

12/23/2023

UNITED REPUBLIC OF TANZANIA  
MINISTRY OF WORKS



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**FINAL BIODIVERSITY MANAGEMENT PLAN (BMP) FOR ENVIRONMENTAL AND SOCIAL IMPACT  
ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF IRINGA-MSEMBE ROAD 104KM TO  
BITUMEN**

**Submitted to:**

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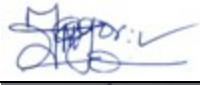
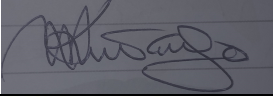






**September, 2023**

## ACKNOWLEDGEMENT

The proponent and the BMP Team wish to express thanks and appreciation to all stakeholders who in one way or the other supported completion of this work of preparation of this BMP. Special thanks to the Iringa Municipality, Iringa Rural Authority as well as RUAHA National Park, TANAPA and MBOMIPA in Iringa Regional for their prompt assistance during the fieldwork. We are also thankful to the Engineering Design Team and other team members of the Consultants for their technical inputs. Last but not least, we thank the leadership of Ward Leaders and Local Communities in the project area for their cooperation and participation in the preparation of this BMP and ESIA updating exercise.

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## Abbreviations

<b>BMP</b>	Biodiversity Management Plan
<b>CITES</b>	Convention on International Trade in Endangered Species
<b>EIA</b>	Environmental Impact Assessment
<b>ESF</b>	Environmental and Social Framework
<b>ESIA</b>	Environmental and Social Impact Assessment
<b>ESS</b>	Environmental and Social Standards
<b>GMP</b>	General Management Plan
<b>GRRE</b>	Greater Rungwa Ruaha Ecosystem
<b>IUCN</b>	International Union for Conservation of Nature
<b>MBOMIPA</b>	Matumizi Bora ya Malihai Idodi Na Pawaga ( <i>Sustainable use of Wildlife Resources Idodi and Pawaga</i> )
<b>MNRT</b>	Ministry of Natural Resources and Tourism
<b>NEMC</b>	National Environmental Management Council
<b>GIIP</b>	Good International Industrial Standard
<b>RoW</b>	Right of Way
<b>RUNAPA</b>	Ruaha National Park
<b>SPANEST</b>	Strengthening the Protected Area Network in Southern Tanzania
<b>TANAPA</b>	Tanzania National Parks
<b>TANROADS</b>	Tanzania Roads Agency
<b>TBS</b>	Tanzania Bureau of Standards
<b>URT</b>	United Republic of Tanzania
<b>WHO</b>	World Health Organisation
<b>WMA</b>	Wildlife Management Area



# 1 Introduction

## 1.1 Overview

This document is the Project Biodiversity Management Plan (BMP) for the project “Upgrading of the Iringa-Msembe Road (104Km) to bitumen standard in Iringa Municipality and Iringa District, Iringa Region, Tanzania. The project construction activities have the potential to generate a wide range of environmental impacts on ecologically sensitive habitats for fauna and flora species, including protected areas i.e., national parks, wildlife management areas, forest reserves, water sources, conservation and community reserves amongst others.

Examples of such impacts include (but not limited to):

- a) Vegetation loss and conversion including impacts to habitats supporting sensitive flora and fauna species, including vulnerable, rare, threatened and endemic species,
- b) Disruption of large mammal movements due to habitat fragmentation
- c) Fauna Road kills due to traffic along the project
- d) Wildlife disturbance from construction noise
- e) Risk of proliferation of invasive species such as *Calotropis procera* and *Solanum incanum* and *Caesalpinia decapetala* on the construction site and subsequent spread of weeds from within the construction site to adjacent protected areas. Some of these invasive species, e.g. *Calotropis procera* exhibit toxicity characteristics that may harm wildlife species.
- f) Increased risk of poaching due to influx of construction workers

The project seeks to proactively address such impacts, and propose mitigation measures to avoid and compensate for negative impacts on biodiversity to reduce their potential severity.

It is worth noting that, the project name ‘Iringa-Msembe road (104km)’ in this BMP and other project documents traverses several villages and ends at the Y-Junction (Ruaha National Park-RUNAPA) gate. The name ‘Msembe’ in this project is a node that is used by the Tanzania Road Agency (TANROADS) in their Road Asset Management System to indicate the name of a particular road. Historically, Msembe was one of the village found within the RUNAPA before the park was gazetted as Saba Game reserve in 1910, and finally as a National Park in 1964 where human settlements are not allowed in the park. The original inhabitants were relocated to villages to the east of the park. However, the name Msembe remained to refer the now Park Headquarters, and TANROADS has retained the naming of the road as Iringa Msembe in their naming system although it ends just at the park gate; also known as the Y-Junction, which is the 104Km distance from Iringa municipality. The existing road traverses a distance of 17Km through the WMA to the Y-Junction (RUNAPA gate).

## 1.2 Goal and Objectives of the BMP

The Road construction activities can create negative outcomes on the natural along the Right of Way (RoW), with some areas such as the MBOMIPA Wildlife Management Area (WMA) and Ruaha National Park (RUNAPA) being regarded as highly sensitive ecological areas exhibiting a high biodiversity of both flora and fauna. The goal of the Biodiversity Management Plan (BMP) is to implement a mitigation

strategy for the project in such a way as NOT to achieve a net biodiversity loss of biodiversity and ecosystem services, or a net gain for the critical habitats and biodiversity features it supports.<sup>1,2</sup> The main objectives of this BMP are therefore:

- a) To describe the current baseline conditions for fauna and flora species, and their ecological characteristics
- b) To describe the actions and measures required for effective biodiversity management
- c) To identify possible impacts of the projects to biodiversity
- d) To outline specific measures to be implemented by TANROADS and its contractors (and subcontractors) to avoid or minimize the negative impacts of the projects to biodiversity
- e) To respect the mitigation hierarchy by avoiding or mitigating biodiversity loss, with the aim of maintaining the diversity of species, habitats and ecosystems and the integrity of ecological functions.
- f) To meet the requirements of the Environmental and Social Impact Assessment (ESIA) findings, the World Bank's Environmental and Social Framework Environmental Social Standards 6 (ESS6) and international best practice for biodiversity conservation
- g) To comply with applicable national and international policies and legislation.

It is important to note that impacts have been identified and presented in the ESIA. This Biodiversity Management Plan (BMP) is prepared specifically to describe actions and measures that will ensure minimal impacts from the construction of the Iringa-Msembe Road to the local biodiversity.

## 2 Policy, Legal and Institutional Framework

This section reviews the policy, legal and institutional frameworks relevant to the proposed project, particularly the BMP. The review covers pertinent policies, legislations, regulations, standards, international agreements that are relevant to the upgrading of the Iringa –Msembe Road. In specific terms, this section reviews relevant issues related to biodiversity protection and management are discussed, including forestry, wildlife, and environmental protection, pollution prevention to ensure that they comply with national and international policies, legislations, standards and frameworks.

### 2.1 Applicable national policies

Table 1 provides a review of applicable national policies for the BMP.

*Table 1: Applicable National Policies for the Iringa-Msembe road project*

S.N	Title	Date	Description and Applicability
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<sup>1</sup> See for example the World Bank's ESF ESS Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

<sup>2</sup> IUCN, 2015. No Net Loss and Net Positive Impact Approaches for Biodiversity.

S.N	Title	Date	Description and Applicability
1.	<b>National Environmental Policy (NEP)</b>	<b>2021</b>	<ul style="list-style-type: none"> <li>One of the overall objectives of the policy is to 'conserve and enhance our natural and man-made heritage, including the biological diversity of the unique ecosystems of Tanzania [section 18 (c)]. The policy requires that development projects be done in a way that does not compromise environmental integrity. It is mandatory to undertake EIA before any development project likely to have significant environmental impacts is given the go-ahead. This is to ensure that development projects are implemented in an economically viable, socially desirable and environmentally acceptable manner (Section 5). Therefore, the policy stresses on the importance of ensuring that there is sustainable development in Tanzania, where development does not cause environmental degradation and considers the environment and biodiversity in any interventions. This BMP contributes to achieving this policy objective.</li> <li>Section 28 and 29 states that in all projects, environmentally sound technologies (that is, those that generate no, low waste, or protect environment) should be used.</li> <li>With regards to biodiversity, the policy states that programmes for the conservation and utilisation of biological diversity shall be pursued to prevent and control the causes of significant reduction or loss of biological diversity (section 32). This section is of particular relevance to this BMP to mitigate the impacts of the project</li> <li>Further, Section 51 of the policy focuses on Improvement in mass transport systems to reduce fuel consumption, traffic congestion and pollution; control and minimization of transport emission gases, noise, dust and particulates; disaster/spill prevention and response plans and standards shall be formulated for transporting hazardous materials. The proposed project shall ensure mitigation of the adverse impacts during project implementation, including noise reduction.</li> </ul>
2.	<b>National Tourism Policy</b>	<b>1999</b>	<ul style="list-style-type: none"> <li>The National Tourism Policy articulates the importance of promoting tourism as a tool and mechanism for economic development and livelihood enhancement for communities. The policy aims to improve the existing tourism infrastructure and to develop it further so as to accrue higher revenues from the sector. It further specifies (Section 4.3) that tourism should be encouraged but with great care in order to promote and develop tourism that is ecologically friendly and environmentally sustainable; and promoting and developing land for tourism in a coordinated manner so as to attract private investment and ensure sustainable tourism development. Section 5.2 promotes the compliance to both the Environmental and Wildlife Policies for any tourism infrastructure development.</li> <li>The proposed Iringa - Msembe road will promote the tourism sector within the region through improving accessibility to RUNAPA and increasing tourists flow in the southern circuit. The project construction will connect Iringa region to RUNAPA, which is among</li> </ul>

S.N	Title	Date	Description and Applicability
			the largest protected areas in Africa, thereby improving access to visitors which in turn will increase revenues and contribute to the National Gross Domestic Product (GDP) and forex revenue.
3.	<b>Tanzania Wildlife Policy</b>	<b>1998 (Revised 2007)</b>	<ul style="list-style-type: none"> <li>• The Tanzania Wildlife Policy emphasizes the importance of protecting Wildlife and Biodiversity across the country. It further emphasizes the development of Protected Areas to enhance wildlife conservation.</li> <li>• Section 2.7 emphasizes the need for infrastructure development to further support wildlife. In this case, the proposed road is expected to contribute to more efficient protection of wildlife through surveillance and patrols along the road through MBOMIPA Wildlife Management Area (WMA).</li> <li>• Further, section 2.1 and 3.3.1 articulate the importance of protecting fauna and flora if there will be any infrastructure development. Part of the proposed Iringa -Msembe project from Tungamalenga to the gate of RUNAPA (17 km) traverses the areas which belong to MBOMIPA WMA. This WMA is a buffer zone to RUNAPA, Lunda Mkwambi Game Controlled Area, Kizigo, Muhesi and Rungwa Game Reserves. This BMP provides for mitigation measures to minimize possible impacts to the wildlife and in particular before approaching RUNAPA. Further, the project will implement the mitigation measures recommended by the ESIA Study.</li> </ul>
4.	<b>National Forest Policy</b>	<b>1998</b>	<ul style="list-style-type: none"> <li>• The policy goal is to enhance the contribution of the forest sector to the sustainable development of the nation and the conservation and management of natural resources for the benefit of present and future generations.</li> <li>• The policy calls for environmental assessment of any investment, which will 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, and it may end up using forest products in form of timber for works, or contribute to forest degradation and reducing the carbon sink for mitigating climate change. The project will implement the mitigation measures recommended by this plan and the ESIA study.</li> </ul>

S.N	Title	Date	Description and Applicability
5.	<b>National Disaster Management Policy</b>	<b>2004</b>	<ul style="list-style-type: none"> <li>The policy recognises that environmental degradation may cause disasters such as floods. Section 2.1.7.8 of the policy (Environmental Conservation) aims at having a clear understanding and measures for environmental conservation for 'all interested parties' and requires that projects undertaken should consider environmental impact assessment. Further, the policy requires that disaster issues be mainstreamed into stakeholder's plans, strategies and policies to enhance mitigation and prevention measures.</li> <li>The mitigation measures for protection of biodiversity outlined in this BMP and the ESIA contributes to the attainment of this policy objective.</li> </ul>
6.	<b>National Water Policy</b>	<b>2002</b>	<ul style="list-style-type: none"> <li>The National Water policy articulated the national framework for optimal use and conservation of water resources in Tanzania. The 3 primary guiding principles focused on (i) socio-economic/water allocation (ii) protection and conservation of water resources and (iii) water and environment</li> <li>The project interventions must comply with section 3.3 which advocates for the conservation of water resources and ensure that there is minimal negative environmental impacts on the water environment.</li> </ul>
7.	<b>The National Construction Industry Policy</b>	<b>2003</b>	<ul style="list-style-type: none"> <li>The Construction Industry Policy emphasizes the importance for Tanzania to develop internationally competitive industries that can export products taking into consideration quality.</li> <li>Section 8.2.2 emphasizes the need to use modern technology that is not harmful for the environment, which must be observed by the project interventions in in all phases.</li> </ul>
8.	<b>The National Investment Promotion Policy</b>	<b>1996</b>	<ul style="list-style-type: none"> <li>The policy seeks to promote the development of industries, minerals and energy as a means of attracting potential investors. The policy recognizes that adequate and reliable transport infrastructure contributes significantly to catalysing the development of the country. However, the policy requires all investment conducted for development to ensure adequate environmental protection [section 5(d)]. This BMP will contribute to this policy requirement through the proposed mitigation measures.</li> </ul>

## 2.2 Applicable national legislation

The following Table 2 provides an overview of the different applicable Acts and Regulations concerning BMP for Iringa-Msembe Road.

*Table 2: Applicable Legislation and Regulations for the project's BMP*

S.N	Title	Date	Description and Applicability
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S.N	Title	Date	Description and Applicability
1.	<b>The Environmental Management Act (EMA) No. 20</b>	<b>2004</b>	<ul style="list-style-type: none"> <li>This is the principal environmental legislation in Tanzania for environmental management. It outlines the principles for environmental management, impact, and risk assessments in addition to control methods and procedures.</li> <li>The road project interventions are required to comply with a various number of provisions of the EMA but primarily sections 47-58 provides the mechanisms for protection, mitigation, and conservation for National Protected Areas in Tanzania The project traverses through MBOMIPA WMA, Ruaha National Park (RUNAPA) and some village forest reserves, and TANROADS is required to comply with the provisions of this Act..</li> <li>Section 81 (1) of the EMA of 2004 requires any person, being a proponent or developer of a Project or Undertaking of type specified in the Third Schedule of the Act, to undertake or cause to be undertaken, at his own cost, an EIA study. It is further specified in Section 81 (2) that the EIA should be carried out prior to the commencement of the Project or Undertaking. The Third Schedule of the Act specifies Projects within "Natural Conservation Areas "as one of the Projects requiring an EIA study. Also, in Section 81(3) stated that a "Permit or License for carrying out of any Project or Undertaking in accordance with any written law shall not entitle the proponent or developer to undertake or to cause to be undertaken a Project or activity without an EIA certificate issued under this Act". This BMP, being part of the ESIA, contributes to compliance to this Act.</li> </ul>
2.	<b>The Wildlife Conservation Act [CAP. 283 R.E. 2022]</b>	<b>2022</b>	<ul style="list-style-type: none"> <li>This is the principal legislation for the conservation and preservation of the diverse wildlife found in Tanzania. Its provisions cover the protection and sustainable utilization of wildlife in Tanzania.</li> <li>Section 35 (1) of the act requires that "Every significant physical development in a wildlife protected area, the Wildlife Management Area, the buffer zone, migratory route or dispersal area to which this section applies, whether that development is prepared by, or is being implemented by a person or organisation in the public or private sector, the prospective developer shall prepare and submit to the satisfaction of the Minister responsible for environment a report on Environmental Impact Assessment of the proposed development" including road construction [Section 35 (3)-b]</li> <li>Considering the project interventions by TANROADS as a public entity affects some protected areas such as MBOMIPA WMA and RUNAPA, and considering the likely impacts of the project to flora and fauna, this BMP proposes mitigation measures to be undertaken to avoid or minimise the impacts of the project by considering all alternatives mitigation measures, as part of the ESIA.</li> </ul>
3.	<b>The Environmental Impact Assessment and</b>	<b>2005 and 2018</b>	<ul style="list-style-type: none"> <li>The primary legislative provisions for the implementation of the EMA of Tanzania. This governs and provides the roadmap for registering Projects (Project proponents) to the NEMC and provide the guidelines</li> </ul>

S.N	Title	Date	Description and Applicability
	<b>Audit Regulations and amendment of regulations</b>		for the independent assessment re-assessment of impacts from development Projects on surrounding environment. The regulations prohibit the project proponent from undertaking any construction project without carrying out an environmental impact assessment study required under the Environmental Management Act.
4.	<b>Environmental Management (Water Quality Standards) Regulations</b>	2007	<ul style="list-style-type: none"> <li>The national standards for water quality which is prescribed and defined by the National Environmental Standards Committee. The regulations also provide the procedures for the management of water quality, as a result of different activities and water use.</li> <li>The project interventions along the RoW must ensure that all applicable aspects of the regulation, which are relevant to the specific intervention, are complied with especially for activities that are expected to be near rivers or streams.</li> </ul>
5.	<b>The Environmental Management (Solid Waste Management) Regulations</b>	2009	<ul style="list-style-type: none"> <li>The Environmental Management – Solid Waste Management Regulations cover the solid waste related provision for the EMA which are governed by three principles including the polluter pays principle, the precautionary principle and the producer extended responsibility principle.</li> <li>The project interventions include the development and construction/rehabilitation of infrastructure in the National Park, which would include the production of waste that would require management and possibly treatment. The Contractor will need to comply with the requirements of the regulations and its requirements.</li> </ul>
6.	<b>The Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations</b>	2011	<ul style="list-style-type: none"> <li>The regulations provide for the control of noise and potential vibration pollution that can result from construction and industrial activities. It also provides the mechanisms for the mitigation of such pollution especially during construction works.</li> <li>The road construction project, and especially during construction phase, must comply with and adopt the requirements, mechanisms and ensure compliance with the regulation standards for noise and vibration pollution. The BMP sets mitigation measures, along with these regulations, to minimise the impacts to wildlife especially in MBOMIPA WMA and RUNAPA.</li> </ul>
7.	<b>The Wildlife Conservation (Corridor Regulations)</b>	2018	<ul style="list-style-type: none"> <li>This is the principal regulations governing wildlife corridors, dispersal areas, buffer zones and migratory routes in Tanzania that are outside National Parks.</li> <li>The project will take into consideration the provisions of these regulations, in conjunction with the provisions of the Wildlife Conservation Act (Cap 283) in all phases. The aim is to ensure that the project do not cause an unmitigated impacts on the Ruaha/Udzungwa-Mikumi corridor through which wildlife traverse from RUNAPA to MBOMIPA WMA and to the north east of the ecosystem (Figure 4) .</li> </ul>

S.N	Title	Date	Description and Applicability
8.	<b>The Water Resources Management Act No.11</b>	<b>2009</b>	<ul style="list-style-type: none"> <li>The principal legislation framework that covers the sustainable use, management, and development of water resources to ensure there is minimal water pollution through sufficient prevention and control measures.</li> <li>The Construction of the road (Iringa-Msembe) is expected to potentially affect water resources in terms of water abstraction from rivers (e.g. Kalenga, Mlowa, Idodi and Tungamalenga Rivers) streams and aquifers must follow the provisions of the Water Resources Management Act to ensure minimal disturbance to water flow and hydrology of the area. Further to that, engagements with the Rufiji Water Basin Board must be conducted during all phases of the Project considering they are the primary stakeholder, in addition to Water Users Association in the local village governments, responsible and engaged with the water resources in the area.</li> </ul>
9.	<b>Forest Act No. 14 2002</b>	<b>2002</b>	<ul style="list-style-type: none"> <li>The Act builds up on the National Forest Policy and covers the importance of protecting forests through development activities, extraction, and exploitation activities in the Forests, It articulates the need for assessing impacts and adequately managing them through the development of an EIA and through adequate engagement with the local village governments.</li> <li>The road construction project is required to comply with the Forest Act Section 18, which requires the preparation of an EIA for any infrastructural development within the vicinity of a forest area. This plan is forms part of the compliance to the Forest Act.</li> </ul>
10.	<b>The Local Government (District Authorities) Act</b>	<b>1982</b>	<ul style="list-style-type: none"> <li>The principal legislative piece that covers the legally recognized definitions for different types of human settlements and recognizes the formal methods of governance for those areas. This includes definitions for townships, villages, wards, districts etc. It also established the local government areas and how the district councils are to be established and maintained for appropriate management and governance of districts.</li> <li>TANROADS and the contractor must ensure that district councils and townships that are affected are adequately consulted and have information disclosed to them including information on BMP.</li> </ul>

## 2.3 Applicable international standards and conventions

### 2.3.1 The World Bank's Environmental and Social Framework (2016)

The World Bank Environmental and Social Framework (ESF)<sup>3</sup> sets out the World Bank's commitment to sustainable development. The ESF protects people and the environment from potential adverse impacts that could arise from Bank-financed projects and promotes sustainable development. The framework was officially approved by the Board of Directors in 2016, and became applicable for all Investment

<sup>3</sup> World Bank (WB) 2016. "World Bank Environmental and Social Framework." World Bank, Washington, DC.] License: Creative Commons Attribution CC BY 3.0 IGO.



Project Financing (IPF) projects initiated on or after October 1, 2018<sup>4</sup>. The ESF enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. The 10 Environmental and Social Standards (ESSs) together with their annexes, set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. Of critical relevance to this BMP is the ESS 6, which outlines the requirements for Biodiversity Conservation and Sustainable Management of Living Natural Resources.

The World Bank's ESS 6 recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. This ESS also addresses sustainable management of primary production and harvesting of living natural resources. ESS6 recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project. The potential, positive role of project-affected parties, including Indigenous Peoples, in biodiversity conservation and sustainable management of living natural resources is also considered.

The objective of ESS6 include but not limited to:

- a) To protect and conserve biodiversity and habitats;
- b) To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity;
- c) To promote the sustainable management of living natural resources; and
- d) To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.

Para 8 of the ESS 6 requires that the environmental and social assessment as set out in ESS 1 will consider direct, indirect and cumulative project-related impacts on habitats and the biodiversity they support. This BMP will consider specific threats to biodiversity, for example, habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, as well as projected climate change impacts. The para requires the significance of biodiversity or habitat is determined to establish their vulnerability and irreplaceability at the global, regional and national level. Further, para 10 requires that through the environmental and social assessment, the Borrower will identify the potential project related risks to and affects habitats and the biodiversity that they support. While para 11 requires the Borrower's assessment to include characterization of baseline conditions to a degree that is proportional and specific to the anticipated risk and significance of impacts.

The proposed upgrading of Iringa – Msembe road Project passes through sensitive wildlife habitats and this ESIA addresses the requirements of ESS6 by preparing this BMP, which provides a detailed study of the baseline ecological conditions so as to inform thorough consideration of direct, indirect and cumulative project-related impacts on habitats and the biodiversity.

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<sup>4</sup> See <https://www.worldbank.org/en/projects-operations/environmental-and-social-framework>

### 2.3.2 Applicable international conventions

Tanzania is signatory to a number of international conventions and protocols that relates to the protection of biodiversity and the environment. Table 3 presents a brief description of the applicable international conventions/protocols to the BMP.

*Table 3: Applicable international conventions for the Project's BMP.*

Convention	Description	Status
United Nations Framework Convention on Climate Change (1997) (Official Gazette Date: 24 May 2004)	The Convention seeks to reduce climate change. The Project will generate emissions that may contribute to climate change.	Ratified
Convention for the Protection of the Ozone Layer (Vienna, 1985) (Official Gazette Date: 08 Sep1990)	To ensure global co-operation for the protection of the ozone Layer. / The Project should aim to reduce or eliminate emissions of manmade ozone depleting substances.	Ratified
Protocol to the United Nations Framework on Climate Change (Kyoto Protocol), 1997	The Protocol introduces emission targets. The Project will generate emissions that may contribute to climate change.	Ratified
The Convention on Wetlands of International Importance – RAMSAR Convention (1971)	The Convention on Wetlands is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The project will likely impact wetlands or areas near to wetlands (Non-Ramsar sites).	In Force
African Convention on the Conservation of Nature and Natural Resources (1968 & 2003)	This agreement was signed across the African continent where African states adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.	Signed
Convention on Biological Diversity (Rio, 1992) (Official Gazette Date: 27 Dec 1996)	The Convention promotes conservation of biological diversity and sustainable use of its components. Road construction could impact habitats.	Ratified
Convention to Combat Desertification (Paris, 1994)	This convention promotes the combating of desertification and to mitigate effects of drought and other impacts related to desertification on communities through international cooperation and partnerships agreements	Ratified
Convention on the Conservation of Migratory Species of Wild Animals 1983 (Bonn Convention)	This international agreement provides a global platform for the conservation and sustainable use of migratory animals and their habitats. The project may impact on migratory species of wild animals and the BMP serves to address the impacts and propose mitigation measures.	Ratified

## 2.4 Institutional Framework for the BMP

Table 4 shows the main institutional framework relevant for implementing the BMP in the project area. A brief description of their roles and responsibilities is given.

Table 4: The institutional framework for the BMP

Category	Institution/Authority	Roles and Responsibilities
Ministries, Departments and Agencies (MDAs)	Vice President's Office - Division of Environment (VPO-DoE)	<ul style="list-style-type: none"> <li>To co-ordinate Environmental Management Policy, Environment Management Act and EIA guidelines. These BMP falls within this mandate.</li> <li>To advise Government on all environmental matters.</li> <li></li> </ul>
	National Environment Management Council (NEMC)	<ul style="list-style-type: none"> <li>Environmental Monitoring and Compliance Auditing; and</li> <li>Advise Government on all environmental matters.</li> </ul>
	Ministry of Transport, Works	<ul style="list-style-type: none"> <li>The Ministry of Works is the parent ministry of TANROADS and as such it is the highest government institution with respect to all the aspects pertinent to the planning, execution, and post-execution operation and maintenance of the road project</li> <li>The ministry is charged with development of policies for road construction project and maintenances.</li> </ul>
	Tanzania Forest Services (TFS) Agency – Iringa District	<ul style="list-style-type: none"> <li>Management of national forest reserves (natural and plantations), forest and bee resources on general lands</li> <li>Monitoring and evaluation</li> <li>Enforcing forest legislations in areas of TFS jurisdiction</li> </ul>
	MBOMIPA WMA (Authorised Association-AA)	<ul style="list-style-type: none"> <li>The road project traverses the WMA and ends at the main entrance of the park</li> <li>One of the basic functions of the Authorised Associations<sup>5</sup> according to the Wildlife Conservation (Wildlife Management Areas) Regulations, 2012 are to</li> </ul>

<sup>5</sup> An Authorised Association (AA) is a community based organization, whose primary objective is to conserve Wildlife resources for the benefit of local community members ordinarily residing in that particular area (see the Wildlife Conservation (Wildlife Management Areas Regulations), 2012.

Category	Institution/Authority	Roles and Responsibilities
		<p>protect the biodiversity of the WMA and undertake resource monitoring (Section 18).</p> <ul style="list-style-type: none"> <li>The AA under the WMA will be actively involved in the road project to monitor the project activities and ensure mitigation measures are implemented to minimise or avoid impacts to critical habitats and biodiversity in the WMA.</li> </ul>
	RUNAPA	<ul style="list-style-type: none"> <li>Tanzania National Parks is responsible for ecological and wildlife health monitoring among its other functions.</li> <li>Since the road project will involve a section of the Msembe gate (Y-Junction), RUNAPA will ensure minimum impacts to biodiversity through monitoring of the project interventions, and compliance to mitigation measures as stipulated in this BMP.</li> </ul>
	Iringa Water Supply and Sanitation Authority (IRUWASA)	<ul style="list-style-type: none"> <li>Potable water supply and sanitation (sewerage) in some parts of the project area e.g. Mlandege, Mwangata</li> <li>Owner of the water supply and sewerage utility along the project road (to be relocated)</li> </ul>
Project Proponent	TANROADS	<ul style="list-style-type: none"> <li>Project investment and project cycle implementation, monitoring and auditing;</li> <li>Conduct ESIA, and prepare BMP.</li> <li>Project operation and decommissioning</li> </ul>
Project Financier	World Bank	<ul style="list-style-type: none"> <li>Project financing</li> </ul>
Local Government Authorities & Communities	Iringa Regional Secretariat	<ul style="list-style-type: none"> <li>Oversee and advise on implementation of national policies, laws, regulations at local government level;</li> <li>Monitoring of project activities, including this BMP.</li> </ul>
	Iringa District Council and Iringa Municipal Council	<ul style="list-style-type: none"> <li>District Environmental Officer (DEMO) and Municipal Environmental Officer (MEMO) responsible for project monitoring on environmental issues</li> <li>Responsible for all development activities, implementation and/or support in the district</li> </ul>

Category	Institution/Authority	Roles and Responsibilities
		<ul style="list-style-type: none"> <li>• In charge of monitoring implementation of the project</li> <li>• Advise on implementation of development of the project and activities at local government level</li> <li>• Overseeing community-investor relations</li> </ul>
	Ward Executive Officers, Village/ <i>Mtaa</i> Chairpersons	<ul style="list-style-type: none"> <li>• Project monitoring (as watchdogs for the environment, ensure well-being of residents) and participate in project activities</li> </ul>
	Environmental Committees at LGA levels.	<ul style="list-style-type: none"> <li>• To extend administrative assistance and advice on the implementation of the project</li> <li>• Managing community's relations</li> </ul>
	Local communities, NGOs, CSOs, FBOs	<ul style="list-style-type: none"> <li>• Project monitoring (as watchdogs)</li> <li>• Provides assistance and advice on the implementation of project</li> <li>• Part of the project beneficiaries through employment opportunities, income generation and CSR projects</li> </ul>

Source: Adapted from the ESIA report 2021, modified.

