 4.8.4 Protected, Ecologically Sensitive Area, Rare and endangered Species

The project road, as noted earlier traverses two wildlife protected and seven (7) forestry protected areas. Only one of these forestry protected area is located along one of the proposed bypass roads. The following are the forest and wildlife protected areas are:

- **Muyowosi Game Reserve:** Located on the RHS of the main alignment of the project road from Km 83+800 (R.Malagarasi) to Km 89+100 (Nyalulanga village). The forest area is characterised by miombo woodland and is a home of wildlife and different species (for details. Common terrestrial wild animals include lion, elephants, leopards, statunga (antelope), hyena, zebra, wild dog, giraffe, hartebeest, topi, and antelope (various species). Other wild animals include buffalo, warthog, bush pig, and various species of birds and different species of reptiles. Also included are different species of birds such as wattle crane, shoe bill – stock. Aquatic wild animals found in the game reserves include crocodile and hippopotamus. The location of the game reserve is shown in Figure 3.
- **North Makere Forest Reserve:** The which is under the authority of TFS (Ministry of Natural Resources and Tourism) is located on the LHS of the main alignment of the project road between R.Makere (Km 50+500) Km 83+800 (R.Malagarasi). The forest is characterised by miombo woodland and wildlife. Common animals include sitatunga (antelope), wild dog, lion, leopard, buffalo, topi, and elephant, etc. Notably part of this forest reserve has been converted into a hunting block, namely Nyamroha hunting block.
- **South Makere Forest Reserve:** The forest is located between Makere and Kabulanzwili and is also under the jurisdiction of TFS. This is also a home of wildlife
- **Nyangwa Village Forest Reserve:** Located on the LHS of the road between Km 52+000 and 56+400
- **Busunzu Village Forest Reserve:** Located on the LHS of the main alignment of the project road between Km 97+200 (R.Nyamguluma) and 100+600 (R,Nyabilembi)
- **Kisogwe Village Forest Reserve:** Located on the RHS of the main alignment between Km 105+600 (R.Mkugwa) and 109+400
- **Maloregwa Village Forest Reserve:** Maloregwa has two forest reserves that are located between Km 123+700 – 124+600 on both sides of the road



- Km 129+500 – 131+000 (4 acres): Miombo woodland forest reserve on both sides of the road. The forest is located about 4m from edge of the road (Plate 32)
- Karombo Village Forest Reserve (located in Kilemba/ Kumkugwa villages): Located on the LHS between Km 155+400 (R.Kanembwa and Km 161+600 (R.Nyanzuki)
- Biturana Village Forest Reserve (Plate 26): This is the only protected area along the two proposed bypass roads.

The principal economic benefit from the wildlife protected areas is tourist hunting.

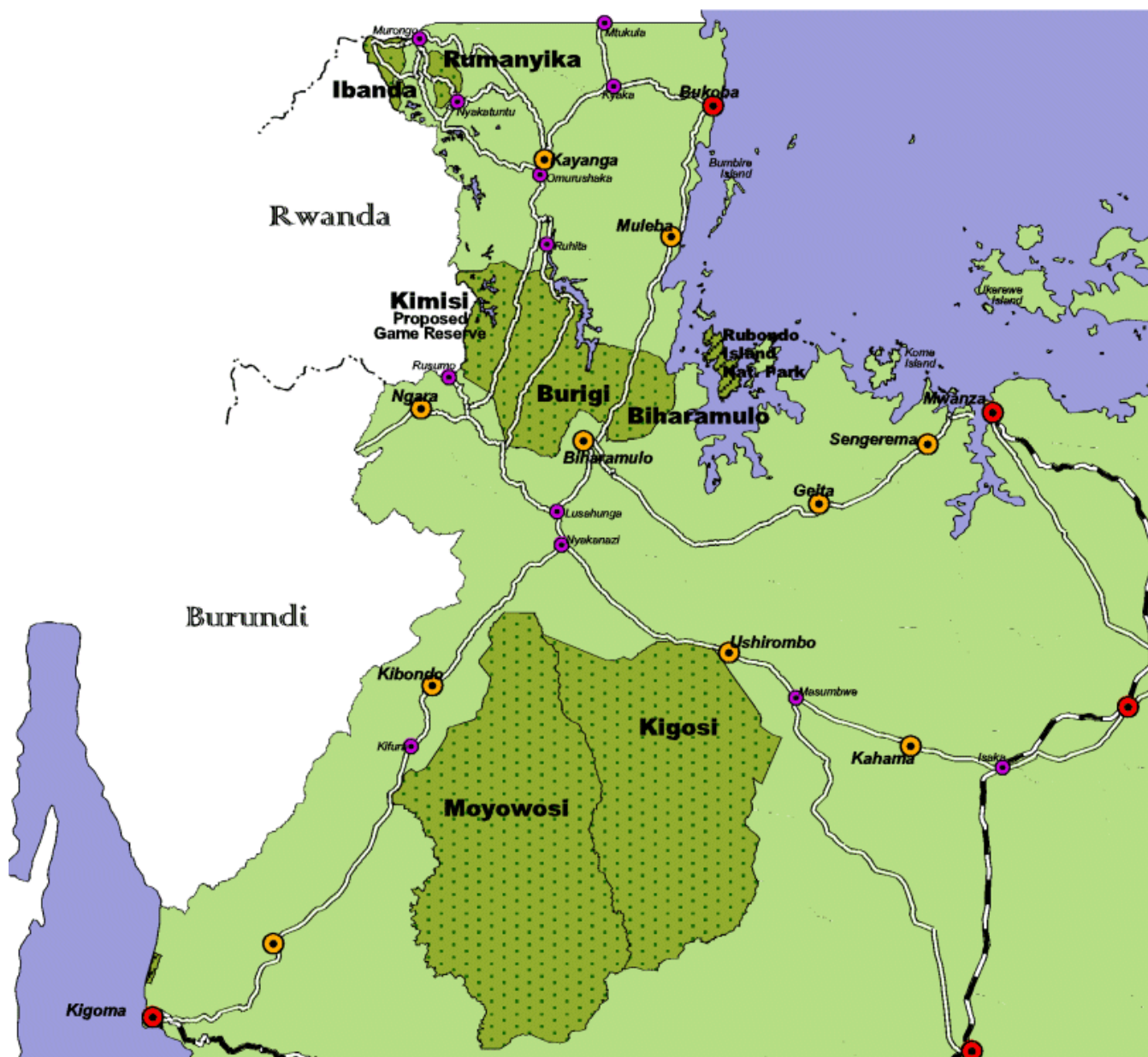


Figure 3: Location of Moyowosi/ Kigosi Game Reserve with Respect to the Project Road

#### 4.9 ENVIRONMENTAL PROBLEMS

The following environmental problems were noted along the road during the study

#### 4.9.1 Unreinstated borrow pits along the road

As noted in sub-section 4.2.7, the study noted substantial numbers of unreinstated borrow pits along the project road, which are located close to the road or settlements. Most of them are located within the RoW, some of them as close as 5m from the road.

These abandoned borrow pits have the following impacts:

- They impair scenic and visual quality to by passers
- Borrow pits located close to settlement areas pose safety hazard to the communities especially children as they are likely to be drowned if the borrow pits are filled with rainy water. This is because children may use the collected water as playground.
- Borrow pits located near settlements could become breeding areas for mosquitoes and snails during the rainy season should they become inundated with water. This is because children may use the collected water as play grounds and contract water borne diseases such as bilharzias.
- Borrow pits located very close to the road presents safety hazard for speeding vehicles as they may be suicidal sites. Locating borrow pits close to the road is clearly unsustainable engineering practice.

#### 4.9.2 Farming Along and Across Water Course

Apart from this issue being raised by Environmental officer for Kankonko district, the survey noted a common practice of farming on the riparians of water courses (along and across water courses – refer to Table 11). This practice causes significant sedimentation of river and drainage systems. This is because agricultural activities make soil loose to be easily carried away by storm water.

Apart from reducing hydraulic capacities of cross drainage structures, sedimentation raises river beds to the extent of causing overtopping storm water after downpour.

Farming of along or across water courses is an infringement of Water Resources Management Act, 2009 and Environment Management Act, 2004, which prevent anthropogenic activities within 60m from water courses.

Riparian zones are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, their biodiversity, and the influence they have on aquatic ecosystems. Riparian zone zones dissipate stream energy. The meandering curves of a river, combined with vegetation and root systems, dissipate stream energy, which results in less soil erosion and a reduction in flood damage. Sediment is trapped, reducing suspended solids to create less turbid water, replenish soils, and build stream banks. Pollutants are filtered from surface runoff which enhances water quality via bio-filtration.

Riparian zones also provide wildlife habitat, increase biodiversity, and provide wildlife corridor enabling aquatic and riparian organisms to move along river systems avoiding isolated communities. They can provide forage for wildlife and livestock.

Vegetation surrounding the stream helps to shade the water, mitigating water temperature changes. The vegetation also contributes wood debris to streams which is important to maintaining geomorphology. From a social aspect, riparian zones contribute to nearby property values through amenity and views.



Riparian zone acts as a sacrificial erosion buffer to absorb impacts of factors including climate change, increased runoff from urbanisation and increased boat wake without damaging structures located behind a setback zone.

Therefore, carrying out agricultural activities in the riparian, apart from compromising its ability to protect river banks against soil erosion, cause sedimentation of the rivers system. In addition, agricultural activities are likely to cause pollution of the river systems, especially if used for gardening; known to be heavy feeder of agro-chemicals. The negative impact due to agricultural activities in the riparian is gauged to be moderate and long term.

#### **4.9.3 Grazing in Wildlife and Forestry Protected Areas**

Grazing in wildlife and forest protected areas: During field survey, contrary to Wildlife Management act, substantial number of livestock groups was seen being grazed in the forestry protected areas

#### **4.9.4 Borrowing of Materials from Forestry Protected Areas**

The issue of borrowing of material for routine maintenance of the existing road was raised by TFS authority in Kasulu as well as Moyowosi management. In addition during the survey, the ESIA experts noted several borrow pits that had been opened within Makere forest reserves (refer to Table 14)

#### **4.9.5 Bush fire**

The local people have a practice of setting fire to activate the growth of young grass for livestock feed. This environmental problem was raised by a DFO for Kibondo district.

#### **4.9.6 Clearing of Forest**

Trees are cleared for eater firewood or to make charcoal, or while clearing new farms. This was raised a DFO for Kibondo district.

#### **4.9.7 High water table**

A section with high water table was noted at Km 29+900, near the junction to Kagera game reserve. This presents difficulties in its maintenance and makes it impassable with lots of difficulties, especially during rainy season.

### **4.10 OTHER DEVELOPMENT PROGRAMMES**

There are othe on-going or proposed development initiatives within the project's area of influence or impact zone. Of relevance here are those likely to affect or to be affected by the proposed road upgrading as follows:

- On-going upgrading of Kidahwe - Nyumbigwa road section (50Km) to bitumen standard
- On-going upgrading of Nyakanazi – Kabingo road section (50Km) to bitumen standard
- The proposed construction of One Stop Border Post (OSBP) facilities for Tanzania and Burundi at Manyovu/ Mugina

## SECTION 5: PRESENTATION OF ALTERNATIVES CONSIDERED

Identification of alternatives is one of the key aspects of a success of the ESIA. All feasible alternatives have to be fully addressed and their advantages and disadvantages compared in order to determine the best alternative. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, social, and environmentally related issues that will be discussed in the evaluation of the alternatives. Alternatives can be identified according to:

- (i) The No-Action alternative (Zero Alternative)
- (ii) Activity alternatives (alternative undertakings)
- (iii) Process alternatives (or Alternative technologies)
- (iv) Scheduling alternatives;
- (v) Input alternatives (Alternative sources of construction materials)
- (vi) Location alternatives (alternative sites)
- (vii) Alternative Design

For any alternative to be considered feasible such an alternative must meet the need and purposes of the development proposal without presenting significantly high associated impacts. Alternatives are typically distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the ESIA process. Incremental alternatives typically arise during the ESIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and therefore are not specifically identified as distinct alternatives. Three alternatives have been identified as follows:

### 5.1 NO GO, ZERO OR BASE (ALT0) ALTERNATIVE

The “No Go “Alternative” refers to the alternative of not embarking the proposed road rehabilitation at all. This alternative would imply that the current status quo without the proposed road construction would continue. It is important to note that the No Go Alternative is the baseline (Base Alternative or ALT0) against which all other alternatives and the development proposal are assessed.

When considering the Zero alternative the impacts (both positive and negative) associated with any specific alternative or the development proposal would not occur and in effect the impacts of the Zero Alternative are therefore inadvertently assessed by assessing the other alternatives. In addition to the direct implications of retaining the status quo there are certain other indirect impacts, which may occur should the Zero alternative be followed.

Overall, the impact of “No Go” alternative impact is considered to be significant in hampering development in terms of local, regional, and national wise transport. The consideration of “No Go” was dismissed as an alternative due to the need and desirability of upgrading this road in order to cope with rapid increase in demand for transit of goods and services into other regions.

---

## 5.2 DESIGN ALTERNATIVES

Design alternatives have considered pavement materials in terms of sub-base, base course, and wearing course. Two pavement alternatives have been considered as follows:

- Alternative 1 (ALT1): Upgrading to AC surface, with paved shoulder, Dense Bituminous Macadam (DBM) base layer, and Cemented Material (CM) sub-base material
- Alternative 2 (ALT2): Upgrading to AC surface, with paved shoulder, Crushed Rock (CRR) base layer, and Cemented Material (C1) sub-base material

Economic analysis shows that ALT1 [Upgrading to AC surface, with paved shoulder, Dense Bituminous Macadam (DBM) base layer, and Cemented Material (CM) sub-base material] is a more most feasible option for implementation. It is therefore recommended to upgrade the road to AC surface, with paved shoulder, DBM base layer, and CM sub-base material.

## SECTION 6: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

### 6.1 INTRODUCTION

This chapter presents analysis of impacts of various components of the project. Several techniques and methods are available for the prediction and analysis of impacts. Examples of such methods include Mathematical Models, Mass Balance Models, Statistical Models, Physical, Image, or Architectural Models, Field and Laboratory Experimental Methods, and Analogues Models.

The methods that were used in this study were mainly Field Method and Analogue Model. The field method used existing data inventories, which was supplemented by field surveys to predict impacts on receptors.

The Analogue Model make predictions based on analogue situations, including comparing the impacts of the proposed project with a similar existing projects, comparing environmental conditions at one site with those at similar sites elsewhere, comparing an unknown impact (e.g. concrete on human skin) with a known environmental impact. The model was developed from site visits, literature searches, expert opinion, and on expert's previous experience.

The impacts are either positive (beneficiary) or negative (adverse). Whether positive or negative, the impacts are classified into direct short term, direct long term, and indirect impacts, reversible or irreversible. Negative impacts need to be abated, while those identified as positive will need to be strengthened so that the objective of the project is enhanced.

#### 6.1.1 Direct Impact

Direct impacts are caused by the road itself that is to say, by road building processes such as land consumption, removal of vegetation, and severance of farmland. For example, the removal of gravel material from a borrow pit, for use in surfacing the road, is an obvious direct impact of road construction. In this case, the land area in which the pit site is located has been directly affected by activities associated with the road project. Direct impacts are generally easier to identify, assess, and control than indirect impacts, since the cause-effect relationship is usually obvious.

##### 6.1.1.1 Direct Short-Term impacts

Direct short term impacts are direct impacts that may be apparent only during the construction stage of the project. Such impacts include impacts that are related to construction works.

##### 6.1.1.2 Direct Long-Term impacts

These are direct impacts that will appear after the construction has been completed, and include impacts related to both construction works and the use of the road.

#### 6.1.2 Indirect Impacts

Indirect impacts are sometimes called secondary, tertiary or chain impacts, depending on how many steps there are between the original source and its impact. They are not a direct result of the strategic action, but occur away from the original source of impact or as a result of a complex pathway. They are linked closely with development projects and may have more profound consequences on the environment than direct impacts.

Indirect impacts are not easier to identify, assess, and control due to difficulties in understanding the cause-effects relationships, but can ultimately be more important. Over time they can affect larger geographical areas of the environment than anticipated.

Examples of indirect impacts include degradation of surface water quality by the erosion of land cleared as a result of a new road and urban growth near a new road.

A subset of indirect impacts is **generated impacts**: where one type or phase of development attracts or facilitates another. An example of a generated impact is a new transport link to a remote area which triggers new housing and employment development.

Indirect impacts are identified by using a causal chain diagram (or causal network diagram).

### 6.1.3 Cumulative Impacts

Cumulative impacts are caused by combined results of past, current and future activities. Over time, direct and indirect human activities combine to collectively impact the environment.

The impacts may differ from the original, individual activities. For example, ecosystems can be damaged by the combined effects of human activities, such as air, land, and/or water pollution, improper handling of industrial waste, and other human development activities. Global warming is the cumulative effect caused by too much greenhouse gas, and it may then cause a loss in biodiversity and acid rain.

The process of cumulative environmental change can arise from any of the four following types of events:

- Single large events, i.e. a large project
- Multiple interrelated events, i.e. road projects within a region
- Catastrophic sudden events, i.e. a major landslide into a river system; and
- Incremental, widespread, slow change, such as a poorly designed culvert or drainage system along a long road extending through a watershed.

These can generate additive, multiplicative or synergetic effects, which can then result in damage to the function of one or several ecosystems (such as the impairment of the water regulation and filtering capacity of a wetland system by construction of a road across it), or the structure of an ecosystem (such as placement of a new road through a forest, leading to m-migration or land clearing which results in severe structural loss to the forest).

A cumulative impact, in the context of road development, might be the de-vegetation and eventual erosion of a roadside pull-out. The scenario might unfold as follows: a road cutting through a mountain range offers some spectacular views, and in the absence of designated rest areas, motorists stop indiscriminately. Roadside vegetation is damaged by vehicle and foot traffic, and the soil is left unprotected. Subsequent rainfall causes erosion and siltation of nearby watercourses. The vegetation never has enough time to recover (because of high traffic volume on the road), and the problem is exacerbated over time.

### 6.1.4 Residual Impacts

Residual impacts are those impacts that remain following the implementation of the mitigation measures proposed for each project phase, taking into account the background environmental conditions and the impacts from existing, committed, and planned projects.

The impacts considered in this study pertain not only to the road right-of-way but also to sites associated with the road. These will include:

- Deposit and quarry and borrow sites
- Construction equipment and materials storage yards;
- Materials processing areas (e.g. concrete batch plant and bitumen heating area)
- Detours and access roads
- Construction camps

In order to identify the impacts easily and effectively, each phase of the project has been broken down into main activities, from which possible impacts have been delivered. The identified potential environmental and social impacts have been classified in accordance with activities causing them. The Prediction and evaluation (impact rating) of environmental impacts of the proposed roads project has been done using the matrix in Table 21. The likely interactions between the development actions/activity and the impact subjects are described (rated) in terms of magnitude and importance on a common scale of between -3 through +3 for both positive and negative impacts as follows:

+3 = Major Positive,    +2 = Moderate Positive,    +1 = Minor Positive,    0 = No Impact,  
-3 = Major Negative    -2 = Moderate Negative,    +1 = Minor Negative,

It is important to note that the impacts discussed below are presented as worst-case scenarios, in the absence of any best management practices (e.g. proper waste disposal) or mitigation measures, such as horizontal realignment to avoid excessive clearing of trees or improvement of sight distance and so road safety, etc.

## 6.2 MOBILIZATION PHASE

### 6.2.1 Creation of Employment

Establishment of construction camp site will create direct and indirect employment to the local as well as people from other places. Direct employment will be in the form of skilled labour as well as non-skilled labour. Indirect employment will include employment of food vendors (especially women) and other small businesses like soft drinks. The Impact is estimated to be positive, direct, short term, and moderate.

### 6.2.2 Loss of Vegetation

Clearing works during establishment of camps and material borrow areas will involve removal of vegetation, including trees. Depending on the location of the camp, clearing of vegetation apart from exposing soil to water erosion, it will remove fertile top soil which is good for supporting plant growth. The negative impact is gauged to be a direct long terms and moderate, and irreversible.

### 6.2.3 Deterioration of Scenic and Visual Quality

Loss of aesthetic quality will result from accumulation of top soil cleared from camp sites, construction material wastes such as concrete, nails, timber, steel, iron sheets etc., and material

packing such as cement bags etc. This will create eye-sore to the by passers. The negative impact will be direct, short term, minor, and reversible.

#### **6.2.4 Generation of Noise and Vibrations**

Pollution due to noise and vibrations will result from operations of construction equipment and trucks during transportation and delivery of construction materials, and works at the camps. Increased traffic movement across and along settlements is likely to cause considerable noise and vibrations. This is likely to interfere with audio communication.

The impact is likely to be eminent if the equipment and trucks are poorly maintained. Since there are no settlements in the neighbourhood of potential sources of construction materials, the impact due to noise and vibrations due to material extraction activities is only likely to be felt by construction workers. The negative impact due to noise and vibrations will be direct, moderate, but short term. The impact is residual since it cannot be mitigated fully.

#### **6.2.5 Deterioration of Ambient Air Quality by Dust**

Deterioration of ambient air quality will be due to generation of dusts at the campsite, during site preparation, construction activities especially those involving the use of cement and extraction of materials at material borrow sites. Deterioration of ambient air quality will also arise from transportation and stockpiling of construction materials at camp site. In addition, the transport trucks may generate clouds of dust as they move across settlements. The impact is estimated to be direct, moderate, short term, and reversible. The impact will be residual since dust cannot be mitigated fully.

#### **6.2.6 Risk of Road Traffic Accidents**

Project activities during mobilization phase will increase the traffic volume and movements. This is likely to increase the likelihood of accidents, especially along materials stock/ source routes discussed in borrow pits) and road crossings, especially settlement centres. Settlements that are likely to be affected most are the relatively highly populated ones such as Kasulu, Kanazi, Makere, Busunzu, Kifura, Nkuba, and Kabingo. The impacts due to pressure on traffic and road safety are gauged to be direct, moderate, short term, and irreversible.

#### **6.2.7 Soil Erosion**

Clearing of vegetation during establishment of camps and material borrow areas will remove fertile top soil which is good for supporting plant growth as well as expose soil to water and wind erosion. The negative impact will be direct, short term, moderate, and irreversible.

#### **6.2.8 Triggering of Child Labour**

Availability of employment by construction activities is likely to trigger child labour and school drop outs if measures are not taken.



## **6.3 CONSTRUCTION PHASE**

### **6.3.1 Creation of Employment**

Construction phase of the project will create both direct and indirect employment for both women and men. Direct employed people will be those working in the direct construction of the road and will include skilled labour (engineers, surveyors, technicians, machinery and equipment operators, drivers, artisans etc.) and unskilled labour. Based on ESIA Expert's experience on past road project, a minimum of 450 local people be absorbed in each of the three lots. So at least 1,350 people will be employed in the whole project. Indirect employed people will include food vendors (especially women) and other small businesses like soft drinks, which are likely to be concentrated at village centres, active construction sites as well as in the neighbourhood of campsites.

This will be a direct, moderate, and short term impact, since it will only occur during the construction period of the project.

### **6.3.2 Extraction, Processing, and Delivery of naturally-occurring Construction Materials**

Environmental and social impacts due to borrowing of materials from borrow pits; sand pits as well quarrying activities will include loss of vegetation, waste disposal, deterioration of aesthetics, and generation of noise and vibrations. Extractions of construction materials from the pits and quarries identified in sub-section 2.3.6 are likely to cause the following negative environmental impacts:

#### **6.3.2.1 Loss of Vegetation and Farmland**

As indicated earlier in sub-section 4.8.1, many sections of the main road alignment, part of the proposed Kasulu bypass road and the proposed Kibondo bypass road traverses miombo woodland forests. The rest traverses scattered settlements as well as scattered fruit and exotic trees. The distribution of the vegetation is shown in Table 18. Some of these miombo woodland forests are protected by the law.

Borrowing of natural gravel and quarrying from the identified potential sites will obviously involve excavation and so clearance of miombo woodland vegetation around. Clearance of vegetation is likely to result into degradation of the production value of farmlands and forestry due to loss of fertile top soil. Removal of vegetation will amount to further degradation of land and landscape, making the area susceptible to water and wind erosion. In addition, quarrying and excavation will destroy the economic and aesthetic value of the quarry site. The impact is gauged to be direct negative moderate, reversible, and long term because once the vegetation has been cleared; it will take substantial time for the cleared vegetation to regenerate.

#### **6.3.2.2 Generation of Noise and Vibrations**

Generation of noise and vibrations will result from the blasting of rocks at quarry site discussed in sub-section 2.3.6. In addition, noise and vibrations will be generated by construction equipment and trucks during extraction (borrowing), transport, and delivery of construction materials to the project site. The problem is likely to be worse if the equipment and trucks are poorly maintained. However, since there are no settlements in the neighbourhood of the identified quarry and borrow sites, the impact due to noise and vibrations will only be felt by construction workers. However, increased traffic movement across settlements and material routes during transport of materials will cause increased noise and vibrations. Increased generation of noise and vibration will in turn interfere with audio communication. If the borrow pits are located within wildlife areas (Moyowosi and

game reserve and North and South Makere forest reserves) which were discussed under sub-section 4.4.81, 4.82, 4.84, and in Table 21 the wild animals will be scared and disturbed, eventually will:

- Interference with animals' behaviours due to restriction of their free movement
- Interfere with animals' home range (grazing, resting, and water drinking area)
- Cause animals to migrate
- Cause animals to hesitate in migration, especially if the borrow areas are located nearby a migration corridor

The negative impact is gauged to be direct, moderate, reversible, and short term, since it will only be felt during the construction phase of the project. The impact will be residual since it cannot be mitigated fully.

#### **6.3.2.3 Deterioration of Ambient air Quality**

Air quality deterioration will be the major direct negative impact during the construction phase of the project. Pollution of ambient air by dust will arise from transportation and stockpiling of construction materials.

Gravel and fill materials will generate dust as they are being transported in uncovered trucks or being off loaded at the site. In addition, the transport trucks may generate clouds of dust as they move across village settlements whose road is not paved.

Although dust is a permanent feature along the unpaved road, especially during dry season, it is likely to increase beyond the current levels, causing alarming effect to the locals.

Further to that, dust will be generated by stone crusher at the quarry sites. Production of dust by transport trucks near settlements along the road is likely to affect human health. The dust is likely to cause bronchial problems, including URTI (Upper Respiratory Tract Infection) to the villagers and workers, let alone being a nuisance to the environment.

Pollution of ambient air will also occur at materials borrow and quarry sites. This will be due to emission of SO<sub>2</sub> NO<sub>x</sub>, CO, and CO<sub>2</sub> from exhaust fumes from material extraction equipment and stone crusher at quarry site. The impact is estimated to be direct, major, reversible, and short term since it will only occur during the construction phase of the project.

The impact will be direct, of moderate significance for short periods in close proximity to material borrow areas, and dwellings during the day and evening.

The impact due to pollution of ambient air by dust and fumes will be residual impact because it cannot be avoided or abated fully.

#### **6.3.2.4 Deterioration of Scenic and Visual Quality**

A common source of deterioration of scenic and visual quality during extraction of materials is the presence of borrow pits after materials have been extracted. The ESIA Expert's past experience has shown that most Contractors prefer to borrow materials very close to the edge of the road in order to minimize haulage distance. This is exactly what was observed during this study, whereby some of the borrow pits were located as close as 10m from the edge of the road and some of them were located in settlements. The other thing is that, more often than not these borrow pits are not reinstated after completion of their use as was noted with abandoned borrow pits discussed in Table 14.

Borrow pits and access road left after extraction of construction materials will impair aesthetics, especially if located close to the road.

Dust generated by construction equipment, machinery, and vehicles will impair visibility making construction sites prone to traffic accidents. In addition, stockpiles of construction materials on road sides will impair scenic and visual quality.

Discolouration of buildings and vegetation along the construction site will occur due to the dust blown by wind. The impact due to deterioration of scenic and visual quality is weighed to be direct, short term, moderate, reversible, and short term, since it will occur during the construction phase of the project.

#### **6.3.2.5 Risk of Accidents to Livestock and Humans due to Opening of Borrow Pits**

If pits and quarries sites especially if located near settlements are left un-reinstated, they may become filled with rainwater and become dangerous to livestock and human, in particular children, due to possible drowning. They may also create breeding sites for vectors like mosquitoes and bilharzias, when filled with rainwater.

Past experience by the Environmental Expert during supervision of construction of roads in the has shown that although standard specifications for road works clearly specifies requirements by the Contractor to reinstate borrow pits before a Take Over Certificate (TOC) is issued, borrow pits are left unreinstated, creating environmental and safety hazards to nearby communities.

The impact due to accidents to human and animals due to un-reinstated borrow pits is will be direct, moderate, reversible, and short term if mitigated as soon as they are no longer in use.

#### **6.3.2.6 Soil erosion**

Clearing of vegetation during extraction of construction materials is likely to cause soil erosion in pits and quarries. Soil erosion will occurs because vegetation and topsoil are either removed or disturbed, leaving behind loose soil, which is too poor to sustain good plant growth and resist erosion due to surface runoff. The impact is likely to be worse if borrow sites are located on steep slopes and near a water course, because higher velocity of runoff is likely to transport loose material to the water course causing serious sedimentation. The impact due to soil erosion will be direct, moderate, reversible, and long term.

#### **6.3.2.7 Impact to Wildlife Areas**

It was discussed earlier in sub-sections 4.8.1, 4.8.2, 4.8.4 and Table 21 that the project road traverses several wildlife habits, namely Moyowosi game reserve and Makere forest reserve (Nyamroha hunting block). If borrowing and quarrying of materials is done within the wildlife habitats, the borrow pits and quarries will become accident black spot for wild animals. The impact will be direct, moderate, long term, and irreversible.

#### **6.3.2.8 Impact Related to Blasting, Drilling and Rock Excavation**

Blasting is used to loosen or break up rocks for removal. Blasting will involve drilling of rock and loosening rock with the aid of explosives. Potential environmental impacts will include dust (air quality), contaminant spills, sedimentation, safety (workers, storage), fly rocks, and debris, noise and explosive detonation effects on people, and structures. The negative impact will be direct and indirect, moderate and short term.

### 6.3.3 General Earthworks during Road and Culverts Construction

#### 6.3.3.1 Loss of Vegetation

Widening of the existing road to accommodate carriage width and its shoulders, road side drain, horizontal realignment of the existing road to improve safety and extending the RoW from the current 45m to 60m will require more land beyond the existing RoW and so further clearing of vegetation as well as loss of farmlands.

Vegetation of particular importance is the protected as well as unprotected miombo woodland forests and private eucalyptus trees that are under sub-section 4.8.1.

Assuming a corridor of impact of 15m (an average width of 6m for existing road and additional of 9m for the widening of the existing road and construction of diversion roads during construction), the average width of corridor that will be cleared will during construction be will be 9m. With this assumption we can estimate the areas of miombo woodland forest that will be cleared different sections of the project road discussed in Table 18 under sub-section 4.8.1. The following table (Table 19) shows a computation of areas of significant miombo and other forest along the project road that is likely to be cleared.

**Table 19: Estimtaed Areas of Trees that are Likely to Cleared along the Project Road**

No.	Road Section Village	Area of Trees (ha)	Vegetation Characteristics
<b>Main Alignment Section</b>			
1.	Nyamyusi - Nyakitonto	0.9	Miombo scrubland on both sides
2.	Nyakitondo - Mugombe	1.71	Large eucalyptus trees on both sides of the road
3.	Mugombe - Nyachienda	5.94	Miombo scrubland on both sides
4.	Nyachienda - Kitagata	1.62	Miombo woodland on both sides
7.	Kitagata - Makere	6.57	Miombo woodland on both sides
8.	Makere - Nyamidaho	3.96	Miombo woodland on both sides
9.	Nyamidaho - Mvugwe	1.71	Miombo woodland on both sides
10.	Mvugwe – R.Malagarasi	i) 0.54 ii) 1.395 iii) 2.9 iv) 4.77 v) 1.35	i) Miombo woodland on both sides ii) Miombo woodland vegetation. iii) Miombo woodland forest on both sides iv) Miombo woodland on RHS Muyowosi game reserve v) Miombo woodland forest on LHS
11.	Nyalulanga – Busunzu B	1.8	Regenerating miombo woodland both sides
12.	Busunzu - Kisogwe	3.05	Miombo woodland on both sides
13.	Kisogwe - Kifura	i) 1.71 ii) 1.71	i) Miombo woodland on both sides ii) Miombo woodland forest on both sides
14.	Kumshindwi - Maloregwa	0.81	Miombo woodland on both sides
15.	Twabagondozi - Kilemba	i) 0.81 ii) 1.8 iii) 0.54	i) Miombo scrubland on both sides ii) Miombo woodland on both sides iii) Miombo woodland with regenerating trees on both sides
16.	Kilemba - Kazilamihunda	i) 1.35 ii) 0.54 iii) 7.02 iv) 0.63	i) Km 151+800 – 153+300: Miombo scrubland on both sides ii) Miombo woodland with a few scattered large trees on both sides iii) Miombo woodland with substantial number of large trees on both sides iv) Regenerating miombo woodland on both sides
17.	Kazilamihunda - Kasanda	0.99	Regenerating miombo woodland

No.	Road Section Village	Area of Trees (ha)	Vegetation Characteristics
18.	Kasanda - Kabingo	i) 0.18 RHS ii) 0.18 LHS i) 0.27 ii) 1.98 iii) 0.036 iv) 0.45	i) Eucalyptus trees on RHS ii) Grevillea LHS i) Miombo scrubland on both sides ii) Mombo woodland forest on both sides iii) Miombo scrubland on both sides iv) Miombo woodland on both sides v) Miombo scrubland on both sides
<b>Total</b>		<b>59.22</b>	
<b>Kasulu Bypass Road Section</b>			
1.	Nyumbigwa	i) 1.08 ii) 1.26	i) Miombo scrubland on both sides ii) Miombo woodland on both sides
2.	Km 4+200 – Kidiana	Not established	Mosaics of miombo woodland, scrubland and eucalyptus trees
<b>Total</b>		<b>2.34</b>	
<b>Kibondo Bypass Section</b>			
1.	Maloregwa Junction – R.Bururuma	i) 0.63 ii) 0.36	i) Scattered miombo woodland ii) Large miombo woodland
2.	R.Bururuma – Kibondo – Nyakanzazi junction	Not established	Mosaics of miombo woodland and scrubland
<b>Total</b>		<b>0.99</b>	

Based on the above table, a total of at least 59 hectares (ha) of trees are likely to be cleared from the main road alignment. In addition, at least 2ha and 1ha of trees are likely to be cleared from existing sections of Kasulu and Kibondo bypasses roads respectively. Estimates of areas of trees that will be cleared from the non-existent sections of the by pass roads will be established after exact alignments of the bypass road have been established.

The negative impact due to loss of vegetation from earthworks will be direct, moderate, irreversible, and long term, since once lost, it will take very long time to recover the benefits of the lost trees.

### 6.3.3.2 Roadside Soil Erosion

Roadside soil erosion will occur because, vegetation will be cleared, and top soil will be removed/ disturbed, leaving behind infertile soil, which is too poor to sustain good plant growth and susceptible to wind and water erosion. Where earth works involve materials cuttings or cut embankment (construction across a hill), the road sides will slope towards the road. But where earth works involve material filling (construction across a flood plains or a river), the road sides slope away from the road. In both cases, the roadside slopes will be prone to shallow mass movements or development of gullies (Plate 1).





**Plate 1: Typical shallow Mass Movement**

Where the roadsides slope towards the road, erosion of side slopes will cause siltation of roadside storm water drains and so reducing their hydraulic capacities. Similarly, where road side slopes away from the road, erosion of the side slopes will reduce hydraulic capacities of cross drainage structures due to siltation.

As noted in sub-section 4.2.4.4, Table 12 the project road traverses twenty (14) floodplains. Construction of high fill embankments will be necessary across these flood plains. The embankments are prone to shallow mass movements and formation of gullies. Erosion of the embankment will undermine the road.

The negative impact will be direct, moderate, long term, and reversible if appropriate mitigation measures are not put in place.

#### **6.3.3.3 Displacement and Loss of Properties**

Most of the settlements along the project road are located outside the old 45m RoW. Nevertheless, there are a few settlements that are located within the RoW. These buildings will have to be demolished to allow construction works. The unfortunate part of it is that even if people are compensated it may be difficult for them to get comparable sites. Some of the houses that will be demolished are within the prime business areas and it could be difficult for these people to obtain similar sites and if they manage to do so it might be at a high cost and customers might be difficult to get. Additionally, there are difficulties of adjusting to new areas and for older people who are uprooted it will result in increased stress and even early deaths. This issue of settlement is thus an area of potential conflict between the people and the government and has social, political, and legal implications. Other properties that will be affected apart from settlements are farmlands. The negative impact due to displacement will be direct, moderate, long term, irreversible, and residual.

#### **6.3.3.4 Disruption/Destruction of Public Utilities and Service**

Sub-section 4.6 has given details of public utilities that are likely to be affected by the road upgrading. The main utilities mainly are likely to be affected are domestic water supply systems.

