APPENDIX B.REFERENCES

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APPENDIX C.WATER QUALITY ASSESSMENT

KAPICHIRA DAM REHABILITATION PROJECT

Environmental and Social Impact Assessment

WATER QUALITY ASSESSMENT REPORT

Date: 17th December 2024

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ABBREVIATIONS

EGENCO……Electricity Generation Company Malawi Limited

EPRP……Emergency Power Restoration Project

ESIA ……Environmental and Social Impact Assessment

HPP……Hydropower Plant

MBS……Malawi Bureau of Standards

UNIMA……University of Malawi

WATER QUALITY ASSESSMENT

Samples were collected at various points within the project area. Some tests were carried on site while others were done in the laboratory. The tests covered physical and chemical properties.

Physical properties were measured using a Hanna probe and these are;

- PH
- Temperature
- Electric conductivity
- Total dissolved solids
- Oxidation reduction potential
- Percentage saturation of dissolved Oxygen present in the water
- Amount of dissolved oxygen present in the water
- Pressure of the water

Chemical properties were measured at the Malawi Bureau of Standards (MBS) laboratory and the University of Malawi laboratory. The chemical properties that were measured are:

- Biological oxygen demand
- Total alkalinity
- Chemical Oxygen Demand
- Anions SO42-
- Anions CO32-
- Anions HCO3-
- Calcium
- Magnesium
- Nutrients NO3-
- Nutrients NO2-
- Nutrients NH4+
- Nutrients Ntot
- Nutrient Ptot
- Nutrient PO43-
- Total dissolved Fe
- Aggressive CO2
- Total suspended solids
- Total organic carbon
- Total inorganic carbon
- Dissolved organic carbon
- Chlorophyll A
- Mercury

Field Work

The first water sampling campaign was conducted from the 7th to 15th August 2024 on Shire River. A total of eighteen water samples were collected. Prior to collecting the water sample each container was first rinsed thrice with the sampled water. The second water sampling campaign was done from the 21st to 22nd of November 2024, this was done is 2 trips due to logistics as there are some chemical parameters that needs to be tested within 24 hours after sample collection.

The properties of water investigated in the second campaign were ;

- Chlorophyll A
- Total inorganic carbon
- Aggressive CO2

Sampling Locations

A Judgmental sampling design protocol was applied in the selection of study stations, taking into account ecological features, geographical location of communities and control points in upstream and downstream of the project environment. The coordinates of sampling locations are shown in Table 1.

Table 1: Sampling Station

STATION NAME	STATION CODE	ENVIRONMENTAL SPHERE	EASTING	NORTHING
Kapichira-bridge 500m downstream	KD1	Surface water	15.907043	34.753840
Kapichira-bridge downstream	KD2	Surface water	15.914389	34.757244
Kapichira bridge 1km downstream from the bridge	KD3	Surface water	15.914998	34.760102
Kapichira dam upstream	KD4	Surface water	15.895330	34.754038
Kapichira main dam	KD5	Surface water	15.893599	34.752134
Kapichira-Nakamba river upstream dam	KD6	Surface water	15.870826	34.746372
Kapichira dam upstream 600m from the dam	KD7	Surface water	15.890071	34.744617
Kapichira main dam 200m from the dam	KD8	Surface water	15.892627	34.745806
Kapichira main dam east side	KD9	Surface water	15.88878	34.75647
Kapichira dam downstream	KD10	Surface water	15.8955	34.7476
Kapichira bridge downstream	KD11	Surface water	15.91628	34.7487
kapichira bridge downstream kapichira (between dam and bridge)	KD12	Surface water	15.9011	34.7499
kapichira dam between the dam and the bridge (200m downstream	KD13	Surface water	15.896702	34.749677
Kapichira - bridge downstream Maganga 1	KD14	Surface water	15.929759	34.758926
Chikwawa shire flood plains (east side)	KD15	Surface water	15.9874	34.8024
Chikwawa at bridge – shire	KD16	Surface water	16.03338	34.80187
Mchere village shire -flood plains	KD17	Surface water	16.1351	34.8917

Pictures





Picture (left and right); measuring physical properties using the Hanna probe



Picture 3: Measuring water temperature directly from the river.

RESULTS

Below are the water properties results from the Hanna probe:

No	Parameter	KD1	KD2	KD3	KD4	KD5	KD6	KD7	KD8	KD9	KD10	KD11	KD12	KD13	KD14	KD15	KD16	KD17	KD18
1	pH	8.27	8.5	8.59	8.62	8.23	8.67	8.11	8.47	8.42	8.34	8.29	8.1	8.1	8.43	7.99	8.36	7.75	7.76
2	Temperature	23.59	23.22	23.56	23.8	24.65	26.07	24.47	24.52	23.94	23.41	25	23.1	23.1	24.4	22.1	24.3	23.98	24.96
3	Total dissolved solids	128	130	124	128	128	128	131	129	128	223	120	224	224	128	195	130	187	238
4	Oxidation reduction potential	100.6	68.7	48.3	28.4	72.7	51.5	60.4	63.7	29.6	26	45.3	53.9	54.1	39.7	37.9	102.9	54.8	79.4
5	Percentage saturation of dissolved Oxygen present in the water	94.9	89	95	99.7	98	113.2	100.2	98.9	95	77.2	101.8	79.6	79.5	96.1	57.8	89.2	49.5	59.2
6	Amount of dissolved oxygen present in the water	8.08	7.61	8.07	8.31	8	9	8.25	8.13	7.89	6.46	8.32	6.72	6.71	8.02	4.99	7.41	4.17	4.9
7	Pressure	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.21	0.12	0.12	0.19	0.12	0.18	0.29
8	µS/cm	256	261	248	256	256	257	261	258	257	446	259	447	447	255	389	259	373	470
9	µS/cmA	249	252	241	250	254	262	259	256	252	432	260	431	431	252	368	256	366	470

Below are the water property results from MBS and UNIMA laboratory:

No	Parameter	KD1	KD2	KD3	KD4	KD5	KD6	KD7	KD8	KD9	KD10	KD11	KD12	KD13	KD14	KD15	KD16	KD17	KD18
1	Total alkalinity	165.64	165.64	153.34	185.32	147.6	155.8	145.96	145.96	150.06	243.54	145.96	151.7	297.98	151.7	169.74	184.04	182.04	273.8
2	BOD	0.57	1.78	0.85	1.29	0.97	0.99	1.98	0.87	1.02	0.98	1.57	1.65	0.42	2.47	1.57	0.89	0.39	0.9
3	COD	17	8	2	15	32	13	16	16	7	13	17	2	28	11	12	5	25	25
4	Dissolved organic carbon	4.38	26.69	13.14	11.81	8.79	4.5	12.78	3.69	7.75	6.27	30.83	11.88	4.56	13.92	22.64	5.25	12.2	5.25
5	Total organic carbon	11.28	55.24	26.9	25.05	18.34	11.25	27.54	10.15	18.5	11.32	53.3	25.35	11.45	27.82	45.2	10.25	24.65	12.01
6	Total inorganic carbon	7.04	49.28	21.12	17.6	14.08	7.04	21.12	7.04	14.08	7.04	17.6	-	-	21.12	35.2	7.04	17.6	7.04
7	SO42-	1.35	1.19	0.98	0.99	0.94	0.06	0.88	1.03	1	1.25	1.02	1.1	1.43	0.99	0.99	1.12	2.2	1.68
8	CO32-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	HCO3-	202	202	187	226	180	190	178	178	183	297	178	185	339	185	185	207	222	334
10	Calcium	141.1	153.6	159.2	156.6	159	158.1	158.1	155	155	170.4	153.3	156.3	214.5	154.1	178	161.8	165.5	174.7
11	Mg	22.66	22.63	22.68	22.87	22.69	22.7	22.9	22.83	22.66	24.7	22.72	22.84	24.67	22.72	24.32	22.78	23.18	24.99
12	NO3-	1.3	1.6	0.3	3.9	0	4	0.9	0	3.2	3.1	0.6	0.1	2.3	0.6	0.6	2.2	0.2	3.2
13	NO2-	0.03	0.04	0.03	0.33	0.02	0.01	0.03	0.08	0.03	0.04	0.03	0.17	0.19	0	0	0.04	0.04	0.45
14	NH4+	0.01	0.02	0	0.03	0	0.02	0	0.03	0.01	0.17	0.02	0.01	0.03	0.07	0.07	0.31	0	0.21
15	Ntot	0.29	0.1	0.026	0.08	0.28	0.28	0.27	0.28	0.27	0.26	0.24	0.23	0.25	0.53	0.53	0.24	0.1	0.25
16	Ptot	0.04	0	0	0.04	0.03	0.03	0.03	0.05	0.05	0.09	0	0.12	0.11	0.05	0.05	0	0.04	0.04
17	PO43-	0.11	0	0	0.12	0.1	0.1	0.12	0.1	0.1	0.09	0.14	0.15	0.27	0	0.36	0.34	0.15	0.15
18	Mercury	bdl	bdl	bdl	bdl	bdl	bdl	Bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
19	Iron	0.08	0.1	0.09	0.05	0.1	0.07	0.09	0.08	0.09	0.09	0.1	0.09	0.1	0.09	0.09	0.09	0.1	0.09
20	Aggressive CO2 (mg/L)	9900	9900	9779	8780	9419	9966	9966	9735	9856	10208	8995	-	-	9350	9235	10032	8727	8635
21	ChlorophyllA	0.427	0.267	0.374	0.374	0.091	0.036	0.096	0.155	0.054	0.021	0.047	-	-	0.048	0.246	0.205	0.214	0.302
22	TSS	306	312	263	251	304	264	197	518	194	416	180	163	306	248	296	168	214	165

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Our Ref code: BS/LAB/35/4

Our Date: 2025-01-17

RUO CONSULTANTS Ltd
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CHICHIRI
BLANTYRE 3

REPORT No. (S) : **CHE/24/BB 124 A**
SAMPLE TYPE : **River Water**
MBS No (S). : **BB 11922-BB 11924**
SAMPLE CODE/REFERENCE No (S) :**Kapichira bridge downstream, Lat. 15.91628, Long: 34.7489, 21/11/24, T= 09:15am, Kapichira Main Dam downstream, Lat: 15.8956, Long: 34.7476, 21/11/24, T=08:34am, Kapichira Main, 22/11/24, T=08:07am**

SAMPLED BY : **Justin Mtawali**
DATE SAMPLE (S) RECEIVED : **22/11/2024**
DATE TEST (S) STARTED : **22/11/2024**
DATE TEST (S) COMPLETED : **17/01/2025**
SAMPLE CONDITION : **Received in closed plastic bottles**
ACCREDITATION : **N/A**

1.0 TESTS REQUIRED & METHODS

Aggressive carbon : Gravimetric

2.0 RESULTS

MBS NO	**BB 11922**	**BB 11923**	**BB 11924**
Sample ID	Kapichira bridge downstream, Lat. 15.91628, Long: 34.7489, 21/11/24, T= 09:15am,	Kapichira Main Dam downstream, Lat: 15.8956, Long: 34.7476, 21/11/24, T=08:34am	Kapichira Main, 22/11/24, T=08:07am
Aggressive carbon, mg/L	8995	8780	9419

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Our Ref code: BS/LAB/35/4

Our Date: 2025-01-17

3.0 DECISION RULE

N/A

4.0 OPINION & INTERPRETATION OF RESULTS

N/A

5.0 CONDITIONS/DISCLAIMER

This report relates only to the sample tested as received and does not imply approval by the Malawi Bureau of Standards of the quality and/or performance of the commodity that has been tested. It shall not be reproduced except in full without written approval of the Malawi Bureau of Standards.