## 3 Methodology

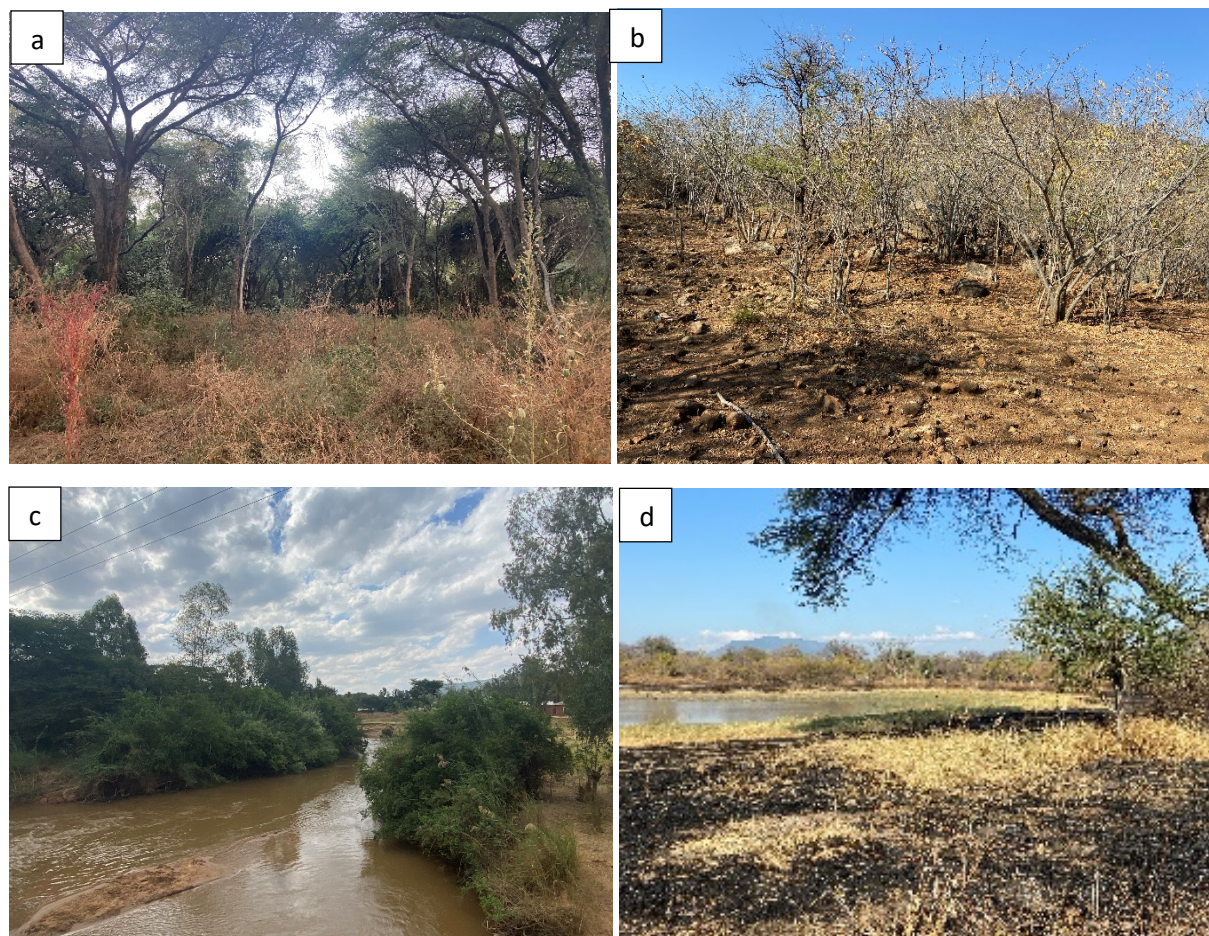
### 3.1 General methods and Approach

In order to gather both primary and secondary data related biodiversity in the area, various methods were employed as summarized in Table 5. The methods included both direct and indirect ways to gather primary data, and literature reviews, reports, publications and books to gather secondary data. For the mammals, plants and birds, eight transects each one covering a length of 500 m perpendicular from the Iringa-Msembe main road were established on either sides of the road covering the major habitats namely Miombo woodland, Wooded grassland, Swampy and riverine areas (Photo 1). Each habitat had two transects. A team comprised of at least two people aided by hand held GPS, field guide book and pair of binoculars walked along the transects once in a day early in the morning (6.30 am to 7.30 am) for eight days (Photo 2). For the amphibians and reptiles, optimistic search method was mainly employed. Opportunistic searches involved searching for the animals in the hiding/busking sites during the day. Further, focus group interviews with the Villages' Natural Resources and Environmental committees were conducted across the 9 villages which lies across the areas where the road construction will take place of which 81 individuals were interviewed (Table 5). Furthermore, during focus group discussion, photo id method was employed especially when interviewees had clues of a specific animal and could not be able to describe it well in Kiswahili (Photo 3). For the secondary data, literature review was conducted of which various technical reports, checklists, journals, books and office records were read.

*Table 5: Various types of data and the methods used in gathering them along the Msembe – Iringa road.*



S/N	Type of Biodiversity Data	Methods
1	Plants	Literature review, direct field observation, focus group interviews
2	Reptiles	Literature review, direct field observation, interview, sign, photo id, optimistic search
3	Mammals	Literature review, direct field observation, interview, sign, photo id
4	Amphibians	Literature review, direct field observation, active search, interview, sign, photo id, optimistic search
5	Birds	Literature review, direct field observation, interview, signs and photo id



*Photo 1: Habitat types across Msembe – Iringa road (a) wood land (b) miombo (c) River rine (d) swamps.*

Photo: E.Martin and W.Kiwango, 2023

*Table 6: Names of the villages and respective number of interviewees present during focus group discussions*

S/N	Village name	Number of interviewees
1	Tungamalenga	9
2	Idodi	9
3	Nyamihuu	9
4	Kalenga	7
5	Mangalali	7
6	Kidamali	12
7	Nzihi	14
8	Nyamahana	6
9.	Mapogoro	8
	<b>TOTAL</b>	<b>81</b>



*Photo 2: Two experts doing birds watch along Msembe- Iringa road during biodiversity survey exercise, (f) an expert with the ranger observing elephant dungs (indirect method) during one of the transect walks in June 2023.*

Photo: E. Martin & W. Kiwango 2023





*Photo 3:(g) An expert displaying one of the animals' photo from a smart phone to confirm species existence using photo id method during Focus group discussions with Natural Resources and Environment committee in one of the villages (h) and Focus group discussion in progress.*

Photos courtesy to © Emanuel Martin & Wilhelm Kiwango 2023.

### 3.2 Stakeholder Consultations

Stakeholder consultations are an important component of the project. It provides a better understanding of the conditions in the project area and the concerns of stakeholders. Therefore, stakeholder consultations have been held frequently during the preparation and implementation of the project.

Throughout the project identification and implementation, different stakeholders at different levels were identified and consulted in order to solicit their concerns, views, opinions and suggestions of the Interested and Affected Parties (IAPs). Consultations were conducted with government Ministries, Departments and Agencies (MDAs), Iringa Municipal Council and Iringa District Council, Wards/villages/*mitaas*, project-affected persons and vulnerable groups traversed by the project road, utility authorities (e.g. water, electricity, fibreoptic cable), RUNAPA, MBOMIPA WMA civil society organizations and other institutions along the project corridor were also consulted and/or informed of the project. Specifically, a third round of consultations, in form of due diligence was conducted to ascertain specific potential impacts to MBOMIPA and propose mitigation measures. Discussions were held with RUNAPA management (Photo 4) and MBOMIPA staff where issues related to potential impacts to critically endangered, endangered and threatened fauna species were discussed. A summary of key issues raised and proposed mitigation measures is provided in Table 7. These consultations were in addition to the first round of consultations carried out by TECU between September and December 2017, 2018, 2022 and 2023 as part of the ESIA.





*Photo 4: Stakeholder consultation with RUNAPA Management.*

Photo: J. Lyimo, 2023.

### 3.2.1 Community meetings

Consultative meetings, Key Informant Interviews (KII), Focus Group Discussions (FGDs) and community meetings were held with relevant personnel, representatives and community at large along the project corridor. A checklist of guiding questions and/or issues was prepared before holding meetings with stakeholders. The key issues raised during consultations were reviewed and analysed for their significance before being incorporated in the report.

The consultation process ensured that stakeholders were given opportunity to participate in the EIA study and decision making process by using different participatory approaches mentioned above. Through dialogue, discussions and other communication channels the consulted stakeholders pointed out issues and concerns to be addressed during EIA undertaking. Issue raised by individual or group of people were cross-checked and discussed to assess the relevance to the project. The main stakeholders and the general issues raised relevant to the ESIA are outlined in the main ESIA report.

### 3.2.2 Stakeholder consultations for the BMP

In addition to the ESIA stakeholder consultation process, specific stakeholder consultations were conducted for the preparation of this BMP. Consultations were conducted in a total of 9 villages along the areas where the road construction will take place in June-July 2023. The villages included

Tungamalenga, Idodi, Nyamihuu, Kalenga, Mangalali, Kidamali, Nzihi, Nyamahana and Mapogoro. Focus group interviews with the Villages' Natural Resources and Environmental committees and the village government authorities were conducted within village government offices with the help of village government officials (Photo 5) (a) and (b). Care was taken to ensure that the consultations include both women and men, vulnerable groups, the youth and the elderly. During the community meetings, discussions centred on the identification of key species of flora and fauna, existing Protected Areas, habitats, anticipated impacts of the road projects to various biodiversity components including flora and fauna, and suggestions on mitigation measures. Key informant interviews were conducted with, MBOMIPA village scouts, MBOMIPA, RUNAPA and Iringa district officials addition to earlier key informant interviews. A checklist of guiding questions and/or themes was prepared before holding an in-depth discussion with all stakeholders. Thus, the mitigation measures proposed in this BMP and other information is an outcome of the stakeholder engagement process conducted during the field surveys.



*Photo 5: Stakeholder consultation meetings along Iringa-Msembe Road. (a) Kidamali village (b) Nyamihuu village*

Photo: E. Martin, 2023

### 3.2.3 Achievements of stakeholder consultations

Stakeholder consultations provided invaluable comments and inputs to the preparation of this BMP. The general perceptions of the communities towards the project was highly positive and in all discussions, the communities expressed their wish to see the project fully implemented. Specifically, they expressed their concerns and proposed mitigation measures for various biodiversity components likely to be affected by the project including identification of flora and fauna in the project's primary area of influence, anticipated impacts and proposition of mitigation measures. Their views and concerns were expertly judged and incorporated in the BMP. **Error! Reference source not found.** shows the main issues raised in all villages consulted and their proposed mitigation measures.

Likewise, RUNAPA management, the REGROW project staff, and MBOMIPA WMA were all generally positive about the project and expressed their wish to have the road upgraded as soon as possible in order to improve tourism visitation and increase the effective management of the two protected areas. Specifically, the third round consultation with RUNAPA management yielded the following results specific to address poaching, increased traffic and road kill threats:

- The 17 Km stretch of the Iringa-Msembe road starts from Tungamalenga Village and ends at the Msembe gate (Y Junction), which is the border between RUNAPA and MBOMIPA WMA. There is no village/human settlements beyond the Y-Junction where the project ends but RUNAPA, which borders MBOMIPA WMA (Photo 6). Although it is expected that the number of traffic will increase, collision with animals will be minimized through the proposed mitigation measures and strict implementation of monitoring measures outlines in this BMP and in the ESMP.

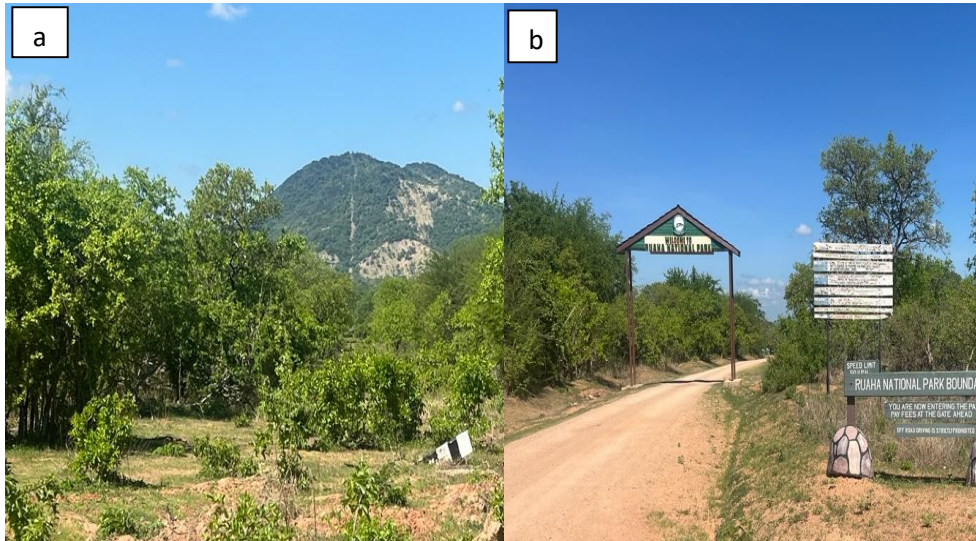


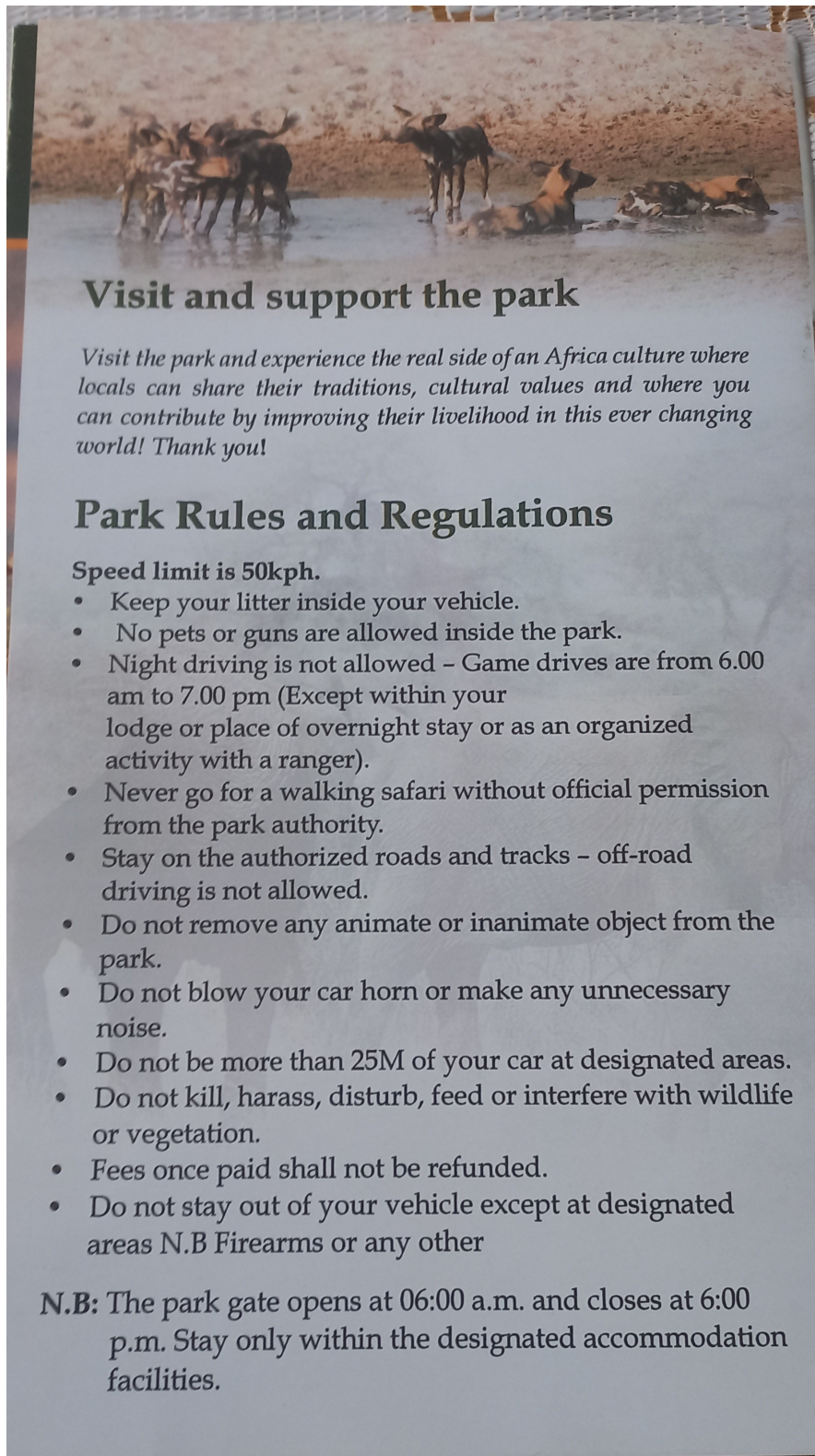
Photo 6: RUNAPA Boundary with MBOMIPA WMA, (a) and the RUNAPA entrance gate, (b)

Photo: J.Luhuro, 2023.

- The road alignment is not an important habitat for the endangered, critically endangered, threatened or restricted range species including Elephants, Vultures and Wild dogs and there are no evidence that they breed, nest, or roost near the road alignment.
- The movements of the wild dog (*Lycaon ictus*) are not predictable, but they usually don't prefer to move in areas with dense population including the road alignment. No records that wild dogs were seen in the road alignment and no any incidents were recorded for its collision with traffic in the existing road
- The road users, who are mainly park staff and tour guides have been trained in wildlife conservation including speeding limits within protected areas and the regulations related to road kills. Night driving is not allowed in RUNAPA, and driving for game viewing is allowed between 6am and 6pm within the park (Photo 7). These restrictions applies also to MBOMIPA<sup>6</sup>.
- According to Park and MBOMIPA regulations, and there is no driving allowed in the protected area between 6am and after 6 pm. This will minimize the possibility of road collisions with animals. This restriction has been included as part of the mitigation strategy during the construction phase of the project

<sup>6</sup> Park Rules and regulations for RUNAPA, MBOMIPA Resource Management Zone Plan, 2006.





## Visit and support the park

*Visit the park and experience the real side of an Africa culture where locals can share their traditions, cultural values and where you can contribute by improving their livelihood in this ever changing world! Thank you!*

## Park Rules and Regulations

**Speed limit is 50kph.**

- Keep your litter inside your vehicle.
- No pets or guns are allowed inside the park.
- Night driving is not allowed – Game drives are from 6.00 am to 7.00 pm (Except within your lodge or place of overnight stay or as an organized activity with a ranger).
- Never go for a walking safari without official permission from the park authority.
- Stay on the authorized roads and tracks – off-road driving is not allowed.
- Do not remove any animate or inanimate object from the park.
- Do not blow your car horn or make any unnecessary noise.
- Do not be more than 25M of your car at designated areas.
- Do not kill, harass, disturb, feed or interfere with wildlife or vegetation.
- Fees once paid shall not be refunded.
- Do not stay out of your vehicle except at designated areas N.B Firearms or any other

**N.B:** The park gate opens at 06:00 a.m. and closes at 6:00 p.m. Stay only within the designated accommodation facilities.

Photo 7: RUNAPA Park rules and regulations

Source: RUNAPA, 2023. Photo: W.Kiwango, 2023.

Table 7: Stakeholder outcomes from consultation process in the Iringa-Msembe Road

S.N	Village	Issues/concerns/proposed mitigation	Suggested Mitigation/enhancement
1	Tungamalenga	<ul style="list-style-type: none"> <li>– The road construction may lead to habitat fragmentation/destruction for wildlife such as warthogs, birds (e.g. wood peckers), snakes,</li> <li>– Loss of food due to cutting of trees which are a source of food for wildlife, e.g. Elephants, Giraffe,</li> <li>– Risk of road accidents to wildlife as they cross the road in MBOMIPA WMA.</li> </ul>	<ul style="list-style-type: none"> <li>– Construction of road bumps in the 17 MBOMIPA WMA section from the village to Msembe gate (especially at Tandala Camp site), awareness raising for road users.</li> <li>– Construction of clearly visible road signs</li> <li>– Enforcing forest and wildlife laws to protect biodiversity</li> </ul>
2	Mapogoro	<ul style="list-style-type: none"> <li>– Risk of road kills from construction equipment and vehicles</li> <li>– Vegetation clearing</li> </ul>	<ul style="list-style-type: none"> <li>– In areas with suspected wildlife corridors, road speed should be reduced</li> <li>– Construction of road signs (animal crossings)</li> <li>– Construction of road bumps</li> </ul>
3	Idodi	<ul style="list-style-type: none"> <li>– Risk of road kills for wildlife especially the Greater and Lesser Kudu, who frequently cross the road at high speed. Other wildlife that could be affected include Giraffes, antelopes and Elephants.</li> <li>– Elephants cross the Kitandalu area every year from May-June</li> <li>– Baboons could be habituated due to human feeding due to anticipated increase in number of travellers and tourists</li> </ul>	<ul style="list-style-type: none"> <li>– Quarrying and borrowing activities should be conducted in areas where these activities have already been conducted and avoid starting new quarrying and borrow pits.</li> <li>– Design and construction should avoid or minimise cutting down of Baobab trees, on which Elephants feed on</li> <li>– Construction of road bumps in areas with high risk of road kills (e.g. Muwira, near Madogoro, Kiherero, the border between Mapogoro and Idodi villages, Kinyaminyi, Hil Top lodge, Nyangogo, Tandala Tented Camp)</li> <li>– Erect road signs showing wildlife crossings and road bumps</li> <li>– Environmental Education to locals and road users on not to feed wildlife</li> <li>– Road signs that prohibits feeding of</li> </ul>

			wildlife
4	Nyamahana	<ul style="list-style-type: none"> <li>– Risk of road kills for wildlife especially Kudus, Elephants, antelopes, zebra, baboons</li> <li>– Quarrying and borrowing could destroy vegetation in the project area</li> </ul>	<ul style="list-style-type: none"> <li>– Construction of road bumps where wildlife frequently cross, e.g. Malinzanga village forest, Muwila</li> <li>– Impose fines for offending drivers</li> <li>– Erect road signs to control vehicle speed</li> <li>– Avoid quarrying and borrowing in areas close to human settlements.</li> </ul>
5	Nyamihuu	<ul style="list-style-type: none"> <li>– Risk of road kills to Baboons, monkeys, reptiles, greater and lesser Kudu, Dik Dik, rabbits</li> <li>– Risk of zoonotic diseases and habituation</li> <li>– Habitat degradation and fragmentation due to cutting down of trees and vegetation</li> </ul>	<ul style="list-style-type: none"> <li>– Erect road signs, awareness raising for all road users, construction of speed bumps</li> <li>– Not many trees/vegetation will be affected by road construction. No native trees that are close to the road</li> <li>– In quarrying, avoid areas that can affect biodiversity, such as hilly and forest areas.</li> <li>– Restore areas in which quarrying and borrowing has been conducted.</li> </ul>
6	Kidamali	<ul style="list-style-type: none"> <li>– Habitat and vegetation destruction</li> <li>– Road kills due to speed,</li> <li>– Noise and vibrations from construction equipment, vehicles and motor cycles may scare wildlife further away.</li> <li>– Habituation due to feeding of wildlife may further result into zoonotic diseases, poisoning of wildlife, and affect their general feeding habit.</li> </ul>	<ul style="list-style-type: none"> <li>– Avoid or minimise cutting down of trees and vegetation close to the road construction</li> <li>– Enforce/comply with national and international standards for noise and vibration control</li> <li>– Erect road signs in areas where wildlife frequently cross</li> <li>– Construction of road bumps</li> <li>– Awareness raising to all road users including tourists</li> <li>– Restoration of disturbed vegetated areas with native species</li> <li>– Awareness raising and training on control of invasive species</li> </ul>

7	Nzihi	<ul style="list-style-type: none"> <li>– Quarrying and borrowing may affect wildlife habitats</li> <li>– Possibility of drying up of seasonal and ephemeral streams (Madogoro area),</li> <li>– Soil erosion during construction activities</li> <li>– Habitat degradation</li> </ul>	<ul style="list-style-type: none"> <li>– Restoration of the natural vegetation through revegetation with native grass and tress after construction</li> </ul>
8	Kalenga	<ul style="list-style-type: none"> <li>– Risk of road kills to wildlife due to increased road traffic</li> <li>– Habitat destruction/degradation</li> <li>– Local migration of wildlife</li> <li>– Increased Human wildlife conflicts to habitat fragmentation</li> <li>– Soil erosion</li> <li>– Noise and vibrations may disturb wildlife</li> <li>– Quarrying and borrowing may destroy wildlife habitats</li> </ul>	<ul style="list-style-type: none"> <li>– Construction of road bumps, awareness raising for all road users, erect road signs, construct a drainage system to minimise soil erosion, revegetation (tree planting).</li> <li>– Environmental education to communities</li> </ul>
9	Mangalali	<ul style="list-style-type: none"> <li>– Habitat destruction/degradation</li> <li>– Noise and vibration from cares, motorcycles and construction equipment</li> <li>– Road kills</li> <li>– Remove of natural vegetation due to construction activities</li> <li>– Soil erosion</li> <li>– Loss of habitat for some species</li> </ul>	<ul style="list-style-type: none"> <li>– Restoration of native plant species, construction of drainage system, construction of livestock crossings</li> </ul>
10	Iringa	<ul style="list-style-type: none"> <li>– Road Kills</li> <li>– Increased poaching</li> <li>– Increased number of traffic due to</li> </ul>	<ul style="list-style-type: none"> <li>– Erect road signs, and speed humps along the 17km. A big sign board at the entrance of MBOMIPA WMA, stiupating the</li> </ul>

		<p>anticoated increase in tourists and tourist vehicles</p>	<p>dos and don'ts for all visitors</p> <ul style="list-style-type: none"> <li>– The road project ends at RUNAPA gate and there is no further villages after the 17Kms</li> <li>– The constructed road will enhance protection of the area through effective anti-poaching activities by park rangers in collaboration with Village Game Scouts for MBOMIPA</li> </ul>
11	Ruaha National Park (RUNAPA)	<ul style="list-style-type: none"> <li>– Road kills,</li> <li>– Increased traffic</li> <li>– Poaching</li> <li>– Presence of endangered species of wildlife</li> <li>– The road project is positively supported as it will enhance tourism and conservation activities in addition to airstrips and other infrastructures supported by the World Bank through the REGROW project within RUNAPA and the Iringa also financed by the World Bank</li> </ul>	<ul style="list-style-type: none"> <li>– RUNAPA enforces the code of conduct signed between contractors and the government. The same code of conduct should be applied to the 17Km stretch through MBOMIPA WMA</li> <li>– Enforce GN 393 of 2023. In case of a road kill, the offender must pay the value of the animal according to the values stipulated in the GN</li> <li>– Erect road signs and humps along the proposed road</li> <li>– Enforce mitigation measures as outlined in the ESMP and BMP.</li> </ul>



## 4 Biodiversity baselines survey summary

### 4.1 The Project's Location

Iringa – Msembe road (104km) is regional road located in Iringa region linking the regional headquarters with RUNAPA) at Msembe. The road is located in Iringa District, specifically within Iringa municipal council and Iringa district council traversing in the western direction from Iringa Municipality off the Iringa-Dodoma trunk road (T005) at Samora round-about (0+000) traversing Kalenga, Nzihi, Kidamali, Nyamahana, Idodi, Mapogoro, and Tungamalenga main village centres up to Msembe main centre and ending up at the main entrance gate of the RUNAPA in Msembe (104+000) as presented in Figure 1 below. The project road covers approximately 9.2km in Iringa municipality and 94.8km in Iringa district.

According to TANROADS-Iringa Region, the Right of Way is 60m in Iringa rural and within the municipality is 20.5m (10.25m both ways from the centreline). However, in order to minimize impacts arising from involuntary resettlement (physical and economic displacement), the construction corridor was re-adjusted to the following RoW used during the design: 20.5m (from km 0+00 at Samora roundabout to km 9+200 at Kalenga village), 45m (from km 9+200 at Kalenga village to km 87+00 at Tungamalenga/MBOMIPA starting point); and 30m (from km 87+00 at Tungamalenga village/MBOMIPA starting point to km 104+00 at RUNAPA entrance gate).

Since the road passes through the MBOMIPA WMA, it is important to reduce clearance of vegetation such as miombo habitats, shrubs, bushes and grass as much as possible. To minimise the impacts on vegetation within the WMA, the road section will be implemented within the existing alignment as much as possible.

Apart from the WMA, the road passes through agricultural potential areas which produce paddy, Irish potatoes, fruits, tomatoes, vegetables, beans and maize. The project road traverses 8 Wards, 13 Villages and 15 streets (*Mitaa*) (Figure 1).

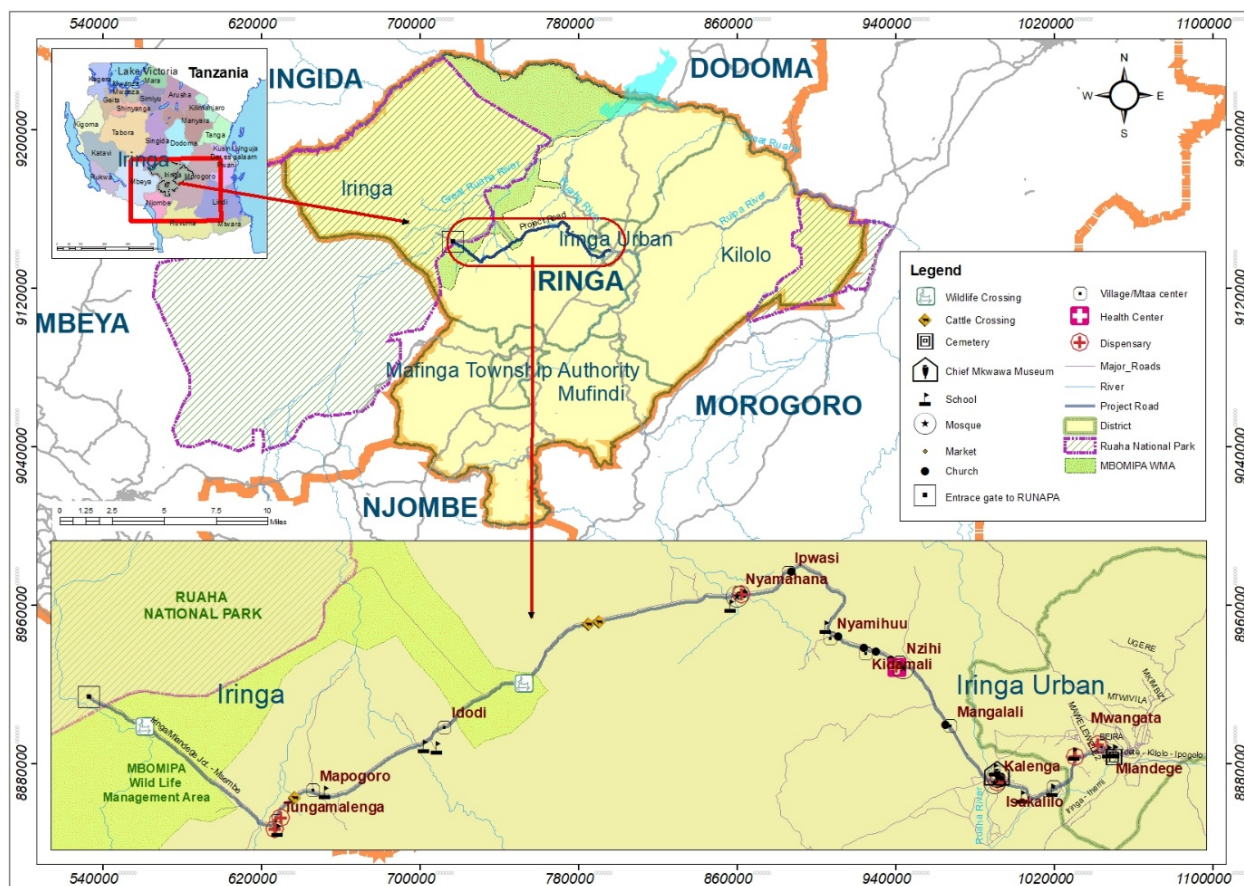


Figure 1: Project's location with key environmental features

Source: Adapted from the Project's' ESIA.