## **Disruption of Domestic water supply Systems**

Sub-section 4.6.2 (Table 16) indicate that a number of domestic water supply pipelines either run very close or cross the project road. A number of domestic points are located within the RoW at Kidiamia, Kanazi, Nyakitonto, Mugombe, and Kiyobela/ Kakonko villages. In addition, main and distribution pipe lines across the project road at Kidiamia, Kanazi, Nyamyusi, Nyakitonto, Mugombe, Nyachienda, Kitagata, Busunzu, and Kazilamihunda villages are likely to be disrupted during road upgrading. Two shallow wells at located close to the road at Nyamidaho are likely to be damaged during construction of the road.

Earthworks across rivers that are sources of domestic water for the local people will deprive of the availability of drinking water for the villages. Examples of such rivers are Nyakasanda (Table 11), Nyamguluma which are sources of drinking water for Nyachienda and Busunzu village respectively. The impacts will be direct, moderate, short term, and reversible.

## **Disruption of Fibre Optic Cable**

It was noted in sub-section 4.6.6 that a fibre optic cable has been laid too shallow to the surface within the RoW. Construction activities, in particular construction of diversions and detours, bridges and their outfalls are likely to disrupt the cable and cause serious interference to communication and data transfer. The impacts will be direct, moderate, short term, and reversible.

### **6.3.3.5 Generation of Noise and Vibrations by Construction Equipment**

Earth moving, compaction, and other construction activities will generate noise and vibrations due to reactions between earth and the equipment. In addition, movement of the machinery, equipment, and dump trucks will also generate noise and vibrations. The noise and vibrations generated will agitate and impair audio communications at settlements along road. The noise impact will also be felt by construction workers and locals. Other impacts of noise and vibrations will be scaring/ disturbance of wildlife in Moyowosi game reserve and Makere forest reserve. This is because noise and vibrations will:

- Interference with animals' behaviours due to restriction of their free movement
- Interfere with animals' home range (grazing, resting, and water drinking area)
- Cause animals to migrate
- Cause animals to hesitate to migrate through animal migration route, especially if stationary equipment are site near migration corridor

The impact will be direct, reversible, of moderate significance, for short periods in close proximity to dwellings and wildlife areas during the day and evening. It is a residual impact since it cannot be mitigated fully.

### **6.3.3.6 Deterioration of Ambient Air Quality by Dust and Fumes**

Deterioration of ambient air quality will be due to production of fumes from exhaust from stationery as well as or moving construction machinery and equipment will emit SO<sub>2</sub> NO<sub>x</sub>, CO, and CO<sub>2</sub>. The impacts due to fumes will affect residents along the project road as well as construction workers. In addition, moving of earth as well as movement of construction machinery and vehicles will generate clouds of dust. Although dust is a permanent feature along the current road during the dry season, it is likely to increase beyond the current levels due to increased traffic volume and



movements. Apart from nuisance, excessive dust level can negatively affect human health. Dust can cause several bronchial problems, including URTI (Upper Respiratory Tract Infection).

In addition, dust particles can affect the growth the crops and other vegetation. Dust abrading leaf surfaces, dust blocking stomata (clogging of pores) of plants, dust increasing the amount of absorbed incident radiation. These are just a number of different impacts dust can have on vegetation and plants. But overall, the effects seem to be a reduction in photosynthetic abilities, the result of which can be stunting their growth due to shading effect, and clogging of the plant's pores.

The negative impact will be direct, of moderate significance for short periods in close proximity to active construction sites and dwellings during the day and evening. The impact will be residual as it cannot be mitigated fully.

#### **6.3.3.7 Generation of Solid and Liquid Wastes**

Among the wastes that will be generated during construction are:

- Top soil and cleared greens from along rivers, existing road and general clearing works
- Excess (spoil) material, excavated from the road
- Demolition materials from existing buildings and road structures (from demolished buildings), corrugated steel culverts), concrete (from demolished concrete culverts), and steel reinforcements (from demolished culverts), etc.
- Material wastes such as sand, fill material, aggregates, gravel, concrete, bitumen, etc.
- Sanitary wastes from project staff working outside the campsite

Apart from impairing the scenic and visual quality of the project site, the wastes generated are likely to cause the following impacts:

- Pollute surface water resources if exposed to surface runoff
- Cause waterborne or airborne diseases (sanitary wastes) if improperly disposed of

The negative impact will be direct, moderate, reversible, and short term as disposal of solid and liquid wastes shall be part and parcel of the construction activities of the project.

#### **6.3.3.8 Road Traffic Congestion and Accidents**

During the construction phase, increased project activities will increase traffic volume as well as movements. These activities will cause traffic congestion and disruption; and possibly accidents. Moreover, along materials stock routes, and specifically at road crossings, especially village/settlements centres, road accidents may occur during construction phase. Other accident black spot areas are where school pupils and students have to cross the project road. Typical accident black spots are those listed in Table 17.

The negative impact due to pressure on traffic and road safety are will be direct, moderate, reversible and long term since they will span over construction as well as operation phase of the project.

#### **6.3.3.9 Increased Consumption of Energy and Natural Resources**

Energy will be consumed to operate construction machinery and equipment as well as other transportation facilities. More energy in the form of fuel and lubricants will be consumed during the construction stage of the project. The energy will be used in the operations of construction equipment. In addition, pressure on natural resources will increase due to increased consumption of

natural resources in the form of fuel wood and charcoal. Past experience by the Environmental Expert in the supervision of road construction projects has shown that some Contractors have tendencies of cutting/ using fire wood as a source of energy for boiling bitumen or cooking. In addition, Contractors cut trees to make road markers pegs, claiming that the pegs have been made from trees cleared from road side or borrow pits. If not prevented to do so by the Engineer, it is likely that Contractors will cut trees from the forest protected areas discussed in sub-section 4.8.4 as well as other unprotected miombo woodland forests to make marker pegs. The impact will be indirect, moderate, short term, and reversible.

#### 6.3.3.10 Resources Use Conflict

Although exact location of this impact cannot be established at this juncture, the presence of worker's camps is potentially a source of social and environmental problems as a result of interaction of local people and workers in the project area. Conflicts between the two groups of people may result due to sharing of social services, like water resources for domestic and construction activities. An example of social conflict due to sharing of social service is the use of rivers Nyakasanda, Nyamguluma, and Mpevi which are sources of domestic water for Nyachienda, Busunzu, and Maloregwa villages respectively for construction work. In addition, the use of the natural dams at Nengo prison discussed under sub-section 4.2.4.1 (Table 11) area is likely to reduce the availability of water for Nengo prison. The negative impact will be direct, moderate, and short term.

#### 6.3.3.11 Reduction in Rivers Flows

Abstraction of water from the seasonal rivers discussed earlier in Sub-Section 4.2.4 for construction works, including dust suppression is likely to reduce the discharges of the rivers and so affecting the flow rate for other users in the downstream. For example, the use of water from rivers Nyakasanda, Nyamguluma, and Mpemvi (Table 11) for construction works, especially during dry season when their flows are at minimum will deprive of the availability of drinking water for Nyachienda, Busunzu, and Maloregwa villages respectively because they are sources of drinking water for the local people. The impact will be direct, moderate, short term, and reversible.

#### 6.3.3.12 Impact to Cultural Sites

Sub-section 4.4 identified one graveyard at Mvugwe village (Km 61+000), is within the RoW on the RHS of the road. Earthworks, if not done carefully are likely to cause damages to the graves.

The removal and re-interment of graves is a highly sensitive issue. In many instances people will point to graves as shrines used in the worship of ancestors. Disturbance and angering of the ancestors will be seen to result in bad luck and misfortune. For example drought will frequently be blamed upon the anger of the ancestor. As such the issue or disturbance of graves has to be approached with the utmost sensitivity and all due regard to custom.

The impact to the cultural site is gauged to be direct, moderate, short term, and reversible.

#### 6.3.3.13 Deterioration of Visual and Scenic Quality

Increased traffic movement and speed will increase the generation of dust. Clouds of dust generated by construction equipment will impair visual quality, making the site prone to traffic accident. The generated dust will impair visual quality due to discolouration of vegetation and buildings along the road.

Another source of deterioration of visual and scenic quality will be cuts across hills. The cuts will impair visual and scenic quality if the cuts are located across settlements. The impact will be direct, moderate, reversible, and short term.

#### **6.3.3.14 Pollution of Nengo Dams by Sedimentation**

Earthworks, in particular clearing and grubbing, removal and disposal of top soil and other excess material are likely to cause pollution of Nengo dams discussed earlier under sub-section 4.2.4.1. If top soil and excess materials are not disposed of properly, they are likely to be transported to the dams along the road by runoff. In addition, if erosion control measures are not put in place, during rainy season the eroded material are likely to be transported to the dams causing sedimentation. The major impact of sedimentation will be reduction of capacities of the dams. The impact will be indirect, moderate, long term, and irreversible.

### **6.3.4 Construction of Cross Drainage Structures**

Construction across water courses will encompass among others demolition of existing and construction of new bridges and culverts. The following impacts are anticipated:

#### **6.3.4.1 River Bank Erosion during Riparian zone Construction**

Works across rivers, drainages, and in the riparian zones during the construction of culverts is likely to disturb or cause losses of vegetation along their banks and riparian zone, consisting of natural and exotic riverine trees discussed in sub-sections 4.2.4.1 and 4.2.4.4 (Table 11). Since all the existing bridges and culverts will be replaced with new ones, all the water courses across the project road will be substantially affected because significant earthworks will be carried out along their riparians.

The impact due to river bank erosion and sedimentation of river systems due to work across rivers and in the riparian zone will be direct, moderate, reversible, and long term.

#### **6.3.4.2 Surface Water and Soil pollution**

During construction of bridges and culverts, pollution of river systems and soil may occur due to sedimentation and accidental spillage of hazardous material such as concrete, fuel, and oils from construction equipment. Spillage of hazardous material to water courses is potentially very detrimental to aquatic fauna such as fishes. Though one cannot predict the location or type of spillage, any spillage to water will be local in nature. This is an unwelcome possibility.

Deposition of concrete and fine sediments during construction across the permanent rivers and other semi-permanent rivers discussed in Table 11 is likely to affect fish and their habitats. Works in the river systems, such as excavations and dredging may cause fish mortalities due to entrainment in excavator's buckets etc.

The negative impact due to water and soil pollution is will be direct, moderate, long term, and reversible since once it has occurred; it will take long term for the ecosystem system to regenerate itself.

#### **6.3.4.3 Modification of Surface and Ground Water Regime**

##### **Surface water flow modification**

Construction of fill embankments will be necessary across nearly all the flood plains discussed in sub-section 4.2.4.4. In addition construction of bridges and culverts across the rivers discussed in

sub-section 4.2.4.1 will involve construction of fill embankment. Construction of road fill embankment across the flood plains and rivers is likely to impede or interfere with natural surface water flow patterns, where by concentrating flow in the upstream, resulting into flooding, soil erosion, channel modification, and sedimentation of streams/rivers far from the vicinity of the road. Another potential impact with the surface water flow could be diversion of river beds. The impact will be indirect, moderate, irreversible, and long term impact.

### **Modification of water table**

Although exact locations of such an impact cannot be predicted now, it is a possibility which should be anticipated where construction has to be done across flood plains. Whereas soil excavations can lower water table in the surrounding areas, embankment can raise water table by restricting water flow-leading into deterioration of vegetation, increased susceptibility to erosion, loss of water for drinking (downstream), agricultural use, and habitat loss. Again, the effect of raising water table to surrounding agriculture and ground water resource availability can be anticipated across the flood plains discussed earlier in sub-section 4.2.4.4 due to the construction of fill embankment. The impacts will indirect, long term, moderate, and irreversible, which would occur during the life time of the operation phase of the project.

#### **6.3.4.4 Generation wastes**

Apart from spoil material, the other types of wastes that will be generated during construction of cross drainage structures will include demolition material such as concrete and reinforcements bars (from old pipe culverts), old culverts, and hard stones (from protection works). These wastes if not properly disposed of will create eye sore to by passers. The impact will be direct, moderate, long term, and reversible.

### **6.3.5 Construction of Roadside drainage Systems**

#### **6.3.5.1 Increased Risk of Roadside Soil Erosion**

In sections where the road traverses through hilly topography with steeper slopes, such as the road sections between Nyakitonto and Mugombe, Nyachienda and Kitagata, Busunzu B and Busunzu A, Busunzu A and Kisogwe, and between Kigondo road crossing and R.Hwadzi (for Kasulu bypass) [refer to Table 10], gullies may easily be formed along ditches, drainage channels, as well as culverts. Formation of such gullies may, apart from destroying farmland and crops beyond the drainage, undermine the road itself.

Where the road traverses in more or less flat topography, such as the road section between Kidiamo and Kanazi, Makere and Busunzu B, R.Hwanzi and Kidiamo (Kasulu bypass section), and Maloregwa and R.Bururuma (Kibondo bypass section) [refer to Table 10], drainage may appear to be difficult. Depending on the adjoining terrain, there may be a need to extend the drainage to longer distance or creating soak pits. This will result into not only increasing construction costs but also clearing vegetation cover. The negative impact due to increased risk of roadside erosion will be indirect, moderate, irreversible, and long term.

#### **6.3.5.2 Disruption of Community Access to their Dwellings and Business Areas**

During construction, disruption of community access to their business activities and residential places at all settlements along the road will occur due to creation of barriers. One of the potential barriers is the construction of road side drainages. The impact of these barriers would be an increase

in travel time for local residents to their business and residential areas. This will be indirect, moderate, reversible, and short term negative impact.

### **6.3.6 Concrete Works and Construction of Cement-stabilized Layers**

#### **6.3.6.1 Health Problems Associated with Handling of Cement and Wet-cement Products**

Construction of road pavement (lying of cement stabilized sub-base layer), culverts, and lined roadside drains will expose workers to cement and wet-cement products (mortar and concrete). Construction workers working with cement and wet-cement products are likely to be affected by URTI due to inhaling cement dust and dermatitis infection due to prolonged contact with cement and wet-cement concrete.

Cement has constituents that produce both Irritant Contact Dermatitis (ICD) and corrosive effects (from alkaline ingredients such as lime) and sensitization, leading to Allergic Contact Dermatitis (ACD) [from ingredients such as chromium IV].

Allergic Contact Dermatitis is inflammation of the skin typically manifested by erythema, mild edema, and scaling. ICD (Plate 31) is a nonspecific response of the skin to direct chemical damage that releases mediators of inflammation predominantly from epidermal cells. A corrosive agent causes immediate death of epidermal cells, manifested by chemical burns and cutaneous ulcers

Allergic Contact Dermatitis is an allergic response (immunological response) of the skin as a result of exposure to a chemical. Chemical exposures that may result in allergic contact dermatitis include epoxy resins, chromates, rubber chemicals, amine hardeners, and phenol-formaldehyde resins.

Findings indicate that cement and wet-cement products (e.g. concrete and mortar) should be treated as hazardous materials, and that workers handling such products should reduce exposure wherever possible. OPC contains varying amounts of hexavalent chromium (Chromium IV), a known carcinogenic, and toxin hazardous to skin, eyes and lungs (Winder, C et al (2009).

#### **Skin contact**

The hazards of wet cement are due to its caustic, abrasive, and drying properties. Wet concrete contacting the skin for a short period and then thoroughly washed off causes little irritation. But continuous contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin.

When wet concrete or mortar is trapped against the skin may cause skin burn or skin ulcer. Cement dust released during bag dumping can also irritate the skin. Moisture from sweat or wet clothing reacts with the cement dust to form a caustic solution, which has a burning effect to the skin.

#### **Allergic skin reaction**

Some workers become allergic to the hexavalent chromium in cement. A small yet significant percentage of all workers using cement will develop an allergy to chromium, with symptoms ranging from a mild rash to severe skin ulcers.

In addition to skin reactions, hexavalent chromium can cause a respiratory allergy called occupational asthma. Symptoms include wheezing and difficulty breathing. Workers may develop both skin and respiratory allergies to hexavalent chromium.

Studies have shown that it is possible to work with cement for years without any allergic skin reaction and then to suddenly develop such a reaction. The condition gets worse until exposure to even minute quantities triggers a severe reaction. The allergy usually lasts a lifetime and prevents any future work with wet concrete or powder cement (Dru Sahai, 2001)

### **Eye contact**

Exposure to airborne dust may cause immediate or delayed irritation of the eyes. Depending on the level of exposure, effects may range from redness to chemical burns and blindness.

### **Inhalation**

Inhaling high levels of dust may occur when workers empty bags of cement. In the short term, such exposure irritates the nose and throat and causes choking and difficult breathing. Prolonged or repeated exposure can lead to a disabling and often fatal lung disease called “silicosis”. There is a link between crystalline silica exposure and lung cancer (ibid).

#### **6.3.6.2 Soil and Water Pollution by Concrete Slurry and Concrete Wastewater**

Concrete works during construction of culverts, and lining of roadside drains is likely to cause leakage of concrete slurry to road sides. Concrete slurry will pollute soil and affect the growth of young trees. In addition, there is a likelihood of the concrete slurry to find their way to rivers either directly during construction of culverts or through storm water system, especially when concreting is done when raining.

Lime is a major component of cement and is found in all concrete products. It dissolves in water to produce an alkaline solution that will burn and kill fish, insects, and plants. Water that comes into contact with unset concrete or concrete dust quickly increases in alkalinity and will be highly toxic to aquatic life. Notably, concrete wastewater has a pH of 12 -13 and is as toxic as bleach, while the pH of freshwater is between 6 and 7. Concrete wastewater causes burns in a similar way to a strong acid. A single bucket of concrete wastewater will easily kill hundreds of fishes.

In addition, leakage of concrete slurry to road sides is likely to cause soil pollution and so killing or stunting the growth of young trees, especially regenerating ones. The negative impact due to soil and water pollution is weighed to be direct, moderate, reversible, long term.

### **6.3.7 Construction of Road Pavement**

#### **6.3.7.1 Health Problems Associated with Handling of Cement and Wet-cement Products**

The impact associated with handling of cement and wet cement products has already been discussed in sub-section 6.3.6.1

#### **6.3.7.2 Deterioration of Ambient Air Quality by Bituminous Fumes**

Apart from dust exhaust fumes from construction equipment, deterioration of ambient air quality will be due to generation of bitumen fumes from bitumen processing plant, pre-coating of chippings with bitumen as well as during spraying of bitumen. The impacts due to bitumen fumes will affect construction workers as well as residents along the project road. The impact due to deterioration of ambient air quality by bituminous fumes will be direct, moderate, reversible, and short term.



### 6.3.7.3 Health Problems Associated with Hydrated Lime

During construction, naturally occurring materials that have high plasticity index (very plastic) are likely to be stabilized with hydrated lime. Hydrated lime if not handled properly, can cause the following health problems:

- Eye contact with lime can cause severe irritation or burning of eyes, including permanent damage.
- Skin contact with lime can cause irritation of skin.
- Ingestion of lime can cause severe irritation of gastrointestinal tract if swallowed.
- Inhalation of lime can cause severe irritation of the respiratory system. Long-term exposure may cause permanent damage.

Although hydrated lime is not listed as a carcinogenetic, it may contain trace amounts of crystalline silica in the form of quartz or cristallite, which has been classified carcinogen to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis

### 6.3.8 Operations of a Construction Camp

Operations of site office, mechanical workshops, site stores, medical clinic, as well as pre-cast yards are likely to have a number of impacts as narrated in the following sub-sections.

#### 6.3.8.1 Generation of Solid and Liquid Wastes

Operations of camps (offices, workshops, storage yards, and kitchens) will generate the following wastes:

- Solid wastes such as plastic and glass containers, steel and aluminium cans, used tyres, used lead-acid batteries, used oil and fuel filters, litter, used printer cartridges, used metal plastic parts, food wastes
- Liquid wastes such as used motor oils and grease, battery acid, grey and black waters
- Biohazard wastes such as syringes, needles, pharmaceutical products packing material

The concern here is their management. If they are not properly managed, treated, or disposed of, they will impair aesthetic quality of the campsite, cause soil, and/ or ground water. Unsafe disposal of biomedical wastes will pose health hazard to any person coming into contact with it. The impact will be direct, moderate, reversible, and short as well as long-term.

#### 6.3.8.2 Fire and Explosion Risks

Activities at mechanical workshops during repair and maintenance of construction equipment poses a risk of fire or explosion, although minor. Small quantities of flammable liquids and compressed gases will be stored and used. Liquids will include fuels (petrol, diesel and, paints, and cleaning solvents). Compressed gases will include oxy-acetylene (for welding and cutting). The impact will be direct, moderate, irreversible, and short term.

#### 6.3.8.3 Risks of Leakage of Hazardous Materials

The project will utilize a number of chemicals during construction and maintenance of construction equipment. Some of the materials will have to be transported from outside the project area, and will therefore require special attention in their transport, handling, and storage. Such materials will



include different grades of lubricants (oils, grease etc.), fuels, and bitumen (all hydrocarbons compounds), paints and solvents, brake fluids, battery acid.

Leakage of such chemicals poses a risk of soil contamination as well as surface and groundwater pollution. The impact is will be direct, moderate, irreversible, and long term since when it occurs, clean-up of chemicals, apart from being very expensive, will take long time.

#### **6.3.8.4 Generation of Human Sanitary Wastes**

Among the wastes that will be generated at the construction camps will be sanitary wastes from construction workers. If sanitation facility is not provided for, they are likely to relieve themselves in the bush causing outbreak of waterborne diseases such as dysentery and diarrhoea. The impact will be direct, moderate, short term, and reversible.

#### **6.3.9 Marital and Social Conflicts**

Road project will lead to increased marital and social conflicts because of increased interaction. Project workers with extra earnings could be the sources of conflicts as they engage in extra-marital affairs. The impact will be indirect, moderate, and short term.

#### **6.3.10 Increase in unwanted Pregnancies**

Increased and unwanted pregnancies especially among school girls as project workers could easily entice school girls with money in return for sexual relationships. This will be an indirect, moderate, and short term negative impact.

#### **6.3.11 Poaching of Wildlife by Construction Workers**

Apart from disturbance by noise and vibrations that will interfere with wildlife home range (already discussed earlier), another impact to the wildlife protected areas will be those related with illegal hunting (poaching) of animals in the wildlife aread discussed under sub-section 4.8.4 by project workers. The impact will be indirect, moderate, short term, and reversible

#### **6.3.12 Triggering of Child Labour and School Dropout**

Availability of employment from construction activities is likely to tempt school children to abstain from school in search of unskilled job resulting into decline in the quality of education.

#### **6.3.13 Occupational Health and Safety Hazards**

Mobilization, construction, demobilization, and phase of the project activities will expose workers, visitors, and the general public to different hazards as follows:

##### **6.3.13.1 Physical Hazards**

##### **6.3.13.1.1 Falling of people, objects or materials**

Working at height during construction of camps (e.g. roofing and block work), construction of box culverts, working above excavation will expose workers to fall hazards resulting into physical injury or fatal accident. In addition, the public will be exposed to excavation fall hazard, especially if the worksite is not physically separated from the surrounding. Similarly, workers working below

height (during construction of camp and culverts) and by passers will be exposed to physical injury due to possible fall of object or material from height.

#### **6.3.13.1.2 Stepping on or striking against objects**

Hazards associated with stepping on objects will result from mainly poor housing keeping at work sites and lack of personal protective gears. Hazards will include being punctured by sharp objects (e.g. nails or any other metallic material) left on the ground and tripping/ tumbling on object.

#### **6.3.13.1.3 Manual Handling Injury -- Overexertion**

Physical hazard associated with lifting and over-exertion is discussed under sub-section 6.3.11.2.2

#### **6.3.13.1.4 Workers being struck or Crushed by Mobile Equipment**

Project workers working near mobile equipment such as overhead crane, excavator, articulated crusher, concrete mixer, dozer, grader, wheeled loader, dump truck, etc. or members of the community near such equipment will be exposed to physical hazards due to the possibility of being hit, entangled, or crushed by the equipment during their operations.

#### **6.3.13.1.5 Transport**

Operations of equipment transporting materials etc. will expose workers and members of the community to traffic accidents.

#### **6.3.13.1.6 Electrical Shock Hazard**

A number of stationery construction and workshop equipment will be operated by electricity. Examples of such equipment include stone crusher plant, concrete batch plant, cement-stabilized material mixing plant (pug mill), bitumen heater, steel reinforcement workshops machines (bar bender, bar cutter, etc.), and workshop metals machines. When control panels of this equipment are not well insulated, exposed, or not earthed or their cables are poorly insulated, will expose workers to electrocution hazard.

#### **6.3.13.1.7 Fire and Explosion**

The impact associated with fire and explosion has already been discussed in sub-section 6.3.8.2.

### **6.3.13.2 Health Hazards**

Construction activities, involving the use of different construction materials will expose workers and the public to health hazards. Health hazards can be categorized into chemical health hazard (due to liquids, dusts, gases, and fumes), physical health hazards to (due to heat, noise and vibrations, compressed air, and manual handling), and biological health hazards.

#### **6.3.13.2.1 Chemical Health Hazards**

##### **Contact with Skin**

Dermatitis is the most occupational skin disease. This will result from exposure to wet cement or cement product

## **Inhalation of harmful Chemicals**

Inhalation of harmful chemicals causes the following respiratory diseases:

- Silicosis (lung scarring) due to inhaling silica dust and commonly found in many rocks, granite rock, aggregates, sand. Inhalation of dust (including cement dust) also causes asthma
- Headache, nausea, dizziness, and loss of co-ordination due to inhalation of carbon dioxide from internal combustion engines exhaust, carbon dioxide welding, especially when working in highly confined space). Headache, dizziness, and vomiting can also be caused by inhalation of solvent vapours. Solvents are used in a wide range of products, which are likely to be used in the construction activities such as adhesives, sealers, paints, solvents, lubricants, and lacquers.
- Drowsiness, vomiting, loss of muscular control, including death due to cadmium poisoning through breathing of cadmium fumes, released during cutting, welding, or brazing operations of cadmium plated steel (especially in confined space). Fatigue, anaemia, colic or wrist-drop due to lead poisoning through breathing lead dust or lead fumes lead poisoning, resulting from demolition of (cutting and burning) old structures covered in lead-based paint.
- Metal-fume fever – a flu-like illness due to inhalation of complex welding fumes from the welding parent metal and its coatings. In addition, zinc fumes are evolved from the welding, brazing, and flame cutting of galvanized steel. Breathing them may cause zinc-fume fever

### **6.3.13.2 Physical Health Hazards**

Physical hazards are hazards resulting from general environment that will be experienced by the workers or from their particular occupation. Physical health hazards include the following:

#### **Noise**

Prolonged exposure to high noise levels from plant and machinery on site or in workshops likely to cause irreversible damage to hearing. The general acceptable sound level upper limit is 85 dB (A), where the sound is reasonably steady and exposure is continuous for 8 hours.

#### **Vibration**

Continuous exposure of the hands to high frequencies of vibrations from tools such as pneumatic hammers, concrete breakers, drills, and chipping hammers cause most common injuries (called vibration white fingers). It starts with a slight tingling or numbness in the fingers and eventually causes whiteness to the tips. The attack may last for about an hour and end with a sudden rush of blood to the affected tip, often causing considerable pain.

#### **Manual Handling Injury**

While handling construction materials manually (e.g. lifting concrete block, cement bags, etc.), workers are likely to be affected through spraining and strains due to over exertion. The effect of which may be to have musculoskeletal injury (total, back injury, upper and lower limb disorders).

### **6.3.13.2.3 Biological Health Hazards**

The likely biological hazard during construction will be drinking of unsafe water, eating contaminated water or food contaminated with rat urine. The diseases that are related with unsafe water are water borne diseases such as diarrhoea, cholera, and amoebic dysentery

Another health hazard will be due to exposure to ionizing radiation. Exposure to ionizing radiation will result from the use of a nuclear gauge, which contain radioactive materials and therefore emits ionizing radiation.

#### **6.3.13.3 Increased Transmission of STIs/HIV**

Construction of the road will increase mobility, migration, and interaction. This is likely to increase transmission of communicable diseases such as HIV/AIDS and other STIs. Increased spread of transmission of HIV/AIDS from construction workers to the local people during and after the construction is one big potential challenge that has to be taken into consideration during and after the construction of the road. The negative impact is likely to be moderate, long term, and irreversible.

### **6.4 DEMOBILIZATION PHASE**

#### **6.4.1 Generation of Solid Wastes**

Wastes from site office, mechanical workshop, pre-cast yard, and stores at the end of the construction phase are likely to cause scenic degradation, pollution and become an eye sore. The wastes likely be generated will include demolition materials from temporary structures, storage facilities (pallets), packing (plastic bags, paper and timber boxes), wastes from pre-cast yard (concrete wastes, metal reinforcements etc. The impact will be indirect, minor, short term, and reversible since it disposal of solid and liquid wastes shall be part and parcel of the construction activities of the project.

#### **6.4.2 Deterioration of Ambient air Quality**

Demobilization; demolition, collection, and transport of demolition wastes will generate dust. The dust generated will affect workers at the site as well as residents as the trucks move across settlements. The impact is gauged to be direct, moderate, reversible, and short term.

#### **6.4.3 Loss of Employment and Economic Activities at the End of the Project**

Completion of road rehabilitation activities nearly all workers will be declared redundant and will therefore be laid off. This will automatically result into loss of income. In addition, traders that had established along the road during construction of the road will no longer be able to trade, this will affect livelihood of the traders. The impact will be indirect, moderate, short term, and reversible.

### **6.5 OPERATION AND MAINTENANCE PHASE**

#### **6.5.1 Positive Impacts**

##### **6.6.1.1 Improved Ambient Air Quality of the Main Road Alignment and Existing Bypass Sections**

Upgrading of the main road alignment section as well as the existing Maloregwa – Nduta bypass section of will very significantly reduce the pollution of ambient air due to particulate matter, since dust generation will be very low. The only source of deterioration of ambient air quality will be emission due to exhaust fumes from traffic.

A number of studies that have been carried out in Tanzania on vehicular air pollution due to nitrogen oxides, carbon monoxide, sulphur dioxide, and ammonia for areas with even higher traffic

volume and concentration than the project area have shown that the levels are insignificant if they are compared to international standards.

It can therefore be concluded that during the operation phase of the project, there will be very significant improvement of air quality due to reduced dust generation and insignificant level of air pollution by exhaust gases from traffic.

The positive impact due to reduction in dust generation along the road will be major and long term, while the impact due to reduced air pollution from exhaust gases is gauged to moderate and long term.

#### **6.6.1.2 Improved Hydrology and Drainage**

Upgrading of the road will improve the drainage, because new bridges and culverts as well as road side drainage with adequate hydraulic capacities will be constructed. Sedimentation of culverts and road side drains will be reduced due to provision control devices and cover vegetation. Sediment carrying storm water runoff from the road will be discharged away from the road by drainage channels. Water stagnation within and on roadsides will be eliminated. Given the fact that during rainy season the existing road was either impassable or passable with lots of difficulties, the road upgrading will have a major positive, direct, and long term impact on the hydrology and drainage of the project road.

#### **6.6.1.3 Reduction in Vehicle Operating Costs**

Lower speeds due to poor road imparts extra stress on motor vehicles' engines (higher engine revolution per unit time) and so faster engine wear as compared to when a vehicle travels at higher speeds (lower engine revolutions per unit time). In addition, improvement of the existing road will result into serving in mileage per litre of fuel as vehicles will be able to travel at relatively higher speeds. Improvement of travel speeds due to upgrading of the road will therefore reduce operating and maintenance costs of vehicles. This will be a direct, major, and long term positive impact.

#### **6.6.1.4 Reduced Rate of Energy Consumption**

Energy consumption rates for vehicles operating on the roadway can be differentiated by comparing changes in traffic operations, as measured by vehicle kilometres travelled and changes in traffic speed throughout the study area. Fuel consumption is proportional to distance travelled, and decreases as speed increases up to about 100 Km per hour (on average). Fuel consumption increases as speed increases above that point. It is anticipated that vehicles will be able to travel at even higher speeds (above 60 Km/hr). This will consequently lead to decreased consumption of energy per unit distance in the form of fuel. This will be a direct, major, and long term positive impact.

#### **6.6.1.5 Reduced Traffic Accidents**

Sub-section 4.2.8 (Table 15) identified sections of the main road alignment that have are prone to traffic accidents. The road in these section are either narrow or have infringed sight distances because they have very sharp horizontal curves or they have sharply curved approaches to bridges or culverts.

Improvement of the road will involve widening of the existing road as well as change in the road geometry. Increased road width and change of geometry, including increasing in radii of curves and installation of speed restraining humps especially at accident black spots discussed in Table 15 will significantly improve the safety of the road, the result of which will be reduction in accident rates.

In addition, reduced generation of dust will improved visibility and so reduce driving hazards. The result of which will be reduced traffic accidents involving motorists as well as pedestrians. The impact will be direct, major, and long term, and irreversible.

#### **6.6.1.6 Reduced Travel Time, and Comfort to Passengers**

Upgrading of the road to bitumen standard will significantly reduce travel time, since vehicles will be able to travel at higher speeds. In addition, construction of Kasulu and Kibondo bypass roads will in the future, when the traffic volume has incread, have significant impact in reducing the travel time between Nyumbigwa and Kidiana and between Maloregwa and Kidiana respectively as it will not be necessary for through traffic to pass through Kasulu and Kibondo town centres. It is estimated that the travel time will be reduced to almost one third of the present travel time. The served travel time could be used to other productive ventures. In addition, though cannot be quantified, upgrading of the road will improve comfort to passengers, due to the absence of corrugations. It is most likely that better passengers' buses will be plying the routes.

The impact will be direct, major, positive, and long term since it will be felt throughout the operation phase of the project.

#### **6.6.1.7 Diversification of the Local Economy**

Upgrading of the project road will attract more investors in the project area. The increased investment will bring in more employment opportunities to the local people including diversification of economic activities hence, reduce dependence on agriculture. Existence of improved and reliable road will influence business activities in the area through increasing population and enhancement of income of the people. The improved road will also bring to the area customers from other regions increasing money circulation and improving household income. During consultative meetings, some of the villagers cited out that diversification of the economy as one of the anticipated positive result of the improved road. The positive impact is gauged to be major, and long-term.

#### **6.6.1.8 Improve Access to Social Services**

The road will enable easy access to social services like modern health facilities, which will be beneficial for women and children who are the groups that deploy these facilities for a considerable extent. Also, school children will benefit since they can reach their school in time. This is apparent to secondary school students who many of them travel from distant villages where there are no secondary schools and easy access to Government administrative offices.

The social services such as schools and hospitals are understaffed because technocrats are not enthusiastic to live in the project area due to unreliable transport. Improved road will attract technocrats to service the project area. This is very true as the data from the district shows that the ratio between teachers and pupils does not much the national required standard of 1:45 per class. With the improved road, there will be reliable and cheap transport services that will link villages to the main road and to the small emerging semi-urban areas to the urban town areas where there are more social services. The positive impact is gauged to be indirect, major, and long term.

#### **6.6.1.9 Increased interaction of people drive for social change**

The project area is inhabited by mainly indigenous people, unlike in urban centres where there is a mixed group of people from all over Tanzania. In migrants are either business people or employees by government or in informal sector. In such situation it is difficult for people to be innovative since no new ideas and experience can easily penetrate in the community. Upgrading of the road will



encourage people from other parts of the country to live in the area. In migrants will come with new ideas into the project area. Such opportunity will create room for social transformation for both groups, share values, and adopt new cultures and diffusion of cultural values suitable for development. The positive impact will be indirect, moderate, and long term.

#### **6.6.1.10 Increased investment**

The project area has potentials for agriculture and forestry. It is anticipated that the improved road will attract many investors to invest in the above mentioned areas; this will have a multiplier effect on the availability of other services such as hotels, schools and medical services. This will be an indirect, moderate long term positive impact.

#### **6.6.1.11 Reduced Transport and Transportation Costs**

The costs of transport and transportation between villages along the project road are high due to poor road. Bus fares double or triple during rainy season as road condition deteriorate. With the improved road the fares are expected to be low. The operating cost of bus operators will also be reduced resulting into reduced bus fares. The impact will be direct, major, and long term.

#### **6.6.1.12 Increased household income due to increased trading activities**

Increased household income is expected due to improved road conditions and improved traffic. It is thus expected that there will be a positive impact on businesses and trading activities adjacent to the road, thereby increasing the income of households along the road. The impact will be indirect, moderate and long-term.

#### **6.6.1.13 Improved Access to Market and Increased Agricultural Production and Productivity**

All the villages along the project road are known for the production of maize and banana. Other crops produced are beans, cassava, rice, coffee, tobacco, cotton, ginger, sorghum/millet, ground nuts, sweet potato, etc. Unreliable market is one of the hindering factors that limit production. The main buyers of farm outputs are the middlemen from Mwanza, Tabora, Singida, and Dodoma. Prices are determined by the buyer, while the seller has no bargaining powers to influence the prices.

Upgrading of the road will lead to increase in agricultural production and productivity. This will result from intensified use of better agricultural inputs such as fertilizers and seeds because of improved access to the farm inputs by the local traders. This will also contribute to food security in the area and beyond.