Stephen M Kuyeli
Director of Testing Services
FOR: DIRECTOR-GENERAL
SMK/mm

Masautso Mtuta
Technical Signatory

End of Report

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Our Ref code: BS/LAB/35/4

Our Date: 2025-01-27

RUO CONSULTANTS Ltd
P.O. Box 31371
CHICHIRI
BLANTYRE 3

REPORT No. (S)	**: CHE/24/BB 124**
SAMPLE TYPE	**: River Water**
MBS No (S).	**: BB 11956-BB 11965**
SAMPLE CODE/REFERENCE No (S)	**: Kapichira Maganga 2 Village, T10:26 am, 22/11/2024; Kapichira bridge (Downstream) 1 Km from the bridge, T=9:35 am, 22/11/2024; Kapichira main dam, Eastside, Lat. 15.8955, Long. 34.7476, T=9:49am, 22/11/2024; Kapichira dam Downstream, Lat. 15.8955, Long. 34.7476, T=8:13am, 22/11/2024; Lisuzu Shire flood plains, Lat. 16.03345, Long. 34. 81049, T=11:45am, 22/11/2024; Kapichira bridge (Downstream) 500m from the bridge, Lat. 15.91628, Long. 34.7489, T=7:27 am, 22/11/2024; Kapichira main dam 200m from main dam, T=8:00 am, 22/11/2024; Kapichira dam, upstream, T=9:10 am, 22/11/2024; Kapichira dam, upstream, 60 m, 22/11/2024; Kapichira, Nakamba river upstream, T=8:31am, 22/11/2024**
SAMPLED BY	**: Justin Mtawali**
DATE SAMPLE (S) RECEIVED	**: 22/11/2024**
DATE TEST (S) STARTED	**: 22/11/2024**
DATE TEST (S) COMPLETED	**: 17/01/2025**
SAMPLE CONDITION	**: Received in closed plastic bottles**
ACCREDITATION	**: N/A**

MALAWI BUREAU OF STANDARDS
Promoting Standardization and Quality Assurance in Malawi

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Our Ref code: BS/LAB/35/4

Our Date: 2025-01-27

1.0 TESTS REQUIRED & METHODS

Aggressive carbon : Gravimetric

2.0 RESULTS

MBS NO	BB 11956	BB 11957	BB 11958
Sample ID	Kapichira Maganga 2 Village, T10:26 am, 22/11/2024	Kapichira bridge (Downstream) 1 Km from the bridge, T=9:35 am, 22/11/2024	Kapichira main dam, Eastside, Lat. 15.8955, Long. 34.7476, T=9:49am, 22/11/2024
Aggressive carbon, mg/L	9,350	9,779	9,856

MBS NO	BB 11959	BB 11960	BB 11961
Sample ID	Kapichira dam Downstream, Lat. 15.8955, Long. 34.7476, T=8:13am, 22/11/2024	Lisuzu Shire flood Plains, Lat. 16.03345, Long. 34. 81049, T=11:45am, 22/11/2024	Kapichira bridge (Downstream) 500m from the bridge, Lat. 15.91628, Long. 34.7489, T=7:27 am, 22/11/2024
Aggressive carbon, mg/L	10,208	10,032	9,900

MBS NO	BB 11962	BB 11963	BB 11964
Sample ID	Kapichira main dam 200m from main dam, T=8:00 am, 22/11/2024;	Kapichira dam, upstream, T=9:10 am, 22/11/2024	Kapichira dam, upstream, 60 m, 22/11/2024
Aggressive carbon, mg/L	9,735	9,966	9,966

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MBS NO	**BB 11965**
Sample ID	Kapichira, Nakamba river upstream, T=8:31am, 22/11/2024
Aggressive carbon, mg/L	9,966

3.0 DECISION RULE

N/A

4.0 OPINION & INTERPRETATION OF RESULTS

N/A

5.0 CONDITIONS/DISCLAIMER

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Director of Testing Services
FOR: DIRECTOR-GENERAL
SMK/mm

Masautso Mtuta
Technical Signatory

End of Report

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Our Ref code: BS/LAB/35/4

Our Date: 2024-12-13

RUO CONSULTANTS Ltd
P.O. Box 31371
CHICHIRI
BLANTYRE 3

REPORT No. (S)	**: CHE/24/BB 123**
SAMPLE TYPE	**: River Water**
MBS No (S).	**: BB 11819-BB 11821**
SAMPLE CODE/REFERENCE No (S)	**: Chikwawa Shire floods plain Lat: 15.9874, Long: 34.8024 Eastside 20/11/2024, 07:10 am; Mchere village Shire floods plain, Lat. 16.1351, Long. 34.8917, 05:42 am 20/11/2024; Chikwawa bridge, Lat. 16.03338, Long. 34.8018**
SAMPLED BY	**: Justin Mtawali**
DATE SAMPLE (S) RECEIVED	**: 20/11/2024**
DATE TEST (S) STARTED	**: 20/11/2024**
DATE TEST (S) COMPLETED	**: 13/12/2024**
SAMPLE CONDITION	**: Received in closed plastic bottles**
ACCREDITATION	**: N/A**

2.0 TESTS REQUIRED & METHODS

Aggressive carbon	: Gravimetric

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Our Ref code: BS/LAB/35/4

Our Date: 2024-12-13

3.0 RESULTS

MBS NO	BB 11819	BB 11820	BB 11821
Sample ID	Chikwawa Shire floods plain Lat: 15.9874, Long: 34.8024 Eastside 07:10 am 20/11/2024,	Mchere village Shire floods plain, Lat. 16.1351, Long. 34.8917, 05:42 am 20/11/2024	Chikwawa bridge, Lat. 16.0338, Long. 34.8018, 06:10 am, 20/11/2024,
Aggressive carbon, mg/L	9235.6	8635	8727.4

4.0 DECISION RULE

N/A

5.0 OPINION & INTERPRETATION OF RESULTS

N/A

6.0 CONDITIONS/DISCLAIMER

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Stephen M Kuyeli
Director of Testing Services
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Our Date: 2024-09-19

Mchere village Shire-flood plains, Longtitude=34.8917, Latitude=16.03338, T=09:05 am, 15/08/2024; Lisuli Shire-flood plains,Longitude=34.81049, Latitude=16.03345, T=10.18am,15/08/2024,

SAMPLED BY : **Justin Mtawali**
DATE SAMPLE (S) RECEIVED : **20/08/2024**
DATE TEST (S) STARTED : **20/08/2024**
DATE TEST (S) COMPLETED : **19/09/24**
SAMPLE CONDITION : **Received in closed plastic bottles**
ACCREDITATION : **N/A**

1.0 TESTS REQUIRED & METHODS

Biochemical Oxygen Demand	: DO Meter (Hanna HI 98193)
Chemical Oxygen Demand	: photometric (Hanna HI 83314)
Total Suspended Solids	: Gravimetric (MS 539:2013)
Sulphates	: Gravimetric (MS 539:2013)
Carbonate	: Titrimetric (MS 539:2013)
Bicarbonate	: Titrimetric (MS 539:2013)
Nitrates	: Photometer HI83314
Nitrites	: Photometer HI83314
Ammonia	: Photometer HI83314
Nitrogen	: photometric (Hanna HI 83314)
Total Phosphorus	: UV-Vis Spectrophotometric
Phosphate	: UV-Vis Spectrophotometric
Calcium	: Atomic absorption spectrophotometer (AAS)
Magnesium	: Atomic absorption spectrophotometer (AAS)
Iron	: Atomic absorption spectrophotometer (AAS)

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2.0 RESULTS

MBS No.	**BB 8155**	**BB 8163**	**BB 8152**
Sample ID	Kapichira bridge 500 m downstream, T=09:21 am, 07/08/2024	Kapichira bridge downstream, T=08:33 am, 07/08/2024	Kapichira bridge 1 km downstream from the bridge, T=08:26 am, 08/08/2024;
BOD, mg/l	0.57	1.78	0.85
COD, mg/l	17	8	2
Total Suspended Solids, mg/l	306	312	263
Sulphates, m/l	1.35	1.19	0.98
Carbonates, m/l	0.00	0.00	0.00
Bicarbonates, mg/l	202	202	187
Nitrates, mg/l	1.30	1.60	0.30
Nitrites, mg/l	0.03	0.04	0.03
Ammonia, mg/l	0.01	0.02	0.00
Nitrogen, mg/l	0.29	0.10	0.026
Total phosphorus, mg/l	0.04	0.00	0.00
Phosphates, mg/l	0.11	0.00	0.00
Calcium, mg/l	141.10	153.60	159.20
Magnesium, mg/l	22.66	22.63	22.68
Iron, mg/l	0.08	0.10	0.09

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Our Date: 2024-09-19

MBS No.	**BB 8146**	**BB 8159**	**BB 8160**
Sample ID	Kapichira dam upstream, T=09:31 am, 09/08/2024	Kapichira main dam, T=14:40 am, 09/08/2024	Kapichira Nakamba river upstream dam, T=13:53 am, 09/08/2024
BOD, mg/l	1.29	0.97	0.99
COD, mg/l	15	32	13
Total Suspended Solids, mg/l	251	304	264
Sulphates, m/l	0.99	0.94	0.06
Carbonates, m/l	0.00	0.0	0.00
Bicarbonates, mg/l	226	180	190
Nitrates, mg/l	3.90	0.00	4.0
Nitrites, mg/l	0.33	0.02	0.01
Ammonia, mg/l	0.03	0.00	0.02
Nitrogen, mg/l	0.08	0.28	0.28
Total phosphorus, mg/l	0.04	0.03	0.03
Phosphates, mg/l	0.12	0.10	0.10
Calcium, mg/l	156.6	159.00	158.10
Magnesium, mg/l	22.87	22.69	22.70
Iron, mg/l	0.05	0.10	0.07