## 4.2 Existing Biological conditions

The biological condition is the key feature of the baseline conditions. In this BMP, the biological environment has been subdivided into fauna and flora baseline conditions. In both cases, the terrestrial and aquatic baseline conditions are described, cognizant of the fact that the project interventions can have impacts on both groups. The following sections describe the different biodiversity types identified in the Project area.

According to the National Biodiversity Strategy and Action Plan<sup>7</sup> (NBSAP) (2015-2020), Tanzania ranks among the most mega biodiversity countries in the world. The country is endowed with different natural ecosystems harbouring a massive wealth of biodiversity. It ranks amongst the top countries<sup>8</sup> in tropical Africa in terms of the distinct eco-regions represented, and in species richness/species endemism. Tanzania lies at the meeting point of six major bio-geographic zones (the dry Somali-Maasai, savannahs, the acacia-commiphora woodlands, the Guinea-Congolian forest, the coastal forest mosaic and the scattered afro-montane/afro-alpine areas) (SPANEST, 2016). The country hosts 6 out of

<sup>7</sup> United Republic of Tanzania (URT) 2015. National Biodiversity Strategy and Action Plan, 2015-2020. Division of the Environment, Vice President's Office. Dar es Salaam.

<sup>8</sup> Strengthening the Protected Area Networks in Southern Tanzania (SPANEST) (2016). Ecological Baseline Study Greater Ruaha-Rungwa and Greater Kitulo-Kipengere Landscapes. TANAPA/UNDP

the 25 world renowned biodiversity hotspots hosting more than one-third of the total plant species on the continent and about 20% of the large mammal population<sup>9</sup>. Despite its mega biodiversity status, Tanzania has also become a hotspot for species at risk of extinction with 1,320 threatened species on the IUCN Red List (2020), representing nearly every taxonomic group<sup>10</sup>. The project area consists of two protected areas, namely MBOMIPA WMA and RUNAPA. These protected areas were designated to protect the biodiversity of flora and fauna, and contribute to sustainable development. However, as any protected area in the country, the two protected areas harbours a diverse number of both flora and fauna species, some of which may be threatened with extinction. The protected areas are described in the following sections

## 4.2.1 MBOMIPA Wildlife Management Area (WMA)

### 4.2.1.1 Location

The Idodi-Pawaga (MBOMIPA) WMA is situated in Iringa District, south-western part of Tanzania between latitudes 6.9° to 8.0° and longitudes 34.8° to 35.7° E. The WMA covers a stretch of 17km (from Km 87+00 to km 104+00) along the project road. The WMA provides a direct connectivity to RUNAPA, and one of the Protected Areas forming the Greater Ruaha Rungwa Ecosystem (GRRE). Other Protected areas in the GRRE include Rungwa, Kizigo and Muhesi Game Reserves, Lunda Mkwambi Game Controlled Area, MBOMIPA, WAGA and UMEWARUA Wildlife Management Areas (Table 8).

*Table 8: Categories of protected areas, their administrative structures and land use classification in the Greater Rungwa-Ruaha Ecosystem.*

Category of PA	Name	Size (Km <sup>2</sup> )	Year of gazettment	Type of use <sup>11</sup> allowed/not allowed	Administered by
National Park	Ruaha National Park	20, 226	1964	Non-consumptive, human settlement not allowed	Tanzania National Parks
Game Reserves	Rungwa Kizigo and Muhesi (3)	15,000	Rungwa (1951), Kizigo (1972), Muhesi (1994)	Consumptive/non- consumptive, human settlement not allowed	Tanzania Wildlife Authority (TAWA)/Wildlife Division (WD)
Game Controlled Area	Lunda Mkwambi (1)	1000	1974	Consumptive/non- consumptive, human settlement not allowed	TAWA/WD

<sup>9</sup> URT, 2015.

<sup>10</sup> Ministry of Natural Resources and Tourism (MNRT), 2022. Tanzania Wildlife Corridor Assessment, Prioritization, and Action Plan. Editors: Penrod, K., H. Kija, V. Kakengi, D.M. Evans, E. Pius, J. Olila and J. Keyyu. Unpublished report. Ministry of Natural Resources and Tourism (MNRT), Dodoma. 155 pp. + Appendices

<sup>11</sup> KEY: As per the Tanzanian Wildlife Conservation Cap 282, consumptive use means the taking of flora or the hunting or capturing of fauna, while non-consumptive use means the use of scenery, cultural and natural resources that does not involve taking any specimen from the PA, such as photographic tourism, walking safaris, hiking, canoeing, boating, scuba diving, mountaineering and any other similar or related activity.

Wildlife Management Areas	Idodi-Pawaga (MBOMIPA)	773	2007	Consumptive/non-consumptive, human settlement not allowed	TAWA/WD, Iringa District Council, MBOMIPA Authorized Association.
	Waga	315.27	2015	Consumptive/non-consumptive, human settlement not allowed	TAWA, Mufindi District Council, TAWA, WD
	UMEWARUA	600.9	2015	Consumptive/non-consumptive, human settlement not allowed	Wanging'ombe District Council, TAWA, WD

Source: Modified from Kiwango and Mabele, 2022<sup>12</sup>.

Administratively, the WMA is located in Idodi and Pawaga divisions, Iringa District, in Iringa Region, hence the name. The WMA comprises of 21 member villages namely Mahuninga, Makifu, Tungamalenga, Mapogoro, Kitisi, Idodi, Nyamahana, Malinzanga and Mafuruto in Idodi division Mbuyuni while Kimande, Itunundu, Mboliboli, Magombwe, Kisanga, Kinyika, Isele, Luganga, Magozi, Ilole Mpya and Mkombilenga are located in Pawaga division (Figure 2). The WMA was formerly part of the Lunda-Mkwambi Game Controlled Area (LMGCA), established in 1974<sup>13</sup> (MNRT, 2013). It borders RUNAPA to the West and North -West, WAGA WMA to the south and LMGCA to the north, and the grazing lands of Mahuninga, Makifu, Tungamalenga, Mapogoro, Idodi, Malinzanga, Mafuruto, Isele, Kisanga, Kinyika, Luganga and Mboliboli to the east. The WMA is formed by 21 member villages located to the east and north east covering a total area of 773Km<sup>2</sup>(Kiwango, 2017, MBOMIPA, 2013, 2023) <sup>14,15</sup> (Figure 2). MBOMIPA was one of the first 16 pilot WMAs, and was officially gazetted in 2006 under the Wildlife Conservation (Wildlife Management Regulations), 2003.

*The management and monitoring of ecosystem, biodiversity and tourism activities in the park and WMA areas is the core business of both RUNAPA and MBOMIPA as their activities are concerned. **Please note that,** MBOMIPA is managing all tourism activities within WMA areas and is the main sources of income. Therefore, the sources of income for RUNAPA, TANROADS and traffic police are from GoT annual budget estimated for this activities which is described as follows: RUNAPA is USD 48,000; MBOMIPA is USD 44,000 and Traffic Police is 13,000 to implement the BMP during the operation phase as per Appendix 1 on BMP management, However, TANROADS will also set aside funds of USD 57,000 from the annual budget to ensure management of the BMP are undertaken during construction and operation phase as indicated in appendix 1.*

<sup>12</sup> Kiwango, W. A., & Mabele, M. B. (2022). Why the convivial conservation vision needs complementing to be a viable alternative for conservation in the Global South. *Conservation & Society*, 20(2), 179-189.

<sup>13</sup> MNRT. (2013). The Wildlife Sub-Sector Statistical Bulletin. Wildlife Division, Dar es Salaam.

<sup>14</sup> See also Kiwango, W. A. (2017). Decentralised environmental governance: an examination of its effectiveness in wildlife management areas, Tanzania. Case study of Idodi-Pawaga WMA (Doctoral dissertation, PhD Thesis, The Nelson Mandela African Institution of Science and Technology, Arusha, Tanzania).

<sup>15</sup> MBOMIPA 2013, Resource Zone Management Plan, MBOMIPA 2023, General Management Plan.

*Among others during Construction and operation phases, TANROADS in collaboration with traffic police and MBOMIPA will install Speed cameras along the stretch of highway that transits the WMA. Traffic police and WMA game scouts who will be patrolling the WMA road section regularly as part of law enforcement will carry out the operation of the cameras and arresting and penalizing violators. TANROADS will finance the purchasing of all cameras and undertake repair where needed during construction and operation phases.*

***In conclusion to the above, MBOMIPA is the Authorised Association responsible for the Management and daily operations of the WMA including undertaking patrol by using Village Game Scouts As commented above, these two agencies conduct joint activities including patrols and anti-poaching as they manage the same ecosystem.***

#### *4.2.1.2 Climate*

The climate of the area is mainly semi-arid, with mean annual rainfall ranging from 500mm-600mm<sup>16</sup>. Precipitation occurs from November to March/early April. The southern part of the WMA receives more precipitation than other parts, usually 750mm-1000mm average per annum<sup>17</sup>. Temperatures are usually high throughout the year that can reach up to 44°C during the day (MBOMIPA, 2014). The average temperatures ranges from 15-35°C, while the altitude ranges from 696 to 2,171m<sup>18</sup>.

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<sup>16</sup> See for example, SPANEST, 2016; Walsh, M. (2000). The development of community wildlife management in Tanzania: Lessons from the Ruaha Ecosystem. In: Proceedings of the Conference on African wildlife management in the new millennium. Mweka, Tanzania, December 13-15 2000.

<sup>17</sup> MBOMIPA, 2023. General Management Plan.

<sup>18</sup> Abade, L., Macdonald, D., & Dickman, A. (2014a). Assessing the relative importance of landscape and husbandry factors in determining large carnivore depredation risk in Tanzania's Ruaha landscape. *Biological Conservation*. 180:241-248

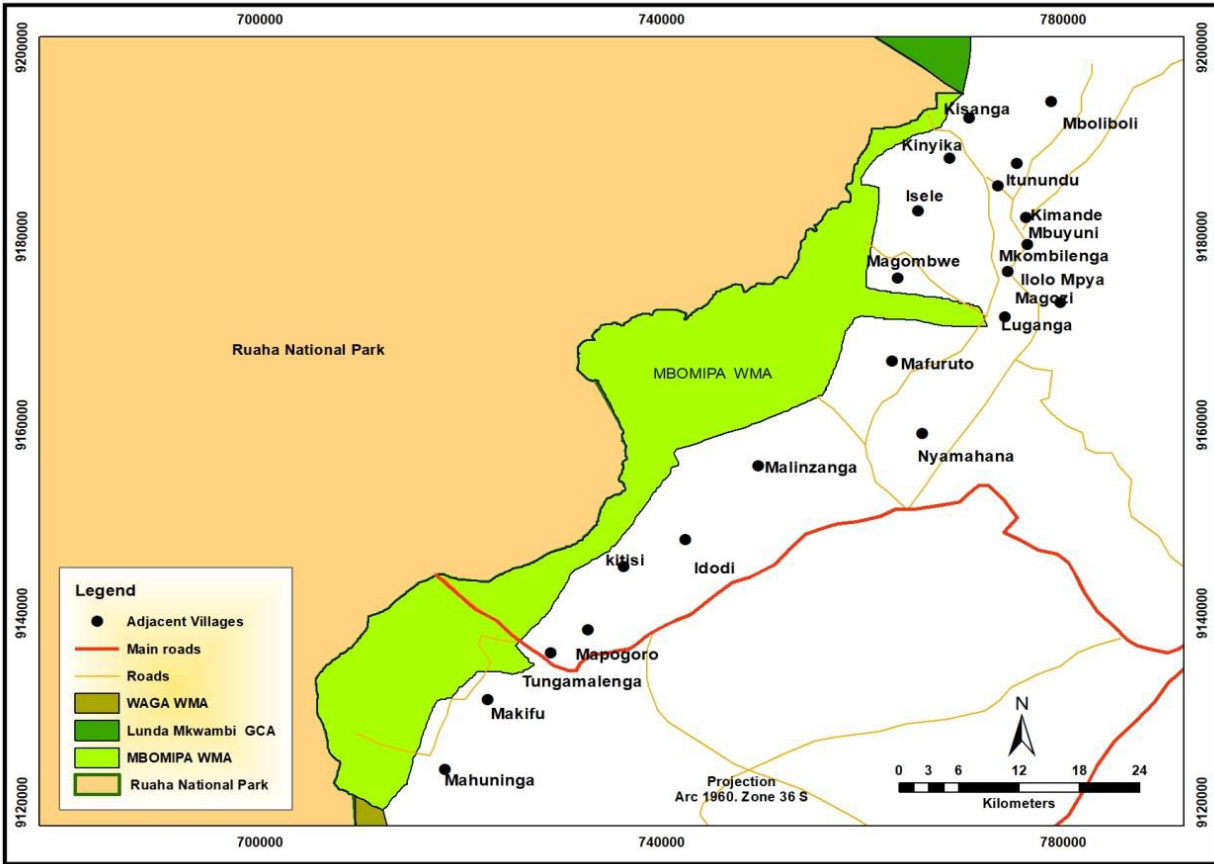


Figure 2: The location of MBOMIPA WMA with constituent villages.

Source: Adapted from MBOMIPA GMP, 2023.

#### 4.2.1.3 Major vegetation types

MBOMIPA WMA forms part of the Rungwa-Ruaha ecosystem, which is important in maintaining biodiversity connectivity, protecting migratory routes and species which could not otherwise be protected in isolated protected areas, and maintain the general ecosystem functioning and important ecological processes. The ecosystem is the only protected area system which represents the transition between the East African *Acacia-Commiphora* zone to the Southern African *Brachystegia* or *Miombo* zone<sup>19</sup>. In general, the WMA consists of *Acacia* woodlands, *Acacia-Commiphora* shrubs, miombo woodlands (*Brachystegia*), *Commiphora-Combretum* trees, (*Acacia tortilis* trees, and riparian vegetation (*Hyphaene spp*) along the Ruaha river banks, and *Combretum-Acacia-Ficus* trees along river banks<sup>20</sup>(Figure 3). This vegetation type is an excellent habitat for a wide range of invertebrate and vertebrate species.

<sup>19</sup> Dickman, A. J. (2009). Key determinants of conflict between people and wildlife, particularly large carnivores, around Ruaha National Park, Tanzania. PhD Thesis, University College London, Kiwango, 2017, Abade et al 2014.

<sup>20</sup> MBOMIPA, 2023. General Management Plan



Apart from the vegetation description within the WMA, the vegetation along the road project does not differ significantly from that of the WMA. Nonetheless, it has been modified through conversion to agricultural land and livestock keeping.

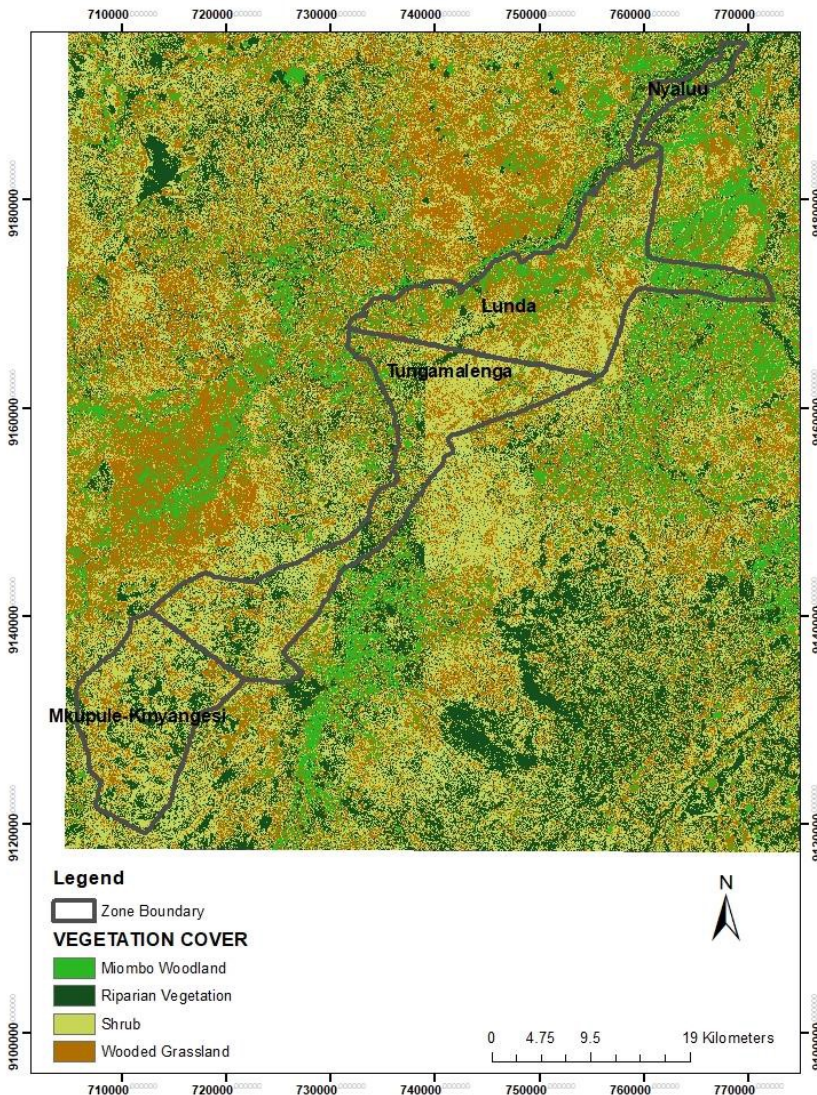


Figure 3: Vegetation cover for MBOMIPA WMA.

Source: Adapted from MBOMIPA, 2023.

#### 4.2.1.4 Wildlife

Given the diverse range of vegetation, the WMA boasts a diverse range of invertebrate and vertebrate species. The area boasts flagship species of wildlife such as Elephants (*Loxodonta africana*) Hippopotamus (*Hippopotamus amphibius*) Giraffe (*Giraffa camelopardalis*) Eland (*Taurotragus oryx*) buffalo (*Syncerus caffer*), Zebra (*Equus zebra*), Lichtensteins hartebeest (*Alcelaphus lichtensteinii*), Roan

antelope (*Hippotragus equines*) and sable antelope (*Hippotragus niger*), Greater Kudu (*Tragelaphus strepsiceros*) and Lesser kudu (*Tragelaphus imberbis*), bushbuck (*Tragelaphus sylvaticus*) Bohor reedbuck (*Redunca redunca*), Impala (*Aepyceros melampus*), Duiker (*Sylvicapra grimmia*), Lion (*Panthera leo*), Leopard (*Panthera pardus*), Cheetah (*Acinonyx jubatus*), Wild dog (*Lycaon pictus*), and six species of Mongoose. Also, the area represents the southern limits of Grant's gazelle's and lesser kudu's ranges.<sup>21</sup>

Further, the WMA also boasts a diversity of bird species estimated at 500 species (out of 568 species recorded in RUNAPA)<sup>22</sup>. Important reptiles common within the WMA include the Nile crocodile (*Crocodylus niloticus*), monitor lizard (*Varanus spp*), python (*Python sebae*), black mamba (*Dendroaspis polylepis*), spitting cobra (*Naja nigricollis*) and puff adder (*Bitis arietans*). In terms of bio-geographic significance, the presence of the East African Sand boa (*Eryx colubrinus*) in the WMA is the southern-most record for the species and the recording of the Turner's fat-toed gecko (*Pachydactylus turneri*) in the WMA is a significant range extension for the species (MBOMIPA, 2014, 2023).

In addition to providing critical dry season water for terrestrial wildlife, the rivers within the WMA are also home to 38 fish species, freshwater mussels, and charismatic riverine species like the African clawless otter. The river's dense woodland and riverine forests are of significant tourism potential and are the critical resources for some species (MBOMIPA 2014, 2023).

#### 4.2.2 Ruaha National Park

##### 4.2.2.1 Location

Ruaha National Park is the second largest National Park in Tanzania with 20,226 km<sup>2</sup> after the annexation of Usangu Game Reserve in Mbeya Region<sup>23</sup>. It is located in the south-west of Tanzania, about 130km from Iringa town. River Ruaha flows along its Southeastern margin and is the focus for game viewing and other tourist activities. The river harbours hippos and crocodiles and it is one of the critical sources of water for wildlife during dry season.

RUNAPA history dates back to 1910 when it was gazetted Saba Game Reserve by the Germans, and then British changed the name to Rungwa Game Reserve in 1946. In 1964, the southern portion of the Game was gazetted as Ruaha National Park. In 1974, a small section of the southeastern part of the Great Ruaha River was incorporated into the park. The RUNAPA is the part of the Rungwa-Kizigo-Muhesi ecosystem which covers about 50,000km<sup>2</sup> forming the GRRE. In 2008, Usangu Game Reserve and other important wetlands in Usangu basin were annexed into the park, making it one of the largest parks in Tanzania and East Africa with an area of about 20,226km<sup>2</sup>. Therefore, ***RUNAPA is responsible for management of the park including park operations, ecosystem management and tourism activities. However, it is also responsible to implement community-based activities outside the park (Outreach activities) in collaboration with local government authorities.***

The management and monitoring of ecosystem, biodiversity and tourism activities in the park and WMA areas is the core business of both RUNAPA and MBOMIPA as their activities are concerned.

The institutional arrangements are such that MBOMIPA and RUNAPA each have their annual operational plans with budgets that cover their day-to-day operations around MBOMIPA-WMA area and Ruaha

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<sup>21</sup> Kiwango, 2017; MBOMIPA 2014, 2023;

<sup>22</sup> SPANEST (2016) has this figure at 560 spp.

<sup>23</sup> The exact new area of the park will likely decrease after downgrading of 774.32 Km<sup>2</sup> to village land.

<https://mwanzotv.com/2023/06/23/hekta-74432-za-hifadhi-ya-taifa-ya-ruaha-kurejeshwa-kwa-wananchi/>



National Park. Further, RUNAPA on daily basis jointly carry out operations outside the park and around WMA in coordination with MBOMIPA in all issues related to anti-Poaching/game Patrol/training\tourist management and ecosystem awareness as well as Monitoring tourism activities around WMA areas during operation phase. However, MBOMIPA, through Village Game Scouts (VGS), carry out these activities around WMA on a daily basis through their annual budget from own source.

As part of Law enforcement the police force through traffic, police are responsible for traffic control for the road across WMA area. In views of the above TANROADS construction, activities and mitigation measures as specified in the BMP for the WMA areas will complement the ongoing activities for management of ecosystem around the areas.

#### 4.2.2.2 Major vegetation types

RUNAPA supports a great diversity of vegetation types. The vegetation types of the park fall under main communities, namely miombo woodland, grassland; riparian vegetation, aquatic and swamp vegetation, savannah, *Combretum-acacia* bushland, Commiphora bushland and evergreen sub-montane forest (RUNAPA GMP, 2018-2028). The southern and western areas of the park are made up of the miombo woodland dominated by *Brachystegia*. This grades into *Commiphora-Combretum* woodland in the north-east with extensive areas of *Terminalia* and *Adansonia* dominated plains in the central areas. In general, the park presents a wide range of physiognomic features which range from treeless grasslands, swamps, bush covered grassland, deciduous wooded grassland, miombo woodlands to riverine woodlands and submontane forests. Over 1770 plant species have been identified in the park, the majority of which are flowering plants.

#### 4.2.2.3 Wildlife

According to RUNAPA's General Management Plan (2018-2028), the park is endowed with various wild animal species due to its diversity of habitats. The significant animal species include topi, impala, zebra, reedbuck, oribi, warthog, sable, hartebeest, elephant, giraffe, crocodile, leopard, lion, cheetah, wild dog, dik-dik, duiker, roan antelope, greater kudu and jackal (RUNAPA GMP, 2009).

The park is an important habitat for diverse bird species both residents and migratory. Birdlife International has declared the Usangu wetland as one of Tanzania's Important Bird and Biodiversity Areas (IBAs) according to 2009 assessment. Up to 574 species of birds have been recorded, about 80% of which are resident and 20% migratory.

The wetland contains species which are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) e.g. the grey crowned crane (*Balearica regulorum*).

**Threatened** species e.g. wattled crane (*Grus carunculata*); **endemic** bird species e.g. ashy starling (*Cosmopsarus unicolor*); **vulnerable** bird species e.g. the pallid harrier (*Circus macrourus*) and black winged pratincole (*Glareola nordmanni*) are also found in RUNAPA.

RUNAPA is located at the end of the proposed project road and therefore will not be directly affected by construction activities. However, its direct connectivity with MBOMIPA WMA implies that fauna species may be impacted by the construction activities, and therefore mitigation measures must be implemented effectively. Nonetheless, upon completion of the project, the park will significantly benefit in terms of tourism promotion and management activities.

## 5 Protected Areas and Key Biodiversity areas in the Project site

We use the Integrated Biodiversity Assessment Tool (IBAT) and a comprehensive literature review to generate a list of Protected Areas and Key Biodiversity Areas within the project site. Key Biodiversity Areas (KBAs) are sites that contribute significantly to the global persistence of biodiversity in terrestrial, freshwater and marine ecosystems, and they are identified through national processes by local stakeholders using a set of globally agreed scientific criteria.<sup>24</sup> According to the World Database on Protected Areas (WDPA) and on KBAs, two protected areas namely MBOMIPA Wildlife Management Area and Ruaha National Park falls within the project's intervention site. Although there are other Protected Areas within the GRRE as outlined in Table 8, they are not directly affected by the project interventions.

### 5.1 Terrestrial mammals

During the survey, a total of 105 mammal species belonging to eight taxonomic groups were found along the area on which the road will be constructed. Of these, rodents recorded the highest number of species (n=33) followed by ungulates (n=29) and carnivores (n=21) while insectivorous recorded the least number (n=1). Importantly, four mammal species namely African elephant (*Loxodonta africana*), wild dog (*Lycaon pictus*) and ground giant pangolin (*Smutsia gigantea*) are listed as Endangered (EN) species according to the IUCN Red list. Further, a total of nine mammal species including three carnivores namely lion (*Panthera leo*), leopard (*Panthera pardus*), cheetah (*Acinonyx jubatus*) have been listed as Vulnerable (VU) under the IUCN red list. Furthermore, three ungulates namely hippopotamus (*Hippopotamus amphibius*), giraffe (*Giraffa camelopardalis*) and topi (*Damaliscus lunatus*) have been listed under VU status according to updated IUCN Red list. Other species listed as VU include Vlei rat (*Otomys spp*), Cape pangolin (*Smutsia temminckii*) and long fingered bat (*Myotis capaccinii*) (see Appendix A). Importantly, African elephant, cheetah, leopard and Cape pangolin have been listed under CITES appendix I while lion, caracal and giraffe have been listed under CITES appendix II. Two species, namely the Gerenuk (*Litocranius walleri*) and the Oribi (*Ourebia ourebi*) are listed as rare in the area. Specifically, the Gerenuk is also listed as Near Threatened by the IUCN red list Appendix 3.

### 5.2 Birds

During the survey, a total of 330 bird species belonging to 77 families were found. Out of these, 47 species were migratory birds and the remaining ones were residents. Precisely, three species of vultures namely hooded (*Necrosyrtes monachus*), white backed (*Gyps africanus*) and white headed (*Trigonoceps occipitalis*) are listed under IUCN red list as Critically Endangered (CR) while other three birds of prey namely bateleur (*Terathopius ecaudatus*), Lappet-faced vulture (*Torgos tracheliotus*) and Martial eagle (*Polemaetus bellicosus*) are listed as Endangered (EN) species under IUCN Red list of endangered species. Consequently, two bird species namely ostrich (*Struthio camelus*) and peregrine falcon (*Falco peregrinus*) are listed under appendix I by CITES while seven species namely Bateleur, crown eagle (*Stephanoaetus coronatus*), hooded vulture, Martial eagle, Pallid harrier (*Circus macrourus*), white headed and white backed vultures are listed by CITES under appendix II (See details appendix 4)

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<sup>24</sup> [https://www.ibat-alliance.org/country\\_profiles/TZA](https://www.ibat-alliance.org/country_profiles/TZA)

### 5.3 Reptiles

During the survey, a total of 24 species of reptiles were confirmed to be present. Out of these, only one species, Pancake tortoise (*Malacochersus tornieri*) has been listed under IUCN Red list as critically endangered species (CR), while the rest have no any threatening statuses. Similarly, all the reptile species found in the area have no CITES listing (details see Table 9).

Table 9: List of reptiles found in various habitats along the Msembe Iringa road

S/ N	Common name	Scientific name	IUCN/CITES status	Direct Method	Signs	Other methods
1	Black mamba	<i>Dendroaspis polylepis</i>	Least concern			Literature, Interview
2	Black-necked spitting cobra	<i>Naja nigricollis</i>	Not evaluated			Literature, Interview
3	Blue-tailed gliding lizard	<i>Holaspis guentheri</i>	Not evaluated	√		Literature
4	Blue-tailed Snake-eyed Skink	<i>Panaspis megalurus</i>	Not evaluated	√		Literature
5	Boulenger's scrub lizard	<i>Nucrus boulengeri</i>	Not evaluated	√		Literature
6	Cape Dwarf Gecko	<i>Lygodactylus capensis</i>	Least concern	√		Literature
7	Variable hinged terrapins	<i>Pelusios rhodesianus</i>	Least concern			Literature
8	Leopard tortoise	<i>Stigmochelys pardalis</i>	Least concern			Literature, Interview
9	Moreau's Tropical house gecko	<i>Hemidactylus mabouia</i>	Least concern	√		Literature, Interview
10	Nile monitor	<i>Varanus niloticus</i>	Not evaluated	√	√	Literature, Interview
11	Pancake tortoise	<i>Malacochersus tornieri</i>	Critically endangered			Literature
12	Puff adder	<i>Bitis arietans</i>	Not evaluated	√		Literature, Interview
13	Savannah monitor lizard	<i>Varanus exanthematicus</i>	Least concern			Literature, Interview
14	Southern Long-tailed Lizard	<i>Latastia longicaudata</i>	Not evaluated	√		Literature
15	Speke's Sand Lizard	<i>Heliobolus spekii</i>	Not evaluated	√		Literature
16	Striped skink	<i>Trachylepis striata</i>	Not evaluated	√		Literature
17	Speckled sand snake	<i>Psammophis punctulatus</i>	Least concern			Interview, Literature
18	Western Yellow-bellied Sand Snake	<i>Psammophis subtaeniatus</i>	Least concern			Literature
19	Dwarf sand snake	<i>Psammophis angolensis</i>	Least concern			Interview, Literature
20	Striped sand snake (Hissing sand snake)	<i>Psammophis sibilans</i>	Least concern			Interview, Literature
21	Tree agama	<i>Acanthocercus atricollis</i>	Not evaluated	√		Interview
22	Tropical Spine Agama	<i>Agama armata</i>	Least concern	√		Interview, Literature

23	Variable skink	<i>Trachylepis varia</i>	Not evaluated	√		Literature
24	Wahlberg's Snake-eyed Skink	<i>Panaspis wahlbergi</i>	Not evaluated	√		Literature

Sources: IUCN red List, ESIA (Iringa-Msembe road), Focus Groups Discussions (FGDs), MBOMIPA GMP, SPANEST 2016.