In addition, upgrading of the road will enable the local people to have access to better paying markets outside the project area where they can sell their agricultural produce at better prices and increase household income and therefore increase their capability to afford other basic needs. The impact will be direct, major, and long term.

#### **6.6.1.14 Improved Road conditions**

Repair and maintenance will focus on activities that ensure the long-term serviceability of the road. Repair and maintenance activities will pertain to the road pavement and its embankments, hydraulic and drainage structures and road furniture and where necessary, re-surfacing. All repair and maintenance works will virtually have positive impacts that will enhance the intended functions of the road and lengthening its life time, especially when it is considered that the number and scope of routine maintenance of the road will be greatly reduced.



#### 6.6.1.15 Impact to Forest and Wildlife Protected Areas

##### **Improved Management of Wildlife and Forest Protected Areas**

Upgrading of the road will augment accessibility to Moyowosi game reserve, Makere North and South forest reserve and other village forest reserves along the project road discussed under sub-section 4.8.4. The improved road will improve their response to emergencies and combating illegal harvesting of wildlife and forest products. Similarly, improved transport will facilitate the movement of other authorities (District forest and game officers) and so improve monitoring and management of the protected wildlife and forests. The positive impact due to improved management of the protected resources will be indirect, major, and long term.

##### **Improvement of Tourism Industry**

Upgrading of the road to bitumen standard is in line with various Government policies that promotes tourism development in Tanzania. The Tourism Policy of Tanzania promotes high quality – low volume tourism, which is focusing on the development of infrastructures that will attract high paying tourists.

Upgrading of this road will have a significant influence in increasing tourist activities in the road impact area especially Moyowosi game reserve and Nyamroha hunting block (located in Makere forest reserve). Upgrading of the road to bitumen standard will further increase the number of tourists visiting the project impact area. The impact due to improvement of tourism will be indirect, moderate, and long term.

#### 6.6.1.16 Improved growth of vegetation due to Reduced Generation of Dust

In sub-section 4.2.5 it was clearly explained how the generation of dust causes stunted growth of vegetation along the project road. It was explained how photosynthesis of vegetation is impaired by dust through abrading of leaf surfaces, blocking of stomata, increasing the amount of absorbed incident radiation.

Upgrading of the road to bitumen standard will significantly improve the growth of vegetation along the road. The impact will be indirect, moderate, long term, and irreversible.

#### 6.6.1.17 Improved Quality of Water Courses across the Road

In sub-section 4.2.5 it was explained how during rainy season the quality of water in water courses is polluted by the dust generated by traffic. It was noted how during rainy season the dust trapped by vegetation can pollute water course after being washed off events and carried into nearby streams increasing their respective particulate loading. The impact will be indirect

#### 6.6.1.18 Improved connectivity and Exports of Goods between Tanzania-Burundi-and Rwanda

The road is an important link between Tanzania and Burundi. The road project goal is to support regional integration, trade, tourism and socio-economic development within the area of the project, and to contribute to poverty reduction. The transport of export goods between Tanzania and Burundi has been facing poor connectivity due to poor road network. Thus, the proposed project road will address the situation and trigger economic development between Tanzania and Burundi. The direct impact will be direct, major, and long term

#### 6.6.1.19 Complementation of other Development Initiatives

Upgrading of Kasulu – Kabingo road section to bitumen standard will augment the on-going initiatives by the government to upgrade Kidahwe – Kasulu section (50km), Nyakanazi – Kabingo section, and Kasulu – Manyovu (48km) to bitumen standard. Upgrading of this road to bitumen standard will also form an important link with between Mwanza, Geita, with Lake Tanganyika corridors. It will also connect the southern part of the country with the neighbouring countries of Rwanda, Burundi, and Democratic Republic of Congo.

### 6.5.2 Negative Impacts

#### 6.5.2.1 Increased Traffic Accidents

At present road traffic accidents are minimal because of the poor road conditions. With poor road conditions even reckless drivers are forced to drive slowly. Upgrading of the road is likely to increase traffic volume and travel speeds. Invariably, improved road conditions will attract more bus services to the road project. This could in turn lead to an increase in the number of accidents especially at school crossings and settlements. Specific black spots are crossings for school children listed in Table 19. Other black spots are settlements in all the village centres in Table 1. The impacts will be direct, moderate, short term, and irreversible. The impact will be residual because accident cannot be prevented fully.

#### 6.5.2.2 Increased Pressure on Natural Resource

Improved road transport due to road upgrading is likely to increase the influx of people to the project area, which will result into more demand for timber and land, as people tend to establish new settlement and agricultural lands. The resultant effect will be increased clearing of vegetation. The negative impact is will be indirect, moderate, reversible, and long term.

#### 6.5.2.3 Increased Noise and Vibrations Pollution

Improvements of the road will definitely results into higher utilization of the roads and so higher traffic volume by generated (additional vehicles travel that results from the road improvement).

The increase in noise and vibrations is not only associated with increased traffic volume, but also with paving of the ring road, since bitumen propagates noise and vibrations much more effectively than gravel and loose soil. The increased noise and vibrations will is likely to change behaviours of wildlife in Moyowosi game and Makere forest reserves as the animals will be disturbed/ scared.

The increased traffic volume through the existing and non-existent Kasulu and Kibondo bypass section will cause/ increase considerable noise and vibrations. The noise will agitate and impair comfort and sleep for people living along the new bypass roads, especially during the night, something they never experienced before.

The increase in noise and vibration impacts due to operation of the road is anticipated to be direct, long term, irreversible, and minor.

#### 6.5.2.4 Facilitation of Poaching and Illegal Logging

Poaching and illegal logging presents a threat to the wildlife protected areas (Moyowosi game reserves and Makere forest reserve).

Upgrading of the road will facilitate illegal harvesting of wildlife and forestry products from the wildlife and forestry protected areas. The improved road will encourage or facilitate poaching, (for

personal consumption and sale to third parties) due to improved mobility. It will also promote illegal logging as it will be easier for illegal loggers to transport the wood.

Discussions with authorities of the above forest and wildlife protected areas noted that the network of poachers (especially of elephants for trophies) is likely to increase during and when the road is upgraded. The impact will be indirect, moderate, long term, and irreversible.

#### **6.5.2.5 Increased Cost of Living**

At present prices of food crops in the project area are relatively low compared to other places in Tanzania. The upgrading of the road will increase prices of cereal crops and might not be affordable to some of the local population, although for the sellers it will be an advantage for their crops to fetch a good price. The impact is gauged to be indirect, minor, and long term.

#### **6.5.2.6 Increased Rate of Crimes**

Improved road is more likely to attract more advanced criminal activities in the project area. Criminals will be able to move faster across the project area. The life of residents will be more in danger than now. Advanced weapons are more likely to increase. Influx of job seekers of all ages and subsequent crime poses a threat to security in the project area. The negative impact will be indirect, moderate, long term, and irreversible.

#### **6.5.2.7 Abuse of Road Corridor**

Past experience has shown that local communities along the road have a tendency of carrying out activities other than those intended for the road reserve. Normally any road has a road reserve, which is utilised for other infrastructure including water supply system, installation of electric, and telephone poles, though the area is under TANROADS. Other users have to get permission from TANROADS to be able to utilise the road reserve. However, communities have the tendency of using the road reserve for farming and other economic activities resulting into soil erosion and eroding the road. These have a negative impact on the sustainability of the road. The negative impact will be indirect, moderate, and long term.

#### **6.5.2.8 Interference with smooth Traffic Flow**

Maintenance activities will interfere with smooth traffic flow. The negative impacts gauged to be insignificantly small will include interference with smooth flow of traffic and effects related to acquisition, storage, processing, and application of construction materials and their equipment. The impact is gauged to be direct, insignificantly minor, and short term.

#### **6.5.2.9 Deterioration of ambient air quality due to Emission from Vehicle**

Although upgrading of the main road alignment as well as the existing Kasulu and Kibondo bypass sections will improve ambient air quality due to reduced generation of particulate matter, increased traffic volume from generated and diverted traffic will cause higher emissions of SO<sub>2</sub> NO<sub>x</sub>, CO, and CO<sub>2</sub>. Similarly, construction of a ring road on the non-existent sections of Kasulu and Kibondo bypass road sections will lead to deterioration of air quality due to traffic emissions.

Motor vehicles are significant sources of pollution that can damage the environment and pose public health issues. Carbon monoxide, nitrogen oxides, and hydrocarbons are released when fuel is burned in an internal combustion engine and when air/fuel residuals are emitted through the vehicle exhaust pipe. Gasoline vapours also escape into the atmosphere during refuelling and when fuel vaporizes from engines and fuel systems caused by vehicle operation or hot weather.

The pollutants in vehicle emissions are known to damage lung tissue, and can lead to and aggravate respiratory diseases, such as asthma. Motor vehicle pollution also contributes to the formation of acid rain and adds to the greenhouse gases that cause climate change.

Pollutants emitted directly from vehicles are not the only cause for concern. On warm, sunny days, hydrocarbons react with oxides of nitrogen to create a secondary pollutant, ozone. In many urban areas, motor vehicles are the single largest contributor to ground-level ozone which is a common component of smog. Ozone causes coughing; wheezing and shortness of breathe, and can bring on permanent lung damage, making it a cause of crucial public health problems. The impact will be direct, moderate, long term, and reversible.

#### 6.5.2.10 Contribution to climate change effect due to emission of Green House Gases

Increased traffic volume during the operation phase of the road will increase the generation of Green Houses Gases (GHGs), particularly CO<sub>2</sub> and N<sub>2</sub>O exhaust gases, the result of which will be contribution to greenhouse effect, global warming, and so climate change. This is because C<sub>2</sub>O and N<sub>2</sub>O are among the six greenhouse gases (others are methane, hydro fluorocarbons, per fluorocarbons, sulphur hexafluoride, and water vapour).

Global warming and climate change refer to an increase in average global temperatures. This is caused by increases in GHGs.

A warming planet thus leads to a change in climate which can affect weather in various ways.

The term greenhouse is used in conjunction with the phenomenon known as the greenhouse effect as narrated hereunder.

- Energy from the sun drives the earth's weather and climate, and heats the earth's surface;
- In turn, the earth radiates energy back into space;
- GHGs trap some of the outgoing energy, retaining heat somewhat like the glass panels of a greenhouse;

Based on the method described in sub-section 4.2.5, the contribution of carbon dioxide due to the increased volume of traffic (projected traffic volume); 1 year after the road upgrading has been upgraded to bitumen standard has been estimated as shown in Table 20.

It is clear from Table 13 and Table 20 that the proposed road upgrading will cause increase the rate of generation of greenhouse gases to increase by nearly 8 times. The impact of green house generation due to upgrading of the road will be indirect, major, and long term.

**Table 20: Estimated Amount of CO<sub>2</sub> Likely to be generated in Kg/day by Road Traffic by 2020 after Road Upgrading**

No.	Type of vehicle	No of vehicles [a]	Type of fuel	Average fuel consumption (Km/litre) [b]	Estimate of Fuel consumption in 223km = (223/b) x a [c]	Amount of CO <sub>2</sub> Currently generated in kg: [c] X [d] where d= 2.3 (for gasoline engines) and 2.7 (for diesel engines)
1.	Motor cycle	1,850	Gasoline	20	20,627.5	47,443
2.	Medium car/ Station wagon	888	Gasoline	9	22,002.7	50,606
3.	4WD vehicle	420	Diesel	8	11,707.5	31,610
4.	Pickup	219	Diesel	8	6,104.6	16,482
5.	Daladala	264	Diesel	8	7,359.0	19,869
6.	Medium bus (30 – 35 passengers)	6	Diesel	6	223.0	602
7.	Large bus (40 seater capacity)	14	Diesel	2	1,561.0	4,215
8.	Light Truck (LGV) – Rigid 2-axles (3-6 tons)	60	Diesel	5	2,676.0	7,225
9.	Medium Truck (MGV) –	63	Diesel	2	7,024.5	18,9966

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Type of vehicle	No of vehicles [a]	Type of fuel	Average fuel consumption (Km/litre) [b]	Estimate of Fuel consumption in 223km = (223/b) x a] [c]	Amount of CO <sub>2</sub> Currently generated in kg: [c] X [d] where d= 2.3 (for gasoline engines) and 2.7 (for diesel engines)
	Rigid 2-axles (7-10 tons)					
10	Heavy Truck (Rigid 3 or 4 axles), typically 12-15 tons capacity,	101	Diesel	2	11,261.5	30,406
11.	Articulated Truck (4 -7 axles), typically 25-32 tons capacity,	264	Diesel	1.5	39,248	105,970
<b>Total Current daily emissions of CO2 (Kg)</b>						<b>504,394</b>

#### 6.5.2.11 Reduced life span of the road due to climate change

As stated earlier, the design life time of the road (with Asphalt Concrete) is 20 years. Variation or increase in temperatures resulting from global warming is likely to affect the life span of the road. Excessive temperatures are likely to cause bleeding of bitumen if mitigation measures are not in place. Similarly, during preparation of sub base layer, cracking of cement-stabilized sub-base layer is likely to occur if curing is not done properly. High temperatures are likely to cause damages of concrete hydraulic structures, especially culverts due to expansion. In addition, flooding resulting from global warming is likely to cause serious damages to or overtopping of hydraulic structures (culverts). The impact will be indirect, moderate, trans-boundary, and long term.

#### 6.5.2.12 Contribution to Depletion of Ozone Layer

Increased traffic volume will contribute to increased depletion of ozone layer due to increased emissions of GHGs.

The Earth's atmosphere is divided into five layers - stratosphere being one of them. Within the stratosphere, there lays a layer, made of a specialized form of oxygen, known as the ozone layer. The layer is made up of three oxygen atoms, contradictory to the usual two oxygen atoms. With no demarcated boundary, the ozone layer is found between 10 to 20 miles above the surface of the Earth. This layer traps the harmful ultraviolet-B (UV-B) radiation emitted by the Sun, and hence plays a crucial role in supporting life on the Earth.

The ozone layer is threatened by a global warming because the fall of its temperature increases the rate of its depletion. This is because GHGs trap the Sun's radiation which in turn makes the planet warmer. This actually means that the heat which is supposed to be reflected back to the space is trapped within the troposphere. When this heat is trapped, it does cause the temperature in the troposphere to increase, but at the same time, it also causes the temperature of the stratosphere to decrease. As the temperature in the stratosphere falls, the ozone molecules in this layer become vulnerable to destruction by the harmful emissions. The impact will be indirect, moderate, trans-boundary, and long term. The effect to increased depletion of ozone layer cannot be mitigated at the project level and therefore a residual impact

#### 6.5.2.13 Wildlife Road Kills

Increased traffic volume and speeds across the wildlife areas discussed in sub-section 4.8.4 earlier (Moyowosi game reserve and Makere forest reserve) is likely to cause wildlife road kills. This concern was also raised by authorities entrusted to manage the protected areas. The impact will be indirect, moderate, and long term.

#### 6.5.2.14 Fragmentation of Settlements and impaired Safety of pedestrians

Cuts across hills tend to cause fragmentation of two sides of the road. The impact will be even significant if the cuts are located across settlements as they create barriers. The impact of these barriers would be an increase in travel time for local residents to their business and residential areas. Another impact of cuts would be to jeopardise the safety of the communities, in particular pedestrians.

#### 6.5.2.15 Reduced Rate of Opening Borrow Pits

At present routine and periodic maintenance of the unpaved road calls for opening of borrow pits along the road after every rainy season. After the road is upgraded to bitumen standard opening of



borrow pits will no longer be necessary. As a result, the impacts that associated with opening of borrow pits will no longer be there. The impact will be direct, moderate, long term.

## **6.6 CUMULATIVE IMPACTS**

### **6.6.1 Creation of Employment**

It was noted in sub-section 4.10 that apart from upgrading this road road section:

- (i) The upgrading of upgrading of Kidahwe - Nyumbigwa road section (50Km) to bitumen standard is ongoing
- (ii) The upgrading of Kabingo – Nyakanazi road section is ongoing
- (iii) The government intends to upgrade Kasulu – Manyovu road section

If one or more of the above road projects, espacailly sections that are linked with this project are concurrently with this project, the number of jobs that will be created would be higher than if only this project was to be implemented at a time.

### **6.6.2 Deterioration of Ambient Air Quality**

During construction, if upgrading of the project road is done in parallel with Kabingo – Nyakanazi section, deterioration of ambient air quality due to particulate matter especially at adjoining sections is likely to be higher, and the area affected (the whole section between Kasulu and Nyakanazi) would be be larger than if the two roads were constructed at different times.

### **6.6.3 Transportation Related Issues**

As noted earlier, during construction of this road the following impacts are anticipated:

- Traffic delays, changes in traffic circulation, and congestion.
- Business and residents access would be rerouted or restricted during construction activities.
- Temporary displacement of bus stops during construction may interfere with transit service.
- Construction activities of the road near local business could result into temporary loss customers for affected businesses due to potential access difficulties.

If construction of this road is done concurrently with one or more of the above project (upgrading of Kabingo – Nyakanazi, Kasulu – Manyovu, and Kidahwe – Kasulu), that are directly with road, the above impacts are likely to be higher that if each of the above projects was to be constructed at a go.

### **6.6.4 Borrowing of Materials**

Construction of the roads will require extensive borrowing of such construction materials as sand, gravel, fill material, and hard stone. These are likely to result into contribution to cumulative impacts to ecosystem due to loss of vegetation and soil erosion.

In addition, given the fact that already there is substantial number of unreinstated borrow pits along the road that were opened during periodic routine maintenance of the existing gravel road, further opening of borrow pits during construction will result into cumulative impacts on health and safety (malaria, safety – due to possible fall or drowning or traffic accidents). The impact will be more

---

profound if the borrow pits are located within the ROW, near or at settlements, or within forestry or wildlife protected areas.

#### **6.6.5 Pollution of water courses**

It was noted under sub-section 4.9.2 that farming along and across water courses is one of the present environmental problems along the project road. This practice causes significant sedimentation of river and drainage systems. This is because agricultural activities make soil loose to be easily carried away by storm water. Apart from reducing hydraulic capacities of cross drainage structures, sedimentation raises river beds to the extent of causing overtopping storm water after downpour.

Clearing and earthworks along and across water courses during construction of drainage structures as well as accidental or deliberate disposal of excess or spoil materials on water courses are likely to exacerbate the present impact of sedimentation of water courses.

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to Bitumen Standard**

**Table 21: Environmental and Social Impact Assessment Matrix**

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction, processing and delivery of construction materials	General earthworks	Construction cross drainage structures	Construction of roadside drainage systems	Concrete and bituminous works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the road	Repair and maintenance of the road
Creation of employment	+2	+2	+2	+2	+2	+2	+1	+1	+1	0	+1
Loss of vegetation and farmlands	-1	-2	-2	-2	-1	-2	0	0	0	-2	0
Deterioration of aesthetics as related to discolouration of vegetation and buildings, unreinstated borrow pits	0	-2	-2	0	0	0	0	0	0	0	0
Impacts related to generation of solid wastes	0	-1	-2	0	-1	-1	-2	-1	0	-1	-1
Generation of noise and vibrations	-1	-2	-2	-2	-2	-2	-2	-2	-1	-2	-1
Deterioration of ambient air quality by particulate (dust)	-2	-3	-3	-1	-2	-2	0	0	-2	+3	-1
Deterioration of ambient air quality exhaust: fumes (SO <sub>2</sub> , NO <sub>x</sub> , CO)	-1	-2	-2	-1	-1	-1	-1	-1	-1	-2	-1
Deterioration of ambient air quality by bituminous fumes	0	0	0	0	0	-2	0	0	0	0	0
Risk of accidents to livestock and human due to borrow pits	-1	-2	0	0	0	0	0	0	0	-2	-2
Road traffic accidents to human and animals	-1	-2	-2	-2	0	0	-2	-1	-1	-2	-1
Accidents related to blasting, drilling, and rock excavation	0	-2	0	0	0	0	0	0	0	0	0
Soil erosion	1-	-1	-2	0	-2	0	0	0	0	-2	0
Impact to wildlife areas	0	-2	-1	0	0	0	0	0	0	-2	0
Displacement and loss of properties	0	0	-3	0	0	0	0	0	0	0	0

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction, processing and delivery of construction materials	General earthworks	Construction cross drainage structures	Construction of roadside drainage systems	Concrete and bituminous works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the road	Repair and maintenance of the road
Disruption of domestic water supply systems	0	0	-2	0	-1	0	0	0	0	0	0
Disruption of optic fibre cable	0	0	-2		-2	-2	0	0	0	0	0
Increased consumption of energy in the form of fuel and lubricants	-1	-2	-2	-2	-1	-2	-2	-1	-1	+2	-1
Increased consumption of forestry products	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
Resource use conflict	0	0	-2	0	0	-2	-2	0	0	0	0
Reduction in river flows	-1	-1	-2	-2	-2	-2	-2	-1	-1	0	0
River banks erosion during riparian zone construction	0	0	-2	-2	-2	0	0	0	0	0	0
Surface water and soil pollution by oil, concrete/concrete slurry	0	0	0	-2	-1	-2	0	0	0	0	0
Surface water and soil due to possible of leakage of hazardous wastes	-1	-1	-1	-1	-1	-1	-1	0	0	-1	-1
Modification of surface water flow pattern	0	0	-2	-2	0	0	0	0	0	-1	0
Modification of water table	0	0	-2	-2	0	0	0	0	0	-1	0
Disruption of community access to dwellings and business areas	0	0	-2	0	-2	0	0	0	0	0	0
Impact to cultural sites	0	0	-2	0	0	0	0	0	0	0	0
Pollution of Nengo dams by sedimentation	0	0	-2	-2	-2	0	0	0	0	-1	0
Health problems associated with handling of cement and wet cement products	-2	0	0	-2	-2	-2	-2	0	0	0	0
Fire and explosion risks	0	0	0	0	0	0	-2	0	0	0	0

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction, processing and delivery of construction materials	General earthworks	Construction cross drainage structures	Construction of roadside drainage systems	Concrete and bituminous works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the road	Repair and maintenance of the road
Reduction in domestic water supply for local people	-1	0	-2	-2	0	-2	0	0	0	0	0
Occupational health and safety related impacts	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2
Risks of leakage of hazardous materials	-1	-1	-2	-2	-1	-2	-2	-1	-1	-1	-1
Marital and social conflicts	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Increase in unwanted pregnancies	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Poaching of wildlife by construction workers	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0
Physical hazard due to fall from height or being hit by falling object	-2	-1	0	-2	-1	0	-2	0	0	0	0
Physical hazard due to stepping on sharp object or striking/ stumbling on objects	-2	0	0	-2	-2	0	-2	-1	0	0	0
Physical hazard due to manual handling (over-exertion)	-2	0	0	-2	-2	0	-2	0	0	0	0
Physical hazard due to workers being struck or crushed by mobile equipment	0	-2	-2	-2	-2	0	-1	0	0	0	0
Physical hazard due to electrocution	-1	-2	0	0	0	-2	0	0	0	0	0
Chemical health hazard due to chemical contact with skin			-1	-2	-2	-2	-2	0	0	0	0
Chemical health hazard due to inhalation of harmful chemicals	-1	-2		-2	-2	-2	-2	0	0	0	0
Physical health hazard due to	-1	-2	-2	-1	-1	-1	-1	-1	-1	-2	-1

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction, processing and delivery of construction materials	General earthworks	Construction cross drainage structures	Construction of roadside drainage systems	Concrete and bituminous works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the road	Repair and maintenance of the road
noise and vibrations											
Biological health hazard due to drinking unsafe water or eating contaminated food	-2	-2	-2	-2	-2	-2	-1	-2	-2	0	0
Biological health hazard due to exposure to ionizing radiation	0	0	-2	0	0	0	0	0	0	0	0
Increased infection of HIV/AIDS	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Improved hydrology and drainage	0	0	0	0	-2	0	0	0	0	+3	0
Reduction in vehicle operating costs	0	0	+1	+1	+1	+1	+1	+1	+1	+3	+3
Reduced travel time and comfort to passengers	+1	+1	+1	+1	+1	+1	+1	+1	+1	+3	+3
Diversification of local economy	0	0	0	0	0	0	0	0	0	+3	+3
Improved access to social services	0	0	0	0	0	0	0	0	0	+3	+3
Increased interaction of people drive for social change	0	0	0	0	0	0	0	0	0	+2	+3
Increased investment	0	0	0	0	0	0	0	0	0	+2	+3
Reduced transport and transportation costs	0	0	0	0	0	0	0	0	0	+3	+3
Increased household income due to increased trading activities	0	0	0	0	0	0	0	0	0	+2	+2
Access to market and increased agricultural production and productivity	0	0	0	0	0	0	0	0	0	+2	+2

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction, processing and delivery of construction materials	General earthworks	Construction cross drainage structures	Construction of roadside drainage systems	Concrete and bituminous works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the road	Repair and maintenance of the road
Improved Management of wildlife and forestry protected areas	0	0	0	0	0	0	0	0	0	+2	+2
Improved tourism	0	0	0	0	0	0	0	0	0	+2	+2
Improved growth of vegetation due to reduced generation of dust	0	0	0	0	0	0	0	0	0	+2	+2
Improved quality of water courses across the road	0	0	0	0	0	0	0	0	0	+2	+2
Complementation of other development initiatives	0	0	0	0	0	0	0	0	0	+2	+2
Facilitation of poaching and illegal logging	0	0	0	0	0	0	0	0	0	+2	+2
Increased costs of living	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
Increased rate of crimes	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
Abuse of road corridor	0	0	0	0	0	0	0	-1	-1	-2	-2
Reduced economic activities after closure of the project	0	0	0	0	0	0	0	-2	-2	-2	0
Contribution to climate change effect due to emission of GHGs	0	0	0	0	0	0	0	0	0	-1	-1
Contribution to depletion of ozone layer	0	0	0	0	0	0	0	0	0	-1	-1
Reduced life span of the road due to climate change	0	0	0	0	0	0	0	0	0	-1	-1
Improved connectivity and exports of goods between Tanzania, Burundi and Rwanda										+2	+2



## SECTION 7: MITIGATION MEASURES

The following sections describe measures that shall be followed by the contractor to ensure that the anticipated environmental and social impacts are avoided, abated, or remediated. Since most of the proposed mitigation measures will be contractual obligations of the contractor (some will not be mitigated by the contractor), they are also included in the Tender Document (Technical Specifications and Bill of Quantities). The Sections under which the proposed measures are found in the Technical Specifications are indicated in bracket after the proposed mitigation measure.

### 7.1 MOBILIZATION PHASE

#### 7.1.1 Creation of Employment

The impact shall be enhanced by ensuring:

- Priority of employment, espacailly unskilled labour is given to the local people, espacailly women
- Contractor Complies with Labour Relations Act
- Wages paid to workers are in accordance with Government Notice No. 196 of June 2013
- Contractor does not employ workers who are below the age of 18 years.

#### 7.1.2 Loss of Vegetation

To mitigate the impact due to loss of vegetation, the following shall be done:

- The contractor shall avoid unnecessary removal of the vegetation, especially trees
- When removal of vegetation is not avoidable, they shall be replaced by original species soon after completion of construction works/ closure of the camp, and its facilities (pre-cast yard, workshop, bitumen processing area, concrete batch plant, etc.)
- During site clearing for the camps, top soil shall be stockpiled so that it is used for vegetation during site reinstatement
- Cleared trees should be stockpiled are left on the road side for the local people to collect as firewood.
- Under any circumstance the Contractor shall not use the cleared trees for other purposes such as firewood or making marker pegs as past experience has shown

#### 7.1.3 Deterioration of Scenic and Visual Quality

The impact due to deterioration of scenic and visual quality shall be mitigated as follows:

- Top soil shall be stockpiled aside to be used for vegetation during reinstatement of camps.
- Material wastes such as concrete and cement blocks wastes will be stockpiled so that it is used in the reinstatement of pits
- Metal wastes such as GS pipes, nails, and reinforcement bars shall be disposed of by recycling. The Contractor shall be transported for recycling in foundry factories in Dar es Salaam by NEMC certified company. To achieve this, the Contractor shall enter into an

agreement with NEMC certified metal collecting company. The metal collecting company shall be approved by the Engineer.

- Cement paper bags and paper boxes (biodegradable) shall be treated on site by either burying or controlled burning
- Non usable timber wastes will be given to the local people to be used as fire wood
- Plastic and hessian bags will be treated on site by controlled burning
- The Contractor shall have a written agreement with NEMC certified company for the collection and transport of PVC pipes, plastic and glass bottles (non-biodegradable) to plastic and glass recycling factories in Dar es salaam

#### **7.1.4 Generation of Noise and Vibrations**

To reduce the impact due to noise and vibrations, the contractor shall adhere to Occupational Health and safety Act No. 5 of 2003 by ensuring that equipment, including trucks are well maintained and properly fitted with exhaust mufflers to minimize noise and vibrations. In addition, workers exposed to severe noise level shall be equipped with earplugs to protect them against prolonged and excessive exposure to noise.

#### **7.1.5 Deterioration of Ambient Air Quality by Dust**

The impact due to pollution of ambient air at the construction camps and material borrow sites shall be mitigated by sprinkling water on access roads to materials and across settlements areas. Workers exposed to severe dust level shall be equipped with dust masks.

#### **7.1.6 Risk of Road Traffic Accidents**

The impact due to accidents shall be mitigated by limiting speeds of project vehicles as well as third party vehicles to 60 Km/ hr by among others installing speed limiting systems in all project cars, providing warning signs at junctions to material stocks routes to warn other road users, speed humps across material stock routes.

#### **7.1.6 Soil Erosion**

The following measures shall be applied to mitigate the impact due to soil erosion:

- Minimize soil disturbance by avoiding unnecessary clearing of vegetation, in particular trees.
- During clearing of the camp site, top soil shall be stockpiled so that it is used to cover the areas to promote natural re-vegetation of grass

#### **7.1.7 Trigger of Child Labour**

To mitigate the impact due to possible child labour and school drop outs, the Contractor shall not employ people the age of 18 years

---

## 7.2 CONSTRUCTION PHASE

### 7.2.1 Creation of Employment

To enhance the impact due to employment, the measures proposed in Sub-Section 7.1.1 shall apply.

### 7.2.2 Extraction, Processing, and Delivery of naturally-occurring Construction

#### Materials

#### 7.2.2.1 Loss of Vegetation and Farmland

To mitigate the impact of loss of vegetation due to extraction of construction materials, the following measures are proposed:

- The Contractor shall borrow material from existing environmentally-sound borrow sites prior to trucking in materials from new sites
- In excavating new or expanding existing pits, relatively fertile/organic top soils shall be well stripped and stockpiled so that it is used to cover the pits after restoration for vegetation growth.
- Site clearing shall be minimised but will permit safe and efficient movement of personnel, materials and equipment, while allowing for excavation of materials
- Cleared trees should be left for the local people to collect as firewood. Under any circumstance the Contractor shall not use the cleared trees for other purposes such as firewood or making marker pegs as past experience has shown
- Immediately after construction, all the borrow pits and quarries shall be rehabilitated by trimming all slopes at a maximum slope of 1:3 (vertical: horizontal), and backfilling with top soil to promote re-vegetating and grading flat the bottom of the borrow pits to minimize the depth of rainwater ponding.
- Before opening a borrow pit or quarry, the Contractor shall submit to the Engineer a request for review and approval. The request among others shall include a sketch showing its location, coverage (area), adjoining features, and management and closure plan. To comply with Clause 1214 of Standard Specifications for Road Works (2000), the request shall also include a written consent of land owners that he/she is prepared to release his land for borrowing material.
- Borrowing of materials near water courses shall not be allowed. The minimum distance from a borrow pit or quarry from any water course shall be 100m.
- The Engineer shall not allow the Contractors to open any borrow pit or do quarrying within Moyowosi game reserve, Makere forest reserve, or any village reserve before satisfying himself that the Contractor has written consent by authority entrusted to manage the protected areas. The permit must state exact locations of area that has been permitted and conditions of the permit. The Engineer shall ensure that Contractor shall comply with all conditions specified in the permit.
- Before a borrow pit or quarry is opened, runoff control measures in the form of catch water drain, berms, etc. shall be put in place re-direct surface runoff away from access route and pit and quarry walls

- Where materials have to be extracted from agricultural land, the land owner shall be compensated after the land has been evaluated by a Valuer. After completion of construction of the project, the compensated borrow sites shall be the property of TANROADS.
- All borrow pits shall be reinstated to the satisfaction of the Engineer and management of protected areas (whichever is applicable) before a takeover certificate (TOC) is issued to the Contractors.

#### 7.2.2.2 Generation of Noise and Vibrations

To reduce the impact due to noise and vibrations, the contractor shall:

- Adhere to Occupational Health and safety Act (2003) by ensuring that construction equipment are properly maintained (including proper tuning of engines) and properly fitted with exhaust mufflers to minimize noise and vibrations due to materials transport trucks
- Adhere to Section 62 of Occupational Health and safety Act (2003) and Section 126 of Factories (Building Operations and Works of Engineering Construction) Rules, 1985, by ensuring that workers exposed to noise level above the limit of 85dB are equipped with ear plugs to protect them against excessive noise level
- Under any circumstance, blasting of rocks at quarry sites shall not be allowed during the night. A day before blasting, the local community surrounding the quarry area shall be informed of the intention to carry out blasting. In addition, 30 minutes prior to blasting, a siren shall be sounded to warn the public
- Where applicable and possible work face of the pit and quarry shall be oriented away from nearby settlements. This practice will direct noise away from settlements and minimize aesthetics impacts
- If it is necessary to borrow materials from within wildlife and forestry protected area, Contractor shall consult the authority entrusted to management the protected area game to ensure that the quarry is are located within less sensitive areas, in particular far away from animals home range (retesting, water eating, grazing) and migration corridors
- Under any circumstance, the quarries shall not be located within the wildlife protected area

#### 7.2.2.3 Deterioration of ambient air quality

The impact due to pollution of ambient air by dust and exhaust fumes shall be mitigated as follows:

- The project road, material haul/ access roads and diversion roads across settlements and active construction sites shall be sprayed with water at least twice a day to suppress the generation of dust
- Haulage trucks carrying dusty material shall be covered with tarpaulin to prevent escape of dust from material being transported
- When equipment are not in use, they shall be switched off to minimize the concentration of exhaust fume from equipment and so protect the workers at material borrow sites
- The Contractor shall properly tune engine of equipment to ensure complete combustion of fuel and so minimize exhaust fumes

- In accordance with Section 62 of Occupational Health and safety Act (2003) and Section 126 of Factories (Building Operations and Works of Engineering Construction) Rules, 1985, the Contractor shall provide workers with dust masks and ensure that they are used properly to prevent them from inhaling polluted air

#### **7.2.2.4 Deterioration of Scenic and Visual Quality**

To mitigate the impact of loss of scenic and visual quality due to borrow pits the following measures shall be applied:

- The minimum distance from the road and new borrow pits shall be 100m
- The contractor shall regularly sprinkle water on the project road, diversion roads across settlements, active construction sites, as well as access to roads to materials borrow sites in order to minimize deterioration of visual and scenic quality due to dust.
- Access roads to material borrow areas shall be reinstated by ripping and scarifying to allow natural generation of grass and trees.

#### **7.2.2.5 Risk of Accidents to Livestock and Humans due to Opening of Borrow Pits**

To minimize the risk of accidents to animals and humans

- The Contractors shall consult authority entrusted to manage wildlife protected areas (Moyowosi game reserve and Makere forest reserve) for approval of any material borrow or quarry site. The Engineer shall not approve any borrow pit or quarry proposal from the Contractors if it is not approved by authority entrusted to manage the wildlife and forestry protected areas
- The depth of borrow pit shall not exceed 3m
- To prevent ponding of borrow pit from rainwater, the Contractor shall ensure that all borrow pits are self-draining throughout (when operational and after being reinstated).
- As much as possible, spoil material shall be spoiled in borrow pits when no longer in use. The Engineer, prior to approving a new spoil area, shall make sure that there is no exhausted borrow pit nearby the proposed spoil areas or there is no possibility of using a nearby borrow pit
- All borrow pits shall rehabilitated by trimming their side slopes to at least 1:3, properly landscaped, their beds flattened to the satisfaction of the Engineer, before a TOC is issued to the Contractor, as required by Clause 1703(e) of the Standard Specifications for Road Works, 2000.
- The minimum distance from the road from any borrow pits shall be 100m. The minimum distance from borrow pits to a dwellings area shall be 500m, while for a quarry the minimum distance shall be 1km
- Maximum depth of quarry face shall be 10 m as specified by Mining regulations and the quarry face shall be benched to 4m high and at least 4m wide

#### **7.2.2.6 Soil erosion**

The following measures shall be applied to mitigate the impact due to soil erosion:

- Minimize soil disturbance by avoiding unnecessary clearing of vegetation

- Control measures for runoff, such as the use of catch water drain, cut off drains, berms and drainage swales in the upper slope of the borrow sites shall be put in place to redirect surface runoff away from access routes and pit walls
- The Contractor shall not be allowed to borrow construction materials within a buffer of 60m from any water course as stipulated by Water Resources Management Act (2009) and Environmental Management Act (2004). The minimum distance from a borrow pit or quarry to water course shall be 100m. In addition, as much as it is practical, the Engineer shall not approved any proposal by the Contractor to borrow material from an area established by the Engineer to have a likelihood of causing serious soil erosion and siltation of a water course.