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MBS No.	**BB 8147**	**BB 8157**	**BB 8161**
Sample ID	Kapichira dam upstream 600 km from the dam, T:11:51am, 09/08/2024	Kapichira main dam 200 km from the dam, T=11:03 am, 10/08/2024	Kapichira main dam east side dam, T=09:41 am, 10/08/2024
BOD, mg/l	1.98	0.87	1.02
COD, mg/l	16	16	7
Total Suspended Solids, mg/l	197	518	194
Sulphates, m/l	0.88	1.03	1.00
Carbonates, m/l	0.00	0.00	0.00
Bicarbonates, mg/l	178	178	183
Nitrates, mg/l	0.90	0.00	3.20
Nitrites, mg/l	0.03	0.08	0.03
Ammonia, mg/l	0.00	0.03	0.01
Nitrogen, mg/l	0.27	0.28	0.27
Total phosphorus, mg/l	0.03	0.05	0.05
Phosphates, mg/l	0.09	0.14	0.15
Calcium, mg/l	158.10	155.00	155.00
Magnesium, mg/l	22.90	22.83	22.66
Iron, mg/l	0.09	0.08	0.09

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Our Ref code: BS/LAB/35/4

Our Date: 2024-09-19

MBS No.	**BB 8151**	**BB 8149**	**BB 8150**
Sample ID	Kapichira dam, downstream, Longitude = 34.7476, Latitude = 15.8955, T=09:26, 12/08/2024	Kapichira bridge downstream, Longitude=34.7487, Latitude= 15.91268T=14:38 pm, 12/08/2024, S3	Kapichira (between dam and bridge) , Longitude = 34.7499, Latitude 15.9011, T= 11:58 am, 12/08/2024
BOD, mg/l	0.98	1.57	1.65
COD, mg/l	13	17	2
Total Suspended Solids, mg/l	416	180	163
Sulphates, m/l	1.25	1.02	1.10
Carbonates, m/l	0.00	0.00	0.00
Bicarbonates, mg/l	297	178	185
Nitrates, mg/l	3.10	0.60	0.10
Nitrites, mg/l	0.04	0.03	0.17
Ammonia, mg/l	0.17	0.02	0.01
Nitrogen, mg/l	0.26	0.24	0.23
Total phosphorus, mg/l	0.09	0.00	0.12
Phosphates, mg/l	0.27	0.00	0.36
Calcium, mg/l	170.40	153.30	156.30
Magnesium, mg/l	24.70	22.72	22.84
Iron, mg/l	0.09	0.10	0.09

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Our Ref code: BS/LAB/35/4

Our Date: 2024-09-19

MBS No.	**BB 8156**	**BB 8154**	**BB 8153**
Sample ID	Kapichira dam between dam and bridge (200 m downstream, T=10:10am, 12/08/2024	Kapichira bridge downstream, Maganga 1, T= 11;54 am, 13/08/2024	Chikwawa Shire flood plain (east side), Longitude=34.8024, Latitude=15.9874, T=06:24 am, 14/08/2024
BOD, mg/l	0.42	2.47	1.57
COD, mg/l	28	11	12
Total Suspended Solids, mg/l	306	248	296
Sulphates, m/l	1.43	0.99	0.99
Carbonates, m/l	0.00	0.00	0.00
Bicarbonates, mg/l	339	185	185
Nitrates, mg/l	2.30	0.60	0.60
Nitrites, mg/l	0.19	0.00	0.00
Ammonia, mg/l	0.03	0.07	0.07
Nitrogen, mg/l	0.25	0.53	0.53
Total phosphorus, mg/l	0.11	0.05	0.05
Phosphates, mg/l	0.34	0.15	0.15
Calcium, mg/l	214.50	154.10	178.00
Magnesium, mg/l	24.67	22.72	24.32
Iron, mg/l	0.10	0.09	0.09

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Our Date: 2024-09-19

MBS No.	**BB 8162**	**BB 8158**	**BB 8148**
Sample ID	Chikwawa at bridge-Shire Longitude=34.80187, Latitude=16.03338, T=10:09 am, 14/08/2024	Mchere village Shire-flood plains, Longtitude=34.8917, Latitude=16.03338, T=09:05 am, 15/08/2024	Lisuli Shire-flood plains, Longitude= 34.81049, Latitude=16.03345, T=10.18am, 15/08/2024
BOD, mg/l	0.89	0.39	0.90
COD, mg/l	5	25	25
Total Suspended Solids, mg/l	168	214	165
Sulphates, m/l	1.12	2.20	1.68
Carbonates, m/l	0.00	0.00	0.00
Bicarbonates, mg/l	207	222	334
Nitrates, mg/l	2.20	0.20	3.20
Nitrites, mg/l	0.04	0.04	0.45
Ammonia, mg/l	0.31	0.00	0.21
Nitrogen, mg/l	0.24	0.10	0.25
Total phosphorus, mg/l	0.00	0.04	0.04
Phosphates, mg/l	0.00	0.12	0.12
Calcium, mg/l	161.80	165.50	174.70
Magnesium, mg/l	22.78	23.18	24.99
Iron, mg/l	0.09	0.10	0.09

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Our Ref code: BS/LAB/35/4

Our Date: 2024-09-19

3.0 DECISION RULE

N/A

4.0 OPINION & INTERPRETATION OF RESULTS

N/A

5.0 CONDITIONS/DISCLAIMER

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RESULTS

To: Tamanda Hauya
Ruo Consultants
Blantyre
tamanda.hauya@ruoconsultants.com

Date: 4 December, 2024

Invoice No: ICU/RUO/12/2024

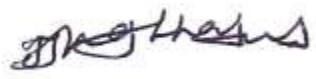
Sn	Sample Name	Date sampled	CO2(mg/L)
1	Chikwawa Shire flood plains eastside	20/11/2024	**35.20**
2	Mchere village shire flood plains	20/11/2024	**17.60**
3	Chikwawa at bridge	20/11/2024	**7.04**
4	Kapichira bridge down stream	22/11/2024	**49.28**
5	Kapichira main dam	22/11/2024	**14.08**
6	Kapichira main dam downstream	21/11/2024	**17.60**
7	Kapichira main dam 200m from Dam	22/11/2024	**7.04**

8	Kapichira Nakumbu River upstream Dam	22/11/2024	**7.04**
9	Kapichira Bridge downstream 500m from bridge	22/11/2024	**7.04**
10	Kapichira Dam(upstream)	22/11/2024	**17.60**
11	Kapichira Dam(down stream)	22/11/2024	**7.04**
12	Kapichira BridgeDownstream 1km from bridge		**21.12**
13	Kapichira Maganga 1village	22/11/2024	**21.12**
14	Kapichira Main dam(east-side)	22/11/2024	**14.08**
15	Kapichira Dam(upstream 600m fromDam)	22/11/2024	**21.12**
16	Lisulu-Shire flood plains	22/11/2024	**7.04**
17	Control		**0.00**

Sn	Sample name	Date sampled	Chlorophyll mg/L
1	Kapichira Dam upper stream	22/11/2024	**0.374**
2	Kapichira Dam upper stream Main dam east	22/11/2024	**0.054**
3	Lisulu Stream Flood plain	22/11/2024	**0.302**
4	Chikhwawa Bridge	20/11/2024	**0.205**
5	Mchere Village Flood Plain	20/11/2024	**0.214**
6	Kapichira Dam upper stream Dam Down Stream	22/11/2024	**0.267**
7	Kapichira Dam upper stream Bridge Down Stream I km	22/11/2024	**0.374**
8	Kapichira Dam upper stream Maganga Village	22/11/2024	**0.048**
9	Kapichira Dam upper stream (bridge down)	21/11/2024	**0.047**
10	Chikhwawa Shire Flood Plain	21/11/2024	**0.246**
11	Kapichira Main Dam	20/11/2024	**0.091**
12	Kapichira Dam upper stream 600 m	22/11/2024	**0.096**
13	Kapichira Dam Down Stream	21/11/2024	**0.021**
14	Kapichira Nakumbu River	22/11/2024	**0.036**
15	kapichira main dam 200 m from dam	22/11/2024	**0.155**
16	Kapichira Bridge Down Stream 500m from bridge	22/11/2024	**0.427**

Sn	Sample name	Date sampled	Hg(mg/L	DOC(mg/L)	TOC(mg/L)
1	Kipichira main dam	9/8/2024	**bdl**	**8.79**	**18.34**
2	Kapichira bridge 500m downstream	7/8/2024	**bdl**	**4.38**	**11.28**
3	Kapichira bridge downstream	7/8/2024	**bdl**	**26.69**	**55.24**
4	Kapichira Dam (bwtn dam & bridge) Down stream 200m	12/8/2024	**bdl**	**4.56**	**11.45**
5	Kapichira bridge downstream Maganga 1	13/8/2024	**bdl**	**13.92**	**27.82**
6	Kapichira bridge1 km from bridge(dwonstream) Maganga vge 1	8/8/2024	**bdl**	**13.14**	**26.9**
7	Chikwawa Shire Flood plain eastside	14/82024	**bdl**	**22.64**	**45.2**
8	Kapichira Nakumbu river upstream Dam	9/8/2024	**bdl**	**4.5**	**11.25**
9	Kapichira Dam(upstream) 600m from dam	9/8/2024	**bdl**	**12.78**	**27.54**
10	Kapichira main dam east-side	10/8/2024	**bdl**	**7.75**	**18.5**
11	Chikwawa at bridge shire	14/8/2024	**bdl**	**5.25**	**10.25**
12	Kapichira bridge downstream	12/8/2024	**bdl**	**30.83**	**53.3**
13	Kapichira(bwtn Dam & bridge)	12/8/2024	**bdl**	**11.88**	**25.35**
14	Kapichira dam upstream	9/8/2024	**bdl**	**11.81**	**25.05**
15	Mchere village shire Flood plains		**bdl**	**12.2**	**24.65**
16	Kapichira main dam 200m from main Dam	10/8/2024	**bdl**	**3.69**	**10.15**
17	Lisuli shire flood plains	15/8/2024	**bdl**	**5.25**	**12.01**
18	Kapichira Dam downstream	12/8/2024	**bdl**	**6.27**	**11.32**

Thank you for consulting with us



Timothy Mguntha – 0888314677.