## 5.4 Amphibians

Our survey revealed a total of 24 species of amphibians in the project's area of influence<sup>25</sup>. Out of these, only one species, puddle frog (*Phrynobatrachus krefftii*) has been listed under IUCN Red list as endangered species (EN), while the rest have no any threatening status. Similarly, all the amphibian species found in the area have no CITES listing (Table 10) The survey conducted by SPANEST (2016) did not find endemic species of amphibians, except possibly a Sand Frog (*Tomopterna spp*) that may be endemic to the RRE as a whole, including Usangu.

Table 10: List of amphibians found in various habitats along the Msembe-Iringa road

S/ N	Common name	Scientific name	IUCN Status				Evidence / Method	
			(Version 3.10)	CITES	Observation	Other		
1	African Bull Frog	<i>Pyxicephalus adspersus</i>	Least concern	No CITES listing		Literature		
2	African Clawed Frog	<i>Xenopus laevis</i>	Least concern	No CITES listing		Literature		
3	African common toad (Guttural toad)	<i>Sclerophrys gutturalis</i>	Least concern	No CITES listing	√	Vocal, Literature, Interview		
4	Bocage's Tree Frog	<i>Leptopelis bocagii</i>	Least concern	No CITES listing		Literature		
5	Senegal Land Frog	<i>Kassina senegalensis</i>	Least concern	No CITES listing		Literature		
6	Dune Squeaker	<i>Arthroleptis stenodactylus</i>	Least concern	No CITES listing		Literature		
7	Hallowell's Toad	<i>Sclerophrys maculata</i>	Least concern	No CITES listing		Literature		
8	Galam white-lipped frog	<i>Amnirana galamensis</i>	Least concern	No CITES listing		Literature		
9	Gunther's Sharpnosed Reed Frog	<i>Hyperolius nasutus</i>	Least concern	No CITES listing		Literature		
10	Guttural Toad	<i>Bufo gutturalis</i>	Least concern	No CITES listing		Literature		
11	African Ornate Frog	<i>Hildebrandtia ornata</i>	Least concern	No CITES listing		Literature		
12	Marbled-snout Burrower	<i>Hemius marmoratus</i>	Least concern	No CITES listing	√	Literature		
13	Mascarene Ridged Frog	<i>Ptychadena mascareniensis</i>	Least concern	No CITES listing	√	Literature		
14	Müller's Clawed Toad	<i>Xenopus muelleri</i>	Least	No CITES listing	√	Literature		

<sup>25</sup> Project Area of Influence as defined in the main ESIA report: The area likely to be affected by the project including all its ancillary aspects.

			concern			
15	Parkerís Toad	<i>Poyntonophrynus parkeri</i>	Least concern	No CITES listing		Literature
16	Petersí Foam Nest Tree Frog	<i>Chiromantis petersii</i>	Least concern	No CITES listing		Literature
17	Puddle Frog (Krefft's River Frog)	<i>Phrynobatrachus krefftii</i>	Endangered	No CITES listing		Literature
18	Red-backed Toad	<i>Schismaderma carens</i>	Least concern	No CITES listing	✓	Literature
19	Red-banded Frog	<i>Phrynomantis bifasciata</i>	Least concern	No CITES listing		Literature
20	Plain Grass Frog	<i>Ptychadena anchietae</i>	Least concern	No CITES listing	✓	
21	Senegal Kassina	<i>Kassina senegalensis</i>	Least concern	No CITES listing	✓	Literature
22	Southern Foam-Nest Frog	<i>Chiromantis xerampelina</i>	Least concern	No CITES listing		Vocal, Literature
23	Tremelo Sand Frog	<i>Tomopterna cryptotis</i>	Least concern	No CITES listing		Literature
24	Guinea Snout-burrower	<i>Hemissus guineensis</i>	Least concern	No CITES listing		Literature

Sources: ESIA (Iringa-Msembe road), IUCN red list,

Field observations and assessments indicate that faunal occurrence is not limited to the KBAs. Given the continuity between the protected areas and the adjacent villages, sightings of various faunal species is not uncommon. However, due to the modification of the habitats (human settlements and agricultural expansion and charcoal burning), these areas can be classified as modified habitats. Big mammals such as Elephants, and large predators such as Lions, Hyaenas, Cheetah, Wild dogs and Leopards tend to venture into human settlements, resulting into human wildlife conflicts. This wildlife normally retreat back to the protected areas although some may be killed in retaliation, especially Lions. According to the ESS 6, modified habitats are areas that may contain large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. In this case, the Contractor should avoid or minimize impacts on such biodiversity and implement mitigation measures as appropriate

## 5.5 Plants

Over a total of 169 plant species belonging to 39 families have been recorded within the area where the road will be constructed. With the exception of two plant species namely Black wood (*Dalbergia melanoxylon*) and African teak (*Pterocarpus angolensis*) which are listed under CITES appendices II & III respectively, the rest of plants within the area have not been listed in any CITES appendices. Interestingly, these two species were also promptly mentioned by communities during focus group discussions. In addition, IUCN Red list has listed black wood as Near Threatened (NT) while African teak as Least Concern (LC), the remaining plants have either LC status or not included in the IUCN Red list. Miombo woodlands were identified within core project areas especially in protected vegetation along



the proposed road. This vegetation was dominant in most part of the project areas from Mlowa towards RUNAPA; remnants of miombo woodland were also recorded in cultivated land. Woodland community was dominated by *Brachystegia spiciformis* and *Combretum sp.* The species composition apart from the aforementioned dominant species was *Pterocarpus angolensis*, *Brachystegia boehmii*, *Afzelia quanzensis*, *Protea gaguedi*, *Erythrina abyssinica*, *Rhus natalensis*, *Anona senegalensis*, and *Vitex doniana*. A complete checklist of plant species recorded during the surveys is provided in Appendix 5.

## 5.6 Invasive species

Invasive Species (IS) is one of the main threats facing biodiversity conservation in the world. These species have a tendency of outcompeting the native species, increase their population density and dominate the habitats, cause health problems to wildlife and humans, change nutrients cycles in the ecosystems and ultimately harm ecosystems in its introduced range. In fact, their impacts are non-discriminatory as they also affect protected areas (PAs). Iringa-Msembe road, being one of the areas that traverse various human settlements and wildlife habitats including Protected Areas such as MBOMIPA Wildlife Management Area (WMA), is not of exception from the AIS scourge. During the field survey which included direct observations and focus groups interviews, a number of Invasive Species plants were noted especially along the sides of the road and disturbed areas such *Calotropis procera* and *Caesalpinia decapetala*, *Solonom incunum* (Photo 8) and *Sena siamea*. In addition, more invasive plants species were noted in the perennial swamps and many parts of the riparian areas in which the road goes through which include *Pistia stratoites*, *Azolla nilotica*, *Azolla filiculoides* and *Typha capensis*. However, *Pistia stratiotes* was observed in the perennial swamp and *Typha capensis* in seasonally flooded areas.

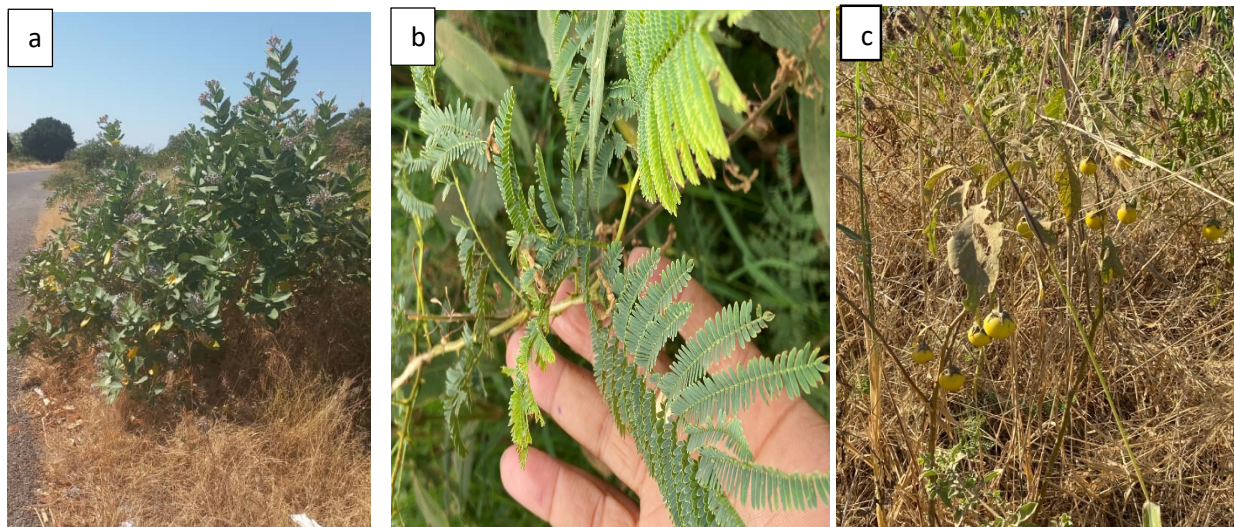


Photo 8: Some of the Alien Invasive Plants observed during the survey, (a) *Calotropis procera* (b) *Caesalpinia decapetala* and (c) *Solonom incunum*.

Source: Field work, 2023. Photo: E.Martin/W.Kiwango

Other alien plants recorded include: *Eucalyptus maidenii* subsp. *Globulus*, *Eucalyptus saligna*, *Azadirachta indica*, *Citrus aurantium*, *Citrus limon*, *Arundo donax*, *Artocarpus heterophyllus*, *Amaranthus hybridus*, *Jacaranda mimosifolia*, *Mangifera indica*, *Manihot esculenta*, *Musa paradisiaca*, *Psidium guajava* and *Schinus molle*. All these species have been classified as Invasive species in the National Invasive Species Strategy and Action Plan.



## 5.7 Confirmation of wildlife corridors

### 5.7.1 Ruaha/ Udzungwa-Mikumi

#### Location, description and animal movements

According to SPANEST (2016) this corridor connects RUNAPA and Udzungwa-Mikumi National Parks. These two protected areas are separated by a wide area that has diverse anthropogenic activities including settlements, farming and livestock. Apart from RUNAPA, there are few protected areas (PAs) of low category such as Lunda Game Controlled Area, Idodi-Pawaga (MBOMIPA) Wildlife Management Area (WMA) and WAGA Wildlife Management Areas (Figure 4). The WMAs form a buffer zone of RUNAPA to the east. Reliable ecological indices indicates the presence of animal movements in the area which are linked by this corridor (Jones *et al.*, 2009) although these movements have been on the decline as human activities intensifies in the area. For example, Elephant signs have been detected continuously from RUNAPA through MBOMIPA, between Mtera reservoir and the escarpment to the south eastward into the Nyang'oro hills on both sides of Ruaha River (Area A in Fig 4).

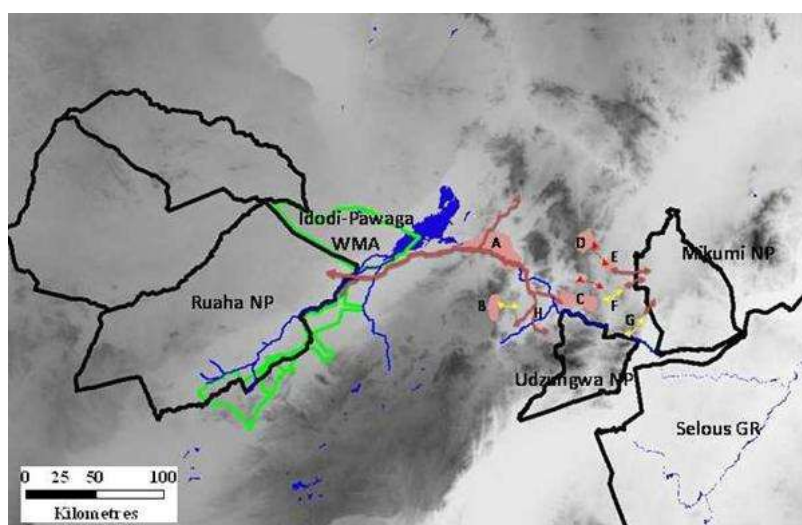


Figure 4: Ruaha-Udzungwa and Mikumi-Udzungwa Corridors

KEY: Pink polygons denotes areas with probable year-round use by elephants. Dar red arrows are movement corridors inferred from detection of elephant signs from field surveys and discussions with local communities. (Source: Jones *et al.*, 2009).

#### Concerned species and threats

Wildlife corridors are often identified through their use by large charismatic mammals, particularly elephants, carnivores and large ungulates (Buffalo, Eland, Giraffe, and Zebra). However, many smaller animals such as duikers, small carnivores, bats, birds and amphibians also use the corridors. Thus corridors may be important both for maintenance of populations in protected areas linked by corridors, and for populations moving through or living in the corridors. Involved species depend of corridor's type. The level of interactions between people and wildlife are significant in the corridor. These interactions are not new and some have been increased from 2013 when settlement and farming were expanded close to protected areas and hunting blocks (open areas). The inclusion of the area north of

Muhesi GR in this corridor could mitigate human encroachment in the GR. The Project interventions will seek to avoid and minimize adverse impacts in these areas where human footprint is already significant.

## 5.8 Natural Habitat baseline assessment

### 5.8.1 Natural habitats along Iringa – Msembe Road

The road runs through part of the Greater Ruaha and Rungwa Landscapes (GRRL) which harbours huge wildlife assemblages, such as African elephant (one of the strongholds of East Africa's elephant population). In addition, the area has a high diversity of ungulates, reflecting its location in an ecotone between the Miombo Woodland and Acacia Savannas. Further, the area has large numbers of predators, including Wild Dog, Cheetah, Leopard and Lion. Furthermore, the site is an Important Bird Area with over some 560 species of birds).

Importantly the GRRL is unique because it covers a transition zone of which the eastern and southern African species of flora and fauna converges. In this way, the GRRL represents the southernmost point for some of the typical East African semi-arid savannah vegetation types (*acacia* woodland) and most northerly distribution of the *Brachystegia* zone of the Zambezian *miombo* woodland of southern Africa.

On the other hand, RUNAPA itself presents a wide range of physiognomic features ranging from plain grasslands, swamps, grassland interspaced with bushes, deciduous wooded grassland, miombo woodlands to riverine vegetation and submontane forests. Over 1770 plant species have been identified in RUNAPA with majority of them being flowering plants (SPANEST, 2016).

### 5.8.2 Aquatic ecology assessment

The assessment of aquatic ecosystem within the site has revealed various types of habitats which ranges at an altitude of 1100 to 1300 m.a.s.l. as follows:

#### 5.8.2.1 Rivers and wetlands

Mainly found in the Great Ruaha River, Little Ruaha, Mlowa, Idodi, Ipwasi and Tungamalenga Rivers. The riverine system by permanent and seasonal flowing water dominated by species such as *Lagarosiphon ilicifolius*, *Ceratophyllum demersum*, *Nymphaea nouchali*, *Trapa natans* var. *africana*, *Utricularia stellaris*, *Utricularia gibba* and *Fuirena stricta*. The riverine ecosystem is linear and narrow in form as it paralleled the stream channel and had either diffuse or sharp edges attributable to the nature of species interactions across the ecotone and disturbances. This vegetation community is localized in the river system particularly the Ruaha, Mlowa, Idodi, Ipwasi and Tungamalenga Rivers. The plant species composition is essentially riverine and intermittently or permanent inundated wetland plants where *Phragmites mauritanus*, *Cyperus denudatus*, *Cyperus papyrus*, *Kylinga elata*, *Ficus sur*, *Ficus sycomorous*, *Phoenix reclinata*, *Ludwigia adscendens*, *Persicaria senegalensis* and *Kigelia africana* are the most common plant species in the riparian vegetation community.

#### 5.8.2.2 River Banks

Having riparian woodland particularly along the river banks and the surrounding flood plains, this habitat is dominated by *Vachellia* species (*Vachellia seyal*, *Vachellia tortilis*, *Vachellia xanthophloea*, *Vachellia polyacantha*, and *Vachellia brevispica*), *Faidherbia albida*, *Tamarindus indica*, *Commiphora africana*, *Garcinia livingstonei*, *Kigelia africana*, *Mimosa pigra*, and *Combretum paniculata*.

## 5.9 Critical Habitat Assessment

### 5.9.1 Definitions and concepts

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. ESS addresses all habitats, categorized as 'modified habitat', 'natural habitat', and 'critical habitat', along with 'legally protected and internationally and regionally recognized areas of biodiversity value' which may encompass habitat in any or all of these categories.

**Modified habitats** are areas that may contain a large proportion of plant and/or animal species of nonnative origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

**Natural habitats** are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

**Critical habitat** is defined as areas with high biodiversity importance or value, including:

- (a) habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches;
- (b) habitat of significant importance to endemic or restricted-range species;
- (c) habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
- (d) highly threatened or unique ecosystems;
- (e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

**Legally protected and internationally recognized areas of high biodiversity value** are areas with a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Simply put, these are **Protected Areas** according to the IUCN. However, this definition extends to areas of high biodiversity value include World Heritage Natural Sites, Biosphere Reserves, Ramsar Wetlands of International Importance, Key Biodiversity Areas, Important Bird Areas, and Alliance for Zero Extinction Sites, among others.

**Restricted-range/ Endemic Species** = Species with world distributions of less than 50,000 km<sup>2</sup>.

**Migratory species** = Any species or lower taxon of wild animals, in which a significant proportion of the members of the entire population or any geographically separate part of the population cyclically and predictably crosses one or more national jurisdictional boundaries.

**No net loss** is defined as the point at which project-related biodiversity losses are balanced by gains resulting from measures taken to avoid and minimize these impacts, to undertake on-site restoration, and finally to offset significant residual impacts, if any, on an appropriate geographic scale.

**Net gains** are additional conservation outcomes that can be achieved for the biodiversity values for which the natural or critical habitat was designated. Net gains may be achieved through full application of the mitigation hierarchy that may include the development of a biodiversity offset.

In areas of **critical habitat**, the Borrower will not implement any project activities that have potential adverse impacts unless all of the following conditions are met:

- (a) No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value;

- (b) All due process required under international obligations or national law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with;
- (c) The potential adverse impacts, or likelihood of such, on the habitat will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated;
- (d) The project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period;
- (e) The project will not involve significant conversion or significant degradation of critical habitats;
- (f) The project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated; and
- (g) A robust and appropriately designed, long-term biodiversity monitoring and evaluation program aimed at assessing the status of the critical habitat is integrated into the Borrower's management program.

Table 11 below shows how the BMP meets the ESS6 criteria, for critical habitat assessment.

*Table 11: How the BMP meets the ESS6 requirements*

<b>S.N</b>	<b>ESS6 requirement</b>	<b>How the requirement is met</b>
a	No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value;	At present, no other viable alternative to the project in habitats of lesser biodiversity value.
b	All due process required under international obligations or national law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with;	All due processes under international obligations and national laws have been adhered to. The BMP adheres to all applicable policies, laws, frameworks. Conventions and standards at the national and international level (including WB ESS6) as discussed in Chapter 2 of the BMP.
c	The potential adverse impacts, or likelihood of such, on the habitat will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated;	The project design has sought to maintain the current alignment to minimise negative impacts to flora and fauna.
d	The project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period	The Critical habitat assessment (section 5.9 of the BMP), and the mitigation measures (section 6.3), BMP action Plan (appendix 1) BMP Monitoring and

		evaluation plan (Appendix 2)but also training (section 7.2 )
e	The project will not involve significant conversion or significant degradation of critical habitats. In circumstances where the project involves new or renewed forestry or agricultural plantations, it will not convert or degrade any critical habitat	The Critical habitat assessment (section 5.9 of the BMP), and the mitigation measures (section 6.3), BMP action Plan (appendix 1) BMP Monitoring and evaluation plan (Appendix 2)but also training (section 7.2 ). Further, since the Critical habitat is also a Protected Area (WMA), there is no anticipated conversion of new or renewed forestry or agricultural plantations
f	The project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated; and	<p>The mitigation hierarchy has been applied according to ESS1 and ESS6 measures. In conclusion, the implementation of the mitigation measures for flora and fauna mentioned above will ensure adherence to ESS6, and particularly the conditions for critical habitat. From this analysis, we conclude that no net loss will occur to CR or EN species as a result of the project activities. The implementation of the mitigation strategy (restoration plan) will achieve a net gain in biodiversity by addressing the underlying baseline threat before the project implementation, such as improved KBA patrols to control poaching (monitoring) and replanting of degraded areas with native tree species (section 6.3.3)</p> <p>Specific measures for road kills and wildlife poaching are</p>

		<p>outlined in:</p> <ul style="list-style-type: none"> <li>• Fauna Mitigation measures, Section 6.3.1</li> <li>• Training in basic wildlife ecology and animal behaviour and also on wildlife laws and policies, including possibilities for prosecution under the Economic Crimes Act apart from the Wildlife Conservation Act (section 7.2)</li> <li>• BMP action plan (Appendix 1) especially on: Road kills, poaching, fauna disturbance, and Human-wildlife conflicts</li> <li>• BMP monitoring and evaluation plan to ensure adherence to the mitigation measures and apply corrective actions for unexpected environmental and social incidents.</li> </ul>
g	A robust and appropriately designed, longterm biodiversity monitoring and evaluation program aimed at assessing the status of the critical habitat is integrated into the Borrower's management program	The BMP Monitoring and Evaluation plan, is attached to the BMP and it aims at assessing and evaluating the status of the critical habitat in all phases of the project.



## 5.9.2 Critical Habitat Triggers

There are five ESS 6 criteria that can be ‘triggers’ if an area of habitat meets any one of them. That area will then be considered critical habitat irrespective of failing to meet any other criterion (Table 12). Therefore, critical habitat can be determined through a single criterion or where a habitat holds biodiversity meeting all five criteria. This approach is generally more cautious but is used more widely in conservation. Critical habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger critical habitat and those that do not. Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative. The assessment for critical habitat was undertaken within the framework defined in the ESS 6 Guidance Note including a comprehensive review of desk-based data, field surveys and stakeholder consultations (Table 13).

The critical habitat triggers assessed in Table 12 refers to the 17 kilometer stretch in which the upgrading of the Iringa Msembe Road will be undertaken. Specifically, this refers to the stretch from km 87+200 at Tungamalenga village/MBOMIPA starting point to km 104+00 at RUNAPA entrance gate (see also Figure 1). MBOMIPA WMA and RUNAPA form a continuous ecosystem with similar fauna and flora characteristics. For this reason, the critical habitat triggers detailed in Table 12 apply to MBOMIPA WMA, and consequently, the WMA and adjoining RUNAPA are critical habitats.

Table 12: Criteria that can trigger Critical Habitat and associated thresholds.

ESS 6 Critical Habitat Criteria	Thresholds
Criterion 1: Critically Endangered (CR) / Endangered (EN) species	(a) Areas that support globally-important concentrations of an IUCN Red-listed EN or CR species (0.5% of the global population AND $\geq 5$ reproductive units of a CR or EN species) <sup>26</sup> ; (b) Areas that support globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a). (c) As appropriate, areas containing nationally/regionally-important Concentrations of an IUCN Red-listed EN or CR species.
Criterion 2: Habitat of significant importance to endemic and/or restricted range species	(a) Areas that regularly hold $\geq 10\%$ of the global population size AND $\geq 10$ reproductive units of a species.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species	a) Areas known to sustain, on a cyclical or otherwise regular basis, $\geq 1$ percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support $\geq 10$ percent of the global population of a species during periods of environmental stress.
Criterion 4: Highly threatened and/or unique	(a) Areas representing $\geq 5\%$ of the global extent of an ecosystem type meeting the criteria for IUCN status of

<sup>26</sup> IUCN A Global Standard for the Identification of Key Biodiversity Areas

ecosystems; and/or	CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.
Criterion 5: Areas associated with key evolutionary processes	No set criteria

Source: Adapted from WB/PLN 2021.

Table 13: Species that Trigger Critical Habitat criteria

Common name	Scientific name	IUCN Listing	CITES Listing (appendix)	Species Information	Critical Habitat Trigger/rationale
African elephant	<i>Loxodonta africana</i>	EN	I/II	Elephants are the largest living land animals, and the only surviving member of the family Elephantidae and the order Proboscidea. MBOMIPA and RUNAPA harbours one of the largest Elephant populations in East African National Parks at 15,836 (+/- 4759SE) (TAWIRI, 2016, RUNAPA, 2018). Tanzania harbours one of Africa's significant populations, second only to Botswana.	The African Elephant is threatened with extinction (endangered) and is listed in CITES appendix I for Tanzania. Ruaha River is also an important ecological function to maintain the viable populations of Elephants and other species within the area. The Ruaha landscape, including MBOMIPA WMA likely harbours $\geq 0.5\%$ of the global <sup>27</sup> population of elephants (3.8% of the global population and $\geq 26\%$ of the national population <sup>28</sup> . <b>Critical Habitat (CH)</b> triggered.
Wild Dog	<i>Lycaon pictus</i>	EN	EN	The African Wild Dog is a wild canine native to sub Saharan Africa. It is one of the world's most endangered mammals. The largest populations remain in southern Africa and the southern part of East Africa (especially Tanzania and northern Mozambique).	According to the IUCN <sup>29</sup> , their population is currently estimated at approximately 6,600 adults in 39 subpopulations, of which only 1,400 are mature individuals. Tanzania, and MBOMIPA and RUNAPA specifically are likely to hold $\geq 0.5\%$ of the global population of wild dogs. <b>CH triggered.</b>

<sup>27</sup> KBA Standards and Appeals Committee (2019). *Guidelines for using a Global Standard for the Identification of Key Biodiversity Areas*. Version 1.0. Prepared by the KBA Standards and Appeals Committee of the IUCN Species Survival Commission and IUCN World Commission on Protected Areas. Gland, Switzerland: IUCN. Viii + 148pp.

<sup>28</sup> Tanzanian population Elephants have a relatively large range currently estimated at 39% of Tanzania's Total Land Area (TAWIRI, 2010). Also, their population in Tanzania has increased from 43,000 in 2014 to 60,000 in 2021 (AWF, 2022).

<sup>29</sup> <https://www.iucnredlist.org/species/12436/16711116#assessment-information>

				RUNAPA and MBOMIPA Protected areas important habitats for wild dogs. Wild dogs form part of the Protected Areas' significance and Exceptional Resources and Values. However, Tanzania wild dogs are threatened with habitat loss, diseases, road kills and human wildlife conflicts.	
Ground Giant Pangolin	<i>Smutsia gigantea</i>	EN		The species is widely but discontinuously distributed throughout West and Central Africa in a broad range of habitats including primary and secondary rainforest formations, swamp forest, forest savannah mosaics and savannah woodlands. In Tanzania, there is an authenticated record from the Mahale Mountains in western Tanzania, where their presence has been confirmed by camera-traps and they may also occur in Gombe National Park (Foley et al. 2014) <sup>30</sup> . It has been recorded in bamboo stands in miombo woodland (	Giant Ground Pangolin <i>Smutsia gigantea</i> has most recently been assessed for <i>The IUCN Red List of Threatened Species</i> in 2019. <i>Smutsia gigantea</i> is listed as Endangered under criteria A2cd+4cd. In terms of population, this species is a solitary, nocturnal and elusive species, which is difficult to census, and as a result, there is no reliable information on population abundance or densities (or occupancy). <b>CH probably not triggered</b>
Bateleur	<i>Terathopius ecaudatus</i>	EN	II	This species is listed as Endangered because it is suspected to have undergone very rapid declines during the past three generations (46	The exact population is probably unknown. Although there have been significant population declines or range contractions suspected in many regions, evidence suggests that it remains

<sup>30</sup> Foley et al. 2014. Field Guide for the Larger Mammals of Tanzania

				years) owing to deliberate and incidental poisoning, pesticides and nest disturbance; threats that are likely to continue this trend into the future.	widespread and common in <b>Tanzania</b> (N. Baker <i>in litt.</i> 2020, C. Kendall <i>in litt.</i> 2020). <b>CH probably NOT triggered.</b>
Lappet-faced Vulture	<i>Torgos tracheliotus</i>	EN		This species is listed as Endangered. Only a small, very rapidly declining population remains, owing primarily to deliberate, poisoning nest predation by humans, reduced food availability and electrocution as well as ecosystem alterations. According to the Birdlife International, data published in 2016 suggests that the population in Africa is declining extremely rapidly, and future population assessments may lead to further up listing	Data from 2005 (Shimelis <i>et al.</i> 2005, indicated that only about 2000 individuals remain <sup>31</sup> . The population is widespread in Northern National Parks, RUNAPA, Selous, Saadani and Moyowosi game reserve. It is absent or rare elsewhere. RUNAPA and MBOMIPA are likely to harbour ≥0.5% of the African Population (est. 5330 in 1992 and declining at a rate of 3.5% per year, equating to 79% decline over three generations) and ≥5 reproductive units. <b>CH triggered.</b>
Martial Eagle	<i>Polemaetus bellicosus</i>	EN	II	This species is listed as Endangered because it is suspected to have undergone very rapid declines during the past three generations (33 years) owing to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines; threats that are likely to continue this trend into the future.	The global population is unknown, but it is still widespread and frequently observed Tanzania (N. Baker <i>in litt.</i> 2020). <b>CR habitat probably NOT triggered</b>

<sup>31</sup> Data probably unknown/unreliable

Pancake Tortoise	<i>Malacochersus tornieri</i>	CR	II	The Pancake Tortoise, <i>Malacochersus tornieri</i> (family Testudinidae), is a small, flat, and soft tortoise of up to about 17.8 cm carapace length, rarely weighing more than 500 g. The flat shape and shell pliability are fundamental adaptations, which have enabled the species to successfully utilize rock crevice microhabitats in East Africa.	<i>Malacochersus tornieri</i> is severely threatened by overexploitation for the international live exotic animal trade, with large numbers of animals recorded in the trade. Observed and estimated population reductions of about 80% have been noted over a combination of the past two generations (30 years) and predicted for the next 15 years (45 years total for three generations), qualifying the species for an assessed conservation status of Critically Endangered (CR A4abcd). Its population is unknown, although it occurs disjunctly from the southern shores of Lake Victoria into the Maasai Steppe and further south in the Somalia-Masai and the Zambesian Floristic Regions (Mwaya et al, 2018). <b>CH probably triggered.</b>
White-backed Vulture	<i>Gyps africanus</i>	CR	II	The white-backed vulture is found in lowland, open wooded savannah, especially areas of Acacia. The most wide spread of all vulture species. Threatened with poisoning, poaching and habitat loss. In Tanzania, the Ruaha-Katavi ecosystem is one of the few remaining strongholds for vultures in Africa.	The species' population has declined extremely rapidly, with a median estimate of 4.1% decline per year. The GRRL is the remaining strongholds for white backed vultures. Although the exact population estimates are unknown, birdlife international predicts a stable population in Tanzania. Nonetheless, poisoning in the project area is not uncommon <sup>32</sup> and this contributes to their rapid population decline, and their uplifting from EN (2012) to CR (2015) in IUCN red list. Latest survey results <sup>33</sup> indicate high abundance of this species in RUNAPA (48.2/100km). More likely to hold ≥0.5

<sup>32</sup> See, for example, <https://www.wcs.org/wildcards/posts/a-poisoning-in-ruaha>

<sup>33</sup> North Carolina Zoo Annual Report for Southern Tanzania Vulture Monitoring and Conservation Programme.