#### **7.2.2.7 Impact to Wildlife Areas**

To mitigate the impact:

- As stipulated by Section 35 of Wildlife Management Act (2009), under any circumstance, the contractor shall not be allowed to borrow materials from Moyowosi game reserve and Makere forest reserve without a written consent by the management of the game reserve.
- The Engineer shall approve borrowing of material from village forest reserves only after he is satisfied that procedure the Contractor has a permit to borrow material from the authority to manage the wildlife and forestry protected areas.

#### **7.2.1.8 Impact Related to Blasting, Drilling and Rock Excavation**

To mitigate impacts related to blasting and rock excavation, the following practices shall be followed:

- The Contractor shall acquire, transport, store, use, and manage explosives in accordance with Explosive Act: Explosives shall be stored in a magazine licenced by Commissioner of Mines, explosives shall be handled and blasting done by a person holding a blasting certificate issued by Commissioner of Mines
- Drilling sites for blasting shall clearly be marked with flags
- Whenever possible, large charges shall be divided into smaller multiple time delayed charges
- Vehicles and, machinery and equipment shall be kept in good working condition and free of fuel leaks
- Blasting shall be done between 08:00 hrs and 16:00 hrs. Under any circumstance, the Contractor shall not carryout blasting during the night

#### **7.2.3 General Earthworks in Road and Culverts Construction**

##### **7.2.3.1 Loss of Vegetation**

To mitigate the impact due to loss of vegetation, the following shall be implemented:

- During construction of the project road, and diversion road, and access roads, fertile top soils shall be well stockpiled so that it is used for top soiling back slopes and other cleared sites as well as reinstatement of borrow pits to promote the growth of grass as discussed in sub-section 7.2.3.2
- As much as possible, the contractor shall avoid unnecessary removal of vegetation; especially the identified riparian and riverine trees by confining clearing works to within the working a corridor of 12m - 15m wide.



- All the construction affected surfaces shall be rehabilitated by filling and grading. The affected surfaces will be reinstated by re-vegetating with natural species and forestry species appropriate to the area as instructed by the Engineer.
- A total of 3,000 trees shall be planted to compensate the indigenous trees that will be lost due realignment of the existing road. The forest officer for Kasulu, Kibondo, and Kakonko districts shall be involved in the identification of tree species suitable for the area for compensation purpose. It is recommended that the local communities along the project road are involved in the preparation, rising of nurseries of seedlings, planting of trees, as well as management of young trees. This will create employment for the local people
- Cleared trees shall be left along the road for the local people to use as firewood. Under any circumstance the Contractor shall not be allowed to use cleared trees either for firewood or any other construction activity such as making marker pegs. ESIA expert's past experience has shown that in their effort to cut down costs, many Contractors tend to cut trees to make marker pegs. It becomes very difficult to establish whether the pegs are made from trees cleared from the road side or trees are cut deliberately aletly to make marker pegs.

#### 7.2.3.2 Roadside Soil Erosion

The following measures shall be implemented to prevent and control soil erosion:

By controlling erosion as follows:

- All high fills (above 2.5m) and cuts not paved or covered by permanent structures shall be grassed after placing at least 10cm of top soil immediately after construction. The Engineer shall determine sections that require grassing and instruct the Contractor accordingly as shown by Plate 2 and Plate 3.
- Top soil of at least 10cm shall be placed on all sections with shallow fills and cuts (less than 2.5m) not paved or covered by permanent structures to promote the growth grass immediately after construction. The Engineer shall determine sections that require top soiling and instruct the Contractor accordingly
- The extent of disturbance shall be limited and the soil surface shall be stabilized immediately
- Existing vegetation shall be preserved to the extent possible, by confining construction activities to road alignment

By controlling surface run off by:

- Diverting storm water from undisturbed area to avoid disturbed areas: Catch water drains shall be excavated on upper sides of slopes to collect and direct runoff water away from cut slopes
- Long slopes shall be broken with temporary diversion to reduce the velocity of runoff
- As much as it is practical grades (slopes) shall be maintained to minimize the velocity of sheet flow over disturbed area and promote evaporation and infiltration of storm water directly into the ground



- Barriers such as check dams, sediment traps, or silt fence<sup>1</sup> shall be installed to control erosion on long steep slopes adjoining water courses. Gabions will be installed to prevent formation of erosion gully along drainage channel in steep slopes.
- On high fill sections, kerb stones shall be installed on the edges of carriageway to direct runoff from pavement to down chutes which shall be installed at determined intervals
- River systems shall be protected
- As much as possible, areas adjoining water course shall be left undisturbed as buffers

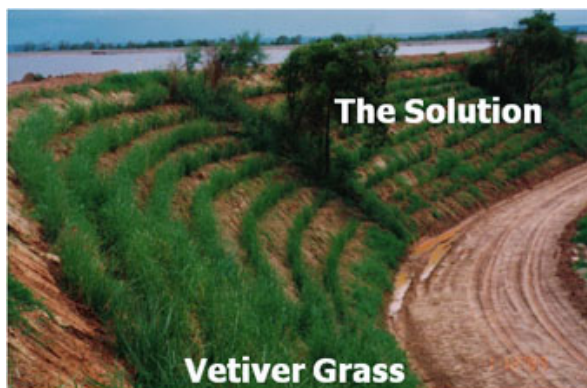


Plate 2: Slope stabilization of a cut embankment



Plate 3: Slope stabilization of a fill embankment

#### 7.2.3.3 Displacement and Loss of Properties

To mitigate the impact due to loss of properties, pursuant to Land Act (1999), Land Acquisition act, 1967 (RE 2002), Road Act (2007), Road Management Regulations (2009), and Land Regulations (compensation claims and Assessment of the value of land for compensations), 2001, all the affected properties between 22.5m and 30m (both sides) from the centreline of the road existing road shall be compensated before commencement of construction works. In addition, properties that are located outside the old RoW of 45m, but will be affected due to alignment of the road shall be compensated accordingly as they are entitled for compensation. The buildings and other properties, including exotic tree forests along the road that are entitled for compensation will be identified and their values established by a Land Valuer in accordance with the Law. After valuation, the PAPs shall be compensated within 6 months after values of their properties have been established.

In addition, affected people shall be given advance notice on demolition and be given time to salvage useful materials from their buildings.

#### 7.2.3.4 Disruption/Destruction of Public Utilities and Service

##### Disruption of Domestic water supply Systems

To mitigate the impact on water supply utilities:

- The Contractor shall consult water supply authorities from respective road section to establish exact locations of water supply utilities within the RoW

---

<sup>1</sup> A silt fence is a temporary barrier designed to retain sediment on the construction site or wherever there is bare disturbed earth. It is designed to filters out sediment from construction run-off, yet allows clean water to pass through.

- The contractors shall work carefully not to damage domestic water utilities along and across the road.
- Where is necessary to excavate the road beyond the pipe lines depth, the contractor shall carefully remove pipe lines which cross the road before commencement construction works. The utilities shall be reinstated immediately after completion of earth works in respective road section. The costs of relocating pipe water supply utilities and installing service ducts shall be borne by the project
- The contractor shall provide ducts for domestic water pipe line crossing for future expansion/ extension of the existing pipe lines networks or new project as instructed by the Engineer. The Engineer shall work closely with District Water Engineer to establish locations of service ducts.

### **Disruption of Fibre Optic Cable**

To mitigate the impact due to disruption of fibre optic cable:

- The Contractor in consultation with the Engineer shall liaise with TTCL authority to obtain drawings or establish exact locations of the cable
- The Contractor shall take diligent care not to damage the cable during construction
- In the event that the cable is damaged, the Contractor shall, without delay inform TTCL authority

### **7.2.3.5 Generation of Noise and Vibrations by construction Equipment and Vehicles**

To mitigate the impact due to noise and vibrations, the measures proposed in Sub-Section 7.2.2.2 shall be applied here as well. In addition, as much as possible, sitting of stationery equipment near sensitive area such as wildlife home range and animal migration corridor shall be avoided.

### **7.2.3.6 Deterioration of Ambient Air Quality by Dust and Fumes**

To mitigate the impact due to air quality deterioration due to dust, the measures proposed in Sub-Section 7.2.2.3 shall apply.

### **7.2.3.7 Generation of Solid and Liquid Wastes**

The following measures will be applied to mitigate the impacts due to deterioration of visual and scenic by solid wastes:

- Top soil shall be stockpiles so that it is used for top soiling to promote regeneration of vegetation as specified by Clause 3102(d) of Standard Specifications
- Excess (spoil) material, excavated from the road shall be spoiled in areas only approved by the Engineer outside the RoW as specified by Clause 2102 of Standard Specifications. The height of spoil shall not exceed 2.5m
- Spoil areas shall be vegetated with indigenous tree species as approved by the Engineer
- Prior to demolishing buildings in the RoW, owners of the properties shall be allowed to salvage valuable materials such roofing iron, windows, doors, and timber.
- Non degradable demolition and material wastes such as concrete, sand, earth, blocks, stones, gravel, and aggregates shall be used to fill pits during their reinstatement. During site reinstatement, the contractor shall add soil to any area backfilled with blocks to fill

large voids and top prevent future settlement. The backfilled areas shall be capped with at least 60cm of soil, contoured to match the surrounding grade, covered with top soil, and re-vegetated.

- Reinforcement bars from the demolition of hydraulic structures (culverts) shall be disposed of as described earlier in sub-section 2.3.2.5.
- Degradable wastes such as heasian bags and boxes, and wooden boxes shall be disposed of by controlled burning or buried on site.
- Cleared trees shall be left on the road side for the local people to collect them for fire wood or other uses. The Contractor shall not be allowed to use cleared trees as a source of energy.
- Liquid wastes, such as grey water (domestic liquid wastes) shall be directed to onsite sanitary treatment system (septic tanks and soak away pits). Mobile sanitation facilities or pits latrines shall be provided by the contractor at all work sites other than the camp that last for at least a month.

#### 7.2.3.8 Road Traffic Congestion and Accidents

The impact due road traffic congestion and accidents shall be mitigated as follows:

- Where a new cross drainage structure (culvert and bridge) has to be constructed at the same location as the existing structure then the Contractor shall avail a suitable temporary crossing structure to accommodate traffic and flow of water prior to demolishing the existing crossing.
- The Contractor shall devise proper traffic management, including deploying traffic management personals at all active construction sites.
- The Contractor shall appropriately post night-reflective traffic warning signs (speed limit, speed humps, works ahead), affixed with reflective hazard warning tape, to notify the public from distant about potential dangers
- The Contractor shall separate working area from public traffic by providing physical barriers such as reflective barricade blocks (affixed with reflective hazard warning tape), guardrails, reflective hazard warning tape, and diversion roads or walkways) and the Contractor shall use guards to protect employees and the communities from physical hazards.
- All moving plants and machinery will be shielded for safety reasons. In addition, warning signs [stating “**HATARI**” (**DANGER**), “**TAHADHARI**” (**WARNING**)] shall be installed to give warning on potential dangers.
- The Contractor shall design and implement a training programme to create road safety awareness for all the schools (refer to Table 21) along the project road
- Temporary speed restraining humps shall be installed near settlements

The barriers and guards shall be used to:

- Reroute pedestrian and vehicular traffic to completely avoid a construction site.
- Guard any permanent ground openings, deep excavation, or pits into which a person or vehicles could fall
- Guard moving or parked construction machinery

- Protect work immediately at the end of the activity or at the end of each day.

#### **7.2.3.9 Increased Consumption of Energy and Natural Resources**

Measures to reduce energy consumption during construction stage of the project will include:

- Limiting unnecessary idling of construction equipment as well as adequately tuning of engines of the construction equipment and vehicles to minimize fuel consumption).
- Encourage carpooling (sharing of vehicles – although this cannot be imposed to the Contractor) among construction workers.
- The Contractor shall not be allowed to use firewood and charcoal for boiling of bitumen. In addition, the Contractor shall not be allowed to use firewood (including trees cleared from borrow pits and road side) and charcoal as sources of energy for cooking.
- The Contractor shall not be allowed to cut trees or use trees cleared from road side or borrow pits to make markers pegs

#### **7.2.3.10 Resources Use Conflict**

To mitigate the impact due to resource use conflict, the Engineer shall not approve sitting of construction camp site in the neighbourhood of village settlements and the camp shall be totally catered by the contractor. The camp shall be furnished with all the necessary social services to minimize interactions of the workers with the local people. In addition water resources that have or will be identified to be used by the local people as sources of domestic water shall not be used by the Contractor for construction works.

#### **7.2.3.11 Reduction in Rivers Flows**

To mitigate the impact due to reduction of water flow for domestic purposes:

- Under any circumstance, the contractor shall not abstract water from water resources that are sources of domestic water for the local people for construction works. These resources include rivers Nyakasanda and Nyamguluma, a pond at Nyakibaya village.
- The Contractor shall obtain permits to abstract water for any river he intend to use for construction activities in accordance with Section 43 of Water resources Management Act, 2009.

#### **7.2.3.12 Impact to Cultural Sites**

To mitigate the impact, the Contractor shall work carefully so as not to cause any damage to the identified grave yard at Mvugwe village. In the event that graves are identified within the RoW, the graves shall be deconsecrated in accordance to Graves (Removal) Act of 1969 as well as UNESCO's code of conduct, i.e. according to the rights of traditional of the people claiming ownership. The graves shall be relocated by excavation to a place selected by the village governments. This shall be done right before commencement of the construction work, and shall be done in consultation with affected people/owners of the graves through village and religious leaders (where applicable) to avoid friction.

#### **7.2.3.13 Deterioration of Visual and Scenic Quality**

To mitigate the impact of deterioration of scenic and visual quality due to dust generation, the Contractor shall regularly sprinkle water on the diversion roads across settlements, active construction sites, as well as access to roads to materials borrow sites. To minimize the impact due

to deterioration of scenic quality due to cuts, the design has specified that all back slopes shall be well trimmed to at least 1:2.

#### 7.2.3.14 Pollution of Nengo Dams by Sedimentation

To mitigate the impact:

- The Contractor shall not be allowed to dispose of spoil or excess material along the project road, but shall do only at areas that have been approved by the engineer.
- Catch water drain shall be excavated on the upslope side of the road to direct runoff away from the dams.

### 7.2.4 Construction of Cross Drainage Structures

#### 7.2.4.1 River Bank Erosion during Riparian zone Construction

To mitigate the impacts, the measures proposed in sub-sections 7.2.3.2 shall be applied. In addition, disturbed river banks, and heads in the neighbourhood of culverts shall be stabilized by planting grass.

#### 7.2.4.2 Surface Water and Soil pollution

The impact due to pollution of water course and soil shall be mitigated by good working practice. The contractors' construction activities shall be performed by methods that will prevent entrance, or accidental spillage of solid matter, contaminants, debris and other pollutants and wastes into surface and ground water bodies.

The following other measures shall be implemented by the Contractor to mitigate the impact due to pollution of soil and water courses:

- In accordance with Clause 1706(a) and (b) of Standard Specifications the Contractor shall comply with all applicable Tanzanian laws, orders, regulations (Sections 34 and 39 of Water Resources Management Act and sections 6, 106, 109, and 110 of Environment Management Act), and water quality standards concerning the control and abatement of water pollution.
- In accordance with Clause 1706(b) of Standard specifications, if wells or other water sources, nevertheless, are polluted, it is the responsibility of the Contractor to compensate for this and provide the consumers with clean drinking water transported through pipes from an unpolluted source if required in the opinion of the Engineer.
- Whenever practical, the Contractors shall isolate concrete works from watercourses
- Concrete handling equipment and vehicles shall be washed down in an area that is isolated from the watercourses so that the toxic leachate is not allowed to enter the watercourse
- As much as it is practical, servicing and/or re-fuelling of equipment shall be restricted at the contractor's yard.
- Oil containers shall be kept properly on concrete containment (secondary containment) built in such a way that spilled oils can be easily recovered
- All construction equipment like excavators working near the riverbanks shall be well serviced to ensure that there is no oil leakage



- Excavated materials and other construction materials shall not be stockpiled or deposited near or on stream banks, or other water course perimeters where they can be washed away by high water or storm run offs or can in any way encroach upon the water course itself

#### 7.2.4.3 Modification of Surface and Ground Water Regime

##### Surface water flow modification

The impact due to modification of water flows has been addressed in the design through proper design of culverts to ensure that they are capable of sustaining possible peak water flows. To minimise impacts on rivers flows, construction in river beds and along river banks will be done during dry seasons. In addition as much as possible, widening of river banks shall be avoided

##### Modification of water table

The impact due to modification of water table has been considered in the design of road pavements. A study of boundaries of floodable zones has been used in the design to ensure adequate cross drains to minimise ponding on one side of the embankment. However, it is strongly recommended that fill materials should be borrowed from raised hillocks rather than adjacent to the road alignment.

#### 7.2.4.3 Generation wastes

The impact shall be mitigated by disposing the wastes as follows:

- Concrete wastes and steel reinforcement bars shall be disposed of as described in sub-section 2.3.2.5
- Hard stone shall be disposed of by reuse by the Contractor, either for protection works or rock fill works
- Old culverts shall be transported to Kigoma TANROADS regional office for future reuse.

#### 7.2.5 Construction of Roadside drainage Systems

##### 7.2.5.1 Increased Risk of Roadside Soil Erosion

To mitigate the impact, measures proposed in sub-section 7.2.3.2 shall be applied. In addition:

- All line drain sections with slopes steeper than 4% shall be lined with concrete or stone masonry material.
- Areas of ground surface clearance (exposed soil) will be minimised by re-vegetating with natural vegetation. In addition, during excavation and grading, top soils will be stored for reuse on slopes to form top soil
- Unnecessary disturbance of sensitive areas like steep slopes shall be avoided
- To prevent formation of erosion gullies along drainage channels areas with steep slopes along the road, especially, the drains shall be extended far from the road and protected by gabions
- Speeds of storm water flows, especially for side drains will be reduced by constructing erosion checks, along all steep slopes

- As much as it is practical, existing vegetation shall be preserved to the extent possible, by confining construction activities to road alignment

#### 7.2.5.2 Disruption of Community Access to their Dwellings and Business Areas

To abate the impact due to disruption of community access:

- The contractor shall provide temporary/ permanent concrete slabs across line drain to enable pedestrians gain access to their business and residential premises at areas that shall be approved by the Engineer.
- The road design has provided permanent access culverts to enable motorists gain access to their feeder roads

#### 7.2.6 Concrete Works and Construction of Cement-stabilized Layers

##### 7.2.6.1 Health Problems Associated with Handling of Cement and Concrete

The following measures will be followed in handling and using cement and concrete safely:

##### **Personal protection**

To protect skin from cement and cement mixtures, workers working in severe cement/concrete environment shall be equipped with:

- Alkali-resistant gloves
- Coveralls with long sleeves and full-length trousers (pull sleeves down over gloves and tuck pants inside boots and duct-tape at the top to keep mortar and concrete out)
- Waterproof boots high enough to prevent concrete from flowing in when workers must stand in fresh concrete
- Suitable dust/respiratory protective gear (dust masks) when cement dust can't be avoided
- Suitable eye protection gears where mixing, pouring, or other activities may endanger eyes (minimum - safety glasses with side shields or goggles, under extremely dusty conditions, tight-fitting unvented or indirectly vented goggles).

##### **Work practices**

The contractor shall ensure that workers:

- Work in ways that minimize the amount of cement dust released
- Mix dry cement in well ventilated areas
- Make sure to work upwind from dust sources
- Where possible, use ready-mixed concrete (mixing by concrete batch plant) instead of mixing on site
- When kneeling on fresh concrete, use a dry board or waterproof kneepads to protect knees from water that can soak through fabric
- Remove jewellery such as rings and watches because wet cement can collect under them



---

## Hygiene

The contractor shall ensure that construction workers adhere to the following:

- Clothing contaminated by wet cement is quickly removed. Skin in contact with wet cement is washed immediately with large amounts of cool clean water
- Do not wash hands with water from buckets used for cleaning tools
- Provide adequate hygiene facilities on site for workers to wash hands and face at the end of a job and before eating, drinking, smoking, or using the toilet. Facilities for cleaning boots and changing clothes should also be available at the campsite

### 7.2.6.2 Soil and Water Pollution by Concrete Slurry and Concrete Wastewater

To mitigate the impact due to possible leakage of concrete wastewater the contractor shall make sure that:

- Concrete slurry or wastewater is not allowed to enter the storm water system
- Concrete slurry and wastewater are collected or diverted to grass or bare soil.
- Slurry control is put in place before concreting is started
- To divert run-off using sandbags, soil or other materials, to a grassed area, pit or bare ground to soak in.
- The area of grass/soil is big enough to deal with the volume of wastewater produced.

## 7.2.7 Construction of Road Pavement

### 7.2.7.1 Health Problems Associated with Handling of Cement and Wet-cement Products

Mitigation measures for health problems associated with handling of cement and wet cement products have already been discussed in sub-section 7.2.6.1

### 7.2.7.2 Deterioration of Ambient Air Quality by Bituminous Fumes

To mitigate the impact due to deterioration of ambient air quality due to bituminous fumes the following shall be observed:

- Bitumen processing facilities (bitumen heater and chipping pre-coating) shall be located in an open, well-ventilated area to minimize the concentration of bitumen fumes
- During bitumen spraying, apart from coveralls, workers shall be equipped with appropriate respirators

### 7.2.7.3 Health Problems Associated with Hydrated Lime

The impact shall be mitigated by:

Safe handling/ storage of material:

- Handling: Keep in tightly closed plastic or non-aluminium metal containers. Protect containers from physical damage. Avoid direct skin contact with the material.
- Storage: Store in a cool, dry, and well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture. Do not store or ship in aluminium containers

Exposure control/ personal protection:

- Provide ventilation adequate to maintain Permissible Exposure Limits (PELs).
- Respiratory protection: Use National Institute for Occupational Safety and Health (NIOSH)<sup>2</sup> approved respirators if airborne concentration exceeds PELs.
- Skin protection: Use appropriate gloves and footwear to prevent skin contact. Clothing should fully cover arms and legs. Should lime get inside clothing or gloves, remove the clothing and the lime promptly.
- Eye Protection: Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.
- Others: Eye wash fountain/stations and emergency showers should be available

The following first aid measures shall be followed:

- Eyes: Immediately flush eyes with generous amounts of water or eye wash solution if water is unavailable. Pull back eyelid while flushing to ensure that all lime dust has been washed out. Seek medical attention promptly if the initial flushing of the eyes does not remove the irritant. Do not rub eyes.
- Skin: Brush off or remove as much dry lime as possible. Wash exposed area with large amounts of water. If irritation persists, seek medical attention promptly.
- Inhalation: Move victim to fresh air. Seek medical attention. If breathing has stopped, give artificial respiration.
- Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel

## 7.2.8 Operations of a Construction Camp

### 7.2.8.1 Generation of Solid and Liquid Wastes

To mitigate the impacts due to generation of wastes, the generated wastes shall be treated and disposed as describe in sub-section 2.3.2.5.

In addition the Contractor shall comply with section 32 of Environmental Management (Hazardous Wastes Regulations, 2008) which requires that all biomedical waste be managed and handled in a manner that will not adversely affect public health and the environment. The Contractor shall handle the medical wastes in a safe manner before transporting it to a nearby medical waste incineration facility.

### 7.2.8.2 Fire and Explosion Risks

To mitigate impact due to possible fire and explosion, safe working environment shall be exercised. This shall include, but not limited to:

- The Contractors shall maintain appropriate fire extinguishers within easy access at all work areas

---

<sup>2</sup> National Institute for Occupational Safety and Health (NIOSH) is the United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

- The Contractors shall recruit Safety Officers who will be responsible for training of all workers how to use fire extinguishers and ensuring safety measures are in place at all work sites
- The Contractors shall prohibit smoking in hot work areas (welding, cutting, and grinding)

#### 7.2.8.3 Risks of Leakage of Hazardous Materials

The following measures shall be implemented to mitigate the potential impact due to leakage of hazardous chemicals:

- Fuel (petrol and diesel) shall be transported by special fuel transport tankers and stored in onsite tanks.
- Lubricating oils, paints, solvents, grease shall be packed in barrel and tins and will be transported by fire extinguisher equipped trucks.
- Underground fuel storage tanks shall not be allowed
- Fuel storage tank(s) at the campsite will be installed in a concrete containment.
- Fuelling stations, equipment service bays and pits shall be concrete paved and provide with drains and oil-water separators
- Refuelling at campsite will be done by a pumps
- Refuelling of construction equipment shall be closely supervised to avoid leaks or releases. Should a spill occur during refuelling, it shall immediately be properly cleaned up.
- Liquids such as fuel, lubricants, and bituminous materials shall be properly handled to avoid leakages to the ground/soil. Lubricating oils stored onsite shall be contained in barrels. All power generators shall be kept within secondary containment to contain any oil or fuel or leak. The barrels will be stored in a secondary containment area to contain any spillage, or in temporary warehouse
- When filling machinery and equipment with oils, the oil shall be pumped from a tank within a temporary secondary containment area to contain any spillage.
- Chemicals such as paint, solvents, and concrete additives shall be stored in a locked utility shed or secured in a fenced area.
- Paint and solvents containers shall be tightly sealed and properly stored to prevent leaks or spills. Unused paints shall be disposed of in accordance with applicable regulations. Spray painting shall not be done on windy days, and drop cloths shall be used to collect and dispose of drips and over-spray associated with all painting activities.
- In the event of spill or leak of hydraulic fluid, oil and other petroleum products, they will immediately be cleaned up to prevent discharge of these fluids into the ground or storm water runoff. Absorbent materials such as polypropylene boom and pads saw dust will be kept on hand for clean-up of spilled liquids on pavement, water, and soil. In the event that there is oil spill on the soil, the soil shall be excavated and treated by incineration.

#### 7.2.7.4 Generation of Human Sanitary Wastes

The impact due to improper disposal of human sanitary wastes shall be mitigated by construction of sanitation facility at the camps. The type of facility will be of water closet (flush type). The sanitary waste water shall be treated and disposed of on-site by septic tank – soak away method.

## **7.2.9 Marital and Social Conflicts**

The impact due to marital and social conflicts will be a residual impact as it cannot be mitigated at the project level.

## **7.2.10 Increase in unwanted Pregnancies**

The mitigation measures proposed in sub-section 7.2.12.2 shall be used to mitigate the impact due to increased unwanted pregnancies. This will be a residual impact because it is impractical to prevent the increase in unwanted pregnancies completely.

## **7.2.11 Poaching of Wildlife by Construction Workers**

The impact due to illegal hunting by project workers shall be mitigated by creating awareness among Contractor's staff not to be involved in illegal hunting of wildlife.

## **7.2.12 Triggering of Child Labour and School Dropouts**

To mitigate the impact, it is recommended that there should be close collaboration between parents, teachers, and village governments to reduce truancy of school children. The Contractor shall not employ people under the age of 18 years.

## **7.2.13 Occupational Health and Safety Hazards**

### **7.2.13.1 Physical Hazards**

#### **7.2.13.1.1 Falling of People, Objects or materials**

Measures to prevent workers fall from work platform will include:

- Providing toe boards and guard rails that will be fitted to the outer side and ends of the working platforms and so secured so as to prevent their outer ward movement. All scaffolds will be close boarded (boards placed with no space between adjacent boards).
- Areas that are slippery after spillage shall be immediately cleaned and sanded as necessary. Chipping from concrete and dust from materials shall be cleaned and not allowed to accumulate
- Materials deposited on the scaffold platform shall be neatly stacked and a clear passageway shall be maintained between the materials and the edge of the platform
- When people are likely to suffer fall of 1 m or more into an excavation, rigid guard rails or barriers of at least 0.9 m with a toe board and an intermediate rail to reduce any unprotected gap to 0.5 m or less shall be put in place. When people are likely to fall into a shallow trench of less than 1 m depth, warning tape shall be put in place to prevent trip and fall will be used

Measures to prevent workers fall from height due to scaffold collapse will include:

- Prevention of overloading including avoiding accumulation of materials and stacking materials
- Scaffold board shall be carefully examined before use to be free from unacceptable faults, such as large knots, knot clusters, large splits

- Scaffolding erection shall be done by an experienced scaffolders and competent supervision

Measures to prevent fall hazard while using ladders

- When used for access, ladders shall be securely tied at their upper ends
- It shall be made sure that they stand on a firm and level ground
- The rung and users footwear shall be kept clean and free from slippery mud, for example
- Along ladder shall be secured to prevent sway
- When works is to be performed from the ladder, when the ladder cannot be tied at the top or secured at the bottom, to prevent movement, the ladder shall be footed
- The ladder shall extend beyond the place of landing by at least 1 m unless adequate handhold is available
- Ladders with missing or defective rungs shall never be used
- Ladders shall always be inspected to identify defects and timber ladders shall not be painted since this may hide defects – transparent varnish or linseed oil will be used as a preservative

Measures to prevent accident due workers working below platform being struck by falling object/ material will include:

- Whenever there is any possibility of people below being struck by materials or tools falling through a gap in the working platform, on all scaffolds the boards will be laid close boarded (side by side) and end without space between the edges of adjacent boards.
- Workers under the platform shall wear safety helmet and shoes at all times

#### **7.2.13.1.2 Stepping on or striking against Objects**

Measures to prevent hazards resulting from stepping sharp objects or striking/ tumbling on objects shall include:

- Work areas shall maintain good housekeeping all the time to prevent possible accidents due to slipping, tumbling, or striking against an object
- The Contractor shall equip all the workers with steel-toe safety shoes

#### **7.2.13.1.3 Manual Handling Injury – Overexertion**

To prevent manual handling injury, the Contractor shall ensure:

- Team handling e.g. using two or more persons
- The use of mechanical aid such as hydraulic crane, wheelbarrow that requires the use manual loading and unloading.
- Where applicable, breaking down the load into manageable components
- Using persons strong enough for the task to be undertaken

#### **7.2.13.1.4 Workers being Struck or Crushed by Mobile Equipment**

To prevent workers being struck by excavating machinery

- During excavation cycle, no person shall be allowed in the vicinity of the machine.
- People in the trench shall be well away from the face and those at ground level kept outside slewing radius of the machine.
- When the excavator operator cannot see all parts of the jib and bucket during the excavation cycle, or when the machine used as crane, to lower materials an experienced banks man shall be used to guide the operator and to ensure that other workers remain well clear of the operation being carried out
- All the workers on site shall be provided with on-site with training in site specific safety procedures and in hazards they may encounter at the site
- Barriers shall be used to separate workers, pedestrians, and vehicles from moving equipment
- Safety plans shall be continually to address changing conditions at the worksites
- Workers shall not be allowed to approach machinery without first signalling the operator to shut down the equipment and receiving acknowledgment from the operator
- Workers shall be provided and wear such as high visibility reflective vests and hard hats, to increase visibility

#### **7.2.13.1.5 Transport**

Measures to mitigate hazards associated with transport of materials will include limiting speeds of construction vehicles to 60km/hr and ensuring that construction vehicles are properly serviced.

#### **7.2.13.1.6 Electrical Shock**

The Contractor shall ensure that all electrical control panels and cable are properly insulated and earthed.

#### **7.2.13.1.7 Fire and Explosion**

Measures to prevent fire and explosion hazard have already been discussed in sub-section 7.2.8.2.

### **7.2.13.2 Health Hazards**

#### **7.2.13.2.1 Chemical Health Hazards**

##### **Contact with skin**

Measures to prevent hazards associated with contact with hazardous materials have been discussed in sub-sections 7.2.6.1

##### **Inhalation of harmful Chemicals**

Measures to prevent inhalation of harmful chemicals will include personal protection and work practices that have been discussed in sub-section 7.2.6.1.

---

#### **7.2.13.2.2 Physical Health Hazards**

##### **Noise**

Measures to prevent physical health hazard due to noise have been presented in sub-section 7.2.2.2 and 7.2.3.5.

##### **Manual Handling**

Measure to prevent physical health hazard due to manual handling have been discussed in sub-section 7.2.12.1.3.

#### **7.2.13.2.3 Biological Health Hazards**

To prevent biological hazards related with sanitation and unavailability of safe drinking water, the Contractors shall:

- Provide adequate sanitation facilities at work site.
- Sanitary waste will disposed of by the use of toilets with septic tanks and soak away pits
- Provide adequate safe drinking water to his workers at all work sites
- Food waste collection bins with lids shall be provided at relevant locations at the camp. The bins shall be emptied on regular basis to pits

The waste management plan described in Environmental and Social Management Plan (ESMP) shall be followed in the management of different types of wastes

To mitigate the impact due to exposure to ionizing radiation, the Contractor shall comply with Occupational and health and safety Act (2003), Atomic Energy Act (2003) and Atomic Energy (Protection from ionizing radiation Regulation, 2004) by among others:

- Prior to using the gauge, obtaining a licence to own and use it
- Store, transport, and use the nuclear gauge in accordance with the law and regulations
- Ensure that only workers trained to use the gauge in accordance with law are allowed to use it
- Ensure that the gauge is used in manner that protect the public as specified by the law and regulations
- Appoint a radiation officer, whose duties and responsibilities are as specified by the law and regulations
- Ensure that records of exposure for users of the gauge are kept and available for inspection

#### **7.2.13.2.4 Increased Transmission of STIs/HIV**

To mitigate the impact due to increased transmission of STIs/ HIV, there shall be a HIV alleviation program. Each of the Contractors shall hire an organization (Sub-Contractor) experienced in the provision of HIV/AIDS awareness and prevention activities to prepare and implement HIV alleviation program on their behalf. The Sub-contractors shall work closely with various stakeholders (including communities and their leaders, schools and health centres, civil societies and CBOs) to have an educational awareness campaign during mobilization,



construction, and demobilization phases of the project in order to prevent the further spread of HIV/AIDS due to road construction activities.

In addition, in accordance with sections 134, 135, and 136 of Factories (Building Operations and Works of Engineering Construction) Rules, 1985, the Contractor will have the obligations to:

- Provide first aid facility at every work site
- Provide and maintain in a good order and clean condition at or near the site of operation or work and conveniently easily accessible a properly constructed and suitable a first-aid room.
- Provide adequate number of trained and qualified first aiders for rendering the service to workers.

## **7.3 DEMOBILIZATION PHASE**

### **7.3.1 Generation of Solid Wastes**

The impact shall be mitigated as follows:

- The above wastes shall be treated and disposed of as described in sub-section 2.3.2.5
- Prior to demobilization, the Contractors shall submit to the Engineer for review and approval a closure plan for the camp (including fuel storage facility, workshop, pre-cast yard), bitumen storage and heating facilities. The plan shall outline steps that the Contractors shall adopt to reinstate the facilities, including disposal of old structures and all facilities that were used in the camp which would no longer be needed and are likely to be of environmental and health hazard.

### **7.3.2 Deterioration of Ambient air Quality**

The impact due to pollution of ambient air by dust shall be mitigated by sprinkling water on the access roads to dump sites as well as covering transporting trucks to minimize escape of wastes from the trucks wastes. The workers at the demolition site shall be provided and ensure that they use dust masks to prevent them from inhaling polluted air.

### **7.3.3 Loss of Employment and Economic Activities at the End of the Project**

The impact due to loss of employment at the closure of the project will be a residual impact as cannot be mitigated at the project level. To manage the impact, while recruiting workers the the Contractors shall inform the expected duration of their employment. In addition, employment and labour relations act shall be adhered to by the Contractors during termination of redundant workers.

---

## **7.4 OPERATION AND MAINTENANCE PHASE**

### **7.4.1 Positive Impacts**

#### **7.4.1.1 Improved Ambient Air Quality of the Main Road Alignment and Existing Bypass Sections**

To enhance the positive impact due to improvement of ambient air quality people along the project roads shall be encouraged to plant strip street trees on road sides which will provide cleaning effect, alleviating air quality deterioration effects.

#### **7.4.1.2 Improved Hydrology and Drainage**

The impact due to improved hydrology and drainage shall be enhanced by ensuring proper and timely maintenance of the road furniture facility, including de-silting of culverts and side drains.

#### **7.4.1.3 Reduction in Vehicle Operating Costs**

The impact due to reduced rate of consumption of energy consumption shall be enhanced by ensuring proper repair and timely repair of the project road.

#### **7.4.1.4 Reduced Rate of Energy Consumption**

The impact due to reduced rate of consumption of energy consumption shall be enhanced by ensuring proper repair and timely repair of the project road.

#### **7.4.1.5 Reduced Traffic Accidents**

The impact due to improved safety shall be enhanced by ensuring that repair and maintenance of the road, including its furniture such as road safety signs are done properly and on timely.