ICU Liaison Officer

CERTIFICATE OF ACCREDITATION

MALAWI BUREAU OF STANDARDS (TESTING)

Malawi Bureau of Standards Act No: 14 of 2012

Facility Accreditation Number: TEST-5 0033

is a SADCAS accredited Testing Laboratory
provided that all SADCAS conditions are complied with

This certificate is valid as per the scope stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

CHEMICAL ANALYSIS

The facility is accredited in accordance with the recognized International Standard

ISO/IEC 17025:2017

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

SADCAS is a subsidiarity organization of SADC. A memorandum of understanding between SADC and SADCAS serves as the basis for the recognition of SADCAS by SADC Member States as a multi-economy accreditation body

Eve Christine Gadzikwa
SADCAS Chief Executive Officer

Date of Renewal of Accreditation: 20 October 2023
Effective Date (Issue No: 1): 20 October 2023
Certificate Expires: 19 October 2028

ANNEXURE A

SCHEDULE OF ACCREDITATION

CHEMICAL ANALYSIS (FOOD)

Laboratory Accreditation Number: TEST-5 0033 (ISO/IEC 17025:2017)

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Mr H Mhango (BS/LAB/WI/PEST/07)
Mr S Nyirenda (BS/LAB/WI/PEST/07)
Mr C Banda (BS/LAB/WI/PEST/07)
Mr B Kanyenda (BS/LAB/WI/FC/26 & (BS/LAB/WI/MYCO/07)

Nominated Representative : Mr S M Kuyeli

Issue No : 03
Date of Issue : 17 February 2025
Expiry Date : 19 October 2028

MATERIALS/PRODUCTS TESTED	TYPES OF TESTS/PROPERTIES MEASURED, RANGE OF MEASUREMENT	STANDARD SPECIFICATIONS, EQUIPMENT/TECHNIQUES USED
Food Products Cereal, Pulses and Related Products	Determination of: Total Aflatoxins (2–150 ppb)	LAB/WI/FC/26 - Reveal Q+ with Lateral flow immune immunochromatographic technique
Food Products Macadamia nuts and related products and Cereal, Pulses and Related Products	Determination of Mycotoxins: - Total aflatoxins - Aflatoxin B_1 - Fumonisin B_1 - Deoxynivanol (DON) - Zearalane (Zea) - Ochratoxins (OTA)	LAB/WI/MYCO/02 by HPLC
Food Products Juices	Determination of Mycotoxins: Patulin	LAB/WI/MYCO/02 by HPLC
Food Products Macadamia, other Nuts and Honey	Determination of Pesticide Residues	BS/LAB/WI/PEST/0 by LC-MS-MS

ANNEXURE A

SCHEDULE OF ACCREDITATION

CHEMICAL ANALYSIS (FUEL)

Laboratory Accreditation Number: TEST-5 0033 (ISO/IEC 17025:2017)

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Mr H Mhango (All methods)

Nominated Representative : Mr S M Kuyeli

Issue No : 03
Date of Issue : 17 February 2025
Expiry Date : 19 October 2028

MATERIALS/PRODUCTS TESTED	TYPES OF TESTS/PROPERTIES MEASURED, RANGE OF MEASUREMENT	STANDARD SPECIFICATIONS, EQUIPMENT/TECHNIQUES USED
Petrochemicals (Diesel)	Distillation Characteristics	ASTM D86
	Kinetic Viscosity	ASTM D445
	Density	ASTM D4052
	Flashpoint	ASTM D93

Pinkie J Malebe
SADCAS Technical Manager

CERTIFICATE OF ACCREDITATION

MALAWI BUREAU OF STANDARDS (TESTING)

Malawi Bureau of Standards Act No: 14 of 2012

Facility Accreditation Number: TEST-1 0019

is a SADCAS accredited Testing Laboratory
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This certificate is valid as per the scope stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

MICROBIOLOGICAL ANALYSIS

The facility is accredited in accordance with the recognized International Standard

ISO/IEC 17025:2017

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

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Eve Christine Gadzikwa
SADCAS Chief Executive Officer

Date of Renewal of Accreditation 20 October 2023
Effective Date (Issue No: 1): 20 October 2023
Certificate Expires: 19 October 2028

ANNEXURE A

SCHEDULE OF ACCREDITATION

MICROBIOLOGICAL ANALYSIS

Laboratory Accreditation Number: TEST-1 0019 (ISO/IEC 17025:2017)

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Ms G B Phiri (All Methods)
Ms B M Mlande (All methods)
Mr C Chigona (All methods)
Mr T Seleman (All methods)

Nominated Representative : Mr S M Kuyeli

Issue No : 02
Date of Issue : 17 February 2025
Expiry Date : 19 October 2028

MATERIALS/PRODUCTS TESTED	TYPES OF TESTS/ PROPERTIES MEASURED, RANGE OF MEASUREMENT	STANDARD SPECIFICATIONS, EQUIPMENT/ TECHNIQUES USED
Potable Water	Enumeration of:	
	- *E. coli*	LAB/WI01/SOP 02 (ISO 9308-1:2014)
	- Total Coliform Bacteria	LAB/WI01/SOP 02 (ISO 9308-1:2014)
	- Heterotrophic Plate Count	LAB/WI01/SOP 01 (ISO 6222:1999)
Milk & Milk Products		
Yoghurt	Enumeration of:	
Cereals	- Total Plate Count	LAB/WI/MIC 17 (ISO 4833)
Maize& Flour	- Coliforms	LAB/WI/MIC 13 (ISO 4832)
Beverages	- Yeast & Moulds	LAB/WI/MIC 18 (ISO 21527)
Juices	- *E. coli*	LAB/WI/MIC 21 (ISO 16649-2)
Confectionary	- Coagulase-positive Staphylococci	LAB/WI/MIC 20 (ISO 46888-1)
Bread	- Enterobacteriaceae	LAB/WI/MIC 15 (ISO 21528-2)
Meat & Meat Products	- *Bacillus cereus*	LAB/WI/MIC 17 (ISO 4833)
Sausages		
Nuts	Detection of Salmonella spp	LAB/WI/MIC 16 (ISO 7932)
Macadamia nuts, Groundnuts and other related products		

Pinkie J Malebe
SADCAS Technical Manager

CERTIFICATE OF ACCREDITATION

MALAWI BUREAU OF STANDARDS (TESTING)

Malawi Bureau of Standards Act No: 14 of 2012

Facility Accreditation Number: TEST-3 0007

is a SADCAS accredited Testing Laboratory
provided that all SADCAS conditions are complied with

This certificate is valid as per the scope stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

CIVIL ENGINEERING TESTING

The facility is accredited in accordance with the recognized International Standard

ISO/IEC 17025:2017

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

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Eve Christine Gadzikwa
SADCAS Chief Executive Officer

Effective Date (Issue No: 1): 17 February 2025
Certificate Expires: 19 October 2028

ANNEXURE A

SCHEDULE OF ACCREDITATION

CIVIL ENGINEERING TESTING

Laboratory Accreditation Number: TEST-3 0007 (ISO/IEC 17025:2017)

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Ms B Kawombe (All methods)
Mr B Banda (All methods)

Nominated Representative : Mr S M Kuyeli

Issue No : 01
Date of Issue : 17 February 2025
Expiry Date : 19 October 2028

MATERIALS/PRODUCTS TESTED	TYPES OF TESTS/PROPERTIES MEASURED, RANGE OF MEASUREMENT	STANDARD SPECIFICATIONS, EQUIPMENT/TECHNIQUES USED
Cement	Compressive Strength	BS EN 196 -1

Pinkie J Malebe
SADCAS Technical Manager

APPENDIX D.AIR QUALITY ASSESSMENT

MALAWI BUREAU OF STANDARDS

Promoting Standardization and Quality Assurance in Malawi

CONSULTANCY REPORT

Consultancy Title: **Baseline air quality assessment at Kapichira site in Chikwawa**

Client/Sponsor: **Ruo Consultants Limited**

Executing Officer: **Luke Banda**

Supervisor: **Steve D Afuleni (Deputy Director of Testing Services)**

Date: October 2025

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EXECUTIVE SUMMARY

The Malawi Bureau of Standards (MBS) conducted assessment of air quality at seven locations of Kapichira construction project site in Chikwawa namely Quarry Site, Batching Plant Area, African Parks Camp, Contractor's Temporary Camp, Bwalo, Clay Site Junction and Borrow Site.

Several parameters of air quality were assessed including total suspended particulate (TSP), PM_{10}, $PM_{2.5}$, Carbon monoxide (CO), Nitrogen dioxide (NO_2) and Sulphur dioxide (SO_2). The assessment was conducted on the 18th and 19th of September 2025. The aim of the assessment was to obtain baseline air quality data that would act as a benchmark for any anticipated changes that might occur due to anticipated activities. An air quality monitoring station was used to read the air quality parameters at the seven assessment stations.

With the exception of $PM_{2.5}$ at Borrow Site, the average results obtained at all assessment sites were below the limits of 230µg/m^3 for TSP, 150µg/m^3 for PM_{10}, 25µg/m^3 for $PM_{2.5}$, 10mg/m^3 for CO, 110µg/m^3 for NO_2 and 150µg/m^3 for SO_2 stipulated in Malawi Standards MS737:2021. At Borrow Site, the average results of $PM_{2.5}$ were slightly higher (35µg/m^3) against the required maximum of 25µg/m^3. This shows that, over, the baseline air quality at Kapichira site comply with the environmental requirements as stipulated in relevant standards. It is recommended that proper environmental management and monitoring plans be put in place to minimize and monitor potential impact on air quality due to planned activities in the area.

1.0 INTRODUCTION

Recognizing that project activities can have an impact on air quality due to emission of gases from machinery and dust from movement of vehicles, an assessment of baseline air quality was conducted at Kapichira sites in Chikwawa. Baseline air quality assessment helps to check current status of air quality which would act as a benchmark and reference point once project activities begin. This helps to monitor the compliance with environmental requirements and effectiveness of Environmental Management Plan (EMP) of the construction project. With this in mind, assessment of TSP, $PM_{10,}$ $PM_{2.5}$, CO, NO_2 and SO_2 was conducted at the project site in September 2025. This report presents the results of the assessment.

2.0 OBJECTIVES

The objective of the assessment was to obtain baseline air quality data through measurement of TSP, $PM_{10,}$ $PM_{2.5}$, CO, NO_2 and SO_2 that would act as a benchmark for any anticipated changes that might occur once the construction activities at the site begin.

3.0 LITERATURE REVIEW

3.1 Particulate matter

Particulate matter refers to any material, except pure water, that exists in the solid or liquid state in the atmosphere. They are minute and discrete particles capable of settling in gaseous medium. Such materials include dust, smoke, soot, fumes and ash. Particulate matter can come from different sources in the environment. Burning of fuels such as diesel by locomotive engines and movement of vehicles on unpaved roads are among other sources that contribute significantly to particulate matter in the ambient environment. Particulate matter can occur in different sizes ranging from fine particle combustion products to coarse, wind-blown dust particles. Particulate matter can range from $0.1\mu m$ to $30\mu m$ or greater in diameter. Of particular

interest, however, are two sizes namely $PM_{2.5}$ and PM_{10}. This is because particles in this size range make a large proportion of dust that can be drawn deep into the lungs.$PM_{2.5}$ refers to particulate matter up to 2.5microns in diameter while PM_{10} refers to particulate matter up to 10 microns in diameter (Malawi Bureau of Standards, 2021). Total suspended particles (TSP) refers to total mass concentration of particulate matter in the air (US EPA, 2001).

Excess exposure to particulate matter has been associated with several negative health effects. For example, particulate matter has been reported to cause nose and throat irritation, lung damage/cancer, and bronchitis. In extreme cases, health complications resulting from excess exposure to particulate matter may lead to early death. Particulate matter also causes haze that reduces visibility. Furthermore, ashes, soot, smoke and dust affect the aesthetics and discolour structures, furniture and cloths (Malawi Bureau of Standards, 2021).

Legislations, policies and guidelines have been developed in Malawi to control exposure to air pollutants. Standards have also been developed to set exposure limits to air pollutants. Table 1 shows limits of exposure with time as specified in Malawi standard (MS 737:2021).