					% of the Global Population and ≥ 5 reproductive units <b>CH triggered.</b>
Hooded Vulture	<i>Necrosyrtes monachus</i>	CR	II	A small, mostly brown vulture with a small, naked, pink head covered with velvety white fluff like feathers. Currently undergoing an extremely rapid population reduction owing to indiscriminate poisoning, trade, persecution, and electrocution. Wide spread in Africa and one of the most abundant vultures	Global Population estimated at 131,000 (Birdlife international). This population is rapidly declining, and it is suspected that overall recent rates of reduction exceed 80% over the current and future three-generation period. Poisoning <sup>34</sup> is of particular concern for this species too. Likely to hold ≥0.5 % of the Global Population and ≥ 5 reproductive units <b>CR triggered.</b>
White Headed Vulture	<i>Trigonoceps occipitalis</i>	CR	II	A medium-sized, mostly dark vulture with an angular, naked, pale pink head and bulky coral-colored beak. The species has extremely large range in Sub-Saharan Africa. It prefers mixed, dry woodland at low altitudes, avoiding semi-arid thorn belt areas.	The already small population is declining at an extremely rapid rate: owing to a variety of threats: poisoning, persecution and ecosystem change. The species has a very small population. Results in RUNAPA shows an abundance of 2.2/100km individuals. Ogada <i>et al.</i> (2016) estimate a median decline of 6.7% per year (range: 2.8-8.8%), equating to a decline of 88% (range: 59-94%) over three generations. <b>CH triggered.</b>

<sup>34</sup> Ibid.

### 5.10 Priority ecosystem services

The fact that, the road traverses through critical habitats and various protected areas, which offers arrays of ecosystem, services to the people and wildlife. Hereunder are the four types of ecosystem services based on the benefits accrued from the ecosystems:

- (i) **Provisioning ecosystem services:** The ecosystems through which the project road will traverse provide important services to both flora and fauna including human beings. These include provisioning of water, food, timber, fodder, wood fuel, and medicinal plants and other non-timber forest products from forested areas, including honey, latex and gums. Trade in ecosystem services such as fish, wildlife meat and crops from agricultural activities help to boost the local and national economies.
- (ii) **Regulating Ecosystem Services:** reflect ecosystem functions that provide value, including flood mitigation, water quality enhancement, carbon sequestration and long-term storage, pest and diseases control. They maintain and improve water quality and counteract the effects on small water bodies, while being important habitats for aquatic and terrestrial flora and fauna. The presence of Protected Areas (PAs) and vegetation act as blanket to cushion run offs especially during rainy seasons. In this way, the PAs helps to control floods, which would otherwise affect locals' settlement areas and their properties. In addition, the diversity of species starting from invertebrates e.g. bees, butterflies to vertebrates e.g. bats and birds do provide pollination services, which are critical in food crops production. Furthermore, the presence of predators within the ecosystem also aid in controlling pests especially mice and rats
- (iii) **Supporting Ecosystem Services:** These include services necessary for producing other ecosystem services such as hydrological circles, soil formation through both chemical and biological weathering processes, nutrient cycling from species such as dung beetles, aardvark and primary production from green plants, photosynthesis, and habitat and biodiversity conservation.
- (iv) **Cultural Ecosystem Services:** These include nonmaterial benefits from the ecosystem services such as spiritual, recreational, aesthetic and educational. Precisely, the presence of small mammals have strong cultural connection with the locals due to their medicinal values. Otter parts such as skin are used on babies to protect against witchcraft (e.g. the Hehe among other cultural groups); the honey badger is eaten in the belief that it will make the consumer tough in fighting. Striped weasels are used to protect a *shamba* (farm) from 'theft' (nyakyusa, safwa, sangu); local doctors and ceremonial dancers use serval cat skin as traditional clothing. As for cultural and medicinal, particular cultural groups, such as the Hadzabe and Hehe, hunt carnivores for food. The palm civet particularly targeted in the Iringa. Also, visiting PAs such as RUNAPA offers educational, aesthetic and recreational values to the visiting schools and tourists.

## 6 Key Biodiversity threats in the project site

### 6.1 Existing biodiversity threats

#### 6.1.1 Deforestation and forest degradation through agricultural expansion

Land clearing, primarily for agricultural activities is the main driver for vegetation clearance. This has been evident, especially within Malinzanga Village where the former village forest reserve has been largely converted to agricultural land and grazing activities (Photo 9). Some parts of these areas remain with a fair vegetation cover. However, the ongoing agricultural expansion will likely degrade and deforest the remaining part (Photo 10). Some communities in this area practice slash-and burn agriculture in which the clear land for agriculture through slashing and burning of vegetation. Cutting and burning of the vegetation usually results in not only the clearing of undergrowth, but also large trees. The nature of this shifting type of agriculture has resulted in a mosaic of forest patches—with the best forests often on the steepest slopes least suitable for cultivation (Photo 10) and a matrix of more or less degraded forest and scrub areas, as well as grasslands

#### 6.1.2 Charcoal production

Charcoal making is another human activity that threaten the biodiversity within the project site through forest degradation and deforestation. This activity is often coupled with firewood collection from the forest reserve for domestic and commercial purposes.



*Photo 9: Ongoing deforestation and degradation for agriculture(R) and livestock grazing (L) within Malinzanga village along the Iringa-Msembe road.*

Source: Field Work, 2023. Photo: W.Kiwango.



*Photo 10: A fair forest cover as seen from Madogoro Junction along the Iringa-Msembe Road. (L) and a rice farm along the road at Mapogoro village*

Source: Field work, 2023. Photo: W.Kiwango

#### 6.1.3 Water shortage

Water shortage, especially during the dry season is one of the biodiversity challenges facing the project's area of influence. This challenge has also been identified by the GMP for MBOMIPA WMA. The seasonal drying of the Ruaha River, which is one of the main sources of water for wildlife within the GRRE not only accentuates the problem, but also trigger the criteria for Critical Habitat according to the ESS6. This is because Ruaha River exhibits ecological functions or characteristics that are needed to maintain the viability of the biodiversity values within the two KBAs. The water points within the WMA are temporary and usually dry up during the dry season. This may necessitate wildlife movements towards human settlements in search of water, thereby increasing the risk of human-wildlife conflicts.

#### 6.1.4 Human-Wildlife Conflicts

The proximity of the WMA to the communities render it a prime area for human wildlife conflicts (HWCs). Large mammals such as Elephants often walk to the villages and inflict costs to the farmers through crop raiding, and sometimes death and injuries. Likewise, carnivores such as Lions, Leopards, Hyaenas, and Wild dogs are responsible for livestock depredation and killing and/or injuring people. Communities usually react through retaliatory killing of the responsible predators<sup>35</sup>, usually resulting in further decimating their populations-particularly Lions and wild dogs, which are vulnerable and endangered under the IUCN red list respectively.

#### 6.1.5 Wildlife poaching

Illegal hunting and killing of wildlife poses another threat to biodiversity in the WMA and other areas such as forest reserves. Unregulated hunting contributes to decreasing population of key species and thus contributes to biodiversity loss. Further, poaching is often associated with bush fires as one of the hunting strategy, further degrading biodiversity.

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<sup>35</sup> For further information on carnivore conflicts in the area, please see Dickman (2009), Dickman et al (2014).

## 6.2 Potential threats and impacts from the project interventions

The implementation of the Iringa-Msembe road project will likely exacerbate the 'baseline' threats to the area. The potential impacts of the Iringa-Msembe road construction project are well documented in the ESIA report (see Chapter 6) in which the valued receptors affected by the planned and unplanned project activities have been identified and the nature and extent of potential negative and positive impacts are described and assessed. This section will focus on the anticipated impact of the project on flora and fauna in the Iringa-Msembe Road in light of the biodiversity information presented in the previous sections. In line with the ESIA, more attention is given to interventions with significant negative impacts because these have the highest potential to cause undesirable effects. In addition, it is to be noted that the project will focus on the upgrading of the existing road, along the current RoW. Maintaining the current road corridor will avoid and minimise potential impacts on flora and fauna, especially in KBAs. Presented below are the anticipated biodiversity impacts and mitigation measures to address these impacts.

### 6.2.1 Wildlife Disturbances from Construction Noise

Activities to be carried out during construction and operation phases of the project will create considerable noise, which may disturb the local wildlife. Many terrestrial wild fauna species including small and medium sized mammals, birds, reptiles and amphibians will particularly be scared by the human presence and relocate away from the source of disturbance. This impact may potentially appear in MBOMIPA WMA area from Tungamalenga up to the Msembe at the main entrance gate, a 17 km stretch that is active in biodiversity conservation and tourism activities

### 6.2.2 Impaired Wildlife Movements

Construction activities will disturb vegetation communities (wildlife habitats) within the proposed project areas. These habitats are not only important for crossing of reptiles and amphibians but also for providing a refuge to mammals. Movements of wildlife in the proposed project areas (outside protected areas) will be impacted from the cumulative effects of habitat loss and fragmentation. The construction of permanent structures may aggravate the adverse effects of habitat loss on the local wildlife as a result of barrier effects resulting from these structures. The populations of the easily adaptive, ecologically flexible animal species such as birds and small mammals will benefit to the disadvantage of more sensitive ones. However, the overall habitat loss is expected to be insignificant, long-term and irreversible and its impacts are not expected to be critical because none of the fauna species recorded is strictly endemic to the project intervention areas. The wildlife including various amphibians and reptiles can still utilise the adjacent vegetation habitats for foraging, breeding, roosting, nesting and as potential dispersal areas.

### 6.2.3 Potential Land Degradation from Borrowes and Quarries

Quarrying involves clearing the vegetation at the sites, excavation and transportation of the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation, landscape impairment (visual intrusion) and soil erosion. The cumulative effects of quarrying and borrow pits may impair wildlife movements, destroy their habitats and even trapping the animals as they move.

#### 6.2.4 Vegetation Clearance and Habitats Loss/Fragmentation

Vegetation which is within existing road's RoW will be cleared during site preparations activities, and construction camps settings as well in order to pave way for road's construction. The implementation of the proposed road project inflicts a permanent irreversible loss of an area proposed for construction of camps and its associated infrastructures which composed mainly of miombo woodland, some grassland patches, bush land and cropland habitats. The most direct impact of site preparation entailing land clearing and levelling on vegetation will be the removal of vegetation and canopy cover and hence destruction, damage and loss of wildlife habitat.

The project area includes all lands subject to direct disturbance from the project and associated infrastructure. Proposed construction would disturb large areas mainly composed of miombo woodland, bush land, thickets and cropland. The immediate impact area in case of the proposed development will be all areas subject to construction; and majority of wildlife particularly birds, reptiles, amphibians and small mammals were reported, observed and recorded utilising the area. The wildlife species will be affected because some part of their microhabitats within the proposed project areas will be damaged. Majority of the impacts will be manifested during construction phase where part of vegetation is sought to be degraded and damaged and hence loss of fauna habitat.

During construction, phase majority of wildlife will be threatened by habitat loss, fragmentation and degradation. Some species in particular herpetiles are sedentary and of low mobility, suggesting that they may have limited capacity to move between patches of habitat isolated by clearing or land-use. At the microhabitat level, structural complexity of vegetation and habitat components at ground level is important to many wildlife species. Species that forage and live in the ground layer, litter or subsoil, are likely to be severely affected as their microhabitats will be degraded by activities such as land clearing and levelling, soil compaction and vehicles movement. Some species including birds, small and medium sized mammals will be able to adapt to the changing environments, others will be restricted to remnant adjacent vegetation patches or else may disappear locally. Species that will have the ability to move through and live within the built matrix are thus more resilient in the constructed structures. Species that will be sensitive to the built environment due to unsuitable habitat, lack of food and barriers for movement will become restricted to the adjacent vegetation of suitable habitat.

#### 6.2.5 Increased Wildlife Injuries and/or Mortalities from Road Accidents

The existing project corridor traverses MBOMIPA WMA area from Tungamalenga up to RUNAPA entrance gate at Msembe, and there are several wildlife corridors that are crossed in this Tungamalenga to Msembe stretch. The WMA acts as a buffer zone surrounding the RUNAPA and allows wildlife animals movement in and out of the National Park. Therefore, due to the uniqueness regarding the ecosystem conservation of the areas the construction and operation activities may cause animal kills from road accidents and ecosystem disturbances from soil grabbing and vegetation clearance. After upgrading of the road, the speeding vehicles may kill or injure wildlife animals within the area. Particular large mammals at risk from road kills include the Greater and Lesser Kudu, Elephants, Giraffes, Zebra and smaller antelopes. Less mobile animals including amphibians, small mammals (hedgehogs) and reptiles will be more susceptible to road kills. Birds such as the Harlequin quail (*Coturnix delegorguei*) are similarly at risk of road kills.



### 6.3 Ongoing Conservation efforts in the project area

The project area consists of two key biodiversity areas as discussed in sections 4.2.1, 4.2.2 and section 5 of this plan. Institution wise, these two areas represents ongoing conservation efforts in the project area. MBOMIPA WMA is responsible for the management of the WMA, especially the day to day operations of the MBOMIPA CBO. Main activities include conducting patrols/anti-poaching activities, and monitoring of flora and fauna. RUNAPA represents another KBA demonstrating conservation efforts in the project area.

#### 6.3.1 REGROW Project

Apart from the conservation efforts discussed in the preceding section, the World Bank is financing the REGROW project currently implemented by RUNAPA among other implementing partners. The main development objective of the project is ***“to improve management of natural resources and tourism assets in priority areas of Southern Tanzania and to increase access to alternative livelihood activities for targeted communities”<sup>36</sup>***. The main project components include:

- a) Strengthen management and improve infrastructure in priority Protected Areas, including RUNAPA. Within RUNAPA the project support infrastructure development such as roads (more than 900 km, airstrips (bitumen standard), bridges and culverts.
- b) Strengthen alternative livelihoods for targeted communities in proximity to the priority Protected Areas
- c) Strengthen landscape management and infrastructure investments in and upstream of the Ruaha National Park
- d) Project management, institutional strengthening, quality assurance and control, and monitoring and evaluation

Under these components, the project expects to REGROW aims to position the Southern Circuit as a popular destination, turning tourism into an engine of economic growth and job creation for the region and the nation. It is expected that the Southern tourism circuit could achieve, in the medium term, the levels of development and success witnessed in the Northern tourism circuit. The project is expected to turn Iringa town into a tourism hub servicing the southern tourist circuit. Since most of Tanzania’s tourism is wildlife based, the project has embarked into strengthening the management and improvement of infrastructures in protected areas as well as the institutions and agencies managing these areas. In line with the World Bank’s corporate goals of ending extreme poverty and promoting shared prosperity in a sustainable way, the REGROW project aims to Strengthen alternative livelihoods for targeted communities in proximity to the priority Protected Areas, including the villages adjacent to RUNAPA and through which the Iringa-Msembe Road traverses.

This BMP for the Iringa-Msembe and its proposed mitigation measures, outlined in the following section, recognizes and complements the ongoing conservation efforts in the areas, including those by the World Bank through the regrow project. The mitigation measures have been designed to add to the existing efforts and also foster collaboration between the managing institutions in the project area.

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<sup>36</sup> The World Bank, 2017. REGROW project appraisal document.

## 6.4 Impact Mitigation Measures

The mitigation measures proposed in this section supplement the ongoing conservation efforts discussed in section 6.3 above. The mitigation hierarchy is key in guiding the identification, implementation and monitoring of specific actions that contribute to the main goal of this BMP, which is to implement a mitigation strategy for the project in such a way as NOT to achieve a net biodiversity loss and ecosystem services or a net gain for the critical habitats and biodiversity features it supports. The mitigation hierarchy is structured around four steps<sup>37</sup>:

- (a) Anticipate and avoid risks and impacts;
- (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
- (c) Once risks and impacts have been minimized reduced, mitigate; and
- (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.

The first two steps are preventive measures, preventing adverse impact and reducing significant impact of the project on biodiversity. Restoration and offset steps are remedial measures, repairing environmental damage and compensating for residual impacts. Further, since the project area in the 17 Killometre stretch has been assessed as a critical habitat, this BMP has sought to ensure that condition (a)-(g) of the ESS for critical habitat are met. In particular, the mitigation measures for flora and fauna have been designed to achieve net gains of those biodiversity values for which the critical habitat was designated (condition f) and that the project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period (condition d).

In the following section, this BMP demonstrates how the mitigation hierarchy is to be applied for both flora and fauna, and rests the responsibilities to TANROADS and the Contractor. Detailed mitigation measures are provided in the BMP Action plan (Appendix 1) and the Biodiversity Monitoring and Evaluation Plan (Appendix 2).

### 6.4.1 Fauna mitigation measures

TANROADS and the Contractor shall take into account the following measures for the better avoidance of further impacts to the areas inside and outside of KBAs:

#### **Avoid/Refrain**

- (i) Avoid habitat fragmentation outside the project footprint, this will help to maintain buffer zones in between areas adjacent the proposed project area and peripheral zones;
- (ii) Do not undertake construction activities at night to avoid disturbance to nocturnal fauna from increased noise and vibration;
- (iii) Undertake pre-clearance checks of trees to support roosting of fauna species;

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<sup>37</sup> ESS 1 para 27.

- (iv) Night working and the use of artificial lighting shall not be permitted to avoid adverse impacts to priority nocturnal fauna;
- (v) Project vehicles shall not be used at night within the project area to avoid adverse impacts to priority nocturnal fauna;
- (vi) Avoid accidental machinery and vehicle collisions with wildlife: Vehicle operation shall be restricted to daylight hours to minimize the risk of vehicle collisions with wild life
- (vii) Avoid spills of hydrocarbon, oil, chemicals and other hazardous materials; and
- (viii) Avoid introduction of invasive species and pests.

**Minimise:**

- (i) Reduced speed limits shall be signposted to minimize the risk of accidental injury and mortality to fauna, including the construction of speed bumps;
- (ii) Design and implement Road Kill Management and Monitoring Plan (RMMP) in all sensitive habitats (identified wildlife corridors crossing the proposed road) which may include reduced speed limits, removal of roadside vegetation to reduce proximity of habitat to road; use of light-coloured pavement in the road surface to improve visibility; installation of wildlife warning signs; regular monitoring and removal of road kill to prevent other scavenger animals being attracted to the road; and installation of virtual fencing;
- (iii) As **mitigation** measures to the environmental sensitive areas (MBOMIPA area, wildlife crossing areas/corridors) – a 17km stretch from Tungamalenga village to Msembe gate – the road will be constructed (within 30m corridor) on low level embankment and use of drift structures, and box culverts in all areas of perennial rivers to allow smooth movement of wildlife to cross from one side of the road to another;
- (iv) Ensure minimum noise emission from construction activities and machinery through implementation of noise control measures presented in ESIA;
- (v) Consider, during detailed construction planning, allowance for buffer distances between construction activities and areas where protected species have been identified (including vehicle movement routes);
- (vi) Minimise preventable noise from equipment through measures such as keeping both stationary and mobile plant and equipment in good working condition (including mufflers, enclosures etc.), and avoiding leaving engines running on standby for extended periods;
- (vii) Select equipment with the lowest noise rating that meets task requirements; and
- (viii) Construction equipment not to exceed acceptable noise level

To enhance the protection and conservation of wildlife species, capacity building and training of Village Game Scouts (VGS) as well as primary and secondary school students will be conducted (**Error! Reference source not found.**) to offset any unforeseen net reduction in flora and fauna. The training and capacity building will be in addition to the ongoing capacity building and training efforts by the Resilient Natural Resources Management for Tourism and Growth (REGROW) project financed by the World Bank and implemented within RUNAPA.

In line with mitigation measures implemented by the REGROW project, within RUNAPA, this project has included in its mitigation, strategy the mitigation measures specific to control road kills and night game drives. This include:

- a) Enforcement of monitoring measures in line with the code of conduct<sup>38</sup> issues by the government and agreed with all contractors. The code of conduct requires, among other things, that “The company commits to full implementing its ‘Contractors Environmental and Social Management Plan’ (C-ESMP) as approved by the client”.
- b) Enforcement of regulations governing road kills as per the Government Notice (GN) No 393 (Wildlife Conservation Cap 283) of 2023, which spells out values (in USD) of various animals to be charged as trophy.

#### 6.4.2 Flora mitigation measures

##### **Avoid/Refrain**

In the Project area, two plant species namely Black wood (*Dalbergia melanoxylon*) and African teak (*Pterocarpus angolensis*) are listed under CITES appendices II & III respectively. The rest of the plants identified (169 plant species) are listed as of Least Concern by the IUCN. None the less, the project:

- (i) Should avoid clearing protected species at all cost, including those listed under CITES appendix II and III, and species of particular ecological importance such as the Baobab trees;
- (ii) The location of camping sites and access road should strictly avoid further loss of any of the protected species by limiting clearance to right of way;
- (iii) Part of the road reserve that will not be required for construction purposes during site preparation stage should be left intact particularly along MBOMIPA WMA, wildlife corridors and towards Msembe;
- (iv) Clearing of vegetation will be done in close collaboration with respective local government authority along the corridor particularly District Natural Resources Officer, Forestry Officer and involvement of RUNAPA and Tanzania Forest Services Agency (TFS) at district/zone level; and
- (v) Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation

##### **Minimise:**

Efforts to reduce the amount of vegetation cleared during all phases of the project, should include the following measures:

- (i) No new access roads should be created where a well-established road is available;
- (ii) Siting for opening of access roads and camp construction should, where possible, target open spaces or areas with less vegetation cover;
- (iii) Movement of exotic tree species through vehicles and other use into the KBAs should be well monitored and discouraged at all costs;

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<sup>38</sup> Ministry of Natural Resources and Tourism 2023. Codes of Conduct and Action Plan For implementing ESHS, CHS and OHS STANDARDS, and Preventing Gender Based Violence On Resilient Natural Resources Management For Tourism And Growth (REGROW).

- (iv) Areas scheduled for vegetation clearance shall be demarcated and activities outside the designated areas (spill over effects ) shall be strictly forbidden;
- (v) Environmentally sensitive areas (e.g. dispersal areas, water points, wetlands, steep slopes, riparian vegetation, breeding and nesting sites) shall be clearly marked and mapped as 'No Go Areas';
- (vi) Herbicide and fire shall not be permitted as a means to clear vegetation to ensure a minimal impact footprint during habitat clearance and to reduce the risk of mortality and injury to wildlife;
- (vii) Vehicle traffic shall be slowed at wildlife crossing point. This reduction in speed limit shall be signposted.

### **Restoration measures**

- (i) Develop re-vegetation plans with the assistance of a local botanist and through consultation with the Department of Forestry and Beekeeping to ensure that re-vegetation proceeds in a manner that is consistent with the management plan for the local vegetation communities to ensure that the species used and their integration, as well as the spacing of trees, are consistent with the local vegetation communities;
- (ii) Re-vegetation should cover both onsite and offsite areas that have been disturbed because of the project activities as soon as the related facilities have been decommissioned;
- (iii) Reclamation should normally be accomplished with native seeds only. These should be representative of the indigenous species present in the adjacent habitat. Possible exceptions should include use of non-native species for a temporary cover crop to out-compete weeds.

#### **6.4.3 Conclusion**

In conclusion, the implementation of the mitigation measures for flora and fauna mentioned above will ensure adherence to ESS6, and particularly the conditions for critical habitat. TANROADS and the Contractors with the help of a biodiversity expert will fully implement these mitigation measures and specific measures outlines in Appendix 1 of this plan, along with appropriate training (Section 7.2) and the effective implementation of the Monitoring and Evaluation plan (section 9. Appendix 2). From this analysis, we conclude that NO net loss will occur to CR or EN species as a result of the project activities. The implementation of the mitigation strategy (restoration plan) will achieve a net gain in biodiversity by addressing the underlying baseline threat before the project implementation, such as improved KBA patrols to control poaching (monitoring) and replanting of degraded areas with native tree species.

## **7 Training and capacity building**

This BMP shall be implemented as part of the implementation of the project ESMP. However, TANROADS do not have biodiversity specialists or ecologists in-house and will rely on external consultants and other specialists to implement key aspects of the BMP and provide further training.

## 7.1 Capacity Building

TANROADS will engage a facilitation team to carry out many of the BMP tasks on their behalf:

- (i) Induction training on the BMP to Contractors and consultants and relevant staff at all levels
- (ii) Consultation and engagement with stakeholders
- (iii) Legal reviews of land classification
- (iv) Assisting TANROADS, or contractors' staff to demarcate KBAs and environmentally sensitive areas prior to construction starting,
- (v) Biodiversity surveys and monitoring of the BMP outcomes
- (vi) Species management
- (vii) Restoration planting guides

Other specialists will be engaged as required to complete other tasks, such as wildlife handling following an incident.

## 7.2 Training

All those responsible for the management and implementation/operation of any aspect of the BMP shall be adequately trained for their role. Evidence of training (e.g. workshops for training, attendance) shall be maintained by TANROADS for auditing and monitoring purposes. Areas that require training have been identified in the BMP action plan. However, the main areas for training include the following (Table 14) below.

Table 14: Training and capacity building needs for the BMP

Responsible	Training scope	Purpose and objectives	Training material	Audience	Schedule/Budget (USD)
Facilitators/Consultants	BMP	Vision, mission, Scope, Goals, objectives, management actions, monitoring and evaluation	Comprehensive training of the BMP, including how to implement	TANROADS, regional Office staff, TANROADS PIT, , Contractors, consultant staff Contractor's workers MBOMIPA and RUNAPA staff,	Q4, 2023/2024, 10,000
Facilitators/Consultants	Environmental Conservation	Basic aspects of environmental conservation	Environmental education and conservation <i>vis</i> environmental assessments, policies and laws, global environmental issues, etc.	Contractors, Contractor's staff, engineering consultants ,regional secretariat	Q1, 2024/2025. 10,000
Facilitators/Consultants	Wildlife	Basic concepts	Wildlife	Contractors,	Q2,



	conservation	of wildlife conservation	behaviour, basic ecology principles	Contractor's staff, engineering consultants, Village Game Scouts (VGS)	2024/2025 10,000
Facilitators/Consultants	BMP Strategy and Action Plan	Management strategies Monitoring and Evaluation	Training of project drivers to identify and report wildlife encountered on roads	Contractors, Contractor's staff and workers VGS, Engineering consultants	Q2 2024/2025 5,000
Facilitators/Consultants	Supervision of the BMP	Monitoring and auditing of the BMP	How to ensure that the actions are completed on time, and in an Integrated way. How to supervise work done by consultants and Contractors.	Contractors, Engineering consultants	Q3 2024, 5000
Facilitators/Consultants	Invasive species	Identification and management of invasive species	the threats, identification, management and control of invasive species	Contractors, engineering consultants, workers	Q4 2024/2025
Facilitators/Consultants/ RUNAPA	Fire Management	Basic concepts of fire management and control/prevention,	Fire ecology, response to fire incidents	Contractors, engineering consultants, workers	Q1 2024/2025 5,000
Facilitators/TANROADS/ MBOMIPA/Village governments	Wildlife Conservation and Protection	Basic concepts of wildlife management and protection	Wildlife management, law enforcement, wildlife laws and policies, community based conservation, criminology	Village Game Scouts, 8 VGS per village for Nyamahana, Nyamihuu, Kidamali, Nzihi, and Mangalali villages, Tungamalenga, Idodi,	Q2 2024/2025, 30,000

				Mapogoro, Malinzanga	
Facilitators/TANROADS/I ringa District Council	Teachers' training	Conduct capacity building for primary and secondary school teachers 16 primary schools and 7 secondary schools in selected wards (	Hand-outs in environment al education, wildlife conservation	Train at least 3 teachers from each school	Q1 2024, 25,000
TANROADS	Capacity building for monitoring and evaluation	To monitor the implementation of the BMP	TANROADS PIT/Biodiversi ty experts	Equipment for field monitoring ( 2 laptops, GPS, Cameras, range finders	15,000
<b>Total costs</b>					<b>115,000</b>

Table 15: Selected Primary and secondary schools for capacity building in the project area

Sn	Ward	Village/Mtaa	Primary school	Secondary school	Total
3	Isakalilo	Isakalilo	01	01	02
		Mtwivila	01	-	01
4	Kalenga	Isakalilo	01	01	02
5	Ulanda	Mangalali	02	-	02
		Ibangamoyo	01	01	02
6	Nzihi	Nzihi	02	-	02
		Nyamihuu	01	-	01
		Kidamali	-	01	01
7	Mlowa	Nyamahana	01	-	01
		Malinzanga	01	01	02
8	Idodi	Idodi	02	01	04
		Mapogoro	01	01	02
		Tungamalenga	02	-	02
Total			16	7	23

## 8 The Biodiversity Management Action Plan

The key roles and responsibilities in the implementation of the BMP during all phases of the project have been identified and outlined in Appendix 1. TANROADS ensures that contractors include in their tender documentations among other requirements, a BMP as part of the ESIA. The table summarises the BMP's action plan, which should be implemented by the responsible parties. It is based on identified threats and impacts for each phase of the project implementation, the management purpose, and proposed management actions. The timeline for implementation is shown in terms of specific phase of the project. Finally, a costs estimate for each year of implementation is indicated.

The implementation of mitigation measures during the construction phase will be the responsibility of the contractor in accordance with contract specifications. The most effective way to achieve this is for the contractor to appoint a qualified biodiversity expert who will specifically coordinate and monitor the implementation of the BMP. TANROADS will supervise the overall construction works including the mitigation measures and reporting during the construction phase. The institutional budget for implementation and monitoring of BMP will include specifically: ***RUNAPA USD 48,000, MBOMIPA USD 44,000 and for Traffic police USD 13,000 during operation phase and TANROADS will be USD 57,000 as part of construction and operation phase for implementation of BMP as detailed in appendix 1 below on management of BMP.***

## 9 Biodiversity Monitoring and Evaluation Plan

The overall objective of biodiversity monitoring and evaluation plan is to qualitatively and quantitatively measure effectiveness of mitigation measures, and develop appropriate responses to non-compliances with Project standards. A framework for monitoring activities and thresholds are provided in this chapter of BMP to be further developed as more information becomes available before the onset of the project activities. Therefore, the monitoring plan aims to:

- (i) Control that all mitigation measures are in place,
- (ii) Measure effectiveness of the mitigation measures, and
- (iii) Provide mechanisms for taking timely action when unexpected environmental and social incidents are encountered,

Mitigation measures for each component of the Monitoring Plan are provided within the scope of the ESMP. To determine whether monitoring outcomes comply with the Project standards, implementation of mitigation measures will be observed and measured, effectiveness of measures will be verified, and results will be recorded and monitored. Monitoring activities will be conducted by independent ESMP consultants/experts, in collaboration with the contractors and report their findings to TANROADS. Finally, monitoring data will be evaluated every three years and the BMP revised/evaluated.