#### **7.4.1.6 Reduced Travel Time, and Comfort to Passengers**

The impact due to reduction in travel and cost shall also be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

#### **7.4.1.7 Improved road conditions**

Repair and maintenance will focus on activities that ensure the long-term serviceability of the road. The activities will pertain to the road pavement and its embankments, hydraulic and drainage structures and road furniture and where necessary, re-surfacing. All repair and maintenance works will virtually have positive impacts that will enhance the intended functions of the road and lengthening its life time, especially when it is considered that the number and scope of routine maintenance of the road will be greatly reduced.

#### **7.6.1.8 Impact to Forest and Wildlife Protected Areas**

#### **Improved Management of Wildlife and Forest Protected Areas**

The impact due to improved management of wildlife and forestry protected areas due to upgrading of the road will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

## Improvement of Tourism Industry

The impact due to improved tourism due to upgrading of the road will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

### 7.6.1.9 Improved growth of vegetation due to Reduced Generation of Dust

The impact due to improved growth of vegetation due to upgrading of the road will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

### 7.6.1.10 Improved Quality of Water Courses across the Road

The impact due to improved water quality will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

### 7.6.1.11 Improved connectivity and Exports of Goods between Tanzania-Burundi-and Rwanda

The impact due to improved water quality will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

### 7.6.1.12 Complementation of other Development Initiatives

The impact will be enhanced by ensuring that repair and maintenance of the road is done timely and properly.

## 7.4.2 Negative Impacts

### 7.4.2.1 Increased Traffic Accidents

To mitigate possible impact due to possible traffic accident:

- “Zebra” crossings with appropriate warning signs shall be put up at all accident black spots. Accident black spots are approaches to settlements, school children, and livestock crossings.
- Warning signs, a series of rumble strips followed by speed restraining humps shall be constructed on both approaches to settlements, school children (refer to Table 17) and livestock crossings
- Cattle crossings shall be provided. The Engineer shall consult village government leaders in determining locations of convenient livestock crossings
- In addition TANROADS shall launch awareness campaign in the use and road safety

The cost of provision of speed restraining humps is covered under the main design report.

- Bus bays (stops) will provided at all villages taking into consideration future growth of the villages
- In order to improve and maintain highway safety, safety barriers (crush barriers/guard rails) will be provided at the following sections:
  - i) High fills
  - ii) Steep side slopes
  - iii) Approaches to bridges
  - iv) Non-yielding light column, gantries and tress with diameter >18 cm

- v) Concrete Bumpers, solid concrete elements, culvert outlets, end of retaining walls

#### 7.4.2.2 Increased Pressure on Natural Resources

The impact cannot be mitigated at road project level. However, although the impact cannot be easily mitigated at project level, relevant local authorities can initiate environmental management measures. This may include proper land management, promotion of tree planting campaigns, proper enforcement of economic instruments charging fees or tax on forest products like charcoal, fuel wood, timber, etc.

Increased pressure on natural resources during the operation phase of the project will be a residual impact as cannot be mitigated at the project level.

#### 7.4.2.3 Increased Noise and Vibrations Pollution

The impact due to noise and vibrations during the operation phase of the project cannot be mitigated at the project level and therefore a residual impact.

#### 7.4.2.4 Facilitation of Poaching and Illegal Logging

The impact due to poaching during the operation phase of the project cannot be mitigated at the project level and therefore a residual impact. However, the wildlife and forestry management and Tanzania forestry authorities should effectively monitor and control access to and harvesting of wildlife and forest products. The co-operation of authorities with local people near the location of the resource should be strengthened, especially by enlisting village councils. In addition to that, legislations pertaining to management of wildlife and forestry should be enforced.

#### 7.4.2.5 Increased Cost of Living

The impact due cannot be mitigated at the project level and therefore a residual impact.

#### 7.4.2.6 Increased Rate of Crimes

The impact due cannot be mitigated at the project level and therefore a residual impact.

#### 7.4.2.7 Abuse of Road Corridor

To minimize the tendency of local people to encroach the road reserve, the design has included installation of concrete markers for end of road reserve.

#### 7.4.2.8 Interference with Smooth Traffic Flow

The measures to mitigate the impact due to interference of traffic flow in sub-section 7.2.3.8 shall be applied here as well.

#### 7.4.2.9 Deterioration of Ambient air Quality due to Emission from Vehicle

The impact due to deterioration of ambient air quality due to increase emissions from vehicles cannot be mitigated at the project level. This requires effort by the government to encourage and enforce measures to reduce vehicles pollution. This can be achieved:

Proper maintenance of vehicles: Proper maintenance of vehicles emission control systems not only limits harmful emissions, but also can improve fuel efficiency and vehicle performance extending the life of the vehicle. Care in storing and handling gasoline and other solvents also reduces evaporative losses to the atmosphere.

Use of low emission or fuel efficient vehicles: This includes the use of low carbon vehicles, use zero carbon vehicles (Battery-electric vehicles, plug-in hybrid-electric vehicles), and use of natural gas vehicles. These technologies can be used in passenger cars, trucks and transit buses.

Introduction of carbon tax: The government should consider introducing carbon tax for diesel vehicles, since diesel vehicles emit more carbon than gasoline vehicles.

#### **7.4.2.10 Contribution to Climate Change Effect due to Emissions of Green House Gases**

The impact due to contribution of the project to global warming during the operation phase cannot be mitigated at the project level. At the government level, the mitigation measures proposed in sub-section 7.4.2.10 above will apply here as well.

#### **7.4.2.11 Reduced Life Span of the Road due to Climate Change**

To mitigate the effect of bleeding of bitumen during the operation phase of the road, the design of the pavement has considered climate zoning, which determines the type of pavement and treatment to be used. The project area is classified in the dry zone (high temperature zone). The bitumen which has been proposed in the design is one which can sustain high temperatures. In addition, a low spray rate of bitumen has been proposed in the design to minimize bleeding at high temperatures. Regarding the treatment of sub base layer, MC-70 bitumen has been proposed to for priming during the stabilization of sub-base layer with cement. MC-70 has been proposed instead of MC-30 because it does not dry faster at high temperatures.

To prevent damages to concrete hydraulic structures resulting from high temperatures to hydraulic structures, the design has provided expansion joints to all box culverts to allow for free expansion when temperatures increases.

To prevent overtopping and failures of hydraulic structures during flooding, the design is based on 50 years (for bridges) and 25 years (for culverts) of flood return period<sup>3</sup>. It is therefore expected that the hydraulic structures will last for at least 50 years.

#### **7.4.2.12 Contribution to Depletion of Ozone Layer**

The effect to increased depletion of ozone layer cannot be mitigated at the project level and therefore a residual impact.

#### **7.4.2.13 Wildlife Road Kills**

The impact due to wildlife road kills across wildlife and forestry protected areas shall be mitigated by installing speed restraining humps as well as posting warning signs at both approaches to the game reserves in order to warn motorists to reduce speeds.

#### **7.4.2.14 Fragmentation of Settlements and impaired safety of pedestrians**

The effect of fragmentation of settlements shall be minimized by providing a series of access stairs. It will however remain as a residual impact as cannot be mitigated fully.

---

<sup>3</sup> A return period also known as a recurrence interval is an estimate of the interval of time between events like an earthquake, flood or river discharge flow of a certain intensity or size. It is a statistical measurement denoting the average recurrence interval over an extended period of time, and is usually required for risk analysis and also to dimension structures so that they are capable of withstanding an event of a certain return period (with its associated intensity).

## **SECTION 8: EXPECTED RESIDUAL EFFECTS AND ENVIRONMENTAL HAZARD MANAGEMENT**

### **8.1 RESIDUAL IMPACTS**

Sections 6 and this section have discussed potential impacts that would occur along the route as a result of different phases of the project road, and how the proposed mitigation measures would contribute to minimizing or eliminating the impacts. As discussed, not all the impacts can be fully mitigated and residual effects will be experienced by the environmental and social receptors affected by the project.

This section discusses and summarizes the potentially significant environmental and social residual impacts of the road project, i.e. those described as major and moderate. Where necessary, this section also identifies activities that will determine the nature or extent of particular residual impacts that are not yet fully defined.

#### **8.1.1 Generation of Noise and Vibrations**

(Related with impact in sub-sections 6.2.4, 6.3.2.2, and 6.3.3.5)

Generation of noise and vibrations will result from construction equipment and trucks during extraction, transportation and delivery of construction materials, as well as due construction activities, particularly earthworks. The impact will be of moderate significance for short periods in close proximity to dwellings during the day and evening.

Excessive noise and vibrations mitigation measures are already proposed and noise will be monitored at sensitive locations (e.g. settlements at which the criteria are thought to be at risk). If noise is likely to cause a nuisance at sensitive locations, additional noise suppression techniques will be considered, but may not be practical. Further measures to control the effect of such noise levels would include close liaison with the residents.

#### **8.1.2 Deterioration of Ambient Air Quality by Dust**

(Related with impact in sub-sections 6.2.3, 6.3.2.3, 6.3.3.6, 6.3.6.1, and 6.3.7.1)

Deterioration of ambient air quality by dust will mainly result from the following activities:

- Extraction of natural materials, particularly borrowing of fill materials, quarrying and crushing/ screening of hard stones
- General earthworks: excavation, filling, and compactions works during the construction of the project, diversion, and access roads
- Movements of construction equipment, particularly trucks and other light duty vehicles, as well as public traffic.
- Concrete works and laying of cement-stabilized layers

The impact will be of moderate significance for short periods in close proximity to active construction sites (borrow, quarry, crusher, and road sites) and dwellings during the day and evening.



Mitigation measures due to generation dust have already been proposed and dust level will be monitored at work sites and dwellings (at which the criteria are thought to be at risk). If dust level is likely to cause a nuisance at sensitive locations, additional dust suppression techniques will be considered. Further measures to control the effect of deterioration of ambient air quality by dust would include use of higher quality dust masks by workers and increased the frequency of water spraying on the diversion roads, and use of advanced dust suppression technique at the crusher plant such as the use vacuum pump technology to suck dust from screens.

### **8.1.3 Deterioration of Ambient Air Quality by Bituminous Fumes**

(Related with impact in sub-section 6.3.7.1)

Apart from dust, deterioration of ambient air quality will be due to generation of bitumen fumes from bitumen processing plant as well as during spraying of bitumen products. The impacts due to bitumen fumes will affect construction workers as well as residents along the project road.

Mitigation measures due to generation bitumen fumes have already been proposed. Nevertheless, the impact, particularly the pungent smell from freshly-sprayed bitumen-product will be felt by the residents in the neighbourhood of the road.

Further measures to control the effect of such noise levels would include avoiding spraying bitumen during the night when dwellers are at home.

### **8.1.4 Loss of Vegetation**

(Related with impact in sub-sections 6.2.2, 6.3.2.1, and 6.3.3.1)

Loss of vegetation will result from extraction of natural materials from borrow pits, widening of and upgrading of the existing road to improve safety. The impact will be of moderate significance for a long term to for the only some of the trees to regenerate naturally (from reinstated trees). The impact will be of moderate significance for long time.

The proposed mitigation measures will not mitigate the impact fully because only a small percentage of the lost vegetation, particularly trees lost from materials borrow areas will be recovered by natural regeneration after over 20 years, and vegetation lost due to the widening and realignment of the existing road cannot be recovered. The mitigation measures proposed to minimize the loss of vegetation and reinstate the affected sites will be monitored.

### **8.1.5 Loss of Land and other Properties**

(Related with impact in sub-sections 6.3.2.1, 6.3.3.1, and 6.3.3.3)

Displacement and loss of properties will result from acquisition of land and demolition of buildings in order to widen the existing road, increasing the RoW from the current 45 m to 60 m (based on Road Act, 2007), realignment of the existing road to improve safety, and borrowing of material. The impact will be of major significance and long term. The proposed mitigation measures will not mitigate the impact fully. This is because even if people are compensated it may be difficult for them to get comparable sites. Some of the houses that will be demolished are within the prime business areas and it could be difficult for these people to obtain similar sites and if they manage to do so it might be at a high cost. Additionally, there are difficulties of adjusting to new areas and for older people who are uprooted it will result in increased stress and even early deaths.



---

### 8.1.6 Road Traffic Congestion

(Related with impact in sub-sections 6.2.6 and 6.3.3.8)

Traffic congestion due to increased movement of construction equipment and vehicles, diverting the already congested public traffic to narrow and relatively poor diversion roads will be a major and short term significant impact. The proposed mitigation measures are therefore not expected to mitigate the impact fully.

Further measures to minimize congestion would include minimizing the lengths of continuous diversions roads.

### 8.1.7 Soil Erosion

(Related with impact in sub-sections 6.3.3.2 and 6.3.4.1)

Clearing of vegetation, which play a great role is stabilizing soil against erosion and disturbance of soil during borrowing of construction materials, construction of culverts, particularly where the soil is more susceptible to erosion as well construction across fill and cut sections are likely to cause soil erosion . The impact is anticipated to be of moderate significance and long term. The mitigation measures proposed are expected to make the impact due to soil erosion low. However, certain areas are particularly prone to erosion and any soil disturbance in these areas could initiate a significance increase in present erosion rate. In these areas the significance of the residual impact can only reasonably be mitigated to a moderate level.

### 8.1.8 Surface Water and Soil Pollution

(Related with impact in sub-sections 6.3.3.7, 6.3.4.2, 6.3.6.2, and 6.3.8.1)

Water pollution of surface water will occur during the construction across water course (discussed in Table 12). Water pollution may be caused by either deposition of fine sediments during the construction across the water courses or accidental spillage of hazardous materials such as concrete or hydrocarbons.

Soil pollution by oil or fuel will occur due to accidental spillage of oil, poor managed oil, or leakage of fuel or oil containers.

In the unlikely situation that unplanned event leads to spillage of concrete waste water or oil to a water course or ground, it is possible that water course/ ground could be affected. However, the project Incident Response Plan (IRP) shall include measures for clean-up of water course and soil.

### 8.1.9 Disruption/Destruction of Public Utilities and Services

(Related with impact in sub-sections 6.3.3.4)

The mitigation measures identified for public utilities and services will, if implemented correctly and in full, prevent any unplanned significant impacts. However, it is likely that there will be instances when unforeseen utilities or services are accidentally disrupted without notice or prior planning. Such disruption could affect large numbers of people living in extensive areas and, although temporary, there is a possibility that an unplanned disruption could hinder income generation (including subsistence activities) of those affected, for example by impeding irrigation to crops or by accidental damage to an irrigation channel. This will also result in residual

resentment towards the project. Such instances will be dealt with through the compensation procedure.

### **8.1.10 Accidents Involving Community Members**

(Related with impact in sub-sections 6.2.6 and 6.3.3.8, and 6.6.2.1)

It is possible that accidents involving local community members along the project road could occur at some stage during both the construction and operation phases of the project. This could include traffic- related accidents or accidents involving falling in open excavations, or other accidents. Traffic related accidents during the construction phase of the project will be caused by increased traffic volume, while during the operation phase of the project; it will be caused by increased traffic volume as well as increased traffic speeds. Although all practical measures have been proposed to ensure that no accidents occur, any incident that harms a person will have a major residual impact in terms of diminishing the quality of life for the victim, negatively impacting them or their household livelihood, and potentially creating hostility towards the project and project team.

Successfully implementation of the proposed mitigation measures, including safety training, traffic management, and driver training (during the construction phase), and high priority placed on safety should ensure that the risk of serious accidents during the construction phase of the project is low.

Mitigation measures have been developed to ensure safety close to residential areas, thereby avoiding the possibility of residual impacts occurring. During construction, the Contractor shall work with communities to manage issues or anxiety surrounding accidents and to give advice on the risks and dangers associated with the project.

### **8.1.11 Accidents on open trench or borrow pits involving Livestock and Wild Animals**

(Related with impact in sub-sections 6.3.2.5, 6.3.2.7, and 6.3.11.1)

It is likely that there will be minor accidents involving livestock within and outside the RoW. Basic health and safety management measures are in place to minimize this, but as stock proof fence will not be used on all fences and borrow pits, there is a risk that animals could move beyond any marker fences, and on to borrow pits, which could result in accidents. Compensation measures via a grievance process will be established which will mitigate any losses incurred reducing the impact to a low level.

If pits and quarries sites are left un-reinstated after their use, they may become filled with rainwater and become dangerous to children and animals. They may also create breeding sites for vectors like mosquitoes and bilharzias, when filled with rainwater.

The impact due to accidents to human and animals due to un-reinstated borrow pits is estimated to be indirect, moderate, reversible, and short term since it can be mitigated as soon as the construction is completed.

### **8.1.12 Un-met Employment Expectations**

(Related to the impact in Sections 6.2.1 and 6.3.1: Creation of Employment)

Because unemployment in the project area, residents in directly affected settlements that are unsuccessful in their job applications are likely to become frustrated when they do not gain

employment. All the villages along the project road will anticipate employment opportunities. This could create resentment and possibly hostility towards those who win job and could cause resentment towards the project.

Measures to manage expectations regarding employment opportunities will help to reduce this potential impact. However, it is likely to remain a key concern of communities and the public in general given the high interest in employment found during the consultations. Hence the impact could be Major.

It is also possible that there will be a short-term residual impact of discontent and perhaps resentment towards the project arising from perceptions of bias in recruitment process. Experience of large scale construction projects indicates that it will be extremely difficult to eliminate all bias from the recruitment process. This residual impact is therefore expected to be moderate.

### **8.1.13 Tension between Communities, Workers and the Project**

(Related to Impact in Section 6.3.3.10 and 6.3.3.10: Resources Use Conflict)

It is likely that there will be incidents and tensions between workers and communities at particular times and locations during the construction phase given the number and range of impacts that will affect communities. The mitigation measures proposed will minimize the project impacts but where any incidents are not completely resolved there could be a localized residual impact in loss of trust and increased discontent with the project and project team. The community relations plan and activities should be designed to address these situations and to minimize residual discontent or resentment among communities.

### **8.1.14 Transmission of STIs/HIV**

(Related to Impact in Section 6.3.12.3)

There is a residual risk that interaction of the workforce with local communities will increase the transmission of communicable diseases such as HIV/AIDS and other STIs, despite health training on communicable diseases. The likelihood and severity will depend upon the health of the workforce and the level of interaction with the local settlements. This impact may include short term outbreaks of diseases (STDs), but also more serious communicable diseases with long term effect on community mortality levels (HIV/AIDs).

A rise in STIs/ HIV is likely to occur in relatively more developed and busier villages centres as compared to less busier communities, where prostitution is strongly discouraged because of stricter social norms in small villages.

### **8.1.15 Grievance over Land and Properties Compensation**

(Related with impact in sub-sections 6.3.2.1, 6.3.3.1, and 6.3.3.3)

Experience has shown that there will be dispute and dissatisfaction between the project and some land owners and users on the project route. This will be caused by perceived or actual instances of disagreement with regard to the compensation process and/or methodology, and associated impact on livelihoods. This could cause resentment and possibly hostility towards the project.

The nature and scale of these negative residual impacts will depend on the quality of implementation of the land acquisition and compensation process, community relations and the

grievance procedures. However, where grievances occur, it is expected that these will be of moderate significance until solved.

### **8.1.16 Additional Cash Injected into Communities**

(Related to the impact in Sections 6.2.1 and 6.3.1: Creation of Employment)

Employment is the most significant positive social impact associated with the project, in the short-medium term. There will be a positive residual impact of the income obtained and spent by local workers in the community. This will be limited in each individual community by the short term nature of the employment of unskilled workers, but more prolonged in the case of semi-skilled or skilled labour. The result should be an increase in the standard of living for families and additional indirect employment for local business as a result of more cash in the local economy. The key issue in determining the scale of this impact will be the total number of Tanzanians employed in the construction works, and the duration of their employment.

There will also be a positive residual impact from money spent locally on goods and services by foreign construction workers in the local communities, which could also help create temporary indirect employment.

Additional cash will also be injected into local communities through the land compensation programme. This positive impact will depend on the extent of out-migration from the affected communities.

### **8.1.17 Wide Distribution of Economic Benefits**

(Related to the impact in Sections 6.2.1 and 6.3.1: Creation of Employment)

Management measures for the recruitment process should ensure that the distribution of jobs and therefore the distribution of economic benefits are spread out over the route. However, individual unskilled jobs will be relatively short. Skilled and semi-skilled workers may benefit from longer periods of employment.

### **8.1.18 Enhanced local experience and Employability**

(Related to the impact in Sections 6.2.1 and 6.3.1: Creation of Employment)

There will be benefits in terms of the additional experience and skills gained by the construction workers. This will apply to some extent to all workers, though mostly to skilled workers, who will be employed for longer periods. The future employment prospects of these workers will be enhanced. Hence, the indirect benefit to the families and communities could be significant.

The potential to realize this positive impact will depend on the training programmes developed by Contractor(s) and to some extent on the individual's willingness to learn. Employees are more likely to enhance employment prospects following construction, since they may also be eligible for positions in other industries. This will be a positive residual impact for the Contractor(s) and employees.

### **8.1.19 Economic benefit of indirect employment opportunities**

(Related to the impact in Sections 6.2.1 and 6.3.1: Creation of Employment)

If local people remain living within the local communities much of the cash injected is likely to remain within the local economy beyond construction period, creating a positive residual impact.

### **8.1.20 Access to new culture and international attitudes**

(Related with impact in sub-section 6.6.1.9)

There are some opportunities for the internationalization of local communities/ greater tolerance and awareness of other cultures which can be seen as a positive impact if communities welcome this. This is because it is most likely that some of the construction workers will be expatriates. The presence of expatriates will give expose the local people to new cultures and international attitudes.

### **8.1.21 Complains procedure**

(Related with impact in sub-sections 6.3.2.1, 6.3.3.1, and 6.3.3.3)

A fair and effective complaints procedure will help to establish a legacy of trust and good relations with communities. The level of trust will be determined by the quality of implementation of all measures, not simply those related to community relations.

### **8.1.22 Wildlife Road Kills**

(Related with impact in sub-sections 6.6.2.13)

Wildlife kills will result from increased traffic volume and speeds across the wildlife areas. Mitigation measures to prevent wildlife kills have been proposed as posting speed limit and warning signs as well as installing speed humps. Nevertheless, experience with the road across Mikumi National Park has shown that reckless drivers do not respect speed limits and drive at higher speeds across speed humps.

Further measures to control wildlife road kills may include installing speed monitoring equipment at the two ends of the wildlife protected areas (recording time of entry and time of exit for any particular vehicle). However this measure cannot be implemented at the project level.

### **8.1.23 Fragmentation of Settlements and impaired safety of pedestrians**

(Related with impact in sub-sections 6.6.2.15)

Cuts across settlements will create a barrier, increase travel time across the road. The cuts will also jeopardise the safety of pedestrians.

Measures to mitigate the impact will include installation of access stairs across cuts to enable pedestrians have access to their residents. However, given the attitude of reckless drivers, traffic accident hazard will not be mitigated by installation of access stairs. Further measure to manage the accident hazard will include installation of posting of speed limit, warning, and installation of speed humps.

## **8.2 ENVIRONMENTAL HAZARD MANAGEMENT AND CONTINGENCY PLAN**

This section describes a general plan through which the Contractor shall prepare himself and response to an emergency environmental hazard.

An emergency is a sudden unforeseen event, which may arise from natural, environmental, physical, or personal unforeseen occurrences. Emergencies which are likely to occur during the construction of the road project may cover one of the following events:

- Worker injury at construction sites or workshops (mechanical, steel, or precast yard, carpentry), quarry, crusher plant, batch plant etc.
- Injuries to workers or member of the public due to collisions or run over
- Fires or explosions at camp sites
- Mishap spills of hazardous material such as large amount of concrete, bitumen, oil, fuel, or paint on the ground or in a river system;
- Outbreak of pandemic diseases such as cholera, diarrhoea, meningitis
- Serious pollution to the water source (by hydrocarbons) which is relied on by the local people for living.

Accident and Emergency Response Plan (ERP) is a detailed program of action to control and/or minimize the effects of emergency requiring prompt corrective measures beyond normal procedures to protect human life, minimize injury, to optimize loss control, and to reduce the exposure of physical assets and the environment from an accident.

### **8.2.1 Purpose and Scope**

The purpose of this ERP is to identify emergency personnel and the logical sequence of actions that should be taken in the event of an emergency during construction of the road project.

The ERP begins to establish written emergency procedures, communication coordination, and clean-up responsibility to minimize hazards resulting from construction and traffic accidents, leakage, mishap spill, fire, and explosion.

### **8.2.2 Emergency Response Team**

The contractor shall form an Emergency Response Team (ERT) as outlined below. The ERT will report through the normal, internal management chain-of-command. Due to the diverse locations, and variety of field activities, which will be involved during construction, establishment of more than one ERT may be necessary. Under all circumstances, prompt and proper treatment of the employee injured employee or person, as well as response of hazardous spills, fires, or explosions, is of utmost importance.

### **8.2.3 Emergency Response Team during Construction**

The team that will be used during construction listed in sub-section 8.2.4 with titles, functions, and reporting relationship.

### **8.2.4 Incident Notification**

Prior to commencement of construction, the contractor will establish the ERT that may include the positions listed below.



- Project Manager: will be the Incident Commander and will have an overall management of emergencies, including the activation and deactivation of ERT
- Construction Manager: will be the Operation Manager and will be responsible for managing emergency' tactical activities as per ERP
- Environmental and Social (E & S) Manager and Health and Safety (H & S) Manager - responsible for managing emergency' tactical activities as per ERP
- Construction Supervisor/foreman: will be the Logistic Provider, whose responsibility will be to provide logistical support for operations during emergency.

First Responder: will be the first person receiving a call on emergency.

### 8.2.5 Emergency Communication Procedure

An important key to effective emergency response is a communication system which relays accurate information quickly. To do this, mobile telephone communication method will be used, and personnel trained. There will be alternative telephone numbers in case one fails by emergency (lack of signal or out of charge). In the event that there are sections of the project road where mobile signals are either weak or unavailable, the Contractor shall provide alternative mode of communications (say satellite phones or radio calls) as alternative means of communication. The list of emergency telephone numbers will be made accessible by all relevant personnel of the project. Where practical, the emergency mobile numbers shall be posted at all sites.

Other important emergency telephone numbers are:

- Police Emergency telephone number
- Police Station(s)
- Fire brigade for (Kasulu)
- District hospitals

The emergency response plan posted in a noticeable place on the project shall identify the designated equipment and the people to operate it.

The following steps shall be followed in communicating for an emergency situation: The person receiving the call (information) will be designated as the "First Responder." First Responder is a member of ERT.

#### 8.2.5.1 STEP 1: Incoming Calls to the First Responder

During road construction, the emergency calls will most likely be generated by Contractor's or Engineer's inspection personnel and will be received by a member of the ERT listed above in sub-section 8.2.4 from a workgroup supervisor/ foremen, worker, an outside agency, or the public. Each foreman/supervisor or lead person on each phase of the road construction (clearing, excavation, grading, etc.) will be equipped with a mobile telephone.



---

#### 8.2.5.2 STEP 2: Classifying Incidents

The risks associated with road construction are generally related to environmental pollution and personal injury. Emergencies associated with camp site/workshop operations could include:

- Worker injury at construction sites or workshops (mechanical, steel, or precast yard, carpentry), quarry, crusher plant, batch plant etc.
- Injuries to workers or member of the public due to collisions or run over
- Fires or explosions at camp sites
- Mishap spills of hazardous material such as large amount of concrete, bitumen, oil, fuel, or paint on the ground or in a river system;
- Outbreak of pandemic diseases such as cholera, diarrhoea, meningitis disease
- Serious pollution to the water source (by hydrocarbons) which is relied on by the local people for living

#### Level 1 Emergency

There is no potential danger to outside the project's right-of-way, no threat to the public, and project personnel can handle the situation. Notification to the Supervisors and other authorities should be within 12 hours.

Examples of Level 1 emergencies include:

- An oil, fluid, or fuel spill of any magnitude that is confined to the site and does not flow onto private, or enter a stream, or river
- An employee or Contractor injury accident resulting into minor injury that may require medical attention, but does not require hospitalization
- Minor property damage that does not compromise the safe operation of equipment or vehicles
- Small bush or structure fire that has been contained within the right-of-way

#### Level 2 Emergency

The potential exists for the emergency to extend beyond the right-of-way.

Examples of Level 2 emergencies include:

- An oil, fluid, or fuel spill of any magnitude that leaves the lease and flows onto private, or that may enter a stream, or river
- An employee or contractor injury accident resulting in hospitalization
- Property damage resulting from fires, explosions, impact, or contacts that exceeds the

---

safety threshold of the equipment or the structure

### **Level 3 Emergency**

Safe operating control has been lost, a fatality has occurred, the public safety is jeopardized, or there is a significant and on-going environmental impact.

Examples of Level 3 emergencies include:

- An oil, fluid, or fuel spill of any magnitude that enters a watercourse and threatens the intake of a local water supply
- Any leak or spill (controlled or uncontrolled) that causes significant environment damage
- A fire, explosion, impact, or contact resulting in the destruction of the project property, injury to the general public and/or damage to private or public structures
- An employee or contractor injury accident resulting in a human fatality

Level 2 and 3 require notification of the project management (Project manager) who will then notify outside the district council's services and NEMC and in certain situation the police authority so that they may be kept informed of the situation. Immediate notification to the supervisor is mandatory.

#### **8.2.5.3 STEP 3 Classification of Emergency Level and Notification**

The workgroup supervisor will determine whether or not the incident is an emergency. If an emergency exists, the Supervisor will classify the Emergency Level and determine the notification level as who has to be notified.

Level 1 emergency will be notified to Supervisors and E & S Manager

Level 2 and 3 emergencies require notification to the Project manager, who will then notify the district council's services and in certain situation NEMC so that they may be kept informed of the situation. Immediate notification to the Engineer is mandatory, who in turn must notify the Employer.

#### **8.2.6 Emergency Response Procedure**

An emergency will be reported from any source: supervisor/ foremen, worker on site, an outside agency, or the public. It should be borne in mind that circumstances may change during the course of an emergency.

The Incident Commander (Project Manager, and/or local emergency agency) will be responsible for the coordination of all on-site activities, emphasizing protecting people first, then environment, and finally property, including:

- Securing the area
- Accounting for personnel and the public; and
- Taking actions depending on the type of emergency.

Responders with appropriate training and fire suppression will be authorized to assist in fire emergency response within the limits of their training and available equipment. Similarly, employees with appropriate training and spill response and clean-up will be authorized to assist in an emergency response within the limits of their training and available equipment. The Incident Commander will have the ultimate authority over how to dispatch project employees to assist with an emergency response. A level 2 or 3 emergency could cause a need for evacuation such as fire and explosion, particularly at quarry and camp site.

The following table (Table 22) summarises the procedure which will be followed in different emergency situations

**Table 22: Response Procedure for Emergencies**

No.	Emergency	Receptor	Emergency Action
1.	Mishap spills of hazardous material such as large amount of concrete, bitumen, oil, fuel, or paint on the ground or in a river system	Escape through site drains to cause soil, surface, groundwater pollution, water source that is used by	<ul style="list-style-type: none"> <li>• If safe to do so, isolate source of leak or spillage to prevent further losses</li> <li>• Isolate the affected area to prevent unauthorised access</li> <li>• Protect side drains by sealing outfall using suitable bung</li> <li>• Use absorbent or brooms to contain spread of spillage - stock held in main workshop</li> <li>• Notify NEMC and Project Manager</li> <li>• Transfer any residual contents and contaminated absorbents to a suitable temporary storage container</li> <li>• Obtain specialist advice of decontamination of surfaces, drains and the interceptors</li> <li>• Remove bung from outfall chamber only when authorised by NEMC</li> </ul>
2.	Fire or explosion	Properties, site users and staff	<ul style="list-style-type: none"> <li>• Shout loudly “Fire, Fire!” and “Moto, Moto!” to inform others of the emergency</li> <li>• Isolate the affected area and evacuate site</li> <li>• If safe to do so, tackle any fire using appropriate fire fighting equipment or appliance (fire extinguisher, sand, water etc.)</li> <li>• Dial police emergency number</li> </ul>
3.	Personal injury to workers or member of the public resulting from accident at site	Staff or member of the public	<ul style="list-style-type: none"> <li>• The Project manager will be notified of the injury</li> <li>• A qualified first aid attendant will administer first aid until the injured is taken to hospital (where necessary)</li> <li>• Where deemed necessary, the site construction manager will notify the police (e.g. death)</li> <li>• All key supervisors will be notified of the injury</li> <li>• Should a an employee become injured and require emergency off-site medical transportation, he/she will be accompanied by a project representative to give pertinent information needed</li> <li>• In the event of death, the construction manager will inform the deceased’s next of kin</li> </ul>
4.	Outbreak of pandemic diseases such as cholera, diarrhoea, meningitis disease	Workers	<ul style="list-style-type: none"> <li>• The project Manager will be notified of the outbreak</li> <li>• Workers will be informed of the outbreak and advised on measures to prevent themselves from contracting the diseases</li> <li>• The H &amp; S Manager to carryout appropriate measures, including treatment of the affected workers, prevent further spread of the disease</li> <li>• Commune officers shall also be informed</li> </ul>

## 8.2.7 Emergency Preparedness

Emergency preparedness is essential for effective emergency response. Essential elements of emergency preparedness will include:

- Chain of Command
- Resources
- Training; and
- Public Education (Community Planning)

### 8.2.7.1 Chain of Command

The organizational structure outlined earlier identifies the ERT; the role of project management in classifying the incident as a Level 1, 2 or 3; and how members of the ERT will coordinate with and advise the management and Incident Commander.

The First Responder will act as the On-Site Commander until a Incident Commander and/or a member of the project management (e.g. Construction Manager) arrives and gives direction to respond to the situation.

The Incident Commander will usually be the on-site commander. Until the Incident Commander arrives, members of the ERT will be responsible for securing the area, mobilizing the emergency response personnel, accounting for all personnel and members of the public, overseeing public and environmental protection, establishing and maintaining communications; and taking direction from the Incident Commander.

Any incidents which require an emergency response will be post-appraised and documented by the First Responder in conjunction with the ERT.

### 8.2.7.2 Resources

Resources for emergency response will include standard medical first aid kits, firefighting equipment (fire extinguishers, sand, etc.), containment and clean equipment [absorbent (absorbent booms and pads, rice hull, sand), brooms, shovel], construction equipment (e.g. bulldozer, forklift, etc.), workers trained in first aid, emergency vehicles, and hospital/dispensaries.

### 8.2.7.3 Training

Daily safety meetings will be conducted during construction that will inform employees of the emergency response procedures, directions to medical facilities, emergency action plans, and the location of written documentation.

The contractor's foremen shall attend specific safety training that addresses familiarization with the terrain and environmental issues in the project area. The agenda for this specialized training may include:

- Geographical considerations: elevation and terrain
- Particularly sensitive habitats
- Travel considerations: 4-wheeler, foot travel

- 
- Wildlife: Bugs to Snakes
  - Laws
  - Spill prevention
  - First aid and First aid kit familiarization
  - Common illness/diseases
  - Drug and alcohol issues
  - Vehicle safety
  - Emergency contacts
  - Forest fires and what to do to prevent forest fires
  - Communications
  - Sensitivity of local residents; and/or

During construction, field personnel will also be trained by the Contractor in a variety of measures to make the job site safe:

- When and how to notify all others when actions or activities undertaken by them could affect health or safety of employees; to inform the Contractor of all injuries to workers; and who/how to report to Contractor any unsafe conditions that come to their attention.
- If in the course of the work an employee could be exposed to hazardous chemicals, or harmful physical agents, the location of material safety data sheets will be specified and made available for review.
- PPEs are expected to be worn that may include reflective vest, protective eyewear, gloves, hard hat, and footwear appropriate for the job site. Steel-toed footwear will be required on a project-specific basis.

## SECTION 9: ENVIRONMENTAL MONITORING PLAN

Environmental Monitoring Plan is an objective, periodical, reliable, and continuing process of observation and assessment of environmental changes. It is intended to ensure implementation of mitigation measures is done in accordance with regulations and standards. It is therefore based on monitoring indicators, which will have to be compared with targets to gauge the effectiveness of the mitigations plans.

It is one of the most important elements of the ESMP and has the following objectives:

- Collection of environmental and social baseline data (Table 30) as basis for gauging the effectiveness of implementation of proposed mitigation measures
- To ensure that mitigation and benefit enhancement measures have been adopted and are effective
- To identify any negative impacts unforeseen during ESIA stage and propose appropriate mitigation measures
- To provide information on the actual nature and extent of key impacts and effectiveness of mitigation and benefit enhancement measures

### 9.1 MONITORING PLAN

#### 9.1.1 Modes of Monitoring

Two basic forms of monitoring shall be performed as described hereunder:

Effects monitoring: Effect monitoring will record the consequences of activities on one or more environmental components. This will involve physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

Measurement Based Inspection: This will involve evaluation of trends in the values of environmental and social parameters systematically measured (quantitatively and/or qualitatively) and collected, to ensure that they are within acceptable legal and technical standards. This will involve collection of samples for analysis. In this, water and air samples will be collected and analysed.

The main tools that will be used for monitoring are checklists, visual examinations, and quantitative measurements of environmental effects monitoring parameters. Written records will be kept detailing the dates that monitoring took place and the findings of the monitoring.