Table 1: Air pollutants limits in the ambient air in Malawi

Substance	Symbol	Maximum allowable limits (µg/m^3)	Average time
Sulphur dioxide	SO_2	350	1 hour
		150	24 hour
		50	1 year
Carbon monoxide	CO	23 (mg/m^3)	1 hour
		10 (mg/m^3)	8 hour
Nitrogen dioxide	NO_2	290	1 hour
		110	24 hour
Particulate matter	$PM_{2.5}$	25	24 hour
		8	1 year
Particulate matter	PM_{10}	300	1 hour
		150	24 hour
		0.50	1 year
Total suspended particles	TSP	230	24 hour
		90	1 year

Source: Malawi Bureau of Standards, 2021

3.2 Carbon monoxide

Carbon monoxide (CO) is a poisonous, colourless, tasteless and odourless gaseous compound. It is usually formed from incomplete combustion of organic matter such as petroleum products. Incomplete combustion occurs where there is insufficient supply of air (Oxygen) for burning fuel. In burning of fuel, Carbon dioxide is produced if oxygen is present in sufficient amounts.

$$C + O_2 \longrightarrow CO_2$$

In the absence of oxygen, the carbon in fuels reacts with carbon dioxide to produce carbon monoxide

$$C + CO_2 \longrightarrow 2CO$$

Usually in engine fuel burning chambers, there is only a limited supply of air (O_2)

Blood in living things contains a substance called haemoglobin. During inhalation, oxygen reacts with the haemoglobin at the lung surface to produce oxyhaemoglobin. This compound is carried in blood to body cell tissues. In the body cells, the oxyhaemoglobin decomposes.

$$\text{Haemoglobin} + O_2 \longrightarrow \text{Oxyhaemoglobin}$$

This reversible reaction keeps body cells supplied with oxygen for a process called respiration through which energy is produced for functioning of the body.

But reaction of carbon monoxide with haemoglobin is irreversible. This results into gradual depletion of haemoglobin from the blood stream, leading to respiration failure and hence death of the victim.

$$CO + \text{haemoglobin} \longrightarrow \text{Carboxyhaemoglobin}$$

Note: Carbon monoxide is taken much more readily than oxygen by haemoglobin.

Sources of CO include:

(a) Internal combustion engines like automobiles, blowers, forklifts,

(b) Poorly maintained gas, oil or paraffin appliances.

(c) Dirty or plugged chimneys of fuel exhausts.

(d) Poorly maintained furnaces, gas heaters or fireplaces.

Limits of exposure to CO differs from country to country and from organization to organization. In Malawi, the exposure limit for CO is 10 mg/m^3 for a period of 8 hours as in Table 1. The American Conference of Governmental Industrial Hygienists (ACGIH) defines the standard threshold exposure-level limits of CO as 25ppm for 8 hours whereas the Occupational Safety and Health Administration (OSHA) Regulation stipulates the guidelines as in Table 2:

Table 2: OSHA Limit of exposure

0 - 1ppm	Normal background level
9 ppm	Max level for living areas.
50 ppm	Max level for enclosed space, 8-hour exposure.
100 ppm	Exposure limit
200 ppm	Mild headache, fatigue, nausea and dizziness.
800 ppm	Dizziness, nausea and convulsion. Death within 2 to 3 hours

3.3 Nitrogen dioxide and Sulphur dioxide

Nitrogen dioxide (NO_2) and Sulphur dioxide (SO_2) are both products of combustion of coal, oil and fossil fuel. The main sources of NO_2 and SO_2 are cars, trucks, and power plants. Both NO_2 and SO_2 can cause lung disease, eye irritation and burning of the skin. They can both contribute towards formation of smog and acid rain which is harmful to plant and aquatic life. The limits of exposure to NO2 and SO2 are provided in MS737:2021

4.0 MATERIALS AND METHODS

Monitoring of air quality parameters was conducted using an air quality monitoring station (QS-AQMS, Hunan QiaShuo Instrument Co. Ltd, China). Once switched on, the equipment reads and displays results of measurements on the LCD in real time. Values detected by the device were automatically and continuously recorded and also uploaded in the equipment's internal memory and on the cloud at the time of measurement. Average values were calculated based on readings obtained at 5 minute interval at every site.



Figure 1: Air quality monitoring station used in the assessment

5.0 RESULTS AND DISCUSSION

The locations and the coordinates of the tests sites are as follows

Location Name	Latitude	Longitude
Quarry Site	-15.9055556	34.7688889
Batching Plant Area	-15.9019444	34.7569444
African Parks Camp	-15.9008333	34.7527778
Contractor's Temporary Camp	-15.9275000	34.7497222
Bwalo	-15.9350000	34.7502778
Clay Site Junction	-15.9830556	34.7786111
Borrow Site	-15.9825000	34.7633333

5.1 Air Quality at Quarry Site

The average results of air quality at the Quarry Site are presented in Table 3 while Figure 2 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 3: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Quarry Site

Parameter	Concentration	Limit (MS737:2021)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.5	10
SO_2 (ug/m3)	10	150
$PM_{2.5}$ (mg/m3)	21	25
PM_{10} (ug/m3)	27	150
TSP (ug/m3)	30	230

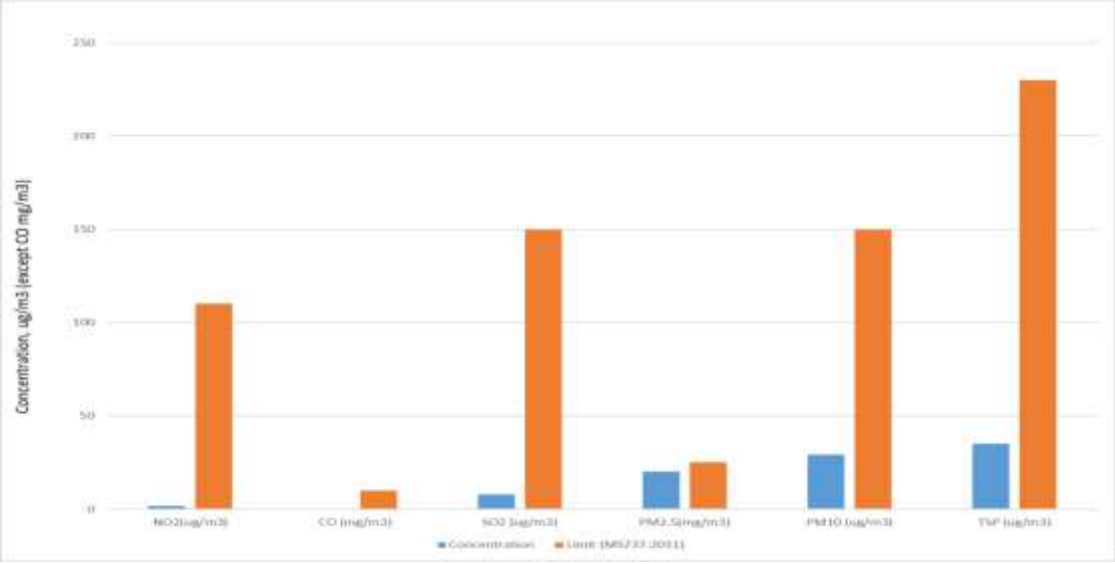


Figure 2: Graphical representation of average results at Quarry Site

Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Quarry Site were below the maximum limits provided in MS737:2021. This means that the current air quality at the site is within the expected normal range for ambient air in Malawi.

5.2 Air Quality at Batching Plant area

The average results of air quality at Batching Plant area are presented in Table 4 while Figure 3 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 4: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Batching Plant area

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.6	10
SO_2 (ug/m3)	6	150
$PM_{2.5}$ (mg/m3)	18	25
PM_{10} (ug/m3)	23	150
TSP (ug/m3)	27	230

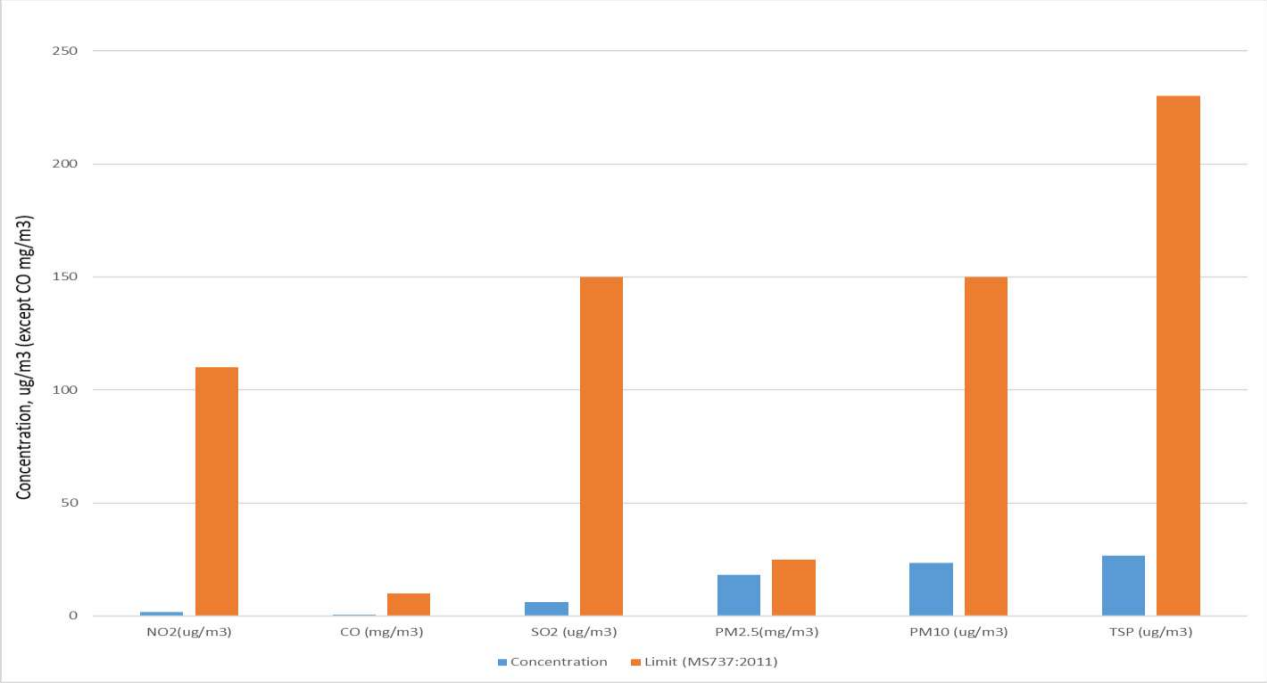


Figure 3: Graphical representation of average results at Batching Plant area

$PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 results obtained at Batching Plant Area were all below the maximum limits provided in MS737:2021. These results show that the current air quality at the site is within the expected normal range for ambient air in Malawi

5.3 Air Quality at African Parks Camp

The average results of air quality at African Parks Camp area are presented in Table 5 while Figure 4 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 5: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at African Parks Camp

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.6	10
SO_2 (ug/m3)	7	150
$PM_{2.5}$ (mg/m3)	21	25
PM_{10} (ug/m3)	35	150
TSP (ug/m3)	44	230