***Specifically, institutional Annual Budget for BMP monitoring and evaluation for RUNAPA will be USD 17,000 from GoT, for MBOMIPA USD 17,000 from (Own sources from tourism activities) for TANROADS will be USD 20,000 from GoT and for Traffic police USD 12,000 from GoT as part of operation costs for monitoring of BMP around MBOMIPA-WMA areas as detailed in Appendix 2 below on monitoring of BMP.***



## APPENDICES

### Appendix 1: Biodiversity Management Action Plan

Valued Ecosystem Component (VEC) <sup>39</sup>	Activity	Impact	Management purposes	Management Actions	Responsible Party	Project Phase	Annual budget(US\$)
Biodiversity	(1) Material Extraction (2) Construction Activities (3) Excavation Activities (4) Transport of materials	Vegetation Clearance	a) Habitat gaps and habitat losses caused by land clearing and cut and fill for access road and inspections roads need to be minimized b) Revegetating and reforesting degraded areas	Prior to construction starting in any area, survey and clearly, mark all potential areas to affect by construction activities. Training workers on Environmental Conservation would be a crucial step in protecting the biodiversity of the PA during project implementation.  Contracted workers should have BMP mitigation measures incorporated in their contracts.	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All Project Phases	<b>The majority of mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</b>  (Specific institutional annual budget for operation phase for RUNAPA will be USD: 7000 and MBOMIPA will be USD: 5000 for <b>undertaking game patrol and enforcement activity</b> )  During operation, TANROADS will allocate additional annual Budget of USD 10,000 for road maintainance and

<sup>39</sup> A Valued Ecosystem Component (VEC) refers to “Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concerns” [Canadian Environmental Assessment Agency (1999)].

				<p>The project must minimize vegetation clearing to avoid unnecessary death of animals particularly species with small home and restricted ranges. Where possible, all standing dead or dying trees should be left undisturbed. The tree may be providing shelter, feeding site, breeding, or roosting site to number of birds</p> <p>Cleared areas will be re-vegetated with indigenous plant species, in consultation with local communities.</p> <p>Replanting of native vegetation should be undertaken during the rainy seasons to ensure high germination rates and revegetation success.</p> <p>Whenever vegetation</p>			<p>Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>
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				<p>is cleared to allow construction activity, topsoil should be removed carefully and well preserved to ensure continued biological activity, including preserving the seedbank;</p> <p>Biological, mechanical, and thermal methods of vegetation control are preferred to chemical methods using pesticides. Chemical control is prohibited in the PA and Biological needs approval from the PA Manager for Ecology programme.</p> <p>Vegetation clearance during operations is kept to a minimal and SOP are adopted.</p> <p>Contractor's landscape plan should be consistent with the BMP.</p> <p>Slope stabilisation and revegetation will be implemented in areas disturbed for project</p>			
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				construction			
	(1) Material Extraction (2) Construction Activities (3) Excavation Activities (4) transport of materials (5) refuelling of vehicles (6) vegetation clearance	Habitat Degradation	a) Habitat gaps and habitat losses caused by material extraction minimized  b) Re-vegetating and reforesting degraded areas	Erosion control measures to minimize in-stream turbidity and deleterious siltation upon the construction of bridges.  Plan restoration of benthic habitat based on area and composition (site specific).  It is recommended that bird counts be <u>undertaken periodically</u> (dry and wet seasons) to establish trends in numbers of IUCN threatened species and overall diversity. This will serve as a good indicator of the quality of environment and well as standards of management practices;  Design road crossings to streams to divert road surface runoff	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All Project Phases	<p>The majority of mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 5,000 and MBOMIPA will be USD: 5000 for <b>undertaking game patrol and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 7,000 for road maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>

				and ditch flow before the road reaches the stream so that the road does not become a point source for sediment influx			
		Disturbance to Fauna	<ul style="list-style-type: none"> <li>To ensure that threatened or protected wildlife can survive and eventually expand population sizes by reducing direct and indirect threats) and increasing available habitat</li> <li>Prevent wildlife disturbance and wildlife deaths</li> <li>Minimise Noise pollution</li> <li>Avoid/minimize Impairment to fauna movements</li> <li>Avoid dangerous encounters between project workers and wildlife</li> </ul>	<p>TANROADS to ensure that project personnel understand the laws and regulations on protected areas in Tanzania.</p> <p>All employees, consultants and contractors are prohibited from the following activities at any time on the site:</p> <p>(a) Hunting terrestrial or aquatic fauna.</p> <p>(b) Collecting native flora for personal or commercial use.</p> <p>(c) Possessing firearms, traps, snares, or other hunting equipment</p> <p>(d) Chasing or disturbing fauna</p> <p>(e) Keeping domestic cats, dogs, chickens, ducks, other domestic</p>	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All project phases	<p>The majority of mitigation measure costs are part of the costs to be covered by the contractor (BOQ) during mobilization and Construction phase;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 5,000 and MBOMIPA will be USD: 7000 for <b>undertaking game patrol and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 7,000 for road maintenance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>

			<p>(e.g., venomous snakes)</p>	<p>pets or otherwise Feeding of wild animals. (f)Noise and vibration abatement in proximity to key avifauna habitats and other sensitive faunal communities (g)Vehicles to be equipped with mufflers recommended by the vehicle manufacturer; (h)Unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible; (k)Noise levels will be monitored during the construction phase of the project. When the pre- determined acceptable noise levels are exceeded by the machinery in use, the contractor(s) will postpone the construction activity until the situation is remedied.</p> <p>Awareness programme needs to be implemented to highlight the importance of wildlife and general</p>			
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				<p>biodiversity to contractors (and even tourists during operation) in the project area.</p> <p>Animals such as sluggish snakes and amphibians found at sites designated for construction of infrastructures during implementation of the project should be translocated to nearby sites instead of being harmed.</p> <p>For the 17Km of road stretch from Tungamalenga to Msembe gate, construct the road (within 30m corridor) on low level embankment and use of drift structures, and box culverts in all areas of perennial rivers to allow smooth movement of wildlife to cross from one side of the road to another.</p>			
		Wildlife	<ul style="list-style-type: none"> <li>To avoid/minimise</li> </ul>	In addition to the aforementioned	CONTRACTOR/TANROADS/BIODIVERSITY	All project	The majority of mitigation measure costs

		Road Kills	<p>road kills for threatened, endangered critically endangered or restricted range fauna species</p> <ul style="list-style-type: none"> <li>• To avoid/minimise threats of road kills for all wildlife species</li> <li>• Avoid/minimize Impairment to fauna movements</li> <li>•</li> </ul>	<p>mitigation measures on disturbance to fauna, the following is proposed specifically to avoid/minimise road kills:</p> <ul style="list-style-type: none"> <li>• MBOMIPA management, including Village Game Scouts must monitor trucks that are entering the WMA for construction purposes</li> <li>• Night driving should be highly restricted to alleviate incidences of road kills. This should go hand in hand with enforcing required speed limits during both night and day driving. Night game driving should NOT be allowed along the 17 Km (MBOMIPA area);</li> <li>• Awareness raising campaigns to explain to drivers about the biodiversity management</li> </ul>	EXPERT (BS)/RUNAPA/MBO MIPA\Traffic Police	phases	<p>are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 5,000 and MBOMIPA will be USD: 5000 and Traffic Police USD 3000 for <b>undertaking game patrol and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 50,000 for road maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>
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				<p>objectives that seek to avoid wildlife collisions and disturbance, including for example:</p> <ul style="list-style-type: none"> <li>-Explanations of the kind of animals likely to be encountered on roads (snakes, nocturnal Wildlife etc.), and the appropriate action to be taken to avoid road kills.</li> <li>-The importance of adhering to local vehicle speed limits, and the consequences of not doing so (e.g. heavy penalties).</li> <li>-The need to report when animals have been hit, and clarity about where these reports are kept and who they need to be reported to.</li> <li>-Appropriate road signage must be implemented, in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals)</li> <li>Speed control</li> </ul>			
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				<p>measures including the construction of speed humps in areas where of frequent wildlife crossing (e.g. Tandala campsite and other identified areas), installation of speed monitoring cameras within the 17 KM stretch, and appropriate road signage to indicate animal crossings, sharp corners, speed limits etc.</p> <p>Appropriate training must be conducted regarding SOP for anyone driving vehicles within the WMA.</p> <p>Enforce GN 393 (Wildlife Conservation Cap 283) on incidences of road kills.</p> <p>A big signboard should be erected at the start of the 17km outlining the rules and regulations for driving within MBOMIPA WMA.</p> <p>Purchasing of speed cameras to be used by</p>			
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				traffic police and game scouts under MBOMIPA.			
		Human-wildlife conflicts	<ul style="list-style-type: none"> <li>To reduce human-wildlife conflicts with local communities.</li> <li>Avoid further negative impacts by local communities on wildlife, their habitats, and their food</li> </ul> Resources (e.g. retaliatory killings)	<p>Implement wildlife encounter protocols and train project workers about what to do when potentially dangerous wildlife is encountered, including a prohibition on handling (or killing) snakes, catching animals deemed to be a threat, or taking any action potentially harmful to wildlife.</p> <p>Set up a rapid response wildlife management unit that has the ability to react quickly to human-wildlife conflict.</p> <p>Awareness raising among communities on animal behaviour.</p>	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All project phases	<p>The majority of mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 7,000 and MBOMIPA will be USD: 5,000 and Traffic Police USD 5000 for <b>undertaking game patrol and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 5,000 for road maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>
	Increased	a)	Minimize the	•Create guard posts on	CONTRACTOR/TANR	All project	The majority of

		Poaching	<p>increased potential for forest encroachment and wildlife poaching by people who could use the upgraded road to access the protected areas.</p> <p>b) Avoid forest encroachment</p> <p>c) Minimize the intensity of poaching and Tree cutting by the people, due to improved access to the area through the access and inspection roads</p>	<p>access and inspection roads near residential area such as the Tungamalenga village</p> <ul style="list-style-type: none"> <li>•Install and maintain signs banning the use of roads by unauthorized people</li> <li>•Install and maintain signs banning hunting, snaring, and other activities that could harm protected wildlife,</li> <li>•Enforce the code of conduct between contractors and the government (TANROADS) on the dos and don'ts within protected areas</li> <li>•MBOMIPA and RUNAPA should collaborate to enforce the Wildlife Conservation Act (cap 283)</li> <li>•Strict enforcement of the monitoring and evaluation protocol.</li> </ul>	OADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	phases	<p>mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 10,000 and MBOMIPA will be USD: 10,000 and Traffic Police USD 5000 for <b>undertaking game patrol and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 7,000 for road maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>
		Invasive Species	<p>– To avoid/minimise the introduction of invasive species in the project areas</p>	Stringent worker environmental awareness and invasive species avoidance training.	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All project phases	The majority of mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;

			<ul style="list-style-type: none"> <li>– To avoid/minimise the spread of invasive species</li> <li>– To raise awareness of all project workers, contractor and consultant on the control and management of invasive species</li> </ul>	<p>An invasive species monitoring, and management plan will be developed to allow early identification of threats and have treatment plans in place.</p> <p>Implement programs to eliminate non-native and invasive species.</p> <p>Implementation of an overarching biodiversity monitoring program along sensitive areas adjacent to the road route, to verify effectiveness of applied mitigations at both construction/operation level.</p> <p>Monitor and implement control measures for any threatening alien species.</p> <p>In areas where invasive</p>			<p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 5,000 and MBOMIPA will be USD: 3000 for <b>undertaking ecosystem management and enforcement activity</b>)</p> <p>During operation, TANROADS will allocate additional annual Budget of USD 4,000 for maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.</p>
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				<p>plants are removed, replanting will be performed with native species.</p> <p>Project maintenance activities shall incorporate landscaping practices that include both the restoration and/or development of substitute habitat and the control of invasive plant species</p>			
		Fire Outbreak	To prevent any project workers and locals from using fires in a way that could impact the protected areas	<ul style="list-style-type: none"> <li>Project workers are prohibited from making fires for cooking, burning trash, or campfire except within the base camp or other locations specified by the Contractors' Environmental Manager</li> <li>Fire risk factors within the vicinity of the site need to be identified and monitored, e.g.</li> <li>Proximity to active</li> </ul>	CONTRACTOR/TANROADS/BIODIVERSITY EXPERT (BS)/RUNAPA/MBOMIPA	All project phases	<p>The majority of mitigation measure costs are part of the costs to be covered by the Contractor (BOQ) during mobilization and Construction phases;</p> <p>(Specific institutional annual budget for operation phase for RUNAPA will be USD: 4,000 and MBOMIPA will be USD: 4000 for <b>undertaking ecosystem management and enforcement activity</b>)</p> <p>During operation,</p>



				slash-and-burn clearing for cultivation by local communities. <ul style="list-style-type: none"> <li>• Fire breaks shall be established around areas of potential high fire risk, e.g. the camp and offices.</li> <li>• Education and awareness raising of local communities with regard to fire management and prevention,</li> <li>• SOP is adopted for Fire Management Plans</li> </ul>			TANROADS will allocate additional annual Budget of USD 7,000 for maintainance and Management of ecosystem and safety measures within 45 RoW within MBOMIPA area.
	<b>PLEASE NOTE:</b> Specifically Annual Budget for RUNAPA will be USD 48,000 for MBOMIPA will be USD 44,000 and for Traffic police will be USD 13,000 during operation phase and TANROADS will be USD 57,000 as part of construction and operation phase for implementation of BMP.						
SUB-TOTAL-1	Biodiversity Management Action Plan (Appendix 1)						USD-162,000
SUB-TOTAL-2	Biodiversity Monitoring and Evaluation Plan, (Appendix 2)						USD- 66,000
SUB-TOTAL-3	Training and capacity building (Table 13)						USD- 115,000
TOTAL 1+2+3	Grand-total for BMP Management+BMP Monitoring+ BMP training and capacity building						<b>USD- 343,066</b>

## Appendix 2: Biodiversity Monitoring and Evaluation Plan

S. N	VEC	Activity	Description	Measurement Method/ Unit	Location	Frequency	Target level/Standard	Responsibility	Cost (USD)
	Biodiversity (Fauna)	Fauna disturbance during construction, habitat degradation injuries and, road kills, Impaired wildlife movements	Conduct adequate surveys to monitor the distribution, density/abundance, diversity and migratory status of Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) fauna species in the 2 KBAs and the rest of the road corridor	Critical habitat survey report, Field Verification Monitoring Reports Census (counting/sampling) for Species of conservation concern (EN, CR,	MBOMIPA WMA, RUNAPA, the rest of the road corridor	Weekly during Construction and quarterly thereafter Quarterly, as per training schedule	-Timely reporting of critical habitat survey reports to avoid any further declines in population or habitat -Recording of fauna populations and movements 100% compliance	RUNAPA, MBOMIPA, TANROADS /Contractor /Biodiversity Expert/consultant	Part of Contractor's Costs (BOQ) during mobilization and construction phases, Additional Budget for operation phase from (TANROADS). USD 3,000, Institutional annual budgets for operation (RUNAPA: USD 3,000, MBOMIPA, USD

S. N	VEC	Activity	Description	Measure ment Method/ Unit	Location	Frequen cy	Target level/Stand ard	Responsibil ity	Cost (USD)
			<p>areas where protected species have been identified (including vehicle movement routes)</p> <p>construction equipment not to exceed acceptable noise levels</p> <p>implementation of noise control measures presented in the ESMP</p> <p>Train project staff/ contractors/engineering on environmental conservation as per training schedule presented this BMP</p> <p>Ensure staff contracts incorporate BMP mitigation measures (dos and don'ts ) as per of the contract</p>	VU) camera traps, photolog			with training needs		3,000.
	Biodiver sity (Flora)	Vegetation clearance and habitats fragmentat ion	<p>limiting vegetation clearance within footprint area only required for construction, maintaining buffer zones and minimum disturbances on vegetated areas outside the project footprints/RoW</p> <p>controlled and monitor</p>	Field Verificati on Monitoring Reports, areas of vegetatio n cleared	All construct ion sites	Daily during construc tion Quarterly training accordin g to	Minim clearing of vegetation and disturbance of wildlife habitats 100% compliance	RUNAPA, MBOMIPA, TANROADS /Contractor /Biodiversit y Expert/con sultant	Part of Contractor's Costs (BOQ) during mobilization and construction phases, Additional Budget for

S. N	VEC	Activity	Description	Measure ment Method/ Unit	Location	Frequen cy	Target level/Stand ard	Responsibil ity	Cost (USD)
			vegetation clearance vegetation restoration, gardening Survey and clearly mark all potential areas to impacted by construction activities Train project workers in fire management and control	/replanted Photolog Training reports		training schedule	in training schedule (fire control and management)		operation phase from (TANROADS). USD 3,000, Institutional annual budgets for operation (RUNAPA: USD 2,000, MBOMIPA USD 2,000.
	Biodiversity (Invasive Species)	Proliferation of Invasive Species	Inspection for weed and invasive plant species outbreaks after the wet season and opportunistically after rain events, and determine the extent of localized outbreaks of exotics in and around the lease. Inspecting for weeds and invasive plant species after significant germination events and recording the level of proliferation. Train project staff on	Field Verification Monitoring Reports Photolog Training report on Invasive plant control	All construction sites	Seasonal	Timely Reporting of Biodiversity Surveys and Information and adequately trained staff in invasive species control to avoid further proliferations 100% compliance with training	TANROADS /Contractor /Biodiversity expert/consultant/MBOMIPA/RUNAPA	Part of Contractor's Costs (BOQ) during mobilization and construction phases, Additional Budget for operation phase from (TANROADS). USD 3,000, Institutional annual budgets for operation (RUNAPA: USD

S. N	VEC	Activity	Description	Measure ment Method/ Unit	Location	Frequen cy	Target level/Stand ard	Responsibil ity	Cost (USD)
			invasive plants control				requirement s		2,000, MBOMIPA USD 2,000.
	Biodiver sity (Aquatic ecosystems/wetlands )	Contamina tion of Soil, groundwat er and surface water contamina tion	<p>Conduct measurements to check if there are any changes to the water quality due to the project activities</p> <p>Conduct measurements to check if there is any impact on water flow due to project interventions</p> <p>Conduct measurements to check if there is any impact on groundwater quality due to project interventions</p> <p>To ensure that project interventions are not affecting the general groundwater level and topographical state of the area, groundwater level measurements are to be conducted</p> <p>Conduct habitat assessment to determine the impact of the project on wetland flora and fauna</p>	Measure ment results benchma rked against IFC/WHO /TZS water quality standards and paramete rs. Water flow and ground water levels results benchma rked against baseline paramete rs Field assessme	All water bodies within the construct ion site	Once before construc tion and quarterl y thereaft er Once per month during dry season and twice per month during wet season (Water quality) Twice a year (once in dry	Zero pollution from spillage and leaks	TANROADS /Contractor /hydrologis t /consultant /MBOMIPA /RUNAPA	Part of Contractor's Costs (BOQ) during mobilization and construction phases, Additional Budget for operation phase from (TANROADS).USD 3,000, Institutional annual budgets for operation (RUNAPA: USD 2,000, MBOMIPA USD 2,000

S. N	VEC	Activity	Description	Measurement Method/ Unit	Location	Frequency	Target level/Standard	Responsibility	Cost (USD)
				nt reports, Field verification photolog		season and once in wet season (water flow)			
	Biodiversity (Land degradation)	Foot print rehabilitation: Rehabilitation of degraded lands and habitats due to construction activities	Excavated soil will be re-used for backfilling e.g. trenches	Excavated soil	All construction sites and campsites.	Quarterly	Zero reported non-compliance per month and after completion of civil works 100% compliance with the BPQOCMP	TANROADS /Contractor /Biodiversity Expert/consultant/MBOMIPA/RUNAPA	Part of Contractor's Costs (BOQ) Additional Budget (TANROADS) USD 2,000 Institutional annual budgets (RUNAPA 2000, MBOMIPA: USD 2000)
			earth materials to be sourced from existing licensed borrow pits	Borrow pits	Existing borrow pits				
			restoration of the vegetation cover	Area of vegetation replanted	All sites				
			backfilling of the borrow-pits after completion of civil works & implement Borrow Pit and Quarry Site Operation and Closure Management Plan (BPQSOCMP)	Borrow pits	Borrow pits				
	Wildlife Road Kills	To avoid/minimize road	Undertaking regular site visit patrol along the roads section (MBOMIPA) to	Road section within	Road section within	Weekly	ZERO accident reporting	TANROADS /Contractor /Biodiversity	Part of Contractor's Costs (BOQ)

S. N	VEC	Activity	Description	Measurement Method/ Unit	Location	Frequency	Target level/Standard	Responsibility	Cost (USD)
	(ECoSYS TERM Management)	kills for threatened, endangered critically endangered or restricted range fauna species To avoid/minimize threats of road kills for all wildlife species.  Avoid/minimize Impairment to fauna movements	control vehicles speeding.  Close follow up on the installed speed cameras on the road section along MBOMIPA to monitor the movement of vehicles.	MBOMIPA	MBOMIPA			y Expert/consultant/MBOMIPA/RUNAPA\Traffic Police	Additional Budget (TANROADS) USD 2,000.  Institutional annual budgets (RUNAPA USD 2000, MBOMIPA:USD 2000), traffic Police USD.4000
	Increase Wildlife Poaching (Ecosystem management)	Minimize the increased potential for forest encroachment and wildlife poaching by people who could use	Undertaking regular site visit patrol along the roads section (MBOMIPA) to control people's movements entering the WMA areas.  Undertake patrol and regular checking of vehicles and visitors entering the WMA areas.	Regular patrol within Road section under MBOMIPA	Road section within MBOMIPA	Weekly	ZERO incidents of wildlife poaching	TANROADS /Contractor /Biodiversity Expert/consultant/MBOMIPA/RUNAPA\Traffic Police	Part of Contractor's Costs (BOQ) Additional Budget (TANROADS) USD 2,000.  Institutional annual budgets



S. N	VEC	Activity	Description	Measure ment Method/ Unit	Location	Frequen cy	Target level/Stand ard	Responsibil ity	Cost (USD)
		the upgraded road to access the protected areas.  Avoid forest encroachme nt Minimize the intensity of poaching and Tree cutting by the people, due to improved access to the area through the access and inspection roads	Close follow up on the installed speed cameras on the road section along MBOMIPA to monitor the movement of vehicles and visitors.  Installation of warning signs at the entrance gate with messages on prohibiting porching activities withing WMA and responsible fines and penalts						(RUNAPA USD 2000, MBOMIPA: USD 2000), traffic Police USd. 4000
	Human-wildlife	To reduce human-	Implement wildlife encounter protocols and	Regular	MBOMIPA -WMA	Weekly	ZERO reporting of	TANROADS /Contractor	Part of Contractor's

S. N	VEC	Activity	Description	Measure ment Method/ Unit	Location	Frequen cy	Target level/Stand ard	Responsibil ity	Cost (USD)
	conflicts	wildlife conflicts with local communities. Avoid further negative impacts by local communities on wildlife, their habitats, and their food Resources (e.g. retaliatory killings)	train project workers about what to do when potentially dangerous wildlife is encountered, including a prohibition on handling (or killing) snakes, catching animals deemed to be a threat, or taking any action potentially harmful to wildlife.  Set up a rapid response wildlife management unit that has the ability to react quickly to human-wildlife conflict. Awareness raising among communities on animal behaviour.	patrol within Road section under MBOMIPA			wildlife-Human conflicts withing MBOMIPA	/Biodiversity Expert/consultant/MBOMIPA/RUNAPA\Traffic Police	Costs (BOQ) Additional Budget (TANROADS) USD 2,000.  Institutional annual budgets (RUNAPA USD 2000, MBOMIPA: USD 2000), traffic Police USD.4000
	<b>PLEASE NOTE:</b> Specifically institutional Annual direct Budget for BMP monitoring and evaluation for RUNAPA will be USD 17,000, for MBOMIPA will be USD 17,000 for TANROADS will be USD 20,000 and for Traffic police will be USD 12,000 as part of operation costs for monitoring of BMP around MBOMIPA-WMA areas.								
	Therefore, annual direct Grand total for BMP Monitoring and evaluation plan will be for operation phase.								USD 66,000

Appendix 3: List of mammal species surveyed for the Iringa-Msembe road project

Taxonomic group	Family name	Common name	Scientific name	IUCN Status	CITES	Evidence/ Method
<b>Afrotheria</b>	Elephantidae	African elephant	<i>Loxodonta africana</i>	EN	I/II	Direct Observation/signs
	Macroscelididae	Four-toed Sengi	<i>Petrodromus tetradactylus</i>	LC		Literature/interviews
	Soricidae	Hildegard's shrew	<i>Crocidura hildegardae</i>	LC		Literature
	Soricidae	Lesser red musk shrew	<i>Crocidura hirta</i>	LC		Literature
	Soricidae	Moonshine shrew	<i>Crocidura luna</i>	LC		Literature
	Procaviidae	Rock hyrax	<i>Procavia capensis</i>	LC		Literature/interviews
	Procaviidae	Tree hyrax	<i>Dendrohyrax arboreus</i>	LC		Literature/interviews
<b>Carnivores</b>	Hyaenidae	Aardwolf	<i>Proteles cristata</i>	LC		Literature/interviews
	Felidae	African civet	<i>Civettictis civetta</i>	LC		Literature/interviews
	Felidae	African Wildcat (Afro-Asiatic Wildcat)	<i>Felis lybica</i>	LC		Literature/interviews
	Herpestidae	Banded Mongoose	<i>Mungos mungo</i>	LC		Literature/interviews
	Canidae	Bat Eared Fox	<i>Otocyon megalotis</i>	LC		Literature/interviews
	Canidae	Black backed Jackal	<i>Canis mesomelas</i>	LC		Literature/interviews
	Mustelidae	Cape Clawless Otter	<i>Aonyx capensis</i>	NT		Literature/interviews
	Felidae	Caracal	<i>Caracal caraca</i>	LC	II	Literature/interviews
	Felidae	Cheetah	<i>Acinonyx jubatus</i>	VU	I	Literature/interviews
	Herpestidae	Dwarf mongoose	<i>Helogale parvula</i>	LC		Literature/interviews
	Herpestidae	Egyptian mongoose	<i>Herpestes ichneumon</i>	LC		Literature/interviews
	Mustelidae	Honey badger	<i>Mellivora capensis</i>	LC		Literature/interviews
	Felidae	Leopard	<i>Panthera pardus</i>	VU	I	Literature/interviews
	Felidae	Lion	<i>Panthera leo</i>	VU	II	Literature/interviews
	Herpestidae	Marsh mongoose	<i>Atilax paludinosus</i>	LC		Literature/interviews

	Felidae	Serval	<i>Leptailurus serval</i>	LC		Literature/interviews
	Herpestidae	Slender mongoose	<i>Herpestes sanguineus</i>	LC		Literature/interviews
	Hyaenidae	Spotted hyaena	<i>Crocuta crocuta</i>	LC		Literature/interviews
	Hyaenidae	Striped Hyena	<i>Hyaena hyaena</i>	NT		Literature/interviews
	Herpestidae	White-Tailed mongoose	<i>Ichneumia albicauda</i>	LC		Literature/interviews
	Mustelidae	Zorilla	<i>Ictonyx striatus</i>	LC		Literature/interviews
	Canidae	Wild dog	<i>Lycaon pictus</i>	EN		Literature/interviews
<b>Chiroptera</b>	Rhinolophidae	Hildebrandt's horseshoe Bat	<i>Rhinolophus hildebrandtii</i>	LC		Literature/interviews
	Vespertilionidae	Long-fingered Bat	<i>Myotis capaccinii</i>	VU		Literature/interviews
	Nycteridae	Slit faced Bat	<i>Nycteris major</i>	DD		Literature/interviews
	Hipposideridae	Stripped leaf Nosed Bat	<i>Macronycteris vittatus</i>	NT		Literature/interviews
	Vespertilionidae	Tanzanian Woolly Bat	<i>Kerivoula africana</i>	EN		Literature/interviews
	Vespertilionidae	Variiegated butterflies Bat	<i>Glauconycteris variegata</i>	LC		Literature/interviews
	Pterododidae	Wahlberg's Epauletted fruit Bat	<i>Epomophorus wahlbergi</i>	LC		Literature/interviews
	Vespertilionidae	Welwitsch's bat	<i>Myotis welwitschii</i>	LC		Literature/interviews
<b>Insectivorous</b>	Orycteropodidae	Aardvark	<i>Orycteropus afer</i>	LC		Literature/interviews
	Erinaceinae	African pygmy hedgehog	<i>Atelerix albiventris</i>	LC		Literature/interviews
<b>Pholidota</b>	Manidae	Cape pangolin	<i>Smutsia temminckii</i>	VU	I	Literature/interviews
	Manidae	Ground Giant Pangolin	<i>Smutsia gigantea</i>	EN		Literature/interviews
<b>Primates</b>	Cercopithecidae	Blue monkey	<i>Cercopithecus mitis</i>	LC		Direct observation
	Galagidae	Thick-tailed Greater Galago	<i>Otolemur crassicaudatus</i>	LC		Literature/interviews
	Cercopithecidae	Guereza Colobus	<i>Colobus guereza</i>	LC		Literature/interviews

	Galagidae	Northern Lesser Galago	<i>Galago senegalensis</i>	LC		Literature/interviews
	Galagidae	Southern galago	<i>Galago moholi</i>	LC		Literature/interviews
	Cercopithecidae	Vervet monkey	<i>Chlorocebus pygerythrus</i>	LC		Direct observation
	Cercopithecidae	Yellow baboon	<i>Papio cynocephalus</i>	LC		Literature/interviews
<b>Rodents</b>	Gliridae	African Dormouse (Kellen's Dormouse)	<i>Graphiurus kelleni</i>	LC		Literature/interviews
	Muridae	African grass rat	<i>Arvicanthis niloticus</i>	LC		Literature/interviews
	Muridae	African marsh rat	<i>Dasymys incomtus</i>	LC		Literature/interviews
	Muridae	African mole rat	<i>Cryptomys hottentotus</i>	LC		Literature/interviews
	Muridae	African woodland thicket rat	<i>Grammomys surdaster</i>	DD		Literature/interviews
	Nesomyidae	Brant's climbing mouse	<i>Dendromus mesomelas</i>	LC		Literature/interviews
	Thryonomyidae	Cane rat	<i>Thryonomys swinderianus</i>	LC		Literature/interviews
	Leporidae	Cape Hare	<i>Lepus capensis</i>	LC		Literature/interviews
	Macroscelididae	Checkered elephant shrew	<i>Rhynchocyon cirnei</i>	LC		Literature/interviews
	Muridae	Creek groove-toothed swamp rat	<i>Pelomys fallax</i>	LC		Literature/interviews
	Muridae	East African Praomys	<i>Praomys delectorum</i>	LC		Literature/interviews
	Muridae	East African Savannah Pouched Rat	<i>Cricetomys ansorgei</i>	LC		Literature/interviews
	Muridae	Fringe-tailed Gerbil	<i>Gerbilliscus robustus</i>	LC		Literature/interviews
	Muridae	Giant pouched rat	<i>Cricetomys gambianus</i>	LC		Literature/interviews
	Muridae	Gray-bellied pygmy mouse	<i>Mus triton</i>	LC		Literature/interviews
	Muridae	Least groove-toothed swamp rat	<i>Pelomys minor</i>	LC		Literature/interviews
	Muridae	Long-tailed Pouched Rat	<i>Beamys hindei</i>	LC		Literature/interviews
	Muridae	Mesic Four-striped grass rat	<i>Rhabdomys dilectus</i>	LC		Literature/interviews
	Muridae	Natal multimammate rat	<i>Mastomys natalensis</i>	LC		Literature/interviews
	Muridae	Neumann's Arvicanthis	<i>Arvicanthis neumanni</i>	LC		Literature/interviews