#### 9.1.2 Baseline Data Collection

Prior to commencement of construction activities, during mobilization phase, the Contractors shall collect and document baseline data for different environmental aspects at strategic locations: settlements, camp, quarry, borrow sites, and water courses. The baseline data that shall be collected will include air quality (dust level), water quality (pH, turbidity), and noise levels. The baseline data collected will be used to compare environmental impacts of the “No Project” and in

the presence of the project and so as to determine the extent of impacts caused by the project. The following table (Table 23) list baseline parameters that shall be collected.

**Table 23: Locations of sites where baseline data shall be collected**

<b>No.</b>	<b>Parameter</b>	<b>Location for Data Collection</b>
1.	Air quality (dust level)	Across settlements, borrow, quarry, camp sites, crusher plant, batch plant, active road construction site
2.	Water quality (turbidity and pH)	All perennial rivers in Table 13 (sub-section 4.2.4)
3.	Noise level	Across settlements, borrow, quarry, camp sites
4.	Vegetation cover	Access or diversion routes, along Moyowosi game teserve, Makere forest reserve, other village forest roTECTED areas, quarry and borrow sites
5.	Soil erosion	Wherever vegetation cover has been removed: access or diversion routes, across river systems, quarry, and borrow sites, wherever earthmoving activities (cut or fill) take place, the camp site, stock pile areas, and spoil disposal areas

## **9.2 MONITORING OF ENVIRONMENTAL AND SOCIAL PARAMETERS**

The following table (Table 24) describe how monitoring of the implementation of proposed mitigation measure will be carried. The table lists the monitoring actions to be taken, the frequency of monitoring actions, locations where such actions are required to be taken, the units of measurement (where applicable), the target levels established and the responsible bodies. Notwithstanding the table-listed key issues, other unanticipated impacts shall also be monitored, and accordingly similar procedure for dealing with these impacts shall be followed to the satisfaction of the Engineer, the Employer, and legal provisions.



**Table 24: Environmental and Social Monitoring Plan**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
1.	Creation of employment	<ul style="list-style-type: none"> <li>• Age of employees</li> <li>• Ratio of local people to immigrants employed by the Contractor,</li> <li>• Workers employment contract</li> <li>• Wages paid to workers</li> <li>• Working hrs</li> </ul>	Camps, quarry, active construction sites	Throughout mobilization construction & demobilization phases	<ul style="list-style-type: none"> <li>• Interview with workers and Contract</li> <li>• Review of employment records (payrolls)</li> </ul>	<ul style="list-style-type: none"> <li>• Age of workers</li> <li>• Percentage of employee especially non-skilled from the local community</li> <li>• Percentage of women workers</li> </ul>	<ul style="list-style-type: none"> <li>• No workers under the age of 18yrs is employed by the Contractors</li> <li>• Non- skilled workers dominated by people from the local community</li> <li>• All workers have employment Contract</li> <li>• Working hrs are in accordance with Labour relations act</li> <li>• Wages are in accordance with GN 196 of 28 June 2013.</li> </ul>	Contractor under supervision of Engineer, village government leaders along the project road
2.	Generation of Dust	<ul style="list-style-type: none"> <li>• Level of dust generated by construction activities</li> <li>• Implementation of dust suppression measures</li> <li>• Use of dust masks/ respirators</li> </ul>	<ul style="list-style-type: none"> <li>• Project road and diversion roads across dwellings and work sites</li> <li>• Access roads to material borrow areas</li> <li>• Quarry sites, and crusher plant</li> <li>• Concrete batch plant</li> <li>• Active work sites</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly during dry season for project, diversion, and access roads</li> <li>• Weekly throughout the year for quarry, crusher, and concrete batch plant based monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Use of Dust Level meter</li> <li>• Interview of workers and communities along the road</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage of workers using dust masks in areas with high</li> <li>• Whether water is sprayer on the roads</li> <li>• Level of dust at PM<sub>2.5</sub> scale</li> </ul>	<ul style="list-style-type: none"> <li>• Dust abatement measures are done as prescribed</li> <li>• Absence of clouds of dust</li> <li>• All workers working in high dust level equipped with dusk mask</li> <li>• Zero complains by workers and local communities</li> <li>• PM<sub>2.5</sub> ≤ 25µg/m<sup>3</sup></li> </ul>	Contractor under supervision of Engineer, communities along the project road
3.	Gaseous emissions	<ul style="list-style-type: none"> <li>• Level of exhaust generated by equipment, bitumen fumes</li> <li>• Working environment for workers exposed to hazardous gaseous fumes</li> <li>• Use of respirators and masks by workers carrying out spray painting, pre-coating of chippings, and bitumen</li> </ul>	Borrow pits, quarry sites, crusher plant, campsite, mechanical workshop, construction sites	Weekly during mobilization and construction period	Visual observation	<ul style="list-style-type: none"> <li>• Presence of high level of smoke</li> <li>• Whether engine tuning, spray painting, and welding works are carried out in well ventilated areas</li> <li>• Whether appropriate PPEs are worn by workers during spray painting, chipping pre-coating and bitumen spraying</li> </ul>	<ul style="list-style-type: none"> <li>• No excessive smoke from equipment</li> <li>• Equipment engine tuning, spray painting, and welding done in a well ventilated area</li> <li>• Appropriate respirators used by workers during spray painting, bitumen pre-coating of chipping, and bitumen spraying</li> </ul>	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
		spraying						
4.	Generation of noise and vibrations	<ul style="list-style-type: none"> <li>• Level of noise, generated by equipment</li> <li>• Presence of exhaust mufflers</li> <li>• Use of ear plugs by staff working in very noisy environment</li> </ul>	Mechanical workshop, quarry site, crusher plan, batch plant	Weekly Daily	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Listening</li> <li>• Interview with workers</li> <li>• Sound level meter</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage of workers in high noise environment using ear plugs, of ear plugs</li> <li>• Whether all equipment have exhaust mufflers</li> <li>• Noise level in dBA scale</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment engines properly tuned</li> <li>• All equipment fitted with mufflers</li> <li>• All workers working in very noisy environment equipped with ear plugs</li> <li>• Noise level <math>\leq 85</math> dBA</li> </ul>	Contractor under supervision of Engineer
5.	Loss of vegetation	<ul style="list-style-type: none"> <li>• Implementation of measures to prevent or minimize loss of vegetation</li> <li>• Implementation of compensation of lost vegetation</li> <li>• Management of cleared trees</li> <li>• No borrowing of materials is done from wildlife and forestry protected areas without written permit from authorities entrusted to manage the protected areas</li> </ul>	<ul style="list-style-type: none"> <li>• Along Moyowosi game reserve, Makere forest reserve, and other village forest reserves</li> <li>• Material borrow areas and quarries</li> <li>• Diversion and access roads</li> </ul>	<ul style="list-style-type: none"> <li>• Once after every one week during mobilization</li> <li>• Weekly during construction period</li> </ul>	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Interview with Managers for Moyowosi game reserve and for TFS Kasulu, and forest officers for Kasulu, Kibondo, and Kakonko districts</li> </ul>	<ul style="list-style-type: none"> <li>• Whether width of clearing is limited to within Col</li> <li>• Whether unnecessary clearing of trees is avoided</li> <li>• Whether top soil removed during clearing and grubbing, material borrowing stockpiled for future use</li> <li>• whether grass planted on bare soil around streams and steep slopes, whether cleared tree are not buried but left for the local people to use for fire wood</li> <li>• Whether borrowing of material is done after receiving written consent from authorities entrusted to manage the protected areas</li> </ul>	<ul style="list-style-type: none"> <li>• Width of clearing confined to Col</li> <li>• Top soil removed during clearing and grubbing and material borrowing stockpiled for top soiling</li> <li>• Cleared trees left around borrow pit and road side for the local people</li> <li>• Contractor does not use trees as a sources of energy or Contractor does cut trees or use cleared trees to make marker pegs</li> <li>• Contractor has permit from authorities entrusted to borrow material from relevant authorities prior to borrowing material in wildlife/ forestry protected areas</li> </ul>	Contractor under supervision of Engineer, local people, Managers for Moyowosi game reserve and for TFS Kasulu, and forest officers for Kasulu, Kibondo, and Kakonko districts
6.	Loss of land	Land acquisition procedure	Camps, all borrow pits, quarries, and spoil areas	Monthly	<ul style="list-style-type: none"> <li>• Review of borrow pits documents</li> <li>• Interview of owners of land</li> </ul>	Whether compensation of land and crops done in accordance with Clause 1214 of standard specs, Land Act and its Regulations	Land acquisition done in accordance with Clause 1214 of Standard specifications and Land Act and its Regulations	

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
7.	Soil erosion	<ul style="list-style-type: none"> <li>•Implementation of measures to prevent/minimize soil erosion</li> <li>•Condition of areas adjoining rivers</li> <li>•Management of storm water during construction of culverts</li> </ul>	<ul style="list-style-type: none"> <li>•All rivers</li> <li>•Borrow pits, quarry, and culverts</li> <li>•Where there has been clearing of ground cover</li> <li>•During earthworks (fill and cut) take place, fill</li> </ul>	Monthly	Visual observation	<ul style="list-style-type: none"> <li>•Whether specified temporary erosion control measures are in place</li> <li>•Whether specified temporary measures to control surface runoff are in place</li> <li>•Whether specified permanent erosion control measures (top soiling, grassing, checks, stone pitching, and tree planting) are implemented</li> </ul>	<ul style="list-style-type: none"> <li>•Specified temporary erosion control measures are in place</li> <li>•Specified temporary measures to control surface runoff are in place</li> <li>•Specified permanent erosion control measures (top soiling, grassing, checks, stone pitching, and tree planting) are implemented</li> </ul>	Contractor under supervision of Engineer
8.	Soil pollution by fuel, oil, and bitumen	<ul style="list-style-type: none"> <li>•Implementation of measures to prevent and deal with oil / fuel spill</li> <li>•Operations of mechanical workshops</li> <li>•Operations of bitumen heating and chipping pre-coating facilities</li> <li>•Management (including storage) of lubricants and bitumen</li> <li>•Management of used oil and fuel filters</li> </ul>	<ul style="list-style-type: none"> <li>•Workshops at both camps</li> <li>•Bitumen storage, heating and chipping pre-coating site</li> </ul>	Weekly throughout construction period	<ul style="list-style-type: none"> <li>•Visual observation</li> <li>•Interview with local communities, turbidity meter</li> <li>•Review of Contractors documents</li> </ul>	<ul style="list-style-type: none"> <li>•Whether lubricants containers placed on concrete-paved ground with secondary containment</li> <li>•Whether filling and topping up of lubricant is done by a hand pump/funnel</li> <li>•Whether topping up of lubricant done in the presence of drip pan</li> <li>•Whether there is no leakage of fuel or oil from equipment</li> <li>•Whether used oil is kept in sealed leak-proof containers on concrete-paved ground with secondary containment</li> <li>•Whether used oil and fuel filters are stored in leak proof containers on concrete-paved ground secondary containment</li> </ul>	<ul style="list-style-type: none"> <li>•Lubricants containers placed on concrete-paved ground with secondary containment</li> <li>•Filling and topping up of lubricant is done by a hand pump/funnel</li> <li>•Topping up of lubricant done in the presence of drip pan</li> <li>•There is no leakage of fuel or oil from equipment</li> <li>•Used oil is kept in sealed leak-proof containers on concrete-paved ground with secondary containment</li> <li>•Used oil and fuel filters are stored in leak proof containers on concrete-paved ground secondary containment</li> <li>•Bitumen drums stored on polythene lined level ground with at least 10cm</li> </ul>	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
						<ul style="list-style-type: none"> <li>Whether bitumen drums are stored on polythene lined level ground with at least 10cm layer of sand</li> </ul>	<ul style="list-style-type: none"> <li>layer of sand</li> <li>Waste oil, used oil and fuel filters, and empty bitumen drums collected for disposal by NEMC company</li> </ul>	
9a.	Sedimentation of river systems	<ul style="list-style-type: none"> <li>Implementation of measures to prevent sedimentation of rivers</li> <li>Level of sedimentation of river systems</li> </ul>	All river systems	Weekly week during construction across the river systems	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Interview with local communities, turbidity meter</li> </ul>	<ul style="list-style-type: none"> <li>Whether spoil or construction materials are disposed or stocked near water courses</li> <li>Whether there is no disturbance on areas adjoining rivers</li> <li>Whether there is any complaints from downstream users on water pollution</li> </ul>	<ul style="list-style-type: none"> <li>Measures to prevent sedimentation are implemented</li> <li>Turbidity as measured in NTU <math>\leq 10\%</math> deviation from the baseline</li> <li>No complaint is received from downstream users of a river</li> </ul>	Contractor under supervision of Engineer
9b.	Pollution of river systems by hydrocarbons (oils and bitumen)	<ul style="list-style-type: none"> <li>Implementation of measures to prevent pollution</li> <li>Presence of hydrocarbons in river course</li> </ul>	All rivers	Twice per week during construction across the river systems Weekly when waster is abstracted from any river for construction works	Visual observation	<ul style="list-style-type: none"> <li>Whether equipment working on river banks has fuel or oil leaks</li> <li>Whether refuelling is done near water courses</li> <li>Whether refuelling is done by pump</li> <li>Whether there is any sign of floating hydrocarbon product (thin-film, rainbow sheen)</li> </ul>	<ul style="list-style-type: none"> <li>No fuel or oil leak from equipment working on river banks</li> <li>No refuelling is done near water courses</li> <li>No sign of floating hydrocarbon product</li> </ul>	Contractor under supervision of Engineer
9c.	Pollution of river systems by fresh cement products (concrete, concrete slurry, cement wastewater)	<ul style="list-style-type: none"> <li>Level of pollution by cement</li> <li>Implementation of measures to prevent pollution</li> <li>Level of water pollution in acidity unit</li> </ul>	All major rivers	Once per week during construction of culverts	<ul style="list-style-type: none"> <li>Visual observation</li> <li>pH meter</li> </ul>	<ul style="list-style-type: none"> <li>Whether concrete are isolated from water courses</li> <li>Whether washing of concrete handling equipment is done near water courses</li> <li>Complains from local people in the downstream</li> <li>Acidity in pH scale</li> <li>turbidity in NTU scale</li> </ul>	<ul style="list-style-type: none"> <li>Concrete works are isolated from water courses</li> <li>No washing of concrete handling equipment is done near water courses</li> <li>No complaints from local people in the downstream</li> <li>pH <math>\leq 1</math> deviation from the baseline</li> </ul>	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
10.	Disruption of domestic water supply pipe line utilities	<ul style="list-style-type: none"> <li>Damages to pipe lines</li> <li>Implementation of measures to prevent damages to water supply utilities</li> <li>Response to complaints with regard to damaged water supply utilities</li> <li>Reinstatement of damaged water supply utilities</li> <li>Installation of service ducts</li> </ul>	Where there are water supply utilities within the CoI.	Weekly during construction of the road section	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Interview with local communities</li> </ul>	<ul style="list-style-type: none"> <li>Whether Contractor liaise with local water authorities whenever construction is being done across sections with utilities within CoI</li> <li>Whether utilities within CoI carefully removed before commencement of construction</li> <li>Whether utilities not damaged</li> <li>Whether there is timely response to complaints with regard to damages to water supply utilities</li> <li>Whether installations of service ducts done in consultation with local water supply authorities</li> </ul>	<ul style="list-style-type: none"> <li>Contractor liaise with local water authorities before commencement of construction across sections with utilities within CoI</li> <li>Utilities within CoI carefully removed before commencement of construction</li> <li>Utilities not damaged</li> <li>There is timely response to complaints with regard to damages to water supply utilities</li> <li>Locations of service ducts determined in consultation of local water supply authorities</li> </ul>	Contractor under supervision of Engineer, Water Engineer for Kasulu, Kibondo, and Kakonko District, local communities
11.	Disruption of fibre optic cable	Damage to fibre optic cable	Active earthworks, line road side drainage worksites	Daily	Visual	<ul style="list-style-type: none"> <li>Whether the Contractor work carefully to prevent damage to fibre optic cable</li> <li>Whether damage to fibre optic cable is immediately reported to TTCL authority</li> </ul>	<ul style="list-style-type: none"> <li>Dame to fibre optic cable is rare</li> <li>Damage to fibre optic cable is immediately reported to TTCL authority</li> </ul>	Contractor under supervision of Engineer, TTCL Regional Manager Kigoma
12.	Generation of wastes (visual impact, soil and surface and ground water pollution)	<ul style="list-style-type: none"> <li>Management of wastes</li> <li>Treatment and disposal of wastes</li> </ul>	Camps and work sites	Weekly throughout mobilization, construction and demobilisation periods	Visual observation	<ul style="list-style-type: none"> <li>Whether wastes are managed, treated, and disposed of as prescribed in Sub-Section 2.3.2.5 and 7.1.3, and 7.2.4.3</li> <li>Whether Contractors have written agreements with NEMC certified for collection and disposal of hazardous wastes</li> </ul>	<ul style="list-style-type: none"> <li>Wastes are managed, treated, and disposed of as prescribed in Sub-Section 2.3.2.5 and 7.1.3</li> <li>Contractors have written agreements with NEMC certified for collection and disposal of hazardous wastes</li> </ul>	Contractor under supervision of Engineer
13.	Impact to wildlife and forestry	Requests and approval of material borrow areas	Moyowosi GR, Makekere forest reserve	Weekly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Review of</li> </ul>	Whether Contractor does not borrow material from wildlife and forestry	Contractor does not borrow material from wildlife and forestry protected areas	Contractor under supervision of Engineer, TFS

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
	protected areas				Contractors submissions	protected areas without written approval by management of game reserves • Whether the Engineer approves opening of borrow pits within forest reserves only after he is satisfied beyond reasonable doubt that the Contractor has permit from the game reserve and the act will not have serious environment impact	without written approval by management of game reserves • Prior to approving opening of borrow pits within village forest reserves the Engineer verifies that the Contractor has permit from District Executive Director and respective village governments and ensures that act will not have serious environment impact	Moyowosi and Makere Game reserves
14.	Reduction in rivers' flows	Compliance with water resources Management Act	Sources of water for construction works	Monthly	• Visual observation • Review of Contractors' submissions	• Whether the Contractor has permits for all sources of water • Whether the Contractor complies with environment conditions specified by permits • Whether the Contractor does not abstract water from rivers Bogwe, Nyakasanda, Mkugwa, and Nyakibaya pond	• The Contractor has permits for all sources of water used for the project • The Contractor complies with environment conditions specified by permits • The Contractor does not abstract water from rivers Bogwe, Nyakasanda, Mkugwa, and Nyakibaya pond	Contractor under supervision of Engineer
15.	Increased consumption of energy and natural resources	Sources of energy for cooking and other construction activities	Camps and work sites	Monthly	• Visual observation • Interview with labourers	• Whether the Contractor uses charcoal and firewood for cooking and bitumen boiling • Whether the Contractor does not cut trees or use trees cleared from road side or borrow pits to make markers pegs	• The Contractor does not use charcoal and firewood for cooking and bitumen boiling • The Contractor does not cut trees or use trees cleared from road side or borrow pits to make markers pegs	Contractor under supervision of Engineer
16.	Damage to graves	Measures to prevent damage to graves	Around grave yard	During construction across sections	• Visual observation • Review of	• Whether all the graves within CoI are relocated in accordance with Grave	Before commencement of construction of section with graves:	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
				with grave yards specified in sub-section 4.3.5	Contractors' submissions • Interview with local communities	(removal) Act • Whether graves outside CoI are clearly marked/ and protected from damage during construction of respective sections • Whether there are any complaints from local communities	• All graves within CoI are relocated in accordance with Grave (removal) Act • Before commencement of section with graves, Whether graves outside CoI are clearly marked/ and protected from damage during construction of respective sections • Whether there are any complaints from local communities	
17.	Pollution of Nengo dams by sedimentation	Planting of trees and vertiver grass	Upstream of R.Igumila • Avoid disposing spoil or excess material along the project road Excavate catch water drain on the upslope side of the road to direct runoff away from the dams	During clearing and grubbing and earthworks along Nengo dams	Visual observation	• Whether spoil and excess material not disposed of along the road • Whether catch water drain has been excavated to direct runoff away from the dams	• Spoil and excess material disposed of away from along the road • Catch water drain has been excavated to direct runoff away from the dams	Contractor under supervision of Engineer
18.	Poaching of wildlife by construction workers	Awareness of Contractor's workers about Wildlife Conservation 2009	General work site	Monthly	• Visual observation • Interview with workers and local communities	• Whether Contractor's staff are aware of wildlife conservation act • Evidence that Contractor's staff is hunting from the nature reserves	• Contractor's staff are aware of wildlife conservation act • There is no evidence that Contractor's staff is hunting wild animals from the protected areas	Contractor under supervision of Engineer
19.	Disruption of community access to dwellings and business areas	Availability of temporary pedestrian crossings at settlements	Dwellings	Monthly	• Visual observation • Interview with local communities	• Whether appropriately spaced temporary pedestrian crossing are availed at all dwellings • Whether local communities complain about the absence of pedestrian crossings	• Appropriately spaced temporary pedestrian crossing are availed at all dwellings • There are no complaints about lack of pedestrian crossings	Contractor under supervision of Engineer, local communities
20.	Health	• Work practice	• Bridge and culvert work	Monthly	• Visual	• Whether appropriate PPE	• Workers working with	Contractor under



**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
	problems associated with handling cement and concrete	<ul style="list-style-type: none"> <li>• Use of PPE</li> <li>• Hygiene</li> </ul>	sites <ul style="list-style-type: none"> <li>• Concrete batch plant area</li> <li>• Precast yard</li> <li>• Where there is laying of cement-stabilized layer</li> </ul>		observation <ul style="list-style-type: none"> <li>• Interview with workers</li> </ul>	are used by workers working with cement and concrete <ul style="list-style-type: none"> <li>• Whether workers work in the manner that minimizes release of cement dust and contact with wet cement product</li> <li>• Whether PPE are issued as required and worn-out PPE are replaced as required</li> </ul>	cement and concrete are equipped with appropriate PPE (gloves, coveralls, with long sleeves, water-proof boots, suitable dust masks, eye protection gear) are used <ul style="list-style-type: none"> <li>• Workers work in the manner that minimizes release of cement dust and contact with wet cement product</li> <li>• PPE are issued and worn-out PPE are replaced immediately</li> </ul>	supervision of Engineer
21.	Risks of fire and explosion	<ul style="list-style-type: none"> <li>• Workers behaviours</li> <li>• Implementation of measures to prevent fire and respond to fire incident</li> </ul>	Workshop	Monthly	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Interview with workers</li> </ul>	<ul style="list-style-type: none"> <li>• Whether adequate, appropriate, and easily accessible fire extinguishers are availed at strategic locations</li> <li>• Whether there is evidence that workers are trained how to use fire extinguishers</li> </ul>	<ul style="list-style-type: none"> <li>• The Contractor avail adequate, appropriate, and easily accessible fire extinguishers are availed at strategic locations</li> <li>• The Contractor has evidence that workers are trained how to use fire extinguishers</li> </ul>	Contractor under supervision of Engineer
22.	Generation of human sanitary wastes	Availability of ablution facilities	Work sites	Monthly	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Interview with workers</li> </ul>	Whether there are ablution facilities at all work sites that lasts for at least a month	All work sites that last for at least month have ablution facilities	Contractor under supervision of Engineer
23.	Traffic congestion and accidents	<ul style="list-style-type: none"> <li>• Implementation of measures to prevent traffic congestion and accidents</li> <li>• Implementation of road safety training programme for schools</li> <li>• Travel speeds of project vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• Project, diversions, and access roads across dwellings and schools</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly for monitoring implementation of measures to prevent accidents</li> <li>• Monthly for monitoring implementation of road safety training</li> </ul>	<ul style="list-style-type: none"> <li>• Visual observation</li> <li>• Interview of road users, schools, local communities</li> <li>• Review of contractors monthly ESMP and HSMP</li> </ul>	<ul style="list-style-type: none"> <li>• Whether there are flagmen at approaches to all active construction sites and material borrow area junctions</li> <li>• Whether there are appropriately posted night-reflective warning signs to warn the public about potential danger (speed</li> </ul>	<ul style="list-style-type: none"> <li>• Flagmen are deployed at approaches to active construction sites and material borrow area junctions</li> <li>• Night-reflective warning signs (speed limit, speed humps, works ahead, etc.) appropriately posted to warn the public about</li> </ul>	Contractor under supervision of Engineer, school children/ teachers

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
				programme	compliance reports	<p>limit, speed humps, works ahead, etc.)</p> <ul style="list-style-type: none"> <li>• Whether there are physical barriers (concrete barricades, tape etc.) to protect employees and other road users</li> <li>• Whether there are speed-restraining humps on approaches to all accident black spots (e.g. school children crossing, dwellings, etc.)</li> <li>• Whether pedestrians and other traffic are rerouted away from active construction sites</li> <li>• Whether the public is protected from all ground openings into which a person or vehicles could fall by night-reflective barricades</li> <li>• Whether the Contractor has evidence that there is awareness creation program on road safety issues among school children</li> <li>• Whether parked construction equipment are guarded</li> <li>• Whether works are protected immediately at the end or end of the day,</li> <li>• Whether all accidents and incidents are reported to the Engineer soon after their</li> </ul>	<p>potential danger (speed limit, works ahead, etc.)</p> <ul style="list-style-type: none"> <li>• Physical barriers (concrete barricades, tape etc.) are in place to protect employees and other road users</li> <li>• Speed-restraining humps are installed at approaches to all accident black spots (e.g. school children crossing, dwellings, etc.)</li> <li>• Pedestrians and other traffic are rerouted away from active construction sites</li> <li>• The public is protected from all ground openings into which a person or vehicles could fall by night-reflective barricades</li> <li>• Review of Contractors' compliance reports and interviews with school children and teachers provide evidence that the Contractors implement awareness creation program on road safety issues among school children</li> <li>• Parked construction equipment are guarded</li> <li>• Works are protected immediately at the end of the day</li> <li>• All accidents and incidents are immediately reported to the Engineer</li> <li>• Drivers of project vehicles are formally informed of</li> </ul>	

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
						<ul style="list-style-type: none"> <li>occurrence</li> <li>Whether drivers of project vehicles are formally informed of speed limit of 60km/ hr and that they adhere to this speed limit</li> <li>Whether measures to prevent re-occurrence of accidents and incidents</li> </ul>	<ul style="list-style-type: none"> <li>speed limit of 60km/ hr and that they adhere to this speed limit</li> <li>There are measures to prevent re-occurrence of accidents and incidents</li> </ul>	
24.	Risk of accidents to animals and human associated with material borrowing	<ul style="list-style-type: none"> <li>Management of material operational borrow areas</li> <li>Closure of material borrow areas</li> <li>No borrowing of materials is done from wildlife and forestry protected areas without written permit from authorities entrusted to manage the protected areas</li> </ul>	<ul style="list-style-type: none"> <li>Dwellings</li> <li>Along Moyowosi game reserve and Makere forest reserve</li> <li>Material borrow areas and quarries</li> </ul>	Weekly	<ul style="list-style-type: none"> <li>Visual inspection</li> <li>Reviews of requests by Contractors' for approval of material borrow areas</li> <li>Interview with managers for Moyowosi game reserve and TFS for Kasulu</li> </ul>	<ul style="list-style-type: none"> <li>Whether procedure for approval of material borrow areas by Contractor are in accordance with Sub-Clause 1214 of Standard specifications of Road Works</li> <li>Whether only borrow pit at minimum distance of 500m from dwellings are approved by the Engineer</li> <li>Whether all borrow pits and quarries are self-draining when operational and after their closure</li> <li>Whether borrowing of material from wildlife and forestry protected areas is done only after receiving written consent from authorities entrusted to manage the protected areas</li> <li>Whether maximum depth of borrow pits is 3m</li> <li>Whether maximum depth of quarry face is 10m</li> <li>Whether all borrow pits and quarries are reinstated in accordance in accordance</li> </ul>	<ul style="list-style-type: none"> <li>The Contractor complies with Sub-Clause 1214 of Standard specifications during land acquisition for borrow pits and quarries</li> <li>Only request for borrow areas located at minimum distance of 500m from dwellings are approved by the Engineer</li> <li>The Contractor ensures that all borrow pits and quarries are self-draining when operational and after their closure</li> <li>Contractor has permit from authorities entrusted to borrow material from Moyowosi game reserve and TFS for Kasulu district prior to borrowing material wildlife/ forestry protected areas prior to borrowing material</li> <li>Depths of borrow pits are limited to 3m</li> <li>Maximum depth of quarry face is 10m</li> <li>All borrow pits and quarries</li> </ul>	Contractor under supervision of Engineer, managers for Moyowosi game reserve and TFS for Kasulu

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
						with Clause 1703e) of Standard specifications of Road Works and to the satisfaction of the Engineer before the Contractor is issued with TOC	are reinstated in accordance in accordance with Clause 1703e) of Standard specifications of Road Works and to the satisfaction of the Engineer before the Contractor is issued with TOC	
25.	Safety risk associated with to blasting, drilling and rock excavation	<ul style="list-style-type: none"> <li>Storage and management of explosive</li> <li>Operations at quarries</li> </ul>	<ul style="list-style-type: none"> <li>Magazine</li> <li>Quarries</li> <li>Rock excavation site along the project road</li> </ul>	Monthly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Review of documents from Contractor</li> <li>Interview of local communities near quarries</li> </ul>	<ul style="list-style-type: none"> <li>Whether Contractors have licences for explosive storage magazines</li> <li>Whether blasting done by holders of blasting certificates issued by Commissioner of Mines</li> <li>Whether blasting done between 08:00 hrs and 16:00 hrs</li> </ul>	<ul style="list-style-type: none"> <li>Contractors have licences for explosive storage magazines</li> <li>Blasting is done by holders of blasting certificates issued by Commissioner of Mines</li> <li>Blasting is done between 08:00 hrs and 16:00 hrs</li> </ul>	Contractor under supervision of Engineer, Inspector of Mines and Explosives
26.	Hazard due to workers fall from height or being hit by falling objects or materials	<ul style="list-style-type: none"> <li>Conditions of scaffold, ladders, and work platform</li> <li>Use of PPE by workers</li> </ul>	<ul style="list-style-type: none"> <li>Workshops</li> <li>Culverts construction work sites</li> </ul>	Weekly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Interview with workers</li> </ul>	<ul style="list-style-type: none"> <li>Whether overloading of scaffold is prevented</li> <li>Whether scaffold board is free from unacceptable faults</li> <li>Whether scaffold is erected by experienced scaffolders and competent supervision</li> <li>Whether ladders used for access are securely tied at their upper ends</li> <li>Whether ladders stand on a firm and level ground</li> <li>Whether ladders are secured to prevent sway</li> <li>Whether ladders that cannot be tied at their top secured at the bottom are footed</li> <li>Whether ladders extend beyond the place of</li> </ul>	<ul style="list-style-type: none"> <li>Overloading of scaffold is prevented</li> <li>Scaffold board is free from unacceptable faults</li> <li>Scaffold is erected by experienced scaffolders and competent supervision</li> <li>Ladders used for access are securely tied at their upper ends</li> <li>Ladders stand on a firm and level ground</li> <li>Ladders are secured to prevent sway</li> <li>Ladders that cannot be tied at their top secured at the bottom are footed</li> <li>Ladders extend beyond the place of landing by at least 1m unless adequate</li> </ul>	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
						landing by at least 1 m unless adequate handhold is available • Whether there are no ladders with missing or defective rungs • Whether boards of platform are laid close boarded and end without space between the edges of adjacent boards, whenever there is any possibility of people below being struck by materials or tools falling through a gap in the working platform • Whether all workers under the platform are equipped with safety helmet and shoes all times	handhold is available • There are no ladders with missing or defective rungs • Boards of platform are laid close boarded and end without space between the edges of adjacent boards, whenever there is any possibility of people below being struck by materials or tools falling through a gap in the working platform • All workers under the platform are equipped with safety helmet and shoes all times	
27.	Hazard due to stepping on sharp object or striking/ tumbling against objects	• Housekeeping at work sites • Use of PPE by workers	• Workshops • Culverts construction work sites	Weekly	• Visual observation • Interview with workers	• Whether a good housekeeping is maintained all the time • Whether all the workers are equipped with steel-toe safety shoes	• A good housekeeping is maintained all the time • All the workers are equipped with steel-toe safety shoes	Contractor under supervision of Engineer
28.	Hazard due to manual handling – overexertion	• How manual handling of loads is done • Implementation of measures to prevent over-exertion	• Workshops • Culverts construction work sites	Weekly	• Visual observation • Interview with workers	• Whether team handling is practices when carrying heavy loads • Whether mechanical aid (e.g. wheelbarrow, hydraulic crane etc.) is used when loads being carried are heavy	• Team handling is practices when carrying heavy loads • Mechanical aid (e.g. wheelbarrow, hydraulic crane etc.) is used when loads being carried are heavy	Contractor under supervision of Engineer
29.	Hazard due to workers being struck or crushed mobile	• How excavation and lifting by crane is done • Implementation of measures to prevent	• Culverts and bridge work sites • Line drain work sites • Where rolling works is	Weekly	• Visual observation • Interview with workers	• Whether there is no worker or member of public within swivel radius of machine during excavation	• There is no worker or member of public within swivel radius of machine during excavation	Contractor under supervision of Engineer

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
	equipment	workers and the public being hit or crushed by mobile equipment	being done			<ul style="list-style-type: none"> <li>Whether workers in the trench are kept well away from the face and those at ground level kept outside slewing radius of the machine.</li> <li>Whether experienced banks man is used to guide the operator and to ensure that other workers remain well clear of the operation when operator cannot see all parts of the jib and bucket</li> <li>Whether all workers exposed to such dangers have received induction as necessary</li> <li>Whether there are barriers to separate workers, pedestrians, and vehicles from moving equipment</li> <li>All workers have high reflective vests and hard hats as minimum PPE</li> </ul>	<ul style="list-style-type: none"> <li>Workers in the trench are kept well away from the face and those at ground level kept outside slewing radius of the machine.</li> <li>Experienced banks man is used to guide the operator and to ensure that other workers remain well clear of the operation when operator cannot see all parts of the jib and bucket</li> <li>Whether all workers exposed to such dangers have received induction as necessary</li> <li>Whether there are barriers to separate workers, pedestrians, and vehicles from moving equipment</li> <li>All workers have high reflective vests and hard hats as minimum PPE</li> </ul>	
30.	Hazard due to electrocution	<ul style="list-style-type: none"> <li>Insulation and earthing of electrical panel and cables</li> </ul>	<ul style="list-style-type: none"> <li>Control rooms for crusher, pug mill, concrete batch plant, bitumen heating facility, and generator sets</li> <li>Power outlets at workshops</li> </ul>	Monthly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Interview with workers</li> </ul>	<ul style="list-style-type: none"> <li>Whether control panels and cabling are well insulated and earthed</li> </ul>	<ul style="list-style-type: none"> <li>Control panels and cabling are well insulated and earthed</li> </ul>	Contractor under supervision of Engineer
31.	Risk of excessive exposure of workers and communities to ionizing	<ul style="list-style-type: none"> <li>Storage of gauge</li> <li>Transport of gauge it is transported</li> <li>Protection of workers and public against exposure to radiations</li> </ul>	<ul style="list-style-type: none"> <li>Storage facility for nuclear gauges</li> <li>Work site (where the gauge is used)</li> </ul>	Weekly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Interview with workers</li> </ul>	<ul style="list-style-type: none"> <li>Whether the Contractor has a licenses to own and use the nuclear gauges</li> <li>Whether the gauges are stored in a facility approved by TAEC</li> </ul>	<ul style="list-style-type: none"> <li>The Contractor has licenses to own and use the nuclear gauges</li> <li>Gauges are stored in a facility approved by TAEC</li> <li>Gauges transported by a</li> </ul>	Contractor under supervision of Engineer, TAEC

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility
	radiation resulting from the use of nuclear gauges					<ul style="list-style-type: none"> <li>Whether transportation of gauges done by a dedicated car marked with warning signs in accordance with law and regulations</li> <li>Whether staff operating the gauges are trained in accordance with the law</li> <li>Whether working areas are demarcated by reflective tapes</li> </ul>	<ul style="list-style-type: none"> <li>dedicated car marked with warning signs in accordance with law and regulations</li> <li>Only staff trained in accordance with the law are allowed to operate the gauges</li> <li>Working areas are always demarcated by reflective tapes</li> </ul>	
32.	Increased incidence of HIV / AIDS	<ul style="list-style-type: none"> <li>HIV/AIDs alleviation program</li> <li>Distribution of condoms</li> </ul>	Camps, work sites, toilets	Monthly	<ul style="list-style-type: none"> <li>Visual observation</li> <li>Review of training reports</li> <li>Visual observation</li> <li>Interview with workers</li> </ul>	<ul style="list-style-type: none"> <li>Whether condoms are distributed at strategic points</li> <li>Whether there is evidence that the Contractor conducts training</li> <li>Whether No. of trainings conducted are in accordance with approved training programme</li> </ul>	<ul style="list-style-type: none"> <li>Condoms are distributed at strategic points</li> <li>There is evidence that training that the Contractor conducts training</li> <li>Whether No. of trainings conducted are in accordance with approved training programme</li> </ul>	Contractor under supervision of Engineer, approved HI/AIDs training NGO



### 9.3 DETAILS ON MONITORING FOR POLLUTION OF SURFACE WATER

As indicated in Table 24, the effects of construction activities across/along rivers monitoring and reporting on water quality shall be done by the Contractor (through E & S Manager). The monitoring shall basically entail routine monitoring of rivers across the project road during earthworks and construction of or culverts. It shall consist of making field measurements of turbidity and pH. The procedure for routine monitoring shall be as follows:

- Two water sampling points shall be established at all major rivers and those used for domestic purposes, one 100m upstream, and the other point will be placed 50 down stream
- Measurements of pH (a gauge for effectiveness of control of water pollution during concreting activities) and Turbidity (NTU) [a gauge for effectiveness of soil erosion control] shall be taken at point approximately 30 minutes before the start of construction activity each day.
- pH measurement shall be taken at each site twice/day during construction activities
- Measurements for Turbidity and pH will be taken at mid depth in the water column.