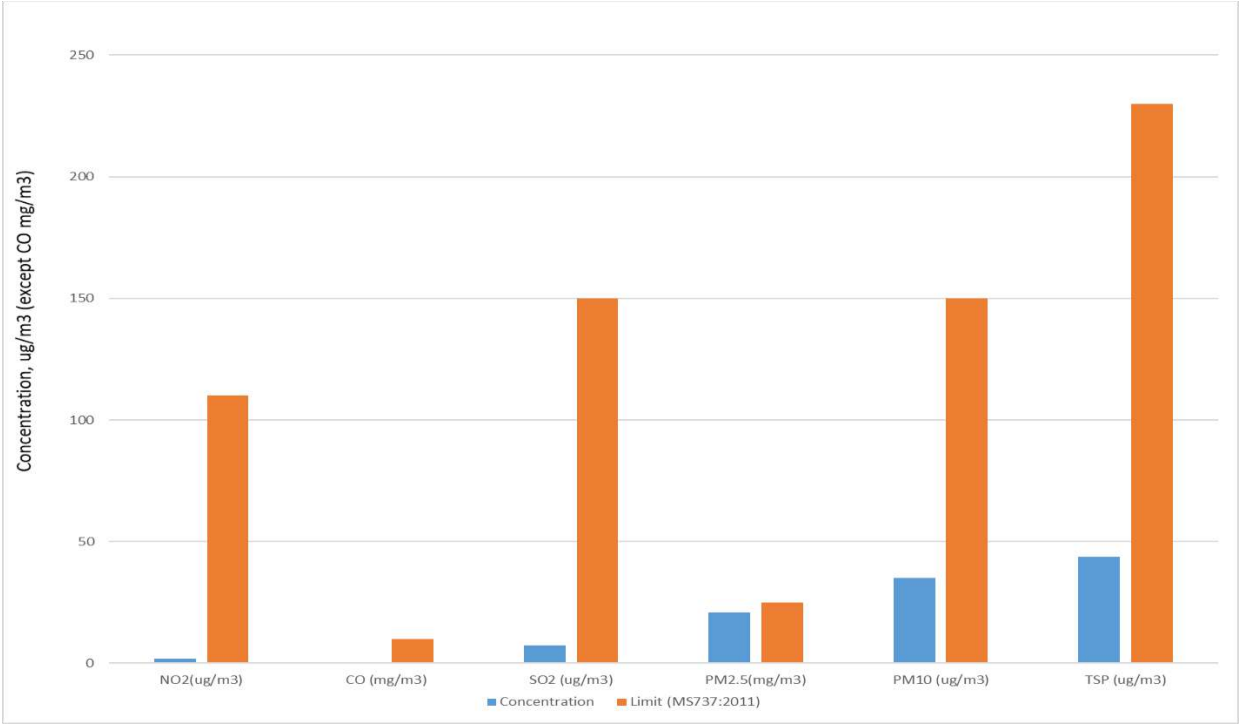


Figure 4: Graphical representation of average results at African Parks Camp

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at African Parks Camp assessment site were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi.

5.4 Air Quality at Contractor's Temporary Camp

The average results of air quality at Contractor's temporary Camp are presented in Table 6 while Figure 5 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 6: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Contractor's temporary Camp

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.5	10
SO_2 (ug/m3)	10	150
$PM_{2.5}$ (mg/m3)	21	25
PM_{10} (ug/m3)	27	150
TSP (ug/m3)	30	230

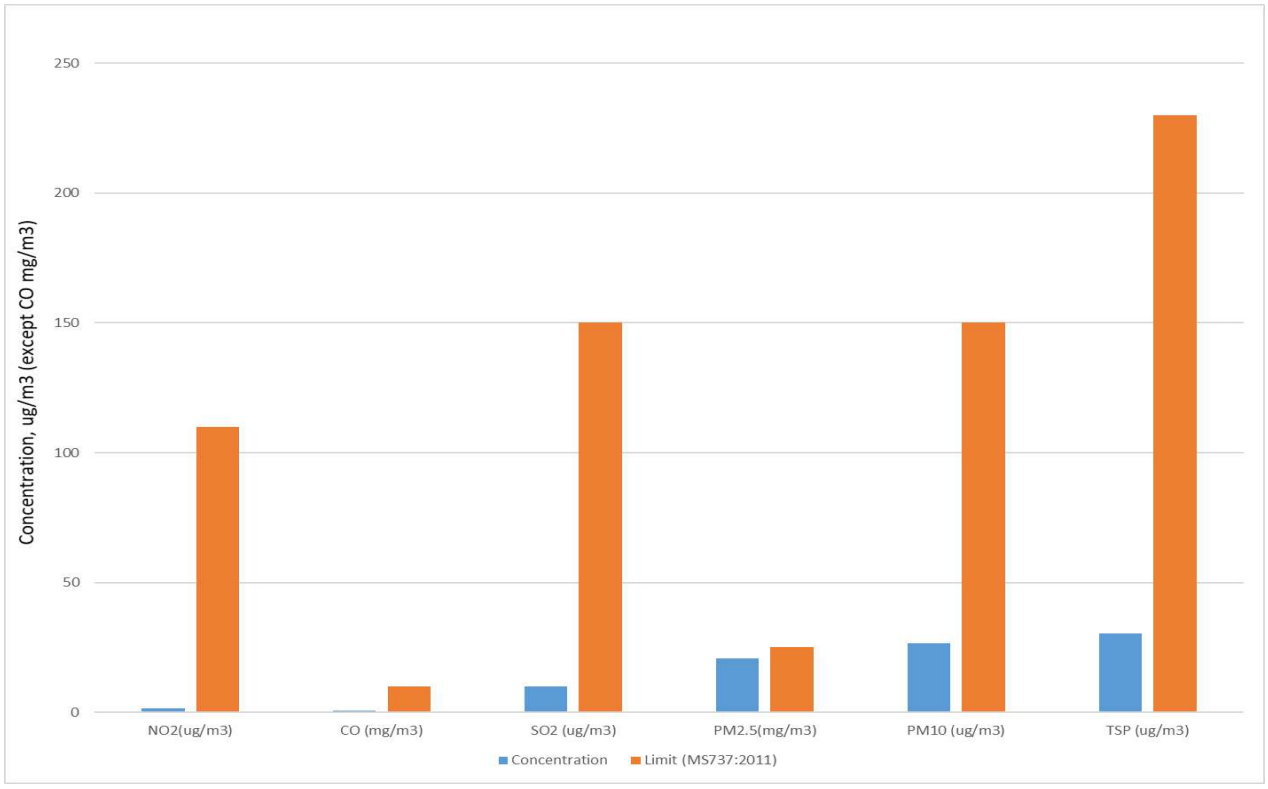


Figure 5: Graphical representation of average results at Contractor's temporary Camp

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Contractor's temporary Camp assessment site were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi

5.5 Air Quality at Bwalo

The average results of air quality at Bwalo are presented in Table 7 while Figure 6 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 7: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Bwalo

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.7	10
SO_2 (ug/m3)	8	150
$PM_{2.5}$ (mg/m3)	21	25
PM_{10} (ug/m3)	30	150
TSP (ug/m3)	36	230

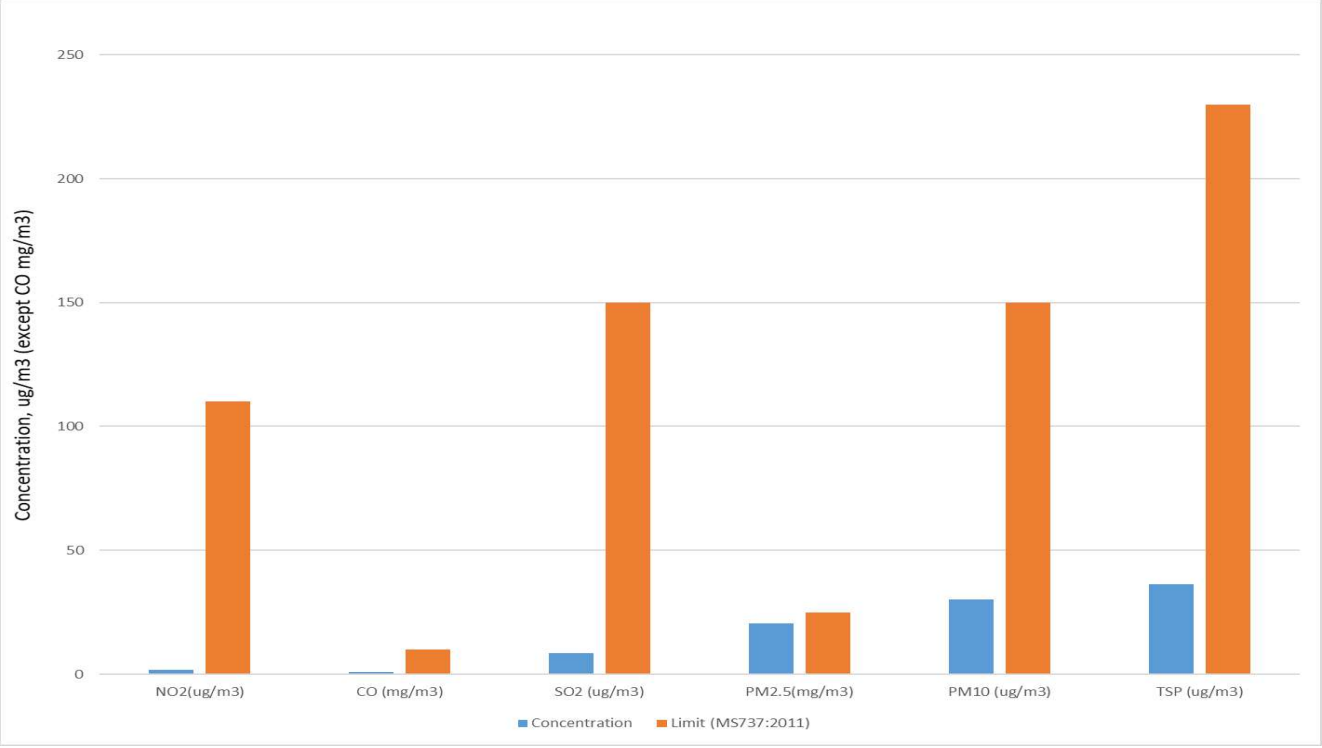


Figure 6: Graphical representation of average results at Bwalo

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Bwalo were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi

5.6 Air Quality at Clay Site Junction

The average results of air quality at Clay site Junction area are presented in Table 8 while Figure 7 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 8: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Clay Site Junction

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.5	10
SO_2 (ug/m3)	10	150
$PM_{2.5}$ (mg/m3)	22	25
PM_{10} (ug/m3)	39	150
TSP (ug/m3)	49	230