	Muridae	Red rock rat	<i>Aethomys chrysophilus</i>	LC		Literature/interviews
	Muridae	Savanna gerbil	<i>Gerbilliscus validus</i>	LC		Literature/interviews
	Muridae	Single striped grass mouse	<i>Lemniscomys rosalia</i>	LC		Literature/interviews
	Muridae	Small eared Dormouse	<i>Graphiurus microtis</i>	LC		Literature/interviews
	Muridae	South African pouched mouse	<i>Saccostomus campestris</i>	LC		Literature/interviews
	Muridae	Spiny mouse	<i>Acomys spinosissimus</i>	LC		Literature/interviews
	Pedetidae	Spring Hare	<i>Pedetes capensis</i>	LC		Literature/interviews
	Muridae	Tiny fat mouse	<i>Steatomys parvus</i>	LC		Literature/interviews
	Muridae	Vlei rat	<i>Otomys sp</i>	VU/LC/NT		Literature/interviews
	Muridae	Woodland thicket rat	<i>Grammomys dolichurus</i>	LC		Literature/interviews
<b>Ungulates</b>	Bovidae	Bohor reedbuck	<i>Redunca redunca</i>	LC		Literature/interviews/signs
	Bovidae	Buffalo	<i>Syncerus caffer</i>	NT		Literature/interviews
	Bovidae	Bushbuck	<i>Tragelaphus scriptus</i>	LC		Literature/interviews
	Suidae	Bushpig	<i>Potamochoerus larvatus</i>	LC		Literature/interviews
	Bovidae	Common Duiker	<i>Sylvicapra grimmia</i>	LC		Literature/interviews
	Bovidae	Common waterbuck	<i>Kobus ellipsiprymnus</i>	LC		Literature/interviews
	Bovidae	Defassa waterbuck	<i>Kobus ellipsiprymnus ssp. defassa</i>	NT		Literature/interviews
	Bovidae	Eland	<i>Tragelaphus oryx</i>	LC		Literature/interviews
	Bovidae	Giraffe	<i>Giraffa camelopardalis</i>	VU	II	Direct observation
	Bovidae	Gerenuk	<i>Litocranius walleri</i>	NT		Literature/interviews
	Bovidae	Grant's gazelle	<i>Nanger granti</i>	LC		Literature/interviews
	Bovidae	Greater kudu	<i>Tragelaphus strepsiceros</i>	LC		Direct observation
	Hippopotamidae	Hippopotamus	<i>Hippopotamus amphibius</i>	VU		Literature/interviews/signs
	Bovidae	Impala	<i>Aepyceros melampus</i>	LC		Literature/interviews/signs
	Bovidae	Kirk's dik dik	<i>Madoqua kirkii</i>	LC		Literature/interviews/signs

	Bovidae	Klipspringer	<i>Oreotragus oreotragus</i>	LC		Literature/interviews
	Bovidae	Lesser kudu	<i>Tragelaphus imberbis</i>	NT		Literature/interviews
	Bovidae	Lichtenstein's hartebeest	<i>Alcelaphus buselaphus ssp. lichtensteinii</i>	LC		Literature/interviews
	Bovidae	Natal Red duiker	<i>Cephalocephus natalensis</i>	LC		Literature/interviews
	Bovidae	Oribi	<i>Ourebia ourebi</i>	LC		Literature
	Equidae	Plains zebra	<i>Equus burchelli</i>	NT		Literature/interviews
	Bovidae	Roan antelope	<i>Hippotragus equinus</i>	LC		Literature/interviews
	Bovidae	Sable antelope	<i>Hippotragus niger</i>	LC		Literature/interviews
	Bovidae	Steenbok	<i>Raphicerus campestris</i>	LC		Literature/interviews
	Bovidae	Suni	<i>Neotragus moschatus</i>	LC		Literature/interviews
	Bovidae	Topi	<i>Damaliscus lunatus</i>	VU		Literature/interviews
	Suidae	Warthog	<i>Phacochoerus africanus</i>	LC		Direct observation/signs

Sources: Ruaha Mammals Checklist, ESIA (Iringa-Msembe Road), MBOMIPA GMP 2023, Focus Group Discussions, Key Informant Interviews, SPANEST (2016), IUCN Red List, CITES

#### Appendix 4: List of Birds surveyed in the Iringa-Msembe road project

S/N	Family name	Common name	Scientific name	Conservation status	CITES	Resident	Migratory status
1	<u>Accipitridae</u>	African Hawk Eagle	<i>Aquila spilogaster</i>	LC		x	
2	<u>Accipitridae</u>	Augur Buzzard	<i>Buteo augur</i>	LC		x	



3	<u>Accipitridae</u>	Bateleur	<i>Terathopius ecaudatus</i>	EN	II	x	
4	<u>Accipitridae</u>	Black-chested Snake Eagle	<i>Circaetus pectoralis</i>	LC		x	
5	<u>Accipitridae</u>	Booted Eagle	<i>Hieraaetus pennatus</i>	LC			x
6	<u>Accipitridae</u>	Eurasian Buzzard	<i>Buteo buteo</i>	LC			x
7	<u>Accipitridae</u>	Crowned Eagle	<i>Stephanoaetus coronatus</i>	LC	II	x	
8	<u>Accipitridae</u>	Dark Chanting Goshawk	<i>Melierax metabates</i>	LC		x	
9	<u>Accipitridae</u>	Western Marsh Harrier	<i>Circus aeruginosus</i>	LC			x
10	Accipitridae	Gymnogene/ Madagascar Harrier	<i>Polyboroides radiatus</i>	LC		x	
11	Accipitridae	Hooded Vulture	<i>Necrosyrtes monachus</i>	CR	II	x	
12	Accipitridae	Lappet-faced Vulture	<i>Torgos tracheliotus</i>	EN		x	
13	Accipitridae	Little Sparrowhawk	<i>Accipiter minullus</i>	LC		x	
14	Accipitridae	Lizard Buzzard	<i>Kaupifalco monogrammicus</i>	LC		x	
15	Accipitridae	Long-crested Eagle	<i>Lophaetus occipitalis</i>	LC		x	
16	Accipitridae	Martial Eagle	<i>Polemaetus bellicosus</i>	EN	II	x	
17	Accipitridae	Pale Chanting Goshawk	<i>Melierax poliopterus</i>	LC		x	
18	Accipitridae	Pallid Harrier	<i>Circus macrourus</i>	NT	II		x
19	Accipitridae	Shikra	<i>Accipiter badius</i>	LC			x
20	Accipitridae	Tawny Eagle	<i>Aquila rapax</i>	VU		x	
21	<u>Accipitridae</u>	Wahlberg's Eagle	<i>Hieraaetus wahlbergi</i>	LC			x
22	<u>Accipitridae</u>	White-backed Vulture	<i>Gyps africanus</i>	CR	II	x	
23	<u>Accipitridae</u>	White-headed Vulture	<i>Trionoceph occipitalis</i>	CR	II	x	
24	<u>Accipitridae</u>	Yellow-billed Kite	<i>Milvus parasiticus</i>	LC			x
25	<u>Accipitridae</u>	Brown Snake-eagle	<i>Circaetus cinereus</i>	LC			x
26	<u>Accipitridae</u>	African Harrier-hawk	<i>Polyboroides typus</i>	LC			x
27	<u>Accipitridae</u>	African Goshawk	<i>Accipiter tachiro</i>	LC			x
28	<u>Accipitridae</u>	African fish eagle	<i>Haliaeetus vocifer</i>	LC		x	
29	Acrocephalidae	Icterine Warbler	<i>Hippolais icterina</i>	LC		x	

30	Acrocephalidae	Olivaceous Warbler	<i>Hippolais pallida</i>	LC			x
31	Alaudidae	Fischer's Sparrow Lark	<i>Eremopterix leucopareia</i>	LC		x	
32	Alaudidae	Flappet Lark	<i>Mirafra rufocinnamomea</i>	LC		x	
33	Alaudidae	Singing Bush Lark	<i>Mirafra cantillans</i>	LC		x	
34	<u>Alcedinidae</u>	Brown-hooded Kingfisher	<i>Halcyon albiventris</i>	LC		x	
35	<u>Alcedinidae</u>	Chestnut-bellied Kingfisher	<i>Halcyon leucocephala</i>	LC		x	
36	Alcedinidae	Giant Kingfisher	<i>Megaceryle maxima</i>	LC		x	
37	Alcedinidae	Pied Kingfisher	<i>Ceryle rudis</i>	LC		x	
38	Alcedinidae	Striped Kingfisher	<i>Halcyon chelicuti</i>	LC		x	
39	Anatidae	Spur-winged Goose	<i>Plectropterus gambensis</i>	LC			x
40	<u>Anatidae</u>	White-backed Duck	<i>Thalassornis leuconotus</i>	LC			x
41	Anatidae	African Pygmy-goose	<i>Nettapus auritus</i>				x
42	Anatidae	Yellow-billed Duck	<i>Anas undulata</i>	LC		x	
43	<u>Anatidae</u>	African comb duck	<i>Sarkidiornis melanotos</i>	LC		x	
44	<u>Apodidae</u>	Böhm's Spinetail	<i>Neafrapus boehmi</i>	LC		x	
45	Apodidae	Little Swift	<i>Apus affinis</i>	LC			x
46	Apodidae	Mottle-throated Spinetail	<i>Telacanthura ussheri</i>	LC		x	
47	Apodidae	Palm Swift	<i>Cypsiurus parvus</i>	LC		x	
48	Apodidae	African Palm-Swift	<i>Cypsiurus parvus</i>	LC		x	
49	<u>Ardeidae</u>	Black-headed Heron	<i>Ardea melanocephala</i>	LC			x
50	<u>Ardeidae</u>	Cattle Egret	<i>Bubulcus ibis</i>	LC			x
51	Ardeidae	Great White Egret	<i>Egretta alba</i>	LC			x
52	Ardeidae	Grey Heron	<i>Ardea cinerea</i>	LC			x
53	<u>Ardeidae</u>	Yellow-billed Egret	<i>Ardea brachyrhyncha</i>	LC		x	
54	<u>Bucerotidae</u>	Crowned Hornbill	<i>Tockus alboterminatus</i>	LC		x	
55	Bucerotidae	Grey Hornbill	<i>Tockus nasutus</i>	LC		x	
56	Bucerotidae	Ground Hornbill	<i>Bucorvus cafer</i>	VU		x	

57	Bucerotidae	Ruaha Hornbill	<i>Tockus ruahae</i>	LC		x	
58	<u>Bucerotidae</u>	Von der Decken's Hornbill	<i>Tockus deckeni</i>	LC		x	
59	Buphagidae	Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>	LC		x	
60	Burhinidae	Spotted Thicknee	<i>Burhinus capensis</i>	LC		x	
61	<u>Burhinidae</u>	Water Thicknee	<i>Burhinus vermiculatus</i>	LC		x	
62	<u>Calypomenidae</u>	African Broadbill	<i>Smithornis capensis</i>	LC		x	
63	<u>Campephagidae</u>	Black Cuckooshrike	<i>Campephaga flava</i>	LC		x	
64	<u>Campephagidae</u>	White-breasted Cuckoo Shrike	<i>Coracina pectoralis</i>	LC		x	
65	Caprimulgidae	Fiery-necked Nightjar	<i>Caprimulgus pectoralis</i>	LC		x	
66	Caprimulgidae	Freckled Nightjar	<i>Caprimulgus tristigma</i>	LC		x	
67	Caprimulgidae	Pennant-winged Nightjar	<i>Macrodipteryx vexillarius</i>	LC			x
68	<u>Caprimulgidae</u>	Mozambique Nightjar	<i>Caprimulgus fossii</i>	LC		x	
69	Centropodidae	Coppery-tailed Coucal	<i>Centropus cupreicaudus</i>	LC		x	
70	<u>Charadriidae</u>	Crowned Lapwing	<i>Vanellus coronatus</i>	LC		x	
71	<u>Ciconiidae</u>	Abdim's Stork	<i>Ciconia abdimii</i>	LC			x
72	Ciconiidae	Marabou Stork	<i>Leptoptilos crumeniferus</i>	LC		x	
73	Ciconiidae	Open-billed Stork	<i>Anastomus lamelligerus</i>	LC		x	
74	Ciconiidae	Saddle-billed Stork	<i>Ephippiorhynchus senegalensis</i>	LC		x	
75	<u>Ciconiidae</u>	White Stork	<i>Ciconia ciconia</i>	LC		x	
76	<u>Ciconiidae</u>	Yellow-billed Stork	<i>Mycteria ibis</i>	LC			x
77	<u>Cisticolidae</u>	Croaking Cisticola	<i>Cisticola natalensis</i>	LC		x	
78	Cisticolidae	Green-capped Eremomela	<i>Eremomela scotops</i>	LC		x	
79	Cisticolidae	Grey-backed Camaroptera	<i>Camaroptera brachyura</i>	LC			
80	Cisticolidae	Miombo Wren Warbler	<i>Camaroptera undosa</i>	LC		x	
81	Cisticolidae	Rattling Cisticola	<i>Cisticola chinianus</i>	LC		x	

82	Cisticolidae	Stout Cisticola	<i>Cisticola robustus</i>	LC		x	
83	Cisticolidae	Tabora Cisticola	<i>Cisticola angusticauda</i>	LC		x	
84	Cisticolidae	Tawny-flanked Prinia	<i>Prinia subflava</i>	LC		x	
85	<u>Cisticolidae</u>	Trilling Cisticola	<i>Cisticola woosnami</i>	LC		x	
86	<u>Cisticolidae</u>	Rufous-winged Cisticola	<i>Cisticola galactotes</i>	LC		x	
87	<u>Cisticolidae</u>	Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>	LC		x	
88	<u>Cisticolidae</u>	Yellow-breasted Apalis	<i>Apalis flavida</i>	LC		x	
89	<u>Cisticolidae</u>	Zitting Cisticola	<i>Cisticola juncidis</i>	LC		x	
90	<u>Coliidae</u>	Blue-naped Mousebird	<i>Urocolius macrourus</i>	LC		x	
91	Coliidae	Speckled Mousebird	<i>Colius striatus</i>	LC		x	
92	Columbidae	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>	LC		x	
93	Columbidae	Green Pigeon	<i>Treron australis</i>	LC			x
94	Columbidae	Laughing Dove	<i>Streptopelia senegalensis</i>	LC			x
95	Columbidae	Mourning Dove	<i>Streptopelia decipiens</i>	LC		x	
96	Columbidae	Red-eyed Dove	<i>Streptopelia semitorquata</i>	LC			x
97	Columbidae	Ring-necked Dove	<i>Streptopelia capicola</i>	LC			x
98	Columbidae	Speckled Pigeon	<i>Columba guinea</i>	LC		x	
99	Columbidae	African Green-Pigeon	<i>Treron calvus</i>	LC		x	
100	<u>Coraciidae</u>	Broad-billed Roller	<i>Eurystomus glaucurus</i>	LC			x
101	Coraciidae	Eurasian Roller	<i>Coracias garrulus</i>	LC		x	
102	Coraciidae	Lilac-breasted Roller	<i>Coracias caudata</i>	LC		x	
103	Coraciidae	Racket-tailed Roller	<i>Coracias spatulata</i>	LC		x	
104	Corvidae	Pied Crow	<i>Corvus albus</i>	LC		x	
105	<u>Corvidae</u>	White-naped Raven	<i>Corvus albicollis</i>	LC		x	
106	<u>Cuculidae</u>	African Cuckoo	<i>Cuculus gularis</i>	LC			x
107	<u>Cuculidae</u>	African Firefinch	<i>Lagonosticta rubricata</i>	LC		x	
108	<u>Cuculidae</u>	Black Cuckoo	<i>Cuculus clamosus</i>	LC			x

109	cuculidae	Diederik Cuckoo	<i>Chrysococcyx caprius</i>	LC			x
110	Cuculidae	Emerald Cuckoo	<i>Chrysococcyx cupreus</i>	LC		x	
111	Cuculidae	Jacobin Cuckoo	<i>Clamator jacobinus</i>	LC			x
112	Cuculidae	Klaas' Cuckoo	<i>Chrysococcyx klaas</i>	LC			x
113	Cuculidae	Levaillant's Cuckoo	<i>Clamator levaillantii</i>	LC			x
114	Cuculidae	Red-chested Cuckoo	<i>Cuculus solitarius</i>	LC			x
115	Cuculidae	Senegal Coucal	<i>Centropus senegalensis</i>	LC		x	
116	<u>Cuculidae</u>	White-browed Coucal	<i>Centropus superciliosus</i>	LC		x	
117	<u>Cuculidae</u>	Common Cuckoo	<i>Cuculus canorus</i>	LC		x	
118	<u>Dicruridae</u>	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	LC		x	
119	<u>Elanidae</u>	Black-shouldered Kite	<i>Elanus axillaris</i>	LC		x	
120	Emberizidae	Golden-breasted Bunting	<i>Emberiza flaviventris</i>	LC		x	
121	<u>Estrildidae</u>	Black-cheeked Waxbill	<i>Estrilda charmosyna</i>	LC		x	
122	<u>Estrildidae</u>	Blue-capped Cordon-bleu	<i>Uraeginthus cyanocephalus</i>	LC		x	
123	<u>Estrildidae</u>	Bronze Mannikin	<i>Spermestes cucullata</i>	LC		x	
124	<u>Estrildidae</u>	Common Waxbill	<i>Estrilda astrild</i>	LC		x	
125	<u>Estrildidae</u>	Crimson-rumped Waxbill	<i>Estrilda rhodopyga</i>	LC		x	
126	<u>Estrildidae</u>	Green-winged Pytilia	<i>Pytilia melba</i>	LC		x	
127	Estrildidae	Grey-headed Silverbill	<i>Lonchura griseicapilla</i>	LC		x	
128	Estrildidae	Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	LC		x	
129	Estrildidae	Orange-winged Pytilia	<i>Pytilia afra</i>	LC		x	
130	Estrildidae	Peters' Twinspot	<i>Hypargos niveoguttatus</i>	LC		x	
131	<u>Estrildidae</u>	Pin-tailed Whydah	<i>Vidua macroura</i>	LC		x	
132	Estrildidae	Purple Grenadier	<i>Uraeginthus ianthinogaster</i>	LC		x	
133	Estrildidae	Red-billed Firefinch	<i>Lagonosticta senegala</i>	LC		x	
134	Estrildidae	Red-cheeked Cordonbleu	<i>Uraeginthus bengalus</i>	LC		x	
135	Estrildidae	Southern Cordonbleu	<i>Uraeginthus angolensis</i>	LC		x	

136	<u>Estrildidae</u>	Red-cheeked Cordon bleu	<i>Uraeginthus bengalus</i>	LC		x	
137	<u>Estrildidae</u>	Fawn-breasted Waxbill	<i>Estrilda paludicola</i>	LC		x	
138	<u>Estrildidae</u>	Zebra Waxbill	<i>Amandava subflava</i>	LC		x	
139	<u>Falconidae</u>	Amur Falcon	<i>Falco amurensis</i>	LC			x
140	Falconidae	Grey Kestrel	<i>Falco ardosiaceus</i>	LC		x	
141	Falconidae	Hobby	<i>Falco subbuteo</i>	LC		x	
142	Falconidae	Lesser Kestrel	<i>Falco naumanni</i>	LC			x
143	Falconidae	Peregrine Falcon	<i>Falco peregrinus</i>	LC	I		x
144	Falconidae	Pygmy Falcon	<i>Polihierax semitorquatus</i>	LC		x	
145	<u>Falconidae</u>	Lanner Falcon	<i>Falco biarmicus</i>	LC		x	
146	Fringillidae	Stripe-breasted Seedeater	<i>Serinus reichardi</i>	LC		x	
147	<u>Fringillidae</u>	Yellow-fronted Canary	<i>Serinus mozambicus</i>	LC		x	
148	<u>Fringillidae</u>	East African Citril	<i>Crithagra hyposticta</i>	LC		x	
149	<u>Fringillidae</u>	Brimstone Canary	<i>Crithagra sulphurata</i>	LC		x	
150	<u>Fringillidae</u>	Reichard's Seedeater	<i>Crithagra reichardi</i>	LC		x	
151	<u>Glareolidae</u>	Collared Pratincole	<i>Glareola pratincola</i>	LC			x
152	Glareolidae	Heuglin's Courser	<i>Rhinoptilus cinctus</i>	LC		x	
153	Glareolidae	Temminck's Courser	<i>Cursorius temminckii</i>	LC		x	
154	<u>Glareolidae</u>	Bronze-winged Courser	<i>Rhinoptilus chalcopterus</i>	LC			x
155	<u>Hirundinidae</u>	African Rock Martin	<i>Hirundo fuligula</i>	LC		x Large Rock Martin	<i>Ptyonoprogne fuligula</i>
156	<u>Hirundinidae</u>	Barred Owlet	<i>Glaucidium capense</i>	LC		x	
157	Hirundinidae	House Martin	<i>Delichon urbica</i>	LC		x	
158	Hirundinidae	Mosque Swallow	<i>Hirundo senegalensis</i>	LC			x
159	<u>Hirundinidae</u>	Wire-tailed Swallow	<i>Hirundo smithii</i>	LC			x
160	<u>Hirundinidae</u>	Grey-rumped Swallow	<i>Pseudhirundo griseopyga</i>	LC		x	
161	<u>Hirundinidae</u>	Lesser Striped Swallow	<i>Cecropis abyssinica</i>	LC			x
162	<u>Hirundinidae</u>	Red-rumped Swallow	<i>Cecropis daurica</i>	LC			x

163	<u>Hyliotidae</u>	Yellow-bellied Hyliota	<i>Hyliota flavigaster</i>	LC		x	
164	Indicatoridae	Greater Honeyguide	<i>Indicator indicator</i>	LC			x
165	indicatoridae	Lesser Honeyguide	<i>Indicator minor</i>	LC		x	
166	Indicatoridae	Scaly-throated Honeyguide	<i>Indicator variegatus</i>	LC		x	
167	<u>Indicatoridae</u>	Wahlberg's Honeybird	<i>Prodotiscus regulus</i>	LC		x	
168	<u>Jacanidae</u>	African Jacana	<i>Actophilornis africanus</i>	LC		x	
169	<u>Laniidae</u>	Common Fiscal	<i>Lanius collaris</i>	LC		x	
170	Laniidae	Magpie Shrike	<i>Corvinella melanoleuca</i>	LC		x	
171	Laniidae	Northern White-crowned Shrike	<i>Eurocephalus rueppellii</i>	LC		x	
172	<u>Leiotrichidae</u>	Arrow-marked Babbler	<i>Turdoides jardineii</i>	LC		x	
173	<u>Leiotrichidae</u>	Black-lored Babbler	<i>Turdoides sharpei</i>	LC		x	
174	Leiotrichidae	Scaly Chatterer	<i>Turdoides aylmeri</i>	LC		x	
175	<u>Lybiidae</u>	Black-collared Barbet	<i>Lybius torquatus</i>	LC		x	
176	<u>Lybiidae</u>	Crested Barbet	<i>Trachyphonus vaillantii</i>	LC		x	
177	<u>Lybiidae</u>	d'Arnaud's Barbet	<i>Trachyphonus darnaudii</i>	LC		x	
178	Lybiidae	Red-fronted Barbet	<i>Tricholaema diadematus</i>	LC		x	
179	Lybiidae	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>	LC		x	
180	Lybiidae	Spot-flanked Barbet	<i>Tricholaema lacrymosus</i>	LC		x	
181	Macrosphenidae	Red-faced Crombec	<i>Sylvietta whytii</i>	LC		x	
182	<u>Malaconotidae</u>	Black-backed Puffback	<i>Dryoscopus cubla</i>	LC		x	
183	<u>Malaconotidae</u>	Black-crowned Tchagra	<i>Tchagra senegalus</i>	LC		x	
184	<u>Malaconotidae</u>	Brown-crowned Tchagra	<i>Tchagra australis</i>	LC		x	
185	<u>Malaconotidae</u>	Brubru	<i>Nilaus afer</i>	LC		x	
186	<u>Malaconotidae</u>	Grey-headed Bush Shrike	<i>Malaconotus blanchoti</i>	LC		x	
187	<u>Malaconotidae</u>	Slate-coloured Boubou	<i>Laniarius funebris</i>	LC		x	
188	Malaconotidae	Sulphur-breasted Bush Shrike	<i>Malaconotus sulfureopectus</i>	LC		x	
189	<u>Malaconotidae</u>	Tropical Boubou	<i>Laniarius aethiopicus</i>	LC		x	



190	<u>Malaconotidae</u>	Orange-breasted Bush-shrike	<i>Chlorophoneus sulfureopectus</i>	LC		x	
191	<u>Meropidae</u>	Blue-cheeked Bee-eater	<i>Merops persicus</i>	LC			x
192	Meropidae	Eurasian Bee-eater	<i>Merops apiaster</i>	LC			x
193	Meropidae	Little Bee-eater	<i>Merops pusillus</i>	LC		x	
194	Meropidae	Swallow-tailed Bee-eater	<i>Merops hirundineus</i>	LC		x	
195	Monarchidae	Paradise Flycatcher	<i>Terpsiphone viridis</i>	LC		x	
196	<u>Motacillidae</u>	African Pied Wagtail	<i>Motacilla aguimp</i>	LC		x	
197	Motacillidae	Long-billed Pipit	<i>Anthus similis</i>	LC		x	
198	<u>Motacillidae</u>	Tree Pipit	<i>Anthus trivialis</i>	LC			x
199	<u>Motacillidae</u>	Western Yellow Wagtail	<i>Motacilla flava</i>	LC			x
200	<u>Motacillidae</u>	Mountain Wagtail	<i>Motacilla clara</i>	LC		x	
201	<u>Motacillidae</u>	African Pipit	<i>Anthus cinnamomeus</i>	LC			x
202	<u>Muscicapidae</u>	Ashy Flycatcher	<i>Muscicapa caerulea</i>	LC		x	
203	<u>Muscicapidae</u>	Capped Wheatear	<i>Oenanthe pileata</i>	LC		x	
204	<u>Muscicapidae</u>	Mocking Cliff-chat	<i>Thamnolaea cinnamomeiventris</i>	LC		x	
205	Muscicapidae	Eastern Bearded Scrub Robin	<i>Cercotrichas quadricolor</i>	LC		x	
206	<u>Muscicapidae</u>	Familiar Chat	<i>Cercomela familiaris</i>	LC		x	
207	Muscicapidae	Grey tit flycatcher	<i>Myioparus plumbeus</i>	LC		x	
208	Muscicapidae	Grey Flycatcher	<i>Bradornis microrhynchus</i>	LC		x	
209	Muscicapidae	Isabelline Wheatear	<i>Oenanthe isabellina</i>	LC			x
210	Muscicapidae	Northern Wheatear	<i>Oenanthe oenanthe</i>	LC			x
211	<u>Muscicapidae</u>	Pale Flycatcher	<i>Bradornis pallidus</i>	LC		x	
212	Muscicapidae	Red-capped Robin Chat	<i>Cossypha natalensis</i>	LC		x	
213	Muscicapidae	Rock Thrush	<i>Monticola saxatilis</i>	LC		x	
214	Muscicapidae	Arnot's Chat	<i>Myrmecocichla collaris</i>	LC		x	
215	Muscicapidae	Southern Black Flycatcher	<i>Melaenornis pammelaina</i>	LC		x	
216	Muscicapidae	Spotted Flycatcher	<i>Muscicapa striata</i>	LC			x

217	Muscicapidae	Spotted Morning Thrush	<i>Cichladusa guttata</i>	LC		x	
218	Muscicapidae	Sprosser	<i>Luscinia luscinia</i>	LC		x	
219	<u>Muscicapidae</u>	White-browed Robin Chat	<i>Cossypha heuglini</i>	LC		x	
220	<u>Muscicapidae</u>	White-browed Scrub Robin	<i>Cercotrichas leucophrys</i>	LC		x	
221	<u>Muscicapidae</u>	Arnot's Chat	<i>Myrmecocichla arnoti</i>	LC		x	
222	<u>Muscicapidae</u>	Northern Black-flycatcher	<i>Melaenornis edolioides</i>	LC		x	
223	<u>Muscicapidae</u>	Cape Robin-chat	<i>Dessonornis caffer</i>	LC		x	
224	<u>Muscicapidae</u>	Common Stonechat	<i>Saxicola torquatus</i>	LC			x
225	<u>Musophagidae</u>	Bare-faced Go-away Bird	<i>Corythaixoides personatus</i>	LC		x	
226	<u>Musophagidae</u>	White-bellied Go-away Bird	<i>Corythaixoides leucogaster</i>	LC		x	
227	<u>Nectariniidae</u>	Amethyst Sunbird	<i>Chalcomitra amethystina</i>	LC		x	
228	<u>Nectariniidae</u>	Beautiful Sunbird	<i>Cinnyris pulchellus</i>	LC		x	
229	Nectariniidae	Eastern Violet-backed Sunbird	<i>Anthreptes orientalis</i>	LC		x	
230	Nectariniidae	Eleonora's Falcon	<i>Falco eleonora</i>	LC			x
231	Nectariniidae	Mariqua Sunbird	<i>Nectarinia mariquensis</i>	LC		x	
232	Nectariniidae	Scarlet-chested Sunbird	<i>Nectarinia senegalensis</i>	LC		x	
233	<u>Nectariniidae</u>	Variable Sunbird	<i>Cinnyris venustus</i>	LC		x	
234	Nicatoridae	Eastern Nicator	<i>Nicator gularis</i>	LC		x	
235	<u>Numididae</u>	Eastern Crested Guinea fow	<i>Guttera pucherani</i>	LC		x	
236	Numididae	Helmeted Guinea fowl	<i>Numida meleagris</i>	LC		x	
237	<u>Oriolidae</u>	African Golden Oriole	<i>Oriolus auratus</i>	LC			x
238	<u>Oriolidae</u>	Eastern Black-headed Oriole	<i>Oriolus larvatus</i>	LC		x	
239	Oriolidae	Golden Oriole	<i>Oriolus oriolus</i>	LC		x	
240	<u>Otididae</u>	Black-bellied Bustard	<i>Lissotis melanogaster</i>	LC		x	