### 9.4 RESPONSIBILITIES FOR MONITORING IMPLEMENTATION OF ESMP

To ensure effective implementation of the mitigations measures, the Supervising Engineer shall deploy an Environmental and Social Specialist (ESS), who will be responsible for regular monitoring of implementation of ESIA, ESMP, Site Specific Environmental and Social Management Plan (SSESMP), and Site Specific Health and Safety Management Plan (SSHSM) by the Contractor. He/she should as well be responsible for ensuring that reporting of implementation of the measures is completed in accordance with the requirements.

The ESS will have the following responsibilities:

- Review Contractor's SSESMP and SSHSM
- Monitoring the effectiveness of the ESMP and other mitigation measures.
- Asses the performance of environmental controls and proposed mitigation measures
- Ensure that the Contractor corrects/ review mitigation measures that are not functioning acceptably
- To provide regular reports on monthly basis on the status of the Contractor's compliance with the ESIA, ESMP, SSESMP, and SSHSM.
- When available on site, attend monthly progress meetings
- To provide input for the preparation of monthly progress report by the Supervising Engineer

The ESS shall visit the project site for 14 days every month. During the visit the ESS shall carry out site inspection and review relevant Contractors documents to determine the compliance of the Contractor with SSHSEM. If necessary, the ESS may interview Contractor's staff.

If the ESS believes that there is a potential for unacceptable impacts, he/she may require changes in the operating procedures or additional mitigations measures. If on the opinion of the ESS, there is serious environmental, social, of health and safety violation by the Contractor, he/she may advise the Resident Engineer to suspend part or all works, until such time that the Contractor has

---

rectified all the serious environmental, health and safety deficiencies to the satisfaction of the Engineer.

## **SECTION 10: SUMMARY OF PUBLIC CONSULTATIONS AND OPINION EXPRESSED**

An important element in the process of impact assessment is consultation with stakeholders (Interested and Affected Parties) to gather information needed to complete the assessment. It is a process whereby different stakeholders influence and share their views regarding development initiatives, decisions, and resources that have an impact on their lives and livelihoods.

Public consultation encourages easier project acceptance and reduces resistance which would otherwise slow down or hamper the project implementation.

Fundamentally these consultations were intended to collect views, concerns, perceptions of the stakeholders related to the rehabilitation of the road. Information related to population, socio-economic activities, environmental issues, sources of livelihood and living standards were also collected.

Prior to the commencement of ESIA review, the experts visited the TANROADS Regional Manager based in Kigoma to inform them of the impending ESIA.

Stakeholders and public involvement was therefore aimed at assisting the consultant in:

- Determining the scope of the ESIA review
- Deriving specialist knowledge about the site
- Evaluating relative significance of the likely impacts
- Improve project design and, thereby, minimize conflicts and delays in implementation;
- Proposing mitigation measures
- Ensuring that the ESIA review is objective, truthful and compete
- Facilitate the development of appropriate and acceptable entitlement options;
- Increase long term project sustainability and ownership

### **10.1 PROJECT STAKEHOLDERS**

The project stakeholders of this project can be classified into the following categories:

- Ministry of Works, Transport, and Communication: Road Sector Environment Section under the department of Works is responsible for overseeing management of environment within the road sector and the preparation/implementation of ESIA required in the road sector
- The project proponent - Tanzania National Roads Agency
- Kasulu, Kibondo, and Kakonko District Councils: the following department executives are relevant to this project; Planning and Liaison Officers, Forest Officer, Game Officers, Bee Officers, Natural Resources Management Officer, Water Engineers, and Environment Management Officers (responsible for promoting environmental awareness in the district related to the protection of the environment and the conservation of natural resources)

- Government institutions: Tanzania Telecommunication Company Ltd, Tanzania Electric Company Ltd, National Environment Management Council (NEMC), Management of Moyowosi Game Reserve, Tanzania Forest Services.
- Communities in the DIZ and AI of the project area

During ESIA review most of the above stakeholders were consulted as shown by stakeholders consultation form in Appendix II which is signed by each of the stakeholder who was consulted.

## **10.2 HOW STAKEHOLDERS WERE INVOLVED**

Consultation with statutory bodies and institutions were made through direct personal interviews. The agenda for these consultations included:

- Presenting the Project
- Defining the Regional/District institutional framework
- Discussing recent experience with respect to compensation eligibility criteria and entitlement packages
- Obtaining from the authorities their environmental and socio-economic concerns and perceptions regarding the proposed road
- Domestic water supply profile in the project area, locations and distribution of domestic water utilities along and across the project road
- Environmental profile in the project area, possible environmental impacts of the project and mitigation measures
- Whether there is any wildlife or forestry protected area in the neighbourhood of the project area.

The following table (Table 25) lists dates, names, and issues that were discussed with statutory officials as well as governmental and non-governmental organizations that were consulted during ESIA study.

**Table 25: Schedule of Consultation with Statutory Bodies and Institutions during ESIA Study**

<b>Date</b>	<b>Name of Person</b>	<b>Title</b>	<b>Issues Discussed</b>
15/07/2016	Wilson Ruheta	DWE – Kasulu DC	<ul style="list-style-type: none"> <li>• Domestic water supply profile for villages along the project road.</li> <li>• Water supply utilities that are likely to be affected by the road upgrading</li> <li>• On-going water supply development and plans that are likely to be affected by the road upgrading</li> <li>• Potential impacts of proposed road upgrading to water supply utilities and proposal to mitigate them</li> </ul>
15/07/2016	Edwin R. Kunyekwa	DFO/DEMO - Kasulu DC	<ul style="list-style-type: none"> <li>• Environmental profile, including vegetation cover profile along the project road, with special interest in forest</li> <li>• Whether there exist any forestry protected areas in the neighbourhood of the project road</li> <li>• Potential impacts of the project to the</li> </ul>

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

Date	Name of Person	Title	Issues Discussed
			environment including forestry and proposal for mitigation measures
15/07/2016	Elicana A. Maige	DGO - Kasulu DC	<ul style="list-style-type: none"> <li>Whether there is any wildlife area along the project road and if any potential impacts to the wildlife area and mitigation measures</li> </ul>
15/07/2016	Jacob W. Kilatu	TFS - Kasulu DC	<ul style="list-style-type: none"> <li>Whether there are any forestry/ wildlife projected areas under TFS authority</li> <li>Whether there are development plans that are likely to affect or affected by the proposed road upgrading Potential impacts of the project and proposal for mitigations measures</li> </ul>
15/07/2016	<ul style="list-style-type: none"> <li>Deogratias P. Kavishe</li> <li>Donald K. Silas</li> </ul>	<ul style="list-style-type: none"> <li>Field Officer, TFS – Kasulu</li> <li>District Forestry Manager, TFS – Kasulu</li> </ul>	<ul style="list-style-type: none"> <li>Whether there is any forestry protected areas along the project road and if any potential impacts to the wildlife area and mitigation measures</li> </ul>
20/07/2016	Eng. Narcis K. Choma	Regional Manager - TANROADS	Environmental and Social issues that should be considered during ESIA study
25/07/2016	Said Shemahonge	Ag. DED- Kibondo DC	<ul style="list-style-type: none"> <li>Introduction of the proposed road upgrading project and seeking for consent to discuss with executive under him</li> <li>Whether he has any environmental/ social issues that should be considered during the study</li> </ul>
25/07/2016	Eng. Peter J. Ngulolwe	District Water Engineer (DWE) – Kibondo DC	<ul style="list-style-type: none"> <li>Domestic water supply profile for villages along the project road.</li> <li>Water supply utilities that are likely to be affected by the road upgrading</li> <li>On-going water supply development and plans that are likely to be affected by the road upgrading</li> <li>Potential impacts of proposed road upgrading to water supply utilities and proposal to mitigate them</li> </ul>
25/07/2016	Mohamed Semdoe	DEMO – Kibondo DC	<ul style="list-style-type: none"> <li>Environmental profile of the district</li> <li>Main environmental problems in the district</li> <li>Protected environmental areas along the road</li> <li>Potential environmental and social impacts of the proposed road upgrading and mitigation measures</li> </ul>
25/07/2016	John Makunja	Ag. – District Community Development Officer (DCDO) – Kibondo DC	Potential socio-economic impact of the project to communities along the road
25/07/2016	<ul style="list-style-type: none"> <li>Seif Salum</li> <li>Rafael Rafike</li> </ul>	<ul style="list-style-type: none"> <li>Ag. District Forestry Officer – Kibondo DC</li> <li>Ag District Natural Resources Officer (DNRO) – Kibondo DC</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation cover profile along the project road, with special interest in forest</li> <li>Whether there exist any forestry or forestry protected areas in the neighbourhood of the project road</li> <li>Potential impacts of the project to forestry and wildlife protected areas (if any) and proposal for their mitigation measures</li> </ul>
25/07/2016	<ul style="list-style-type: none"> <li>Aloyce P. Mganga</li> <li>Innocent Mutagwaba</li> </ul>	Senior Managers – Moyowosi/ Kigosi game reserve	<ul style="list-style-type: none"> <li>Brief of Moyowosi Game Reserve</li> <li>Environmental problems in the protected area</li> <li>Likely environmental impacts of the project and mitigation measures</li> </ul>
27/07/2016	Imelda J. Hokororo	Ag. DPLO – Kakonko DC	<ul style="list-style-type: none"> <li>Whether there are development plans that are</li> </ul>

Date	Name of Person	Title	Issues Discussed
			likely to be affected by the proposed road upgrading <ul style="list-style-type: none"> <li>• Potential impacts of the project and proposal for mitigations measures</li> </ul>
27/07/2016	Nuru J. Barakabitse	DEMO – Kakonko DC	<ul style="list-style-type: none"> <li>• Environmental profile of the district</li> <li>• Main environmental problems in the district</li> <li>• Protected environmental areas along the road</li> <li>• Potential environmental and social impacts of the proposed road upgrading and mitigation measures</li> </ul>
27/07/2016	<ul style="list-style-type: none"> <li>• Riziki Andrew</li> <li>• Francy John</li> </ul>	<ul style="list-style-type: none"> <li>• Ag. DWE – Kakonko DC</li> <li>• Water Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Domestic water supply profile for villages along the project road.</li> <li>• Water supply utilities that are likely to be affected by the road upgrading</li> <li>• On-going water supply development and plans that are likely to be affected by the road upgrading</li> <li>• Potential impacts of proposed road upgrading to water supply utilities and proposal to mitigate them</li> </ul>

The public was consulted through public meetings which were conducted at selected villages. The main objectives of community consultations were:

- To provide clear and accurate information about the project to the communities along the proposed road
- To obtain main concerns and perceptions of the population and their representatives regarding the road;
- To obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures

To ensure that these groups participate in meetings, advance notices were sent to village government leaders to inform the communities, including disabled, women, aged people, and youth of the meeting. Secondly, every village indicated the convenient date, time, and convenient venue to convene the meetings. In collaboration with village leaders, central locations were identified for the meeting venues.

A total of ten (10) public consultative meetings were held. The meetings the involved the following villages: Kidiama, Kanazi, Makere, Kalimungoma, Nyangwa, Busunzu, Nyankwi, Nyaruranga, Kisogwe. Other villages that were involved are Kitahana, Mvugwe, Kumkambati, Kuntundu, Kumkugwa, Twabagondozi, Kasanda Kakonko, and Kabingo. To allow community members to participate fully the meetings were arranged close to their places of residences. People of from groups of different interests were involved as well as ward and village and district officials whereby varying views, concerns and questions about the project were expressed by communities and other stakeholders and were collected by the consultant team for review and or further use.

During consultation the stakeholders were briefed on the proposed road project as well as the ESIA process, and the governing environmental legislation. The public was then given opportunities to air their views and opinions concerning the project. Potential impacts – both positive and negative impacts as well as mitigation measures were also gathered as presented in the preceding section.

Presented in Table 26 is a schedule of public consultative meetings, which were held in different villages along the project road corridor. The schedule shows dates, participated Villages, and the number of community members that participated in the meetings.

**Table 26: Schedule of Consultative Meetings with Communities along the road**

No	Date	Time	No of Participants	
			Participated Village	No. of Attendees
1.	24 <sup>th</sup> July 2016	Unrecorded	Kanazi	36
2.	25 <sup>th</sup> July 2016	Unrecorded - 13:59 hrs	Makere, Kalimungoma, Nyangwa	50
3.	26 <sup>th</sup> July 2016	10:53 – 13:18 hrs	Busunzu, Nyankwi, Nyaruranga	42
4.	26 <sup>th</sup> July 2016	Unrecorded	Kisogwe	34
5.	26 <sup>th</sup> July 2016	Unrecorded	Kitahana	55
6.	26 <sup>th</sup> July 2016	Unrecorded	Mvugwe, Kumkambati, Kumtundu	40
7.	27 <sup>th</sup> July 2016	10:09 – 10:59 hrs	Kumkugwa, Twabagondozi	30
8.	27 <sup>th</sup> July 2016	12:00 – 13:30 hrs	Kasanda	45
9.	27 <sup>th</sup> July 2016	16:02: - 17:08	kakonko	
10.	27 <sup>th</sup> July 2016	Unrecorded	Kabingo	13

The meetings were chaired by village chairmen and recording of minutes was done by village Executive officers. Copies of minutes of the meetings are attached as Appendix II. Notably although the minutes were recorded by the village representatives, the consultant also recorded issues, concerns, and views of the participants to be included in the public consultation chapter of this report to ensure that all discussed issues do not pass unrecorded.

## 10.4 RESULTS OF STAKEHOLDERS CONSULTATION

### 10.4.1 Consultation with Statuary Bodies and Institutions

The following table (Table 27) summarizes issues and concerns that were raised by the statutory bodies and institutions that were consulted during ESIA study.

**Table 27: Results of consultation with Statuary Bodies and Institutions**

No.	Institution/ Village	Issues/ concerns
<b>Kasulu District Council</b>		
1.	Wilson Ruheta – DWE, Kasulu	<p>Sources of domestic water supply profile for villages along the project road are:</p> <ul style="list-style-type: none"> <li>• Kasulu town: Sources of water include Miseno, Nyanka, and Nyakatoke gravity schemes. A number of distribution pipe lines either run along or cross the road. Plans are also underway to rehabilitate the existing water supply system for Kasulu as well as construct additional water supply sources.</li> <li>• Kidiana: Gravity scheme with sources at Mgandazi,, Nyasha, Nyandala villages. The source supply Nyasha, Nyandala, and Kidiana villages. Some distribution pipe lines cross the project road and the proposed bypass road. In addition, some Domestic Points (DPs) are close to the road</li> <li>• Kanazi: Gravity scheme with some distribution lines across the project road. A main pipe line supply to Mbondo MATI crosses the project road. In addition, some DPs are located near the road.</li> <li>• Nyamyusi: Gravity scheme with source at Nyakabano B. Main</li> </ul>



No.	Institution/ Village	Issues/ concerns
		<p>pipe line to storage tank cross the project road.</p> <ul style="list-style-type: none"> <li>• Nyakitonto: Same source as Nyamyusi. Main pipe line cross the project road and some DPs are close to the road.</li> <li>• Mugombe: Same source as Nyamyusi village. Some of distribution lines cross the project road.</li> <li>• Nyachienda: Gravity scheme with source at Lulengela. Some of the distribution pipe lines cross the project road.</li> <li>• Kitagata: Same source as Nyachienda. Some of the distribution pipe lines cross the project road.</li> <li>• Makere: Pumping scheme – a borehole with distribution network. Another source includes improved shallow well. Some of the shallow wells are located close to the road</li> <li>• Nyamidaho: Two shallow wells which are located near the road</li> <li>• Mvugwe: Two shallow wells, which are located on the LHS near the road</li> <li>• The above water supply utilities are likely to be disrupted by construction activities. To mitigate the impact, prior to commencing construction works, the utilities should be relocated. In addition, the design should provide services ducts to allow for future extension/ expansion of the existing water supply system. Locations of service ducts should be established in consultation with DED office</li> </ul>
2.	<ul style="list-style-type: none"> <li>• Elicana A. Maige – DGO, Kasulu DC</li> <li>• Edwin R. Kunyekwa – DFO/ DEMO, Kasulu DC</li> </ul>	<p>The project road traverses along a number of forestry protected areas.</p> <ul style="list-style-type: none"> <li>• The LHS of the road section between R. Malagarasi and Makere is a forestry protected areas, namely North Makere Forest Reserve under the authority of Tanzania Forestry Services agency (TFS). Part of North Makere Forest Reserve has been converted to a game reserve, namely Nyamroha Hunting Block. Common animals include sitatunga (antelope), wild dog, lion, leopard, buffalo, topi, and elephant, etc.</li> <li>• The road section between Makere and Kabulanzwili is a forestry protected area under TFS, namely South Makere Forest Reserve. Part of North Makere</li> <li>• There is one village forest reserves along the project road include Nyangwa village forest reserve, which is located on the LHS of the road</li> <li>• There is one wildlife migration corridor is located at Mvugwe village, along Moyowosi game reserve.</li> </ul>
3.	Deogratias P. Kavishe and Donald K. Silas – TFS, Tunduru	<ul style="list-style-type: none"> <li>• South Makere Forest Reserves starts from just after the bridge for R.Makere (except village)</li> <li>• The South and North Makere Forest Reserves were declared/ gazetted on 14 October 1955, under GN 375, 1955. And also under Cap 3, 1989</li> <li>• North Makere Forest Reserve starts from R.Makere towards Kibondo, but diverts to the east-northern direction (on the RHS of the road</li> <li>• North Makere forest reserve covers an area of 72,350 ha, while South Makere covers 75,278 ha</li> <li>• Past experience has shown that many contractor have tendencies to open borrow pits from land without consulting owners – the Contractor should not borrow materials from forest reserves without permit from relevant authorities. If it is necessary to do so, the Contractor will have to pay fees in accordance with Forest Act No. 12 of 2002 and GN of 2015</li> </ul>

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Institution/ Village	Issues/ concerns
		<ul style="list-style-type: none"> <li>• Under any circumstance the Contractor should not set a camp in the forest reserve</li> <li>• The Contractor should not involve in forest product business – should not harvest forest products</li> <li>• Cleared land should be compensated by planting trees somewhere else</li> </ul>
4.	Jacob W. Kilatu – DPLO, Kasulu DC	<ul style="list-style-type: none"> <li>• Several government institutions buildings such as schools, dispensaries/ health centres, and administrative buildings located close to the road are likely to be affected by the road upgrading activities, especially widening and construction of diversion roads.</li> <li>• Private properties, such as buildings and farmlands) are also likely to be affected by the project. To mitigate the impact, construction activities should be done in a manner that minimizes impacts to government and private properties.</li> <li>• Construction will employ both skilled and non-skilled labour. To enhance the positive impact, priority for employment should be given to the local people.</li> <li>• The project should minimize the impact due to traffic along settlements, blasting, material borrowing, generation of dust, noise</li> <li>• The project should consider construction of community centre as part of cooperate responsibility</li> </ul>
<b>Kibondo District Council</b>		
1.	Eng. Peter J. Ngulolwe - DWE, Kibondo DC	<p>Major sources of domestic water supply are open shallow traditional wells and protected springs.</p> <p>Other sources of domestic water supply are:</p> <ul style="list-style-type: none"> <li>• Busunzu village: Pumping scheme - water is pumped from a borehole to a storage tank before being distributed to consumers.</li> <li>• Kifura village: Plans are underway to drill a borehole at Kifura village. Water will be distributed to consumers after being pumped to a storage tank</li> <li>• Kigendeka – Kibondo town: Water supply from Nyamisevi prison. Plans are underway to extend the supply to cover Twabagondozi village. Implementation of the plan awaits funding from United Nations High Commission for Refugees</li> <li>• Plans are underway to construct one dam (with catchments at Kanembwa (near Kanembwa Military base) and Nyendala to harvest and store rain water</li> <li>• Upgrading of the road and construction of the bypass is likely to disrupt water supply pipe network. To mitigate the impact, the Contractor should involve the district council to identify locations pipes within direct impact zone. In addition, service ducts should be installed to allow future extension or extension of the networks. Locations of service ducts should be decided after consulting relevant district authority</li> </ul>
2.	Mohamed Shemdoe, DEMO, Kibondo DC	<p>The project will cause the following impacts:</p> <ul style="list-style-type: none"> <li>• Air pollution due to generation of dust. Crusher plant should be located away from settlements</li> <li>• Soil erosion due to clearing of vegetation</li> <li>• Water pollution by sediments from clear land</li> <li>• Destruction of habitats</li> <li>• Impact on the amount of rain. Clearing of vegetation (canopy cover) will reduce rain and impair micro climate</li> <li>• During material investigation the council should be involved</li> </ul>
3.	John Makunja, Ag. – DCDO,	The proposed road upgrading will have the following impacts to the

No.	Institution/ Village	Issues/ concerns
	Kibondo DC	<p>communities:</p> <ul style="list-style-type: none"> <li>• Create employment to the local communities</li> <li>• Create market and give better prices for agricultural products</li> <li>• Improve access to social services, especially health services</li> <li>• Increased spread of HIV/ AIDs. To mitigate the impact, HIV committee should be involved; HIV alleviation intervention should be planned and implemented.</li> <li>• Triggering of child labour. To enhance the impact, prioritize employment to the local people. This will also minimize sabotages of contractor's properties.</li> <li>• Increased of unplanned pregnancy</li> </ul>
4.	<ul style="list-style-type: none"> <li>• Seif Salum, Ag. DFO, Kibondo DC</li> <li>• Rafael Rafike, Ag DNRO, Kibondo DC</li> </ul>	<p>Common environmental problems are:</p> <ul style="list-style-type: none"> <li>• Bush fire</li> <li>• Overgrazing and grazing in protected areas</li> <li>• Illegal cutting of trees to make charcoal, or as source of energy for tobacco drying,</li> <li>• Clearing of trees resulting from shifting cultivation</li> </ul> <p>Nearly every village along the project road have village forest a reserve. Forestry and wildlife protected areas include:</p> <ul style="list-style-type: none"> <li>• Busunzu village forest reserve: located on the LHS of the road. It is located immediately after the sharp corner, past the village centre</li> <li>• Kisogwe village forest reserve: Located on the RHS of the road</li> <li>• Kifura village forest reserve: Located between 8 – 9km off the road</li> <li>• Maloregwa village forest reserve: The village has two forests reserves along the project road</li> <li>• Rusohoko village forest reserve</li> <li>• Kigendeka village forest reserve: Located 8km off the project road</li> <li>• Kumkugwa village forest reserve: Notably, the forest reserve acts as a buffer zone for Moyowosi game reserve</li> <li>• Village forest reserves along Kibondo Bypass Road: Biturana village forest reserve (starts immediately after Nduta refugee camp), Nengo village forest reserve. Another important village forest reserve which is not located along the bypass but in its the neighbourhood is Kumhasha (Naviumbu – from the river)</li> </ul> <p>The proposed road upgrading will have the following impacts:</p> <ul style="list-style-type: none"> <li>• Clearing of trees. Clearing of trees at Busunzu across a water spring will cause serious impact on the availability of domestic water to the local people, especially when it is considered that the local people rely on this source of water.</li> <li>• Domestic water supply source at Busunzu village (pumping source) will be affected</li> <li>• Clearing of trees will result into loss of fire wood for the local people – unnecessary clearing should be avoided</li> <li>• Road construction is likely to disrupt domestic water supply utilities, especially main and distribution pipe lines</li> <li>• Upgrading of the road will improve access to forest reserves and so increase pressure to natural resources</li> <li>• Road upgrading will reduce travel time and costs to the local people.</li> <li>• Reduced transport cost due to upgrading of the road will reduce the cost of transport of agricultural produce , which will result into increased production</li> <li>• Improved access to social services (health services, market)</li> </ul>

No.	Institution/ Village	Issues/ concerns
		<ul style="list-style-type: none"> <li>• Improved mobility will improve security of the project area</li> <li>• Improved administration of the project area</li> </ul> <p>The following are proposed</p> <ul style="list-style-type: none"> <li>• Some of the construction camps be built in Kibondo District</li> <li>• Camps should be constructed in areas that are connected to national power grid and that after road construction they should be handed over to government institutions.</li> <li>• Borrow pits should be reinstated by contractor immediately after their use by planting trees or improved to a safe state for harvesting rainwater.</li> </ul>
5.	Aloyce P. Mganga and Innocent Mutagwaba - Senior Managers, Moyowosi/ Kigosi Game Reserve	<ul style="list-style-type: none"> <li>• Moyowosi/ Kigosi game reserve is located in Kibondo, Kakonko (Kigoma Region), Bugombe, Kahama (Shinyanga Region), Kaliua, (Tabora Region), Biharamulo (Kagera Region), and Mbogwe (Geita Region) Districts.</li> <li>• Moyowosi is located in Kibondo and Kakonko Districts, while Kigosi (divided into Kigosi North and Kigosi South) is located in the remaining Districts.</li> <li>• The game reserve covers a total area of 21,060 square kilometres, of which 11,480 square kilometres are located in Moyowosi game reserve while the remaining (9,630 square Kilometres) are located in Kigosi game reserve.</li> <li>• Moyowosi game reserve was gazetted in 1981 under GN. No. 1 of 1981, while Kigosi game reserve was gazetted in 1983 under GN. No. 68 of 10<sup>th</sup> June 1983 (No. 68.10/6/83)</li> <li>• The game reserve is divided into three (3) zones: Moyowosi, which is the headquarter of the whole game reserve (located at Kifura village), Kigosi North and Kigosi South</li> <li>• The game reserve starts just after R.Malagarasi (if travelling from Kasulu towards Kibondo) and ends at Nyalulanga/ Nyankwi village (past Mvugwe village). The project road section from R.Malagarasi to Nyalulanga village (about 7Km) therefore borders the game reserve, but then diverts away from the road.</li> <li>• There used to be animal migration corridor across the road at Mvugwe village but animal no longer migrate to other game reserves as the corridor has been blocked by settlements</li> <li>• Common terrestrial wild animals in the game reserves are lion, elephants, leopards, statunga (antelope), hyena, zebra, wild dog, giraffe, hartebeest, topi, and antelope (various species). Other wild animals include buffalo, warthog, bush pig, and various species of birds and different species of reptiles. Also included are different species of birds such as wattle crane, shoe bill – stock,</li> <li>• Aquatic animals found in the game reserves include crocodile, hippopotamus, and different species of fishes</li> <li>• Endangered species include wild dogs. The reason for their being endangered species are: destruction of their habitats by blocking of protected areas by human population – blocking migration corridor, competition with other carnivals (larger), conflicts with pastoralist (human – carnival conflicts)</li> </ul> <p>Upgrading of the road will have the following impacts:</p> <ul style="list-style-type: none"> <li>• Will boost tourism sector due to improved travel time</li> <li>• Improved management of game reserves due to improved mobility, and response to issues in other zones. This will improve management efficiency of the game reserve.</li> <li>• Opening of business opportunities for local people (which were</li> </ul>

**Revised Environmental Impact Assessment Report for the Proposed Upgrading of Kasulu – Kabindo – Kabingo Road Section and Construction of Kibondo Bypass (202km ) to BitumenStandard**

No.	Institution/ Village	Issues/ concerns
		<p>hindered by the poor road) and so reduce dependency on natural resources</p> <ul style="list-style-type: none"> <li>Increased pressure to natural resources (especially harvesting of timber) due to improved mobility by local people and outsiders</li> </ul> <p>Present environmental problems in the game reserve include:</p> <ul style="list-style-type: none"> <li>Illegal hunting (poaching) and tree felling by local people as well as by refugees to increase income because basic needs supplied by humanitarian aids are inadequate</li> <li>Bush fire – done illegally by local people to promote grass growth to attract animals for hunting</li> <li>Grazing in the game reserve</li> </ul> <p>Proposed measures to mitigate the impacts:</p> <ul style="list-style-type: none"> <li>Contractor should adhere to laws pertaining to hunting and harvesting of forest products</li> <li>Contractor should not borrow materials from game reserve without permit from relevant authorities</li> </ul>
<b>Kakonko District Council</b>		
1.	Nuru J. Barakabitse, DEMO, Kakonko DC	<p>Common environmental problems are:</p> <ul style="list-style-type: none"> <li>Farming very close or along water courses, contrary to water resources management act</li> <li>Overgrazing, including grazing in water course</li> <li>Clearing of trees to make charcoal</li> <li>Clearing of trees due to shifting cultivation practice</li> <li>Poor management of solid waste - collection, transport and disposal – existing dump site is not operational</li> </ul> <p>Forestry Protected areas:</p> <ul style="list-style-type: none"> <li>One village forest reserve between R.Kanembwa and R.Nyanzuki on the LHS of the road. The forest does not have wildlife</li> </ul> <p>Likely impacts of the project:</p> <ul style="list-style-type: none"> <li>Loss of vegetation, in particular along village forest reserve. The impact should be mitigated by minimizing unnecessary clearing of vegetation and compensating cleared trees</li> <li>Modification of hydrological regime, especially where there are fills or cuts</li> <li>Soil erosion due to clearing of vegetation. Mitigate by maintaining natural flow speed of water for water courses</li> <li>Health and safety issues, such as accidents and occupational diseases. Mitigate the impact by putting in place measures to prevent accidents and protecting workers against occupational diseases</li> </ul>
2.	<ul style="list-style-type: none"> <li>Riziki Andrew Ag. DWE, Kakonko DC</li> <li>Francy John, Water Technician</li> </ul>	<p>Domestic water supply profile for villages along the project road:</p> <ul style="list-style-type: none"> <li>Kanembwa village: Open traditional and river</li> <li>Kazilamihunda village: Pipe water from gravity scheme, R.Kazilamihunda. Distribution pipe lines cross the project road at some point</li> <li>Nkuba village: Stream and open traditional wells</li> <li>Kasanda village: Borehole with hand pump, existing pipe water system (but currently not operational) and R.Mhadzi</li> <li>Kiyobela/ Kabingo villages: Pipe water from a gravity scheme. Some DPs are located close to the road</li> </ul> <p>Potential impacts of the project:</p>

No.	Institution/ Village	Issues/ concerns
		<ul style="list-style-type: none"> <li>• Damages to DPs located close to the road</li> <li>• Damage to borehole with hand ump at Kasanda village as it is located close to the road</li> <li>• Pollution of rivers systems</li> <li>• Change of hydrology of river systems due to earthwork activities</li> <li>• Disruption of domestic water supply utilities along and across the road. Mitigate by involving DWE to identify their locations. In addition, valuate affected properties are repair/ replace at project cost. Also install service ducts to allow for future extension/ expansion of existing water supply system</li> </ul>
3.	<ul style="list-style-type: none"> <li>• Imelda J. Hokororo, Ag. DPLO, Kakonko DC</li> </ul>	<p>The following plans are underway to be implemented along the project road:</p> <ul style="list-style-type: none"> <li>• Construction of a market at Mtendeni (Kasanda). The road improvement will encourage consumers from Kabingo, Kazilamihunda, and Kibondo because improved access (reduced travel time and cost)</li> </ul> <p>Road upgrading will have the following impacts:</p> <ul style="list-style-type: none"> <li>• Encourage/ attract investors to invest in the project area for hotels, fuel stations, schools, hospitals, etc. At present poor road discourage them to invest</li> <li>• Improve transport of agricultural products (vegetables, fruits from Kibondo) and so reduce their costs</li> <li>• Integrate culture from different areas</li> <li>• Loss of properties due to relocation</li> <li>• Generation of dust due to construction activities</li> <li>• Damages to utilities e. water supply utilities</li> <li>• Loss of vegetation due to clearing works</li> <li>• Increased spread of HIV/ AIDs</li> </ul>

#### 10.4.2 Consultation with Communities along the Project

The following table (Table 28) summarizes issues and concerns that were raised by the public through public meetings and interviews during ESIA study. It is worth to note that the views are not categorized according to village/meeting because there were many repeated points.