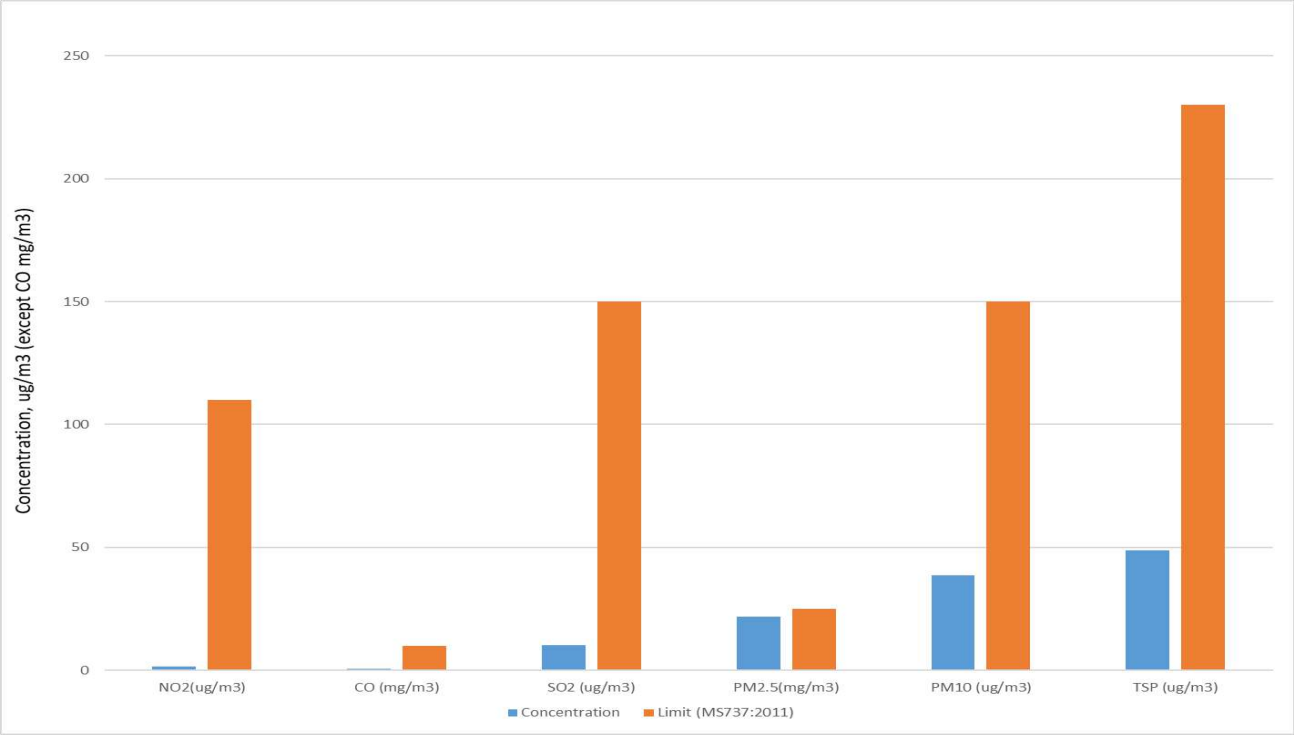


Figure 7: Graphical representation of average results at Clay Site Junction

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Clay Site Junction assessment site were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi

5.7 Air Quality at Borrow Site

The average results of air quality at Borrow Site area are presented in Table 9 while Figure 8 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 9: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Borrow Site

Parameter	Concentration	Limit (MS737:2011)
NO_2 (ug/m3)	2	110
CO (mg/m3)	0.6	10
SO_2 (ug/m3)	9	150
$PM_{2.5}$ (mg/m3)	35	25
PM_{10} (ug/m3)	43	150
TSP (ug/m3)	48	230

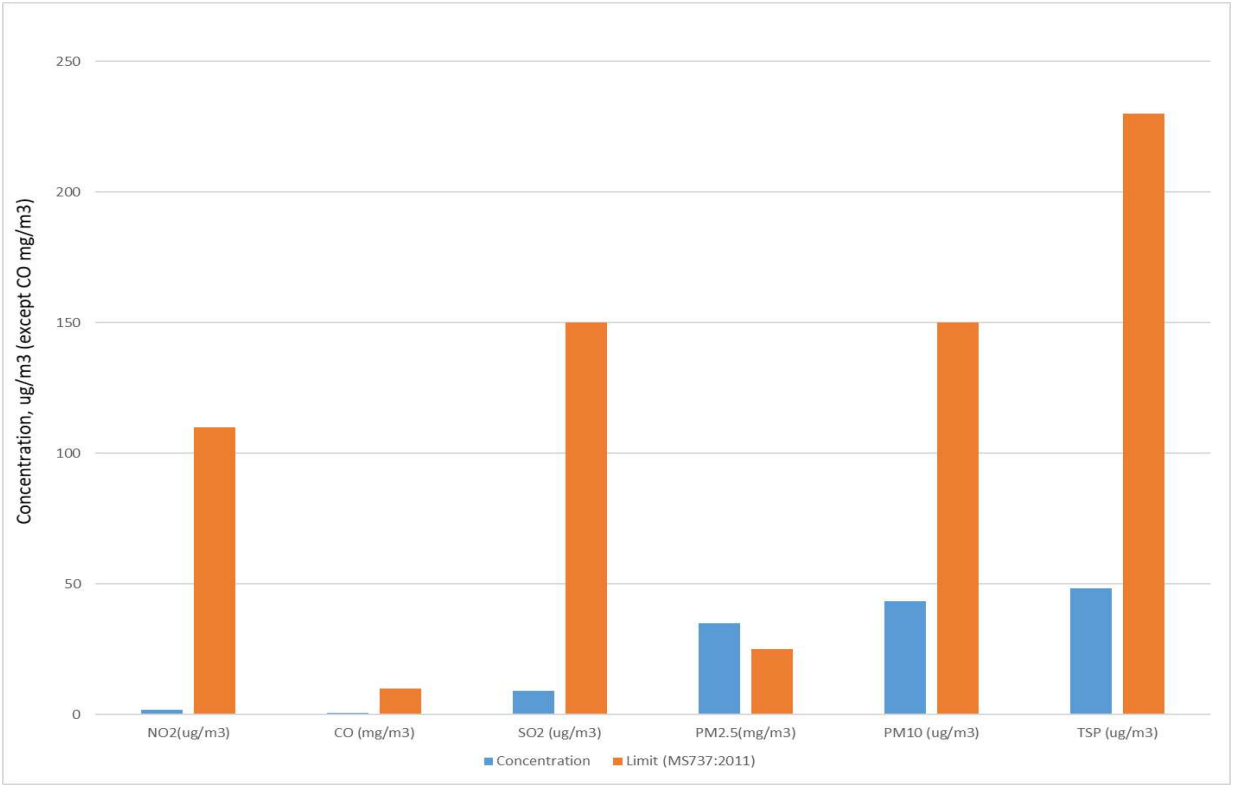


Figure 8: Graphical representation of average results at Borrow Site

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Borrow Site were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi

6.0 CONCLUSION AND RECOMMENDATION

The results of air quality assessment at all the seven assessment sites in the study area show that the baseline air quality meets the requirements of MS737:2021. As a matter of recommendation, proper control measures should be put in place to minimize negative impact on air quality once the project activities begin.

7.0 REFERENCES

Malawi Bureau of Standards. (2021). *Industrial emissions-Emissions from mobile and stationary sources-Specification.* Blantyre: Malawi Standards Board.

Manhas, S. (2013). *The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon- A Health Analysis and Recommendations for Further Action.* Multnomah County : Multnomah County Health Department.

US EPA. (2001). *Air Quality Criteria for Particulate Matter.* Washington DC.

MALAWI BUREAU OF STANDARDS

Promoting Standardization and Quality Assurance in Malawi

CONSULTANCY REPORT

Consultancy Title:	**Baseline air quality assessment at Kapichira site in Chikwawa**
Client/Sponsor:	**Ruo Consultants Limited**
Executing Officer:	**Luke Banda** **Alick Katsonga**
Supervisor:	**Steve D Afuleni (Deputy Director of Testing Services)**

Date: January 2025

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EXECUTIVE SUMMARY

This report outlines results of assessment of air quality to monitor total suspended particulate (TSP), PM_{10}, $PM_{2.5}$, Carbon monoxide (CO), Nitrogen dioxide (NO_2) and Sulphur dioxide (SO_2) at Kapichira site in Chikwawa. The assessment was conducted in November 2024. The aim of the assessment was to obtain baseline air quality data that would act as a benchmark for any anticipated changes that might occur due to anticipated activities. An air quality monitoring station was used to read the air quality parameters at the three assessment stations namely Main Dam area, Water Intake area and Kapichira Bridge. At Main Dam area, the average results were as follows: 12.8µg/m^3 (TSP), 9.2µg/m^3 (PM_{10}), 7.8µg/m^3 ($PM_{2.5}$), 0.5mg/m^3 (CO), 1.8µg/m^3 (NO_2) and 5.3µg/m^3 (SO_2). At Water Intake area, the average results were as follows: 14.8µg/m^3 (TSP), 9.8µg/m^3 (PM_{10}), 8.0µg/m^3 ($PM_{2.5}$), 0.5mg/m^3 (CO), 1.8µg/m^3 (NO_2) and 9.4µg/m^3 (SO_2). At Kapichira Bridge area, the average results were as follows: 19.8µg/m^3 (TSP), 17.5µg/m^3 (PM_{10}), 11.1µg/m^3 ($PM_{2.5}$), 0.02mg/m^3 (CO), 2.0µg/m^3 (NO_2) and 10.0µg/m^3 (SO_2). The average results obtained at all assessment sites were below the limits of 230µg/m^3 for TSP, 150µg/m^3 for PM_{10}, 25µg/m^3 for $PM_{2.5}$, 10mg/m^3 for CO, 110µg/m^3 for NO_2 and 150µg/m^3 for SO_2 stipulated in Malawi Standards MS737:2021. It can be concluded that the baseline air quality at Kapichira site comply with the environmental requirements as stipulated in relevant standards. It is recommended that proper environmental management and monitoring plans be put in place to minimize and monitor potential impact on air quality once due to planned activities in the area.

1.0 INTRODUCTION

Construction activities can have an impact on air quality due to emission of gases from machinery and dust from movement of vehicles. Assessment of baseline air quality helps to check current status of air quality which would act as a bench mark and reference point once construct activities begin. Air quality assessment can be used to monitor the compliance with environmental requirements and effectiveness of Environmental Management Plan (EMP) of the construction project.

The Malawi Bureau of Standards (MBS) assessed TSP, $PM_{10,}$ $PM_{2.5}$, CO, NO_2 and SO_2 at Kapichira site in Chikwawa. The assessment was conducted in November 2024. This reports presents the results of the assessment.

2.0 OBJECTIVES

The objective of the assessment was to obtain baseline air quality data through measurement of TSP, $PM_{10,}$ $PM_{2.5}$, CO, NO_2 and SO_2 that would act as a benchmark for any anticipated changes that might occur once the construction activities at the site.

3.0 LITERATURE REVIEW

3.1 Particulate matter

Particulate matter refers to any material, except pure water, that exists in the solid or liquid state in the atmosphere. They are minute and discrete particles capable of settling in gaseous medium. Such materials include dust, smoke, soot, fumes and ash. Particulate matter can come from different sources in the environment. Burning of fuels such as diesel by locomotive engines and movement of vehicles on unpaved roads are among other sources that contribute significantly to particulate matter in the ambient environment. Particulate matter can occur in

different sizes ranging from fine particle combustion products to coarse, wind-blown dust particles. Particulate matter can range from 0.1μm to 30μm or greater in diameter. Of particular interest, however, are two sizes namely $PM_{2.5}$ and PM_{10}. This is because particles in this size range make a large proportion of dust that can be drawn deep into the lungs.$PM_{2.5}$ refers to particulate matter up to 2.5microns in diameter while PM_{10} refers to particulate matter up to 10 microns in diameter (Malawi Bureau of Standards, 2021). Total suspended particles (TSP) refers to total mass concentration of particulate matter in the air (US EPA, 2001).

Excess exposure to particulate matter has been associated with several negative health effects. For example, particulate matter has been reported to cause nose and throat irritation, lung damage/cancer, and bronchitis. In extreme cases, health complications resulting from excess exposure to particulate matter may lead to early death. Particulate matter also causes haze that reduces visibility. Furthermore, ashes, soot, smoke and dust affect the aesthetics and discolour structures, furniture and cloths (Malawi Bureau of Standards, 2021).

Legislations, policies and guidelines have been developed in Malawi to control exposure to air pollutants. Standards have also been developed to set exposure limits to air pollutants. Table 1 shows limits of exposure with time as specified in Malawi standard (MS 737:2021).

Table 1: Air pollutants limits in the ambient air in Malawi

Substance	Symbol	Maximum allowable limits (µg/m^3)	Average time
Sulphur dioxide	SO_2	350	1 hour
		150	24 hour
		50	1 year
Carbon monoxide	CO	23 (mg/m^3)	1 hour
		10 (mg/m^3)	8 hour
Nitrogen dioxide	NO_2	290	1 hour
		110	24 hour
Particulate matter	$PM_{2.5}$	25	24 hour
		8	1 year
Particulate matter	PM_{10}	300	1 hour
		150	24 hour
		0.50	1 year
Total suspended particles	TSP	230	24 hour
		90	1 year

Source: Malawi Bureau of Standards, 2021

3.2 Carbon monoxide

Carbon monoxide (CO) is a poisonous, colourless, tasteless and odourless gaseous compound. It is usually formed from incomplete combustion of organic matter such as petroleum products. Incomplete combustion occurs where there is insufficient supply of air (Oxygen) for burning fuel. In burning of fuel, Carbon dioxide is produced if oxygen is present in sufficient amounts.

$$C + O_2 \longrightarrow CO_2$$

In the absence of oxygen, the carbon in fuels reacts with carbon dioxide to produce carbon monoxide

$$C + CO_2 \longrightarrow 2CO$$

Usually in engine fuel burning chambers, there is only a limited supply of air (O_2)

Blood in living things contains a substance called haemoglobin. During inhalation, oxygen reacts with the haemoglobin at the lung surface to produce oxyhaemoglobin. This compound is carried in blood to body cell tissues. In the body cells, the oxyhaemoglobin decomposes.

$$\text{Haemoglobin} + O_2 \longrightarrow \text{Oxyhaemoglobin}$$

This reversible reaction keeps body cells supplied with oxygen for a process called respiration through which energy is produced for functioning of the body.

But reaction of carbon monoxide with haemoglobin is irreversible. This results into gradual depletion of haemoglobin from the blood stream, leading to respiration failure and hence death of the victim.

$$CO + \text{haemoglobin} \longrightarrow \text{Carboxyhaemoglobin}$$

Note: Carbon monoxide is taken much more readily than oxygen by haemoglobin.

Sources of CO include:

(a) Internal combustion engines like automobiles, blowers, forklifts,

(b) Poorly maintained gas, oil or paraffin appliances.

(c) Dirty or plugged chimneys of fuel exhausts.

(d) Poorly maintained furnaces, gas heaters or fireplaces.

Limits of exposure to CO differs from country to country and from organization to organization. In Malawi, the exposure limit for CO is 10 mg/m^3 for a period of 8 hours as in Table 1. The American Conference of Governmental Industrial Hygienists (ACGIH) defines the standard threshold exposure-level limits of CO as 25ppm for 8 hours whereas the Occupational Safety and Health Administration (OSHA) Regulation stipulates the guidelines as in Table 2:

Table 2: OSHA Limit of exposure

0 - 1ppm	Normal background level
9 ppm	Max level for living areas.
50 ppm	Max level for enclosed space, 8-hour exposure.
100 ppm	Exposure limit
200 ppm	Mild headache, fatigue, nausea and dizziness.
800 ppm	Dizziness, nausea and convulsion. Death within 2 to 3 hours

3.3 Nitrogen dioxide and Sulphur dioxide

Nitrogen dioxide (NO_2) and Sulphur dioxide (SO_2) are both products of combustion of coal, oil and fossil fuel. The main sources of NO_2 and SO_2 are cars, trucks, and power plants. Both NO_2 and SO_2 can cause lung disease, eye irritation and burning of the skin. They can both contribute towards formation of smog and acid rain which is harmful to plant and aquatic life. The limits of exposure to NO2 and SO2 are provided in MS737:2021

4.0 MATERIALS AND METHODS

The assessment site was divided into three stations namely Main Dam area, Water Intake area and Kapichira Bridge area. Monitoring was done at the three stations using an air quality monitoring station (QS-AQMS, Hunan QiaShuo Instrument Co. Ltd, China) which displays results of measurements on the LCD straight at the time of measurement (Figure 1). Values detected by the device were automatically and continuously recorded and also uploaded in the equipment's internal memory and on the cloud at the time of measurement. Data was collected continuously when the equipment was switched on at each site. The collected data was divided into 5 minutes interval and average values were calculated based on these intervals.



Figure 1: The QS-AQMS air quality monitor used in the assessment

5.0 RESULTS AND DISCUSSION

5.1 Air Quality at Main Dam Area

The average results of air quality at Main Dam area are presented in Table 3 while Figure 2 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 3: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Main Dam area

Parameter	**Average result (µg/m^3)**	**Limit MS737:2011(µg/m^3)**	**Exposure period**
$PM_{2.5}$	7.8	25	24 hours
PM_{10}	9.2	150	24 hours
TSP	12.8	230	24 hours
CO	0.5	10	8 hours
SO_2	5.3	150	24 hours
NO_2	1.8	110	24 hours

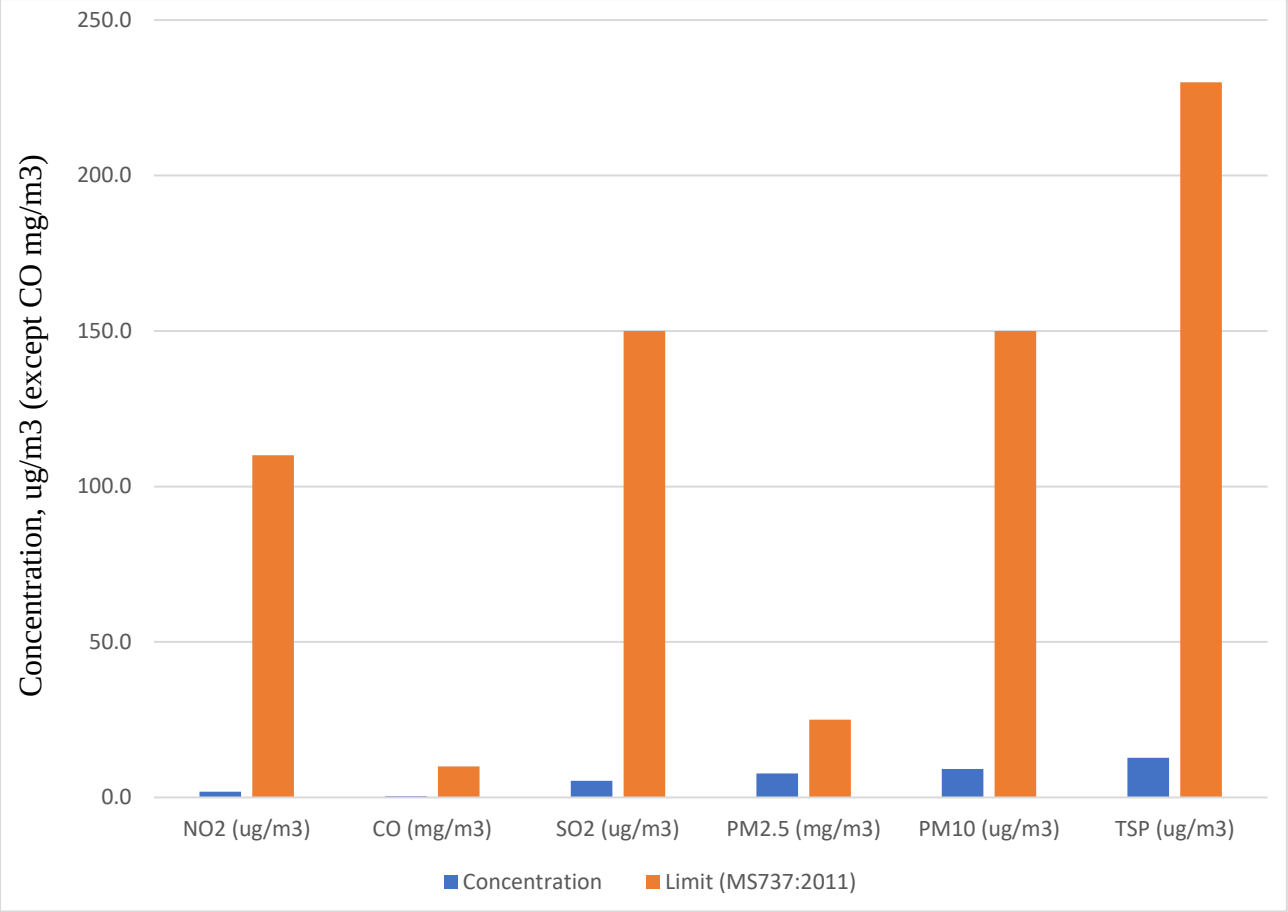


Figure 2: Graphical representation of average results at Main Dam are

Values of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at the Main Dam site were below the maximum limits provided in MS737:2021. This means that the current air quality at the site is within the expected normal range for ambient air in Malawi.

5.2 Air Quality at Water Intake area

The average results of air quality at Water Intake area are presented in Table 4 while Figure 3 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 4: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Water Intake area

Parameter	Average result (µg/m^3)	Limit MS737:2011(µg/m^3)	Exposure period
$PM_{2.5}$	8.0	25	24 hours
PM_{10}	9.8	150	24 hours
TSP	14.8	230	24 hours
CO	0.5	10	8 hours
SO_2	9.4	150	24 hours
NO_2	1.8	110	24 hours