241	<u>Otididae</u>	White-bellied Bustard	<i>Eupodotis senegalensis</i>	LC		x	
242	<u>Paridae</u>	Cinnamon-breasted Tit	<i>Parus pallidiventris</i>	LC		x	
243	Paridae	Red-throated Tit	<i>Parus fringillinus</i>	LC		x	
244	<u>Paridae</u>	White-bellied Tit	<i>Parus albiventris</i>	LC		x	
245	Passeridae	Grey-headed Sparrow	<i>Passer griseus</i>	LC		x	
246	Passeridae	Grey-headed Sparrow	<i>Passer griseus</i>	LC		x	
247	<u>Passeridae</u>	House Sparrow	<i>Passer domesticus</i>	LC		x	
248	Passeridae	Swahili Sparrow	<i>Passer suahelicus</i>	LC		x	
249	<u>Passeridae</u>	White-browed Petronia	<i>Petronia superciliaris</i>	LC		x	
250	<u>Phasianidae</u>	Coqui Francolin	<i>Francolinus coqui</i>	LC		x	
251	<u>Phasianidae</u>	Crested Francolin	<i>Francolinus sephaena</i>	LC		x	
252	Phasianidae	Harlequin Quail	<i>Coturnix delegorguei</i>	LC		x	
253	Phasianidae	Hildebrandt's Francolin	<i>Francolinus hildebrandti</i>	LC		x	
254	Phasianidae	Red-necked Spurfowl	<i>Francolinus afer</i>	LC		x	
255	Phasianidae	Shelley's Francolin	<i>Francolinus shelleyi</i>	LC			x
256	Phasianidae	Red-winged Francolin	<i>Pternistis afer</i>	LC		x	
257	<u>Phoeniculidae</u>	Abyssinian Scimitarbill	<i>Rhinopomastus minor</i>	LC			x
258	Phoeniculidae	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>	LC		x	
259	<u>Phylloscopidae</u>	Willow Warbler	<i>Phylloscopus trochilus</i>	LC			x
260	<u>Picidae</u>	Bearded Woodpecker	<i>Dendropicus namaquus</i>	LC		x	
261	<u>Picidae</u>	Cardinal Woodpecker	<i>Dendropicus fuscescens</i>	LC		x	
262	Picidae	Golden-tailed Woodpecker	<i>Campethera abingoni</i>	LC		x	
263	Picidae	Nubian Woodpecker	<i>Campethera nubica</i>	LC		x	
264	Picidae	Cardinal Woodpecker	<i>Dendropicus fuscescens</i>	LC		x	
265	<u>Pittidae</u>	African Pitta	<i>Pitta angolensis</i>	LC			x
266	<u>Platysteiridae</u>	Black-throated Wattle-eye	<i>Platysteira peltata</i>	LC		x	
267	<u>Platysteiridae</u>	Chinspot Batis	<i>Batis molitor</i>	LC		x	
268	<u>Ploceidae</u>	Baglafaecht Weaver	<i>Ploceus baglafaecht</i>	LC		x	

269	<u>Ploceidae</u>	Black-necked Weaver	<i>Ploceus nigrocollis</i>	LC		x	
270	<u>Ploceidae</u>	Black Bishop	<i>Euplectes gierowii</i>	LC		x	
271	<u>Ploceidae</u>	Chestnut Weaver	<i>Ploceus rubiginosus</i>	LC		x	
272	<u>Ploceidae</u>	Grey-capped Social Weaver	<i>Pseudonigrita arnaudi</i>	LC		x	
273	<u>Ploceidae</u>	Holub's Golden Weaver	<i>Ploceus xanthops</i>	LC		x	
274	<u>Ploceidae</u>	Lesser Masked Weaver	<i>Ploceus intermedius</i>	LC		x	
275	<u>Ploceidae</u>	Red-billed Buffalo Weaver	<i>Bubalornis niger</i>	LC		x	
276	<u>Ploceidae</u>	Red-billed Quelea	<i>Quelea quelea</i>	LC		x	
277	<u>Ploceidae</u>	Southern Red-headed Weaver	<i>Anaplectes rubriceps</i>	LC		x	Red-headed Weaver
278	<u>Ploceidae</u>	Southern Red Bishop	<i>Euplectes orix</i>	LC		x	
279	<u>Ploceidae</u>	Speckle-fronted Weaver	<i>Sporopipes frontalis</i>	LC		x	
280	<u>Ploceidae</u>	Spectacled Weaver	<i>Ploceus ocularis</i>	LC		x	
281	<u>Ploceidae</u>	Village Weaver	<i>Ploceus cucullatus</i>	LC		x	
282	<u>Ploceidae</u>	Southern Masked Weaver	<i>Ploceus velatus</i>	LC		x	
283	<u>Ploceidae</u>	White-headed Buffalo Weaver	<i>Dinemellia dinemelli</i>	LC		x	
284	<u>Ploceidae</u>	White-winged Widowbird	<i>Euplectes albonotatus</i>	LC		x	
285	<u>Ploceidae</u>	Yellow Bishop	<i>Euplectes capensis</i>	LC		x	
286	<u>Ploceidae</u>	Black-headed Weaver	<i>Ploceus melanocephalus</i>	LC		x	
287	<u>Ploceidae</u>	Fan-tailed Widowbird	<i>Euplectes axillaris</i>	LC		x	
288	<u>Ploceidae</u>	Thick-billed Weave	<i>Amblyospiza albifrons</i>	LC		x	Grosbeak Weaver
289	<u>Podicipodidae</u>	Great Crested Grebe	<i>Podiceps cristata</i>	LC			x
290	<u>Psittacidae</u>	Brown Parrot	<i>Poicephalus meyeri</i>	LC		x	
291	<u>Psittacidae</u>	Fischer's Lovebird	<i>Agapornis fischeri</i>	NT		x	
292	<u>Psittacidae</u>	Yellow-collared Lovebird	<i>Agapornis personatus</i>	LC		x	

293	<u>Pteroclididae</u>	Black-faced Sandgrouse	<i>Pterocles decoratus</i>	LC		x	
294	<u>Pteroclididae</u>	Yellow-throated Sandgrouse	<i>Pterocles gutturalis</i>	LC			x
295	<u>Pycnonotidae</u>	Yellow-bellied Greenbul	<i>Chlorocichla flaviventris</i>	LC		x	
296	<u>Pycnonotidae</u>	Yellow-vented Bulbul	<i>Pycnonotus barbatus</i>	LC		x	
297	Pycnonotidae	Grey-olive Greenbul	<i>Phyllastrephus cerviniventris</i>	LC		x	
298	<u>Rallidae</u>	African Water Rail	<i>Rallus caerulescens</i>	LC		x	
299	<u>Scolopacidae</u>	Common Sandpiper	<i>Actitis hypoleucos</i>	LC			x
300	Scolopacidae	Greenshank	<i>Tringa nebularia</i>	LC		x	
301	Scopidae	Hamerkop	<i>Scopus umbretta</i>	LC		x	
302	<u>Strigidae</u>	African Scops Owl	<i>Otus senegalensis</i>	LC		x	
303	<u>Strigidae</u>	African Wood Owl	<i>Strix woodfordii</i>	LC		x	
304	Strigidae	Pearl-spotted Owlet	<i>Glaucidium perlatum</i>	LC		x	
305	Strigidae	Spotted Eagle Owl	<i>Bubo africanus</i>	LC		x	
306	<u>Strigidae</u>	Verreaux's Eagle Owl	<i>Bubo lacteus</i>	LC		x	
307	<u>Strigidae</u>	Northern White-faced Owl	<i>Ptilopsis leucotis</i>	LC		x	
308	Struthionidae	Ostrich	<i>Struthio camelus</i>	LC	I	x	
309	<u>Sturnidae</u>	Ashy Starling	<i>Lamprotornis unicolor</i>	LC		x	
310	Sturnidae	Hildebrandt's Starling	<i>Lamprotornis hildebrandti</i>	LC		x	
311	Sturnidae	Red-winged Starling	<i>Onychognathus morio</i>	LC		x	
312	Sturnidae	Superb Starling	<i>Lamprotornis superbus</i>	LC		x	
313	<u>Sylviidae</u>	Banded Parisoma	<i>Curruca boehmi</i>	LC		x	
314	<u>Sylviidae</u>	Common Whitethroat	<i>Curruca communis</i>	LC			x
315	Sylviidae	Garden Warbler	<i>Sylvia borin</i>	LC			x
316	Threskiornithidae	Glossy Ibis	<i>Plegadis falcinellus</i>	LC			x
317	Threskiornithidae	Hadada Ibis	<i>Bostrychia hagedash</i>	LC		x	

318	<u>Turdidae</u>	Bare-eyed Thrush	<i>Turdus tephronotus</i>	LC		x	
319	<u>Turdidae</u>	Kurrichane Thrush	<i>Zoothera libonyanus</i>	LC		x	
320	<u>Turnicidae</u>	Common Buttonquail	<i>Turnix sylvatica</i>	LC		x	
321	<u>Tytonidae</u>	Barn Owl	<i>Tyto alba</i>	LC		x	
322	<u>Tytonidae</u>	Barn Swallow	<i>Hirundo rustica</i>	LC			x
323	<u>Upupidae</u>	Common Hoopoe	<i>Upupa epops</i>	LC			x
324	<u>Vangidae</u>	White Helmet Shrike	<i>Prionops plumatus</i>	LC		x	
325	<u>Vangidae</u>	Retz's Helmetshrike	<i>Prionops retzii</i>	LC		x	
326	<u>viduidae</u>	Steel-blue Whydah	<i>Vidua hypocherina</i>	LC		x	
327	<u>Viduidae</u>	Straw-tailed Whydah	<i>Vidua fischeri</i>	LC		x	
328	<u>Viduidae</u>	Cuckoo finch	<i>Anomalospiza imberbis</i>	LC		x	
329	<u>Viduidae</u>	Long tailed paradise whydah	<i>Vidua paradisaea</i>	LC		x	
330	<u>Zosteropidae</u>	African Yellow White-eye	<i>Zosterops senegalensis</i>	LC		x	

Sources: Ruaha Birds Checklist, ESIA (Iringa-Msembe Road), MBOMIPA GMP 2023, Focus Group Discussions, Key Informant Interviews, SPANEST (2016), IUCN Red List, CITES, Birdlife International (<http://datazone.birdlife.org/country/tanzania>)

#### Appendix 5: List of plants surveyed in the iringa-Msembe road project

Family/Sub-family	Species name	Life form	Uses	IUCN	CITES
<b>Malvaceae</b>	<i>Abutilon guineense</i>	Herb	Traditional medicine		
<b>Fabaceae</b>	<i>Acacia amythethophylla</i>	Shrub	Firewood, fodder, traditional medicine		
<b>Fabaceae</b>	<i>Acacia brevispica</i>	Tree	Firewood, charcoal		
<b>Fabaceae</b>	<i>Dalbergia melanoxylon</i>	Tree	Carvings, music instruments, furniture	NT	II
<b>Fabaceae</b>	<i>Acacia nigrescens</i>	Tree	Firewood, charcoal		
<b>Fabaceae</b>	<i>Acacia sieberiana</i>	Tree	Firewood, charcoal, fodder		
<b>Fabaceae</b>	<i>Acacia tortilis</i>	Tree	Firewood, charcoal		
<b>Euphorbiaceae</b>	<i>Acalypha ornata</i>	Herb	Traditional medicine		
<b>Euphorbiaceae</b>	<i>Acalypha racemosa</i>	Shrub	Traditional medicine		
<b>Amaranthaceae</b>	<i>Achyranthes aspera</i>	Herb	Traditional medicine		

<b>Malvaceae</b>	<i>Adansonia digitata</i>	Tree	Food (fruit), fodder		
<b>Amaranthaceae</b>	<i>Aerva lanata</i>	Herb	Traditional medicine		
<b>Fabaceae</b>	<i>Aeschynomene abyssinica</i>	Shrub	Fodder, traditional medicine		
<b>Fabaceae</b>	<i>Afzelia quanzensis</i>	Tree	Firewood, charcoal, timber		
<b>Rubiaceae</b>	<i>Agathisanthemum globosum</i>	Herb	Traditional medicine		
<b>Asteraceae</b>	<i>Ageratum conyzoides</i>	Herb	Traditional medicine		
<b>Fabaceae</b>	<i>Albizia amara</i>	Tree	Firewood, charcoal		
<b>Fabaceae</b>	<i>Albizia gummifera</i>	Tree	Firewood, charcoal, live fence		
<b>Fabaceae</b>	<i>Albizia versicolor</i>	Tree	For making ropes, firewood		
<b>Sapindaceae</b>	<i>Allophyllus africanus</i>	Shrub	Fruits edible, traditional medicine		
<b>Sapindaceae</b>	<i>Allophyllus rubifolius</i>	Shrub	Fruits edible, traditional medicine		
<b>Asphodelaceae</b>	<i>Aloe lateritia</i>	Shrub	Traditional medicine		
<b>Anonaceae</b>	<i>Anona senegalensis</i>	Shrub	Fruits edible, poles, charcoal		
<b>Poaceae</b>	<i>Aristida adoensis</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Aristida babicolis</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Aristida stenostachya</i>	Grass	Fodder		
<b>Asparagusaceae</b>	<i>Asparagus aethiopicus</i>	Climber	Traditional medicine		
<b>Asparagusaceae</b>	<i>Asparagus africanus</i>	Climber	Traditional medicine		
<b>Asparagusaceae</b>	<i>Asparagus falcatus</i>	Climber	Traditional medicine		
<b>Asteraceae</b>	<i>Aspilia mosambicensis</i>	Herb	Traditional medicine		
<b>Acanthaceae</b>	<i>Asystasia gangetica</i>	Herb	Traditional medicine		
<b>Meliaceae</b>	<i>Azadirachta indica</i>	Tree	Traditional medicine, firewood, timber, poles		
<b>Malvaceae</b>	<i>Azanza garckeana</i>	Tree	Traditional medicine, food (fruits edible), firewood		
<b>Acanthaceae</b>	<i>Barleria spinulosa</i>	Herb	Traditional medicine		
<b>Lamiaceae</b>	<i>Becium obovatum</i>	Herb	Traditional medicine		
<b>Asteraceae</b>	<i>Bidens lineariloba</i>	Herb	Traditional medicine, animal fodder		
<b>Asteraceae</b>	<i>Bidens pilosa</i>	Herb	Traditional medicine, animal fodder		
<b>Acanthaceae</b>	<i>Blepharis affinis</i>	Herb	Traditional medicine		



<b>Acanthaceae</b>	<i>Blepharis ciliaris</i>	Herb	Traditional medicine		
<b>Convolvulaceae</b>	<i>Bonamia mossambicensis</i>	Liana	Traditional medicine		
<b>Capparaceae</b>	<i>Boscia angustifolia</i>	Tree	Firewood, charcoal		
<b>Capparaceae</b>	<i>Boscia salicifolia</i>	Tree	Firewood, charcoal		
<b>Fabaceae</b>	<i>Brachystegia boehmii</i>	Tree	Firewood, charcoal, timber		
<b>Fabaceae</b>	<i>Brachystegia microphylla</i>	Tree	Firewood, charcoal, timber		
<b>Fabaceae</b>	<i>Brachystegia spiciformis</i>	Tree	Firewood, charcoal, timber		
<b>Euphorbiaceae</b>	<i>Bridelia cathartica</i>	Shrub	Fodder, traditional medicine, fruits edible		
<b>Euphorbiaceae</b>	<i>Bridelia scleroneura</i>	Shrub	Traditional medicine		
<b>Capparaceae</b>	<i>Capparis tomentosa</i>	Shrub	Traditional medicine, Fencing (live fence)		
<b>Fabaceae</b>	<i>Cassia abbreviata</i>	Tree	Firewood, charcoal, live fence		
<b>Fabaceae</b>	<i>Cassia floribunda</i>	Shrub	Firewood, timber, charcoal		
<b>Poaceae</b>	<i>Chloris pycnothrix</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Chloris virgata</i>	Grass	Fodder		
<b>Combretaceae</b>	<i>Combretum aculeatum</i>	Shrub	Firewood, traditional medicine		
<b>Combretaceae</b>	<i>Combretum apiculatum</i>	Shrub	Firewood, traditional medicine		
<b>Combretaceae</b>	<i>Combretum molle</i>	Tree	Firewood, Timber and poles, Medicine		
<b>Combretaceae</b>	<i>Combretum zeyheri</i>	Shrub	Firewood, charcoal, traditional medicine		
<b>Commelinaceae</b>	<i>Commelina africana</i>	Herb	Traditional medicine, animal fodder		
<b>Commelinaceae</b>	<i>Commelina benghalensis</i>	Herb	Traditional medicine, fodder		
<b>Burseraceae</b>	<i>Commiphora africana</i>	Tree	Traditional medicine, Fencing (live fence)		
<b>Burseraceae</b>	<i>Commiphora eminii</i>	Tree	Traditional medicine, Fencing (live fence)		
<b>Burseraceae</b>	<i>Commiphora merkeri</i>	Tree	Traditional medicine, Fencing (live fence)		
<b>Asteraceae</b>	<i>Conyza bonariensis</i>	Herb	Traditional medicine		
<b>Boraginaceae</b>	<i>Cordia monoica</i>	Shrub	Traditional medicine		
<b>Boraginaceae</b>	<i>Cordia ovalis</i>	Shrub	Traditional medicine		
<b>Boraginaceae</b>	<i>Cordia sinensis</i>	Tree	Traditional medicine		
<b>Cucurbitaceae</b>	<i>Cucumis figarei</i>	Climber	Traditional medicine, food		
<b>Cyperaceae</b>	<i>Cyperus alternifolia</i>	Sedge	Fodder		

<b>Cyperaceae</b>	<i>Cyperus alternifolius</i>	Sedge	Fodder		
<b>Cyperaceae</b>	<i>Cyperus exaltatus</i>	Sedge	Fodder, thatch material		
<b>Cyperaceae</b>	<i>Cyperus involucratus</i>	Sedge	Thatch material		
<b>Cyperaceae</b>	<i>Cyperus rotundus</i>	Sedge	Fodder		
<b>Poaceae</b>	<i>Dactyloctenium aegyptium</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Dactyloctenium bogdanii</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Dactyloctenium giganteum</i>	Grass	Fodder		
<b>Solanaceae</b>	<i>Datura stramonium</i>	Herb	Traditional medicine		
<b>Fabaceae</b>	<i>Delonix elata</i>	Tree	Traditional medicine, firewood, charcoal		
<b>Fabaceae</b>	<i>Delonix regia</i>	Tree	Traditional medicine, firewood, charcoal		
<b>Poaceae</b>	<i>Dicanthium annulatum</i>	Grass	Fodder, Traditional medicine		
<b>Fabaceae</b>	<i>Dichrostachys sinerea</i>	Shrub	Firewood, charcoal, live fence		
<b>Apocynaceae</b>	<i>Dictyophleba lucida</i>	Liana	Traditional medicine, food		
<b>Poaceae</b>	<i>Digitaria milanjana</i>	Grass	Fodder		
<b>Sterculiaceae</b>	<i>Dombeya burgessiae</i>	Tree	Firewood		
<b>Acanthaceae</b>	<i>Duosperma clinopodioides</i>	Herb	Traditional medicine		
<b>Acanthaceae</b>	<i>Dyschoriste hildebrandtii</i>	Shrub	Traditional medicine		
<b>Poaceae</b>	<i>Echinochloa colona</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Echinochloa haploclada</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Eleusine indica</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Eleusine multiflora</i>	Grass	Fodder		
<b>Asteraceae</b>	<i>Emilia coccinea</i>	Herb	Traditional medicine		
<b>Poaceae</b>	<i>Eragrostis aspera</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Eragrostis congesta</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Eriochloa fatmensis</i>	Grass	Fodder		
<b>Fabaceae</b>	<i>Erythrina abyssinica</i>	Tree	Firewood, traditional medicine		
<b>Euphorbiaceae</b>	<i>Erythrococca menyharthii</i>	Shrub	Traditional medicine		

<b>Myrtaceae</b>	<i>Eucalyptus maculata</i>	Tree	Timber, charcoal, firewood		
<b>Myrtaceae</b>	<i>Eucalyptus saligna</i>	Tree	Timber, charcoal, firewood		
<b>Ebenaceae</b>	<i>Euclea natalensis</i>	Shrub	Firewood, traditional medicine		
<b>Ebenaceae</b>	<i>Euclea racemosa</i>	Shrub	Traditional medicine		
<b>Euphorbiaceae</b>	<i>Euphorbia candelabrum</i>	Tree	Traditional medicine		
<b>Euphorbiaceae</b>	<i>Euphorbia cuneata</i>	Shrub	Traditional medicine		
<b>Fabaceae</b>	<i>Faidherbia albida</i>	Tree	Firewood, traditional medicine		
<b>Proteaceae</b>	<i>Faurea saligna</i>	Tree	Firewood, charcoal, traditional medicine		
<b>Moraceae</b>	<i>Ficus sur</i>	Tree	Fire wood, food (fruits edible)		
<b>Moraceae</b>	<i>Ficus sycomorus</i>	Tree	Fire wood, food (fruits edible)		
<b>Tiliaceae</b>	<i>Grewia bicolor</i>	Shrub	Firewood, food (fruit), fodder		
<b>Tiliaceae</b>	<i>Grewia forbesii</i>	Shrub	Firewood, food (fruit), fodder		
<b>Tiliaceae</b>	<i>Grewia mollis</i>	Shrub	Firewood, food (fruit), fodder		
<b>Boraginaceae</b>	<i>Heliotropium steudneri</i>	Herb	Traditional medicine		
<b>Poaceae</b>	<i>Heteropogon contortus</i>	Grass	Fodder		
<b>Malvaceae</b>	<i>Hibiscus diversifolius</i>	Shrub	Traditional medicine		
<b>Apocynaceae</b>	<i>Holarrhena pubescens</i>	Tree	Traditional medicine		
<b>Lamiaceae</b>	<i>Hoslundia opposita</i>	Shrub	Traditional medicine		
<b>Acanthaceae</b>	<i>Hygrophyla auriculata</i>	Herb	Traditional medicine		
<b>Poaceae</b>	<i>Hyparrhenia rufa</i>	Grass	Fodder, thatch grass		
<b>Poaceae</b>	<i>Hyparrhenia variabilis</i>	Grass	Fodder, thatch grass		
<b>Convolvulaceae</b>	<i>Ipomoea bullata</i>	Herb	Traditional medicine		
<b>Convolvulaceae</b>	<i>Ipomoea obscura</i>	Herb	Fodder		
<b>Bignoniaceae</b>	<i>Jacaranda mimosifolia</i>	Tree	Firewood		
<b>Bignoniaceae</b>	<i>Kigelia africana</i>	Tree	Traditional medicine		
<b>Cyperaceae</b>	<i>Kyllinga alata</i>	Sedge	Fodder		
<b>Apocynaceae</b>	<i>Landolphia buchananii</i>	Liana	Traditional medicine		
<b>Anacardiaceae</b>	<i>Lannea humilis</i>	Shrub	Traditional medicine, firewood		
<b>Anacardiaceae</b>	<i>Lannea stuhlmannii</i>	Shrub	Traditional medicine, firewood, food (fruit, juice), fodder (leaves)		
<b>Verbanaceae</b>	<i>Lantana camara</i>	Shrub	Traditional medicine, fodder, live fence		

<b>Lamiaceae</b>	<i>Leonotis mollissima</i>	Shrub	Traditional medicine		
<b>Lamiaceae</b>	<i>Leucas martinensis</i>	Shrub	Traditional medicine		
<b>Verbanaceae</b>	<i>Lipia javanica</i>	Herb	Traditional medicine		
<b>Capparaceae</b>	<i>Maerua angolensis</i>	Tree	Traditional medicine, charcoal, firewood, food (fruit), fodder (leaves)		
<b>Capparaceae</b>	<i>Maerua crassifolia</i>	Tree	Traditional medicine, charcoal, firewood, food (fruit), fodder (leaves)		
<b>Capparaceae</b>	<i>Maerua triphylla</i>	Shrub	Charcoal, firewood		
<b>Bignoniaceae</b>	<i>Markhamia lutea</i>	Tree	Firewood		
<b>Bignoniaceae</b>	<i>Markhamia obtusifolia</i>	Tree	Firewood		
<b>Celastraceae</b>	<i>Maytenus senegalensis</i>	Shrub	Firewood, charcoal, traditional medicine		
<b>Sterculiaceae</b>	<i>Melhania velutina</i>	Herb	Traditional medicine		
<b>Meliaceae</b>	<i>Melia azedarach</i>	Tree	Traditional medicine, firewood, timber, poles		
<b>Cucurbitaceae</b>	<i>Mormodica foetida</i>	Climber	Traditional medicine, food		
<b>Moraceae</b>	<i>Morus alba</i>	Tree	Fruits edible		
<b>Lamiaceae</b>	<i>Ocimum bacilicum</i>	Herb	Traditional medicine		
<b>Lamiaceae</b>	<i>Ocimum suave</i>	Herb	Traditional medicine		
<b>Asclepiadaceae</b>	<i>Orbea denboefii</i>	Herb	Traditional medicine		
<b>Anacardiaceae</b>	<i>Ozoroa insignis</i>	Shrub	Firewood, food (fruit), traditional medicine		
<b>Poaceae</b>	<i>Panicum colorotum</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Panicum infestum</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Panicum maximum</i>	Grass	Fodder		
<b>Chrysobalanaceae</b>	<i>Parinari curatellifolia</i>	Tree	Fruits edible, firewood, charcoal, traditional medicine		
<b>Poaceae</b>	<i>Pennisetum mezianum</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Pennisetum polystachion</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Pennisetum purpureum</i>	Grass	Fodder		
<b>Polygonaceae</b>	<i>Persicaria senegalensis</i>	Herb	Traditional medicine		
<b>Proteaceae</b>	<i>Protea gaguedi</i>	Tree	Firewood, charcoal, traditional medicine		
<b>Fabaceae</b>	<i>Pterocarpus angolensis</i>	Tree	Firewood, charcoal, timber	LC	III
<b>Anacardiaceae</b>	<i>Rhus natalensis</i>	Shrub	Firewood, food (fruit), traditional medicine		
<b>Acanthaceae</b>	<i>Ruellia megachlamys</i>	Herb	Traditional medicine		
<b>Anacardiaceae</b>	<i>Sclerocarya birrea</i>	Tree	Firewood, food (fruit), traditional medicine		

<b>Malvaceae</b>	<i>Sida cordifolia</i>	Shrub	Traditional medicine		
<b>Solanaceae</b>	<i>Solanum incanum</i>	Herb	Traditional medicine		
<b>Solanaceae</b>	<i>Solanum indicum</i>	Shrub	Traditional medicine		
<b>Loganiaceae</b>	<i>Strychnos spinosa</i>	Tree	Fruits edible		
<b>Myrtaceae</b>	<i>Syzygium cordatum</i>	Tree	Fruits edible, fire wood		
<b>Myrtaceae</b>	<i>Syzygium cuminii</i>	Tree	Fruits edible, fire wood		
<b>Fabaceae</b>	<i>Tephrosia pumila</i>	Herb	Traditional medicine		
<b>Fabaceae</b>	<i>Tephrosia villosa</i>	Herb	Traditional medicine		
<b>Combretaceae</b>	<i>Terminalia brownii</i>	Tree	Firewood, Timber and poles, Medicine		
<b>Poaceae</b>	<i>Themeda triandra</i>	Grass	Fodder		
<b>Poaceae</b>	<i>Urochloa mossambicensis</i>	Grass	Fodder		
<b>Asteraceae</b>	<i>Vernonia adoensis</i>	Shrub	Traditional medicine, firewood		
<b>Verbanaceae</b>	<i>Vitex doniana</i>	Tree	Fruits edible, traditional medicine, firewood		
<b>Verbanaceae</b>	<i>Vitex mombasae</i>	Tree	Fruits edible, traditional medicine, firewood		
<b>Asteraceae</b>	<i>Xanthium strumarium</i>	Herb	Traditional medicine		
<b>Rutaceae</b>	<i>Zanthoxylum chalybeum</i>	Tree	Traditional medicine, firewood		

Sources: IUCN red list, Tanzania Forest Research Institute (TAFORI), MBOMIPA GMP 2023, Focus Group Discussions, Key Informant Interviews, SPANEST 2016, ESIA (Iringa Msembe Road), CITES.



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## Terms of Reference

### **PROJECT: UPGRADING OF IRINGA–MSEMBE ROAD (104 KM) TO BITUMEN STANDARD IN IRINGA MUNICIPALITY AND IRINGA DISTRICT, IRINGA REGION, TANZANIA**

#### **Overview**

This methodology describes the approach and methods to be used to conduct the additional biological assessment for the proposed project. The main goal is to prepare a Biodiversity Management Plan (BMP) as part of the Environmental and Social Impact Assessment (ESIA) report.

#### **A. Fauna assessment**

For the fauna study, specific methods for different taxa will be employed covering pre-determined/specific distances of the proposed road (RoW). Data collection will comprise a variety of standard assessment methods such as:

1. Conduct deskwork involving review of existing relevant literature, including the ESIA for the Project, General Management Plans of the existing Protected Areas, Projects reports, published papers, policies, laws and regulations relating to biological aspects in the project area.

The review will aim at documenting the existing information on the following parameters to ascertain:

1. Fauna groups distribution, diversity and abundance/species richness, their migratory status and patterns amongst others;
2. Information on ecologically important or sensitive habitats, including national parks/wildlife protected areas i.e. national parks, wildlife sanctuaries, conservation and community reserves amongst others as well as any significant natural sites in the project areas;
3. Establish conservation status of faunal groups in the project areas in terms of being; *rare*, *vulnerable*, *threatened* or *endangered species*.
4. Conduct field surveys with the aim to:
  - a. Identify and categorize the various habitat types in the areas crossed by the project. The categorization should be based on conservation and sensitivity values in terms of national, regional, as well as global significance as shown by species types and their conservation status. This will also be complemented through documentary review;
  - b. Directly observe (field observations) and analyse various faunal parameters to supplement the literature review;
  - c. Conduct interviews with local communities on various faunal parameters.
5. To assess the envisaged negative impact of the proposed road project on the faunal diversity along the areas of the road project, field interviews with representatives of the communities in villages along the RoW will be conducted. This information will be supplemented by documentary review.
6. Preparation of the BMP: Information compiled from (a-c) will be used to prepare the draft Biodiversity Management Plan, showing objectives, activities and implementation schedule. The BMP will be prepared to the extent possible considering outline in the Guidance Note for ESS6.



## **2. Methods for Flora assessment**

In order to conduct the assessment of the flora survey in the project site, the following data collection methods will be employed.

**Desk review:** A desktop review of existing information on floristic studies conducted in the landscape and specifically within the project site (mainly MBOMIPA WMA) will be conducted by the technical team. This will include, but not limited to published and unpublished reports, books, and journal papers. The ESIA for the project will form the back bone of the review. Further, the existing policies and legislations will also be covered. The identification of the threatened plant species will be conducted through the review of the current CITES list (Convention on International Trade on Endangered Species of Wild Fauna and Flora) released in 2021, the International Union for Conservation of Nature (IUCN) Red List of threatened plant species and the United Republic of Tanzania National Biodiversity Strategy and Action Plan (NBSAP) 2015-2020.

**Field survey and data collection:** Field surveys will be conducted to collect floral information that will supplement the desk review.

This will include:

1. Do a description of plant/vegetation groups in the project areas in terms of their distribution, diversity and abundance/species richness amongst others
2. The plant community types in the project areas (especially along the road corridor) will be classified, based on existing literature as either forests, woodlands, grasslands, bush land, or agricultural land
3. Direct field observations to determine and document the type of vegetation composition such as forest ecosystems i.e. closed forests, woodlands, bush lands, grasslands and agricultural lands
4. Conducting key informant interviews with representatives from the community, and making direct observations.
5. Documenting the existing (of any) of invasive plant species in the areas of the project and assess their risks from conservation and agriculture perspectives through direct field observations
6. Propose measures to be undertaken in the project to ensure sustainability of the project with respect to mitigating and enhancing its vegetation diversity.

Each identified plant in the study system will be assigned with conservation status following the combination of CITES list and IUCN. Finally, the collected information will be used to inform the Biodiversity Management Plan.