**Table 28: Results of consultation with the Public**

Village	No.	Issues/Comment from Community	Response by Consultant to Issue Raised
Kidiama	1.	Raised household income and standard of living: The proposed project will raise the number of buyers (increased demand). Increased demand will raise prices of farm produce consequently increased income of farmers, hence accelerated quality of life	It is a valid potential impact
	2.	Employment opportunities to youth during project construction: Employment opportunities – the project will provide jobs to villagers either directly as labourers during road construction or indirectly through trading with workers and road users during and after construction, hence reducing poverty to some extent	
	3.	Improvement on transportation services: Due to the	



<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		improvement on transportation services it will enable people to reach at the intended places timely at reasonable cost	
	4.	Increase of road accidents: Many people are not familiar with road signs especially children, elders and while others are normally drunk while crossing the road	
	5.	Family instabilities: The project workers might solicit couple and seduce them for sexual activities and this might cause conflict within families or breakage of marriages. So for that case villagers as whole should corporate in order to maintain their family status	
	6.	Unfair compensation: Communities are worried that the government might not pay them the real value of the affected properties. Most of the villagers think that the government will give them low compensation	The government will compensate every affected property according to the government schedule of properties. There are schedules made by the government in the Ministry of land in valuation department, these values are updated every year to take care of inflation of Tanzanian shilling. The same schedule which is used in other project will be used to evaluate the properties of this project
	7.	Temporary road diversions and bridge during road construction: During road construction temporary routes should be prepared so that vehicles/buses continue to operate along the route. For example, near Herujuu village there is Kingati bridge. So villagers requested that during construction, the government should rehabilitate the Kingati bridge so that it will assist villagers to continue doing their daily activities with less impacts	The suggestion will be presented to the responsible authority for consideration. The community were told that the operations of the services will continue during construction
	8.	Replacement of social infrastructure: If the project affect any public property e.g. school, water facilities, village market, church, mosque or any other institution, the Government should make sure that those properties are relocated for instance at Songambe village there is community water well, community market and worshipping structures.	All affected community structures will be compensation and the users will be able to elect a new structure for use.
	9.	PAP participation: Compensation exercise should be implemented in a participatory manner where all family members will be aware of the entitlements of	It was stressed during the community meeting that all the couples affected



<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		the affected properties and the amount of money expected to be received. This will help to avoid misuse of the money and family conflicts. The couple should be both signatories of the bank account.	should open a joint account where the both partners will be able to get money jointly and budget its used.
	10.	Adequate time should be provided to PAP for re-location. All PAPs wanted to know when the exercise is expected to take place. PAPs wanted to get prior-information on the commencement of the project particularly construction activities.	The PAPs were told that prior information will be given to them on time so that they can prepare themselves for vacating the RoW.
	11.	Indecisive tendency of the government retard people's development: Information about this road improvement has been heard for a long time but there is no serious steps taken to implement the plans. This has retarded development of people especially those residing along the road corridor, as they can neither improve their structures nor expand their businesses. They also cannot plant crops on the fields. The communities are keen to know when the project is going to be implemented as one of villager said that in the year 2010 they were informed about the same project but surprisingly until now the project is not yet implemented	The government is there for the development of its people. It has good intention for every citizen; however, the government has limited resources to implement every intention. It has to look for resources from different group within and outside. It is true that the government wanted to improve this road long time ago but the funds were not available to complete this long road. The government had to go and outsource funds from the AfDB. Now the funds are available now the government will construct this road as planned
	12.	Entitlement framework for tree owners is not known: Some people planted trees along the corridor for different uses either for shading or for timber, firewood, and even charcoal. Entitlement for compensation of trees is not clear	Eligibility criteria will be used to select those who are eligible compensation and those who are not entitled. There are two measurements those who are located in 22.6to 30 metres will be compensated while those in below 22.5 are not entitled for compensation
	13.	People's favour: Villagers requested the government to think profoundly and consider those who will be affected without compensation meaning that those who are within (45m) so the government should favour them by finding new destination for them to	It might be difficult to rethink about those who are within 45m, because by doing so the government will be

<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		reside.	breaking it own laws.
Kanazi, Kitangata, and Kasasa villages	1.	They are expecting to benefit from enhanced market due to increased number of outsiders who will be passing in the villages and buy local produce	
	2.	They expect easy access to farming inputs/implements that can promote and increase agricultural productivity	
	3.	When road construction will take place it means that villagers especially youth will have huge chance to get employment or petty trading	
	4.	Unfortunately, the village mosque is located within the right of way, now the community is worried whether the government will compensate the structure to be demolished	The structure will be compensated and the users will use the compensated funds to re-elect a new structure
	5.	When will the road construction take off?	Road upgrading is a process. When RAP is completed and the PAPs are out of the RoW, the government will look for the contractor and be awarded the contract. Then the construction activities will start
	6.	The road will increase hazardous disease like increased HIV/AIDS cases resulting from increased social interactions with people from outside the region and the country	Measures to combat the spread of HIV/AIDs shall be put in place
	7.	Improved road will increase accidents especially at village centres and where the road transverse public places including primary schools, religious institutions and market places	
	8.	Environmental pollution such as noise and dust will affect people's health. Dusts might bring new diseases including respiratory. Excavation of trenches during construction will destroy original shape of the village while clearance of tree will affect village scenery	The contract during construction will be instructed to water road surfaces in all active construction sites. The contractor will also be instructed to plant new trees after completion of the road
	9.	Suggested that education program for HIV/AIDS has to be developed and implemented. Also, since currently there is no any HIV testing centre in the ward, establishment of HIV screening centre will assist people to be aware of their health status	Valid concern
	10.	They want the Government to choose the best contractor to avoid sub-standard roads that are not	

<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		sustainable	
	11.	Villagers congratulated this road programme for implementing the project in a participatory manner, unlike in some other programs where there is no communication made by government to the beneficiaries	
	12.	Measures should be taken in selecting sites for obtaining construction materials to avoid sites that vibrations might cause cracks to peoples properties (crusting)	
Makere, Nyangwa, and Kalimungoma villages	1.	Many anticipated benefits from the project were mentioned as direct and indirect employments, easy and reliable transport services and improved marketing of agricultural produce	
	2.	Increased imported goods after road construction as many people will be interested to import products from Kigoma as they are assured of good transportation services	
	3.	After road construction, it will decrease dust as well as diseases caused by dust like eyes diseases and influenza	
	4.	Road project will increase risks of road accidents especially to school children, drunkards, aged people and livestock. It is important for the road design to consider proper mitigations in village centres and where the road transverse primary/secondary schools	
	5.	What will come first, demolition of structure or compensation?	Eligible PAPs will be compensated before commencement of construction
	6.	Improvement of the road will increase influx of people in the area either permanently or temporary. The existing health facilities are already stretched might not be able to cope with an increased demand. HIV/AIDS and other diseases will also be accelerated therefore a health centre with a testing facility and ARVs should be considered as mitigating health problems.	Noted
	7.	Increased unwanted pregnancy cases	Noted
	8.	Precautions should be undertaken during construction when excavating adjacent section of the road closer to existing water pipelines and water points	
	9.	Employment should not be gender bias. Male and female should be given equal opportunities for employment	

Village	No.	Issues/Comment from Community	Response by Consultant to Issue Raised
	10.	There were some different opinions among participants concerning the road alignment some people wanted the road to be realigned to avoid destructions on peoples properties along the existing corridor of impact while others were uncomfortable with changing the existing alignment	
	12.	Villagers were complaining that the Government through TANROADS spread a written order to all affected people along / within the RoW instructing the people to remove the properties by themselves in a specified timeframe; otherwise the government will demolish the structures at the owner's expenses. What is the ultimate destination of these loyal ones?	There is nothing to give those who demolished their structures located in the RoW, we thank you for being faster and good example for those who have not removed the structures. You did not lose anything because those who didn't are going to do it now
	13.	People will migrate into the project area. The available social services inadequate to cope with the demand	
Mvugwe, Kuntundu, Kumkambati villages	1.	The project will provide jobs and income generating opportunities villagers hence reducing poverty in the village	
	2.	The village in general will benefit to some extent as the road will enhance efforts on social development activities, i.e. health, education, agriculture	
	3.	It will reduce transport cost which is now seems to a burden to them from one place to another at a reliable and comfortable travel	
	4.	The project will accelerate infectious disease such as AIDS/HIV, unwanted pregnancy to youth and other related diseases. It will also increase marital conflict within the family and between families, though it won't be pronounced	
	5.	It was also stated in the meeting that the RoW was set as far back as in the year 1984 when Mwl. Nyerere visited the village and instructed people to leave the road reserved areas as the government would plan to improve and expand the road in the future	
	6.	They recommended that there should be capacity building to enhance PAP to make right decisions on resettlement matters before implementation and after	
	7.	During the road construction the priority for employment opportunities should be given to villagers instead of bringing in people from other places to work in the section of the village while the	

<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		local youth are unemployed	
Nyankwi, Busunzu, Nyaruranga villages	1.	Reliable transport will increase demand for local produce this will motivate farmers to increase production and productivity resulting in improved standard of living	
	2.	Normally contractors do not care people's health as a result no precautions are taken to mitigate dust even if water is available in neighbourhoods. It was recommended that the contractors should collaborate with village governments in implementation of the proposed mitigation measures	
	3.	People also wanted to know what will be the procedures to compensate people whose plots/land are used sources materials for road constructions, for example gravel and stones	Those affected people will be compensated by the contractor. The agreement will be made between both parties
	4.	It is important for the road design to put road bumps at every village centres and where the road transverse primary schools	
	5.	Villagers suggested education programs as main precaution measure to be undertaken. Also, since currently there is no any HIV testing centre in the ward, establishment of HIV screening centre will assist people to be aware of their health status	HIV/AIDS awareness creation among families should be done to reduce chances of these conflicts
	6.	Presence of crime cases will increase in the villages as a result of immigrants who are seeking employment. Also the improved road will make it possible to travel long distance within a short time therefore robbery and thefts can be easily committed if precautions are not taken	Community policing should be established and strengthening were exists
	7.	Family conflicts, separations and divorces caused by presence of people with more financial capabilities than the local people	
Kitahana and Kisogwe villages	1.	Due to the road construction villagers will get temporally employment especial youth whereby both skilled and unskilled labourers, food vendors, small business enterprises will acquire temporal informal jobs to sustain their livelihood	
	2.	Once the road has been improved, it will simplify transportation of different commodities hence people will get imported goods which are not produced in Kigoma	
	3.	The improvement of road will create a room for investors to invest their capital, technology and skills in Kigoma that will boost development	
	4.	At first most of the villagers will face the problem of	

<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
		road accident because they are not aware of the new constructed road and its sign. Also children and drunkards will face this problem	
	5.	Increase of HIV/AIDS as well as Unplanned and early pregnancies: This will be commonly to school girls, as due to their lusts they will tend to date contractors. Also spread of HIV/AIDS if they will not be careful	
Twabagondozi, and Kumkubwa villages	1.	Community members were also worried about the existing grave yard and a village government office that are likely to be removed	
	2.	To reduce HIV infections contractor(s) should not locate a camp closer to settlements in an attempt to reduce the rate of infection. The closer the camp to the communities the bigger the interaction between the project workers and the community members and the chances of infection rate increases	
	3.	The government should fulfil their promises for Nyakanazi- Kasulu to Manyovu road is overdue promise, but none of these have been fulfilled	
	4.	Contractor should also be told to report and maintain frequent communications with village governments. This will help in solving some common conflicts between project workers and the community	
	5.	Employment provided by the contractor particularly of villagers should be done through Village government offices and job opportunities should be announced through village governments to avoid child labour/ school absentees and increased school drop outs. This will also ensure fairness and avoid unnecessary complaints from villagers because of favours to those related to village leaders	
	6.	Where it will be necessary to extract required earth and other materials for road construction, the contractor should try to avoid destroying the land terrain as much as possible	
Kasanda, Kewe, Nkuba villages	1.	The project will promote utilization of natural resources and traditional things. Locally produced commodities will be sold in towns instead of relying on village market	
	2.	The project will provide jobs and income generating opportunities to the people hence reducing poverty in the villages	
	3.	Reliable transport will increase demand for local produce hence people will be ready to cultivate more products with end result in improved standard of living	

Village	No.	Issues/Comment from Community	Response by Consultant to Issue Raised
	4.	Separation of families, kin's and friends who have been living together for a long time and supporting each other socially, economically and morally ( social fabric)	
	5.	It will destroy people's houses and sources of livelihoods including business premises	
	6.	Road accidents will increase especially near village centres, primary schools	
	7.	The project will also reduce portion of cultivatable land, consequently resulting in small farm sizes for the affected people	
	8.	Participants wanted to know what will happen to the house structures of which the corridor of impact touches a slight part of the entire property	
	9.	Villagers were complaining that the Government through TANROADS spread a written order to all affected people along or within the RoW instructing them to demolish properties in the RoW by themselves in a specified timeframe, otherwise the government will demolish at a cost of the property owners. Following this order, some people responded positively and removed the structures. Are they going to be compensated or not?	Those who demolished the structures were within 0-22.5 metres and are not entitled for compensation
	10.	Employment opportunities should be directed to the villagers especial those who are capable to do unskilled labour. In addition to the road project, the villagers advised the government to support other socio-economic activities in the village in order to improve living standard of people	
	11.	This may promote market for their products e.g. local products –banana and beans and maize	
	12.	Villagers were complaining that the Government through TANROADS spread a written order to all affected people along / within the corridor of impact instructing them to remove the properties by themselves in a specified timeframe and that otherwise the government will come for it but on expenses of the property owners. Following this order, some people responded positively and demolished structures from the RoW	
	13.	People have lost trust in the government, as they think road rehabilitation is becoming a rumour. it has taken so long	
Kiziguzigu, Kabingo, Ruyenzi, and Kiyobela	1.	The proposed project will brings development because different people will be attracted to invest in Kigoma due to availability of good transport services	



<b>Village</b>	<b>No.</b>	<b>Issues/Comment from Community</b>	<b>Response by Consultant to Issue Raised</b>
villages			
	2.	Improvement of the road will lead to reliable transport and reduced bus fares whereby transportation prices rise during the rainy season when the road condition is in bad shape	
	3.	It will bring in illegal migrants from the neighbouring countries since the village is located along the border	
	4.	Diseases such as HIV/AIDS, where currently it is low but it can increase as a result of increased interaction of project workers and communities	
	5.	Health care system is not adequate enough to support increasing population, and increased diseases due to project activities	
	6.	The Government through TANROADS spread a written order to all affected people along the corridor of impact instructing the people to remove the properties by themselves in four months' time and that otherwise the government will come for it but on expenses of the property owners. Following this order, some people responded positively and remove the houses away from the corridor of impact because they could not stand the order from the authorities. What is the ultimate destination of these loyal ones?	
	7.	Opinion on by-pass: In the meetings there were some differences among participants with some asking the possibility of diverting the road route to avoid destructions / demolition of structures and people's properties along the RoW others were uncomfortable with changing the existing alignment. However, the majority did not want the idea of diverting the road alignment because they thought it will not have as much benefits as using the existing alignment	
Kakonko, Mbizi Mganza, Itumbiko villages	1.	After the newly road has been constructed it will leads to reduction of transportation cost as now due to poor road they use high cost in transportation especially during rainy seasons	
	2.	Economic growth: This will happens because there would be good availability of transport services whereby people will transport their products from one place to another. Also due to road construction it will influence investors as well as diversification of economy as people will no longer depend only on agriculture activities rather they will engage in different economic activities	
	3.	Increase of sex workers: This is because, the	

Village	No.	Issues/Comment from Community	Response by Consultant to Issue Raised
		constructors will go there without their spouses so by that case women will get a chance to sell their bodies whether directly or indirectly in order for them to get money to sustain their lives	
	4.	For those who will lose their properties with no compensation will face hardships as they have to start new life. Also for those who have their kiosks along the road once they lost them, might also turn into poverty	
	5.	For those who owned the land before 1967 and they are within 0m-22.5m but they haven't given notice yet what should they do?	For surely, those in 22.5 have all received a notice from TANROADS and need to demolish their structures and resettle somewhere else
	6.	On the issue of graves, in all villages people were told that during road construction there are some graves which might be found within 0m-30m, but in case of any grave found the one who is responsible will be compensated by giving him or her money to re-burial the remains and conduct reburial ceremony and they have to find another place to rebury the remains with the support from community leadership	
	7.	All villages decided that in order to avoid increase of unplanned pregnancies, HIV/AIDS and STIs as well as separation of families, contractor's camp should be built far away from village centres. Also contractors should be told customs and taboos of intended village in order to maintain respect and avoid misunderstanding with villagers	

## 10.5 STAKEHOLDERS CONCERNS AND HOW THEY HAVE BEEN ADDRESSED

Most of the concerns which were raised by stakeholders during consultation have been incorporated in the ESIA. Nevertheless, some of the concerns or proposals by the stakeholders could not be included due to technical and legal reasons. Table 29 summarises how concerns that were raised during ESIA study have been addressed in ESIA report.

**Table 29: Stakeholders' Issues Response Form**

No	Issue Raised by Stakeholders	Response by Consultant to Issue Raised	Section in ESIA
1.	The project will create direct and indirect employment to the local people. During recruitment of workers, especially unskilled and semi-skilled labour, priority should be given to the local people. Job opportunities should be announced through village government to avoid child labour/ and increased school drop outs. This will ensure fairness and avoid unnecessary complaints from village because of favouritism	Priority of employment, especially unskilled labour is given to the local people Contractor does not employ workers who are below the age of 18 years	7.1.1 and 7.2.1

<b>No</b>	<b>Issue Raised by Stakeholders</b>	<b>Response by Consultant to Issue Raised</b>	<b>Section in ESIA</b>
	tendency by government leaders		
2.	Upgrading of the road will cause increased agricultural production and productivity because of improved access to better prices for agricultural inputs as well as improved access to markets and better prices agricultural produce	Valid positive impact	6.6.1.13
3.	Upgrading of the road will cause opening of business opportunities that are now hindered by the poor road	Valid positive impact	6.6.1.10
4.	Upgrading of the road will improve access to social services such as health and market services	Valid positive impact	6.6.1.8
5.	Upgrading of the road will improve access to forest reserve and so increase the rate of their illegal harvesting	The impact cannot be mitigated at the project level	6.6.2.4
6.	Upgrading of the road will reduce travel time and costs to the local people	Valid positive impact	6.6.1.6
7.	Upgrading of the road will boost tourism due to reduced travel time	Valid positive impact	6.6.1.15
8.	Upgrading of the road will improve management of wildlife and forestry protected area owing to improved mobility	Valid positive impact	6.6.1.15
9.	Upgrading of the road will raise household income and standard of living as the number of buyers and so price of agricultural produce will increase	Increased household income will result from is increased activities along the road	6.6.1.12
10.	Upgrading of the road will improve ambient air quality because of reduced dust generation	Road upgrading will improve ambient air quality due to reduced generation of particulate matter	6.6.1.1
11.	Employment of construction workers should not be gender biased	Priority of employment shall be given to capable women	7.1.1 and 7.2.1
12.	Upgrading of the road will simplify transport; making it possible to transport commodities not produced outside Kigoma	Valid positive impact	6.6.1.13
13.	Upgrading of the road will attract investors to invest their capital, technology and skills in Kigoma region	Valid positive impact	6.6.1.10
14.	Major sources of domestic water supply to villages along the project road are pipe water from gravity schemes, boreholes with hand pumps, open traditional wells, and rivers. Some of these water supply utilities, in particular domestic points, main and distribution pipe lines, and boreholes either cross or are located very close to the road. There therefore likely to be disrupted by road construction activities. To mitigate the impact, the Contractor should work careful so as avoid damaging the utilities. Utilities that will be damaged by construction activities should be compensated by the project accordingly	The Contractor shall work careful so as avoid damaging utilities along the and across road. Utilities that will be damaged by construction activities shall be compensated by the project accordingly	6.3.3.4 and 7.2.3.4
15.	The project road passes along Moyowosi game, Makere forest reserve and several village forestry protected areas. Under any circumstance, the Contractor should not set a camp in the wildlife and	The Engineer shall not approved any borrow pit unless he is satisfied the Contractor has a permit from to borrow material	7.2.2.5, 7.2.2.7

No	Issue Raised by Stakeholders	Response by Consultant to Issue Raised	Section in ESIA
	forestry protected areas and the contractor should not borrow construction materials from the protected areas without written permit from authorities entrusted to manage the protected areas.	from authorities entrusted to manage forestry and wildlife protected areas.	
16.	The road upgrading will cause displacement and loss of public and private properties in the form of buildings and farmland along the road. Construction activities should be done in a manner that minimizes impacts to government and private properties.	Properties that are entitled for compensation shall be compensated accordingly. The Contractor shall work in a manner that avoid unnecessary damage to public utilities	7.2.3.3, 7.2.3.4
17.	The project should consider constructing community centres as a part of co-operate responsibility.	This cannot be decided at this juncture but will depend on Contractors' attitude as well as the attitude of the local people attitude towards the project	NA
18.	Construction activities will cause air pollution due to generation of dusts. Stone crushing plants should be located away from settlements. Other impacts will include soil erosion due to clearing of vegetation, water pollution by sedimentation. It is recommended that district councils should be involve during material source investigation.	Valid negative impact. Crusher plants shall not be located near settlements areas	6.2.5, 6.3.3.6, 6.2.7, 6.3.3.2, 6.3.3.7, 6.3.2.3, 7.2.2.5
19.	Construction activities are likely to trigger child labour	Construction activities will trigger child labour and school dropouts	6.3.13
20.	Construction activities will increase the spread of sexually transmitted diseases such as HIV/ AIDS. To mitigate the impact, the project should plan and implement HIV alleviation interventions	The contractor will establish HIV/ AIDS campaign during the road construction Distribution of condoms will be carried out	7.2.12.2.4
21.	The project road passes along several village forest reserves. Nearly every village along the project road has a forest reserve. Widening and realignment of the road will cause clearing of trees	Widening and realignment activities will clear vegetation along the road	6.3.3.1,
22.	Material borrow areas should be reinstated by the contractor immediately after their use by planting trees or improve to a safe state for harvesting rainwater.	Borrow pits shall be reinstated to make them safe for animals and the public	6.3.2.5
23.	Construction activities are likely to cause accidents and occupational diseases	Construction activities are likely to cause occupational accidents and diseases	6.2.6, 6.3.2.5, 6.3.2.8, 6.3.3.8, 6.3.6.1, 6.3.7.1, 6.3.7.3, 6.3.8.2, 6.3.8.3, 6.3.12
24.	Construction activities, in particular construction of fill embankments are likely to cause change in hydrological regime	Fill embankments and cuts are likely to cause interfere with surface and ground water regime	6.3.4.3

No	Issue Raised by Stakeholders	Response by Consultant to Issue Raised	Section in ESIA
		resulting into surface water flow modification or modification of water table	
25.	Upgrading of the road is likely to increase traffic accidents involving pedestrians and vehicles, especially at village centres because people are not familiar with road signs.	Speed humps and warning signs shall be installed at accident black spots	6.2.6, 6.3.2.7, 6.3.3.8, 6.6.2.1
26.	The road project is likely to cause family instability because project workers tend to seduce local women for sex	The project will lead to increased marital and social conflicts because of project workers with extra earnings could be the sources of conflicts as they engage in extra-marital affairs	6.3.9
27.	Communities are worried that compensation is not likely to be fair.	All the affected properties between 22.5m and 30m from the centreline of the road existing road shall be evaluated by certified Valuer and compensated before commencement of construction works	7.2.3.3
28.	Adequate time should be given for the PAPs for relocation	Affected people shall be given advance notice on demolition and be given time to salvage useful materials from their buildings	7.2.3.3
29.	There was a concern on the indecisive tendency by the government whereby people are informed of the project but the project takes very long to get implemented. This has retarded of people residing along the project as they find it difficult to improve their structures or expand their businesses. They can't also plant crops in their field. The communities are keen to know when the project will be implemented.	The process from planning to implementation of a decision to upgrade road is long and takes time. The people have to bear with the government.	NA
30.	Villagers requested the government to consider compensation of properties within 45m RoW	This is not possible because by so the government will be breaking its own laws	NA
31.	Villagers wanted to know when the road construction will commence	This will depend on availability of funds	NA
32.	Construction activities will cause noise and air pollution which will affect people's health. Dust might bring new disease including respiratory disease	Construction activities will cause generation of dust	6.2.5, 6.3.3.6, 6.2.7, 6.3.3.2, 6.3.3.7, 6.3.2.3,
33.	Material borrow areas should be selected in such a way that they do not cause cracks to houses due to vibrations	Borrow pits and quarry shall be located away from settlement areas	7.2.2.5
34.	Wanted to know the timing of compensation – whether	Demolition will be done after	7.2.3.3

<b>No</b>	<b>Issue Raised by Stakeholders</b>	<b>Response by Consultant to Issue Raised</b>	<b>Section in ESIA</b>
	compensation will be paid after or before demolition of properties	compensation	
35.	Influx of people during construction will overload existing social services. Of particular importance are the already stretched health facilities. In addition HIV/AIDs and diseases will be accelerated. A health centre with a testing facility and ARV should be considered as a mitigation measure.	This will be put in the contractor contract to establish health services for his employees	7.2.12
36.	Construction activities will increase unplanned and early pregnancy cases, especially to school girls because their lusts they tend to date project workers.	Increased and unwanted pregnancies could result from the tendency by project workers to entice school girls with money in return for sexual relationships.	6.3.10
37.	Villager wanted the road to be realignment in order to avoid destruction of peoples properties	This is not possible	NA
38.	Subsequent to notice by TANROADS those owners of buildings within the RoW to demolish them, several people obeyed the notice by demolishing the buildings. Villagers wanted such loyal people to be considered for compensation because they have been loyal to the government.	This is not possible	NA
39.	Experience has shown that Contractors do not care about people's health. As a result measures are not taken to mitigate dust even if water is available nearby. It was recommended that the Contractors should collaborate with village governments in implementation of the proposed mitigation measures	Watering of the road during construction will be carried out	7.1.5, 7.2.2.3, 7.2.3.6
40.	People wanted to know the procedure for compensating people whose land will be used for borrowing construction materials such as gravel and stones	Where materials have to be extracted from agricultural land, the land owner shall be compensated after the land has been evaluated by a Valuer	7.2.2.1
41.	Speed restraining humps should installed at every village centre and along primary schools	Speed humps and warning signs shall be installed at approaches to village centres and schools	7.4.2.1
42.	Crime cases are likely to increases in the villages due to in migration by job seekers during the road construction. In addition, improved road will make it easier for robbers and bandits to commit crimes, if precaution measures are not taken.	Valid negative impact of the project	7.4.2.6
43.	Community members are worried about the existing grave yards along the project road that they are likely to be removed.	As much a possible the contractors will avoid damaging graves along the road. Where avoidance is not possible affected graves shall be relocated in accordance with the law.	7.2.3.12
44.	To reduce HIV infections contractors should not located camps closer to village settlements. The closer	The Engineer shall not approve sitting of construction camp site	7.2.3.10

No	Issue Raised by Stakeholders	Response by Consultant to Issue Raised	Section in ESIA
	the camp to the communities the higher the interaction between the project workers and the community members and the chances of infection rate increase.	in the neighbourhood of village settlements and the camp shall be totally catered by the contractor	
45.	The fact that project workers will move to the project area without their spouses sex workers are likely to be attracted to the project area to sell their bodies	It is a valid negative impact	6.3.9



## SECTION 11: CONCLUSION AND RECOMMENDATIONS

### 11.1 CONCLUSION

The road upgrading is essential for the development of the economy of Tanzania and the neighbouring countries such as Rwanda, Burundi, and Uganda. The project will have both positive and negative impact to the environment and the local communities along it.

Among the positive impacts the project will have improved road safety, and reduced maintenance costs of the road.

One of the most negative significant sociological impacts that will result from the road project will be the issue of resettlement and compensation due to permanent loss of land as the result of trying to recover and/or acquire the right of way required for the project road, new alignments on sharp curves or due to extension of road reserve. However, there will be no major realignment and therefore the number of people that will be displaced will be few. Other negative impacts will include disruption of public utilities, increased noise, and vibrations, and deterioration of ambient air quality during construction, increased traffic accidents, loss of vegetation, soil erosion, and soil and water pollution.

The spread of HIV/AIDs, STIs associated with immigrant road construction workforce, sitting of the construction camps and later the presence of truck drivers that will use the project road were mentioned to be sociological impacts of the project. This was a major concern and was highlighted during public consultations and the measures to be taken by the Contractor were mentioned to the respective communities consulted.

Measures have been proposed to enhance impacts which are positive to the environment and the local people. For those impacts that are negative, mitigation measures have been proposed to avoid or abate them to the extent possible for the purpose of maximizing benefits of the road project and minimizing detriments of the project intervention to the communities.

It has been estimated that the total cost for implementing mitigation measures (excluding the cost of compensation of affected properties) and monitoring plans is estimated to be TZS 3,261,000,000/= (TZS Three Billion, Two hundred Sixty One Million only)

### 11.2 RECOMMENDATIONS

Subsequent issues raised by many stakeholders, the following are recommended:

#### 11.2.1 Compensation

Since valuation was conducted in between 5 and 6 years ago and as a result there is inflation and devaluation of Tanzanian shillings:

- The Government should update valuation figures to meet the current market prices and speed up the process of compensation, fairly and now promptly effected, transparent, accurate, free from threats and political interference and non-bureaucratic, based on technical principles and professional work of valuation report.
- Each PAP should be knowledgeable about his / her entitlement before her/his cheque is prepared or other modes of payment and before effecting payments, that is, during disclosure.

---

This will allow each PAP to know what s/he deserves and sort out discrepancies with the project before proceeding to the payment stage

### **11.2.2 Coordination and Information Sharing**

The majority of potential / PAPs complained about poor coordination among various Government agencies and lack of proper channels of information sharing and updates

- TANROADS should strengthen coordination with other agencies like TANESCO, Water Authorities and Land Department in order to avoid conflicts and continuation of services provision to customers who are affected by the road
- TANROADS should strive to improve its efforts to disseminate and educate people about laws related to land acquisition to avoid PAPs' complaints and lose their trust to their government

### **11.2.3 Acquisition of Land and Properties outside the Old 45m RoW**

Although it may be expensive for TANROADS to serve official notices to potential PAPs found within 7.5m, there should be a proper way of informing people about Tanroads intention of acquiring such land within 7.5m and ensuring and convincing the owners that the land will only be officially acquired by Government after compensation. As it is, people do not trust TANROADS.

---

## **REFERENCES**

- African Development Bank Groups Policy on the Environment Policy, 2004
- African Development Banks Involuntary Resettlement, 2003
- Agricultural and Livestock Policy (1997)
- Antiquities Act No 22, 1964 (Revised Edition: 2002)
- Architects and Quantity Surveyors Act No 16, 1997 (Revised Edition 2010)
- Atomic Energy (Protection from Ionizing Radiation) Regulations, 2004
- Atomic Energy Act No 7, 2003
- Contractors Registration Act No 17, 1997 (Revised Edition 2007)
- Employment and Labour Relations Act, 2004
- Energy Policy of Tanzania (1992)
- Engineers Registration Act No 15, 1997 (Revised Edition 2007)
- Environmental Impact Assessment and Audit Regulations, 2005
- Environmental Management Act No 20, 2004
- Explosives Act (Cap 45) No. 56, (Revised Edition 2002)
- Factories (Building Operations and Works of Engineering Construction) Rules, 1985
- Forest Act No. 14, 2002
- General EIA Guidelines and Procedure (2002)
- Government Notice No. 196 of July 2013
- Grave (Removal) Act No. 9 of 1969 (Revised Edition, 2002, Cap 72)
- Hazardous Waste Regulations, 2009
- HIV and AIDS (Prevention and Control) Act, 2008
- Industrial and Consumer Chemicals (Management and Control) Act, 2003
- Kakonko District Council, District Socio-economic Profile, 2016
- Kasulu District Council, District Socio-economic Profile, 2014
- Kibondo District Council, District Socio-economic Profile, 2016
- Land (Assessment of the Value of Land for Compensation) Regulations, 2001
- Land (Compensation Claims) Regulations, 2001
- Land Acquisition Act 1967 (Revised Edition, 2002)
- Land Act Cap. 114 (No. 4), 2004 (amendment of Land Act 1999)
- Land Use Planning Act No 6, 2007

---

Mineral Policy of 1998:

Mining (Safety, Occupational Health & Environment Protection) Regulations, 2010

Mining Act No 14, 2010

Ministry of Works (2005). Environmental Code of Practice for Road Works

National Environmental Policy, 1997

National Forest Policy, 1998

National Gender Policy, (1992), Revised in 2002

National Human Settlements Development Policy, 2000

National Land Policy, 1995 (Revised in 1997)

National Policy on HIV/AIDS, 2001

National Strategy for Growth and Reduction of Poverty, 2003

National Transport Policy, 2003

National Water Policy, 2002

Non-Citizens (Employment Regulations), 2015

Occupational Health and safety Act No. 5 of 2003

Occupier's Liability Act No 54, 1968

Potomac River Media (2009) available at,  
<http://www.rivermedia.com/consulting/er/oilspill/effects.htm> accessed on 10th May 2009

Public Health Act No 1, 2009

Road Act No. 13, 2007

Road Management Regulations, 2009

Sahai, Dru (2001). Cement hazards and Controls: Health Risks and Precautions in Using Cement. Construction Safety Magazine, Volume 12, No 2, Summer 2001. Construction Association of Ontario.

Solid Waste Regulations, 2009

Tanzania Wildlife Policy, (2009)

Tanzania's Property and Business Formalization Programme, 2004

The Constitution of Tanzania

Village Land Act Cap. 114 (No. 5), 1999

Water Resources Management Act, 2009

Wildlife Conservation Act, 2009

Workers Compensation Act No 20, 2008

## **APPENDICES**



## APPENDIX I: PHOTOGRAPHS



Plate 4: R.Bogwe (note the crossing type and riparian vegetation)



Plate 5: R.Ruchugi (note the use of riparian for gardening)



Plate 6: R.Ruchugi crossing (note a flood plain)

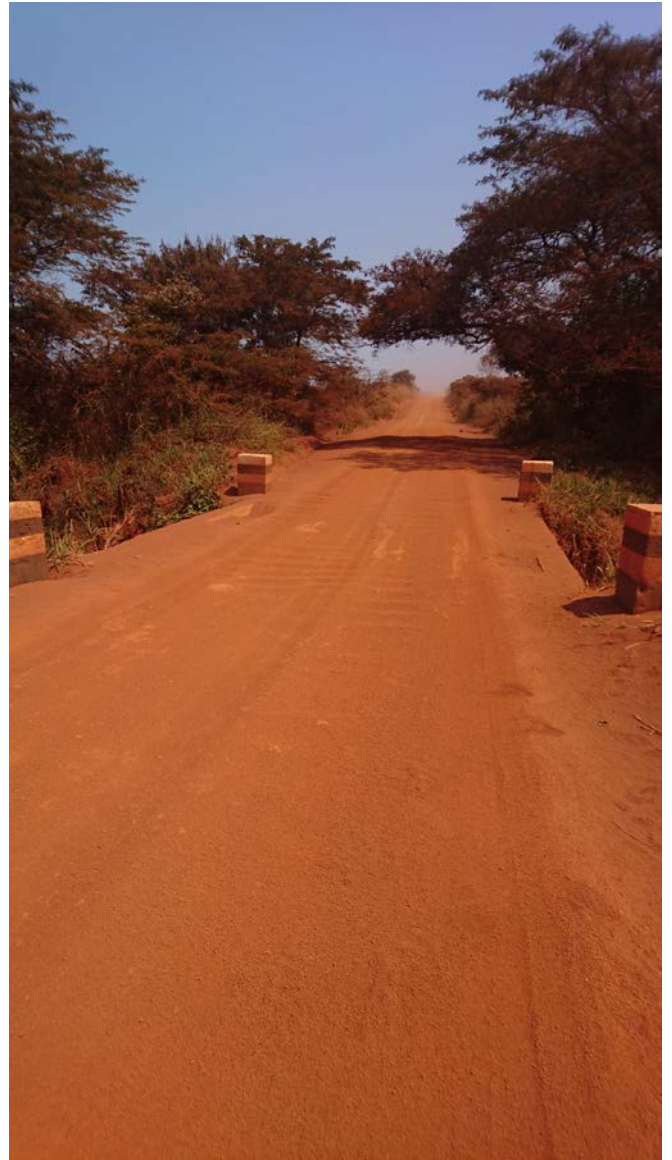


Plate 7: R.Nyaluseke – Note Riparian Vegetation and Crossing





Plate 8: Sharply curved Approach to Crossing for R.Kalenge



Plate 9: R.Nyakasanda Crossing. Note Local People Fetching Water)



Plate 10: R.Makere (Note Rocky Bank)



Plate 11: Bailey Bridge Crossing for R.Makere



**Plate 12: Bailey Bridge Crossing for R. Malagarasi. Note Miombo woodland Riparian Vegetation**



**Plate 13: R. Malagarasi. Note riverine trees and Rocky Banks**





Plate 14: R.Memvi – Note Sharply Curved approach



Plate 15: R.Keza – Note Riverine Riparian



Plate 16: A section R.Hwadzi – Note Farming Activities on the River Bed

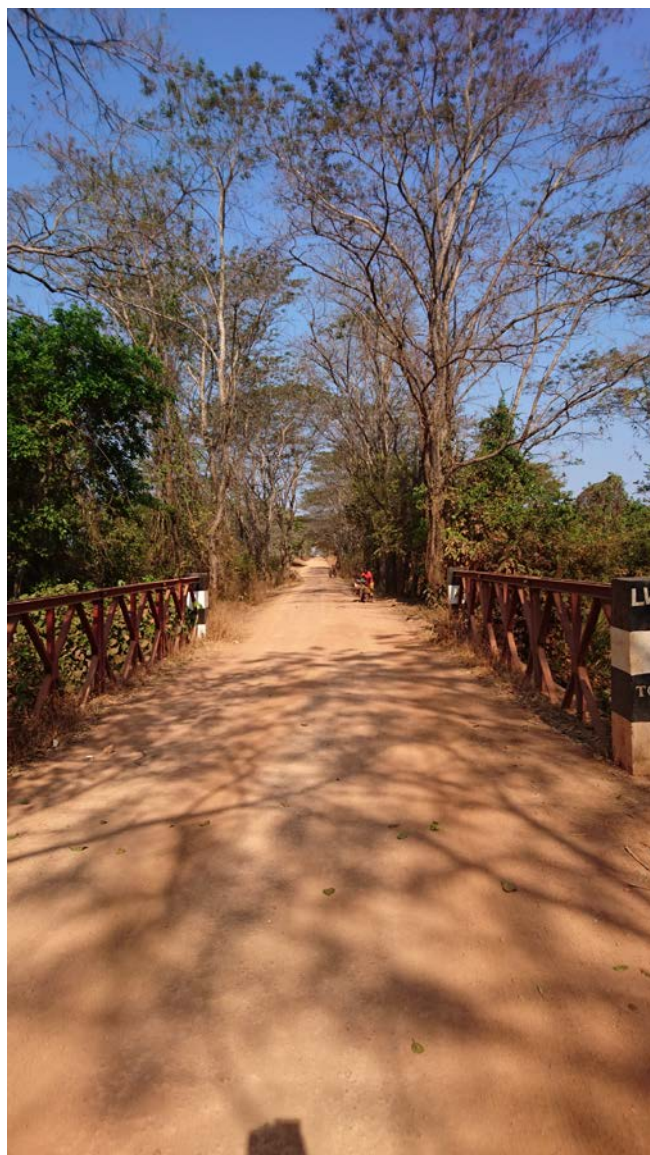


Plate 17: Crossing for R.Bururuma. Note Type of Riparian Vegetation





Plate 18: Clay Brick Making across a Flood at Km 47+700



Plate 19: Typical Vegetation Characteristics Across R.Malagarasi Flood Plain



**Plate 20: A section with High Water Table around Km 29+900 at Kasanda village**



**Plate 21: Typical vegetation cover along the road between Kidima and Kanazi villages**





**Plate 22: Typical Miombo woodland scrubland for Nyamyusi – Road Nyakitonto Section**



**Plate 23: Eucalyptus trees along the Alignment at Mkombozi Village**



**Plate 24: Vegetation cover characteristics along Maloregwa – Nduta section of Kibondo bypass Section**



**Plate 25: Vegetation along R.Bururuma – Biturana Section of the Kibondo Bypass Road Section (note Refugee Temporary Settlements)**





Plate 26: Biturana Village forest Reserve at the edge of Nduta Refugee Camp



Plate 27: Existing track for Biturana – Nengo Section of Proposed Kibondo bypass Road





**Plate 28: Miombo Scrubland vegetation across Nengo Prison Area**



**Plate 29: R.Nyamguluma at Km 97+200 – Note Riverine Vegetation on its upstream**





Plate 30: Typical Unreinstated Borrow Pit Located in Settlement Area, 10m from the Road (Nyamyusi Village)



Plate 31: Irritant Contact Dermatitis



Plate 32: Miombo woodland forest reserve between Km 129+500 – 13+000 (Rusohoko village)

---

## **APPENDIX II: MINUTES OF CONSULTATIVE MEETINGS**



---

## **APPENDIX III: LOCATION OF THE PROJECT ROAD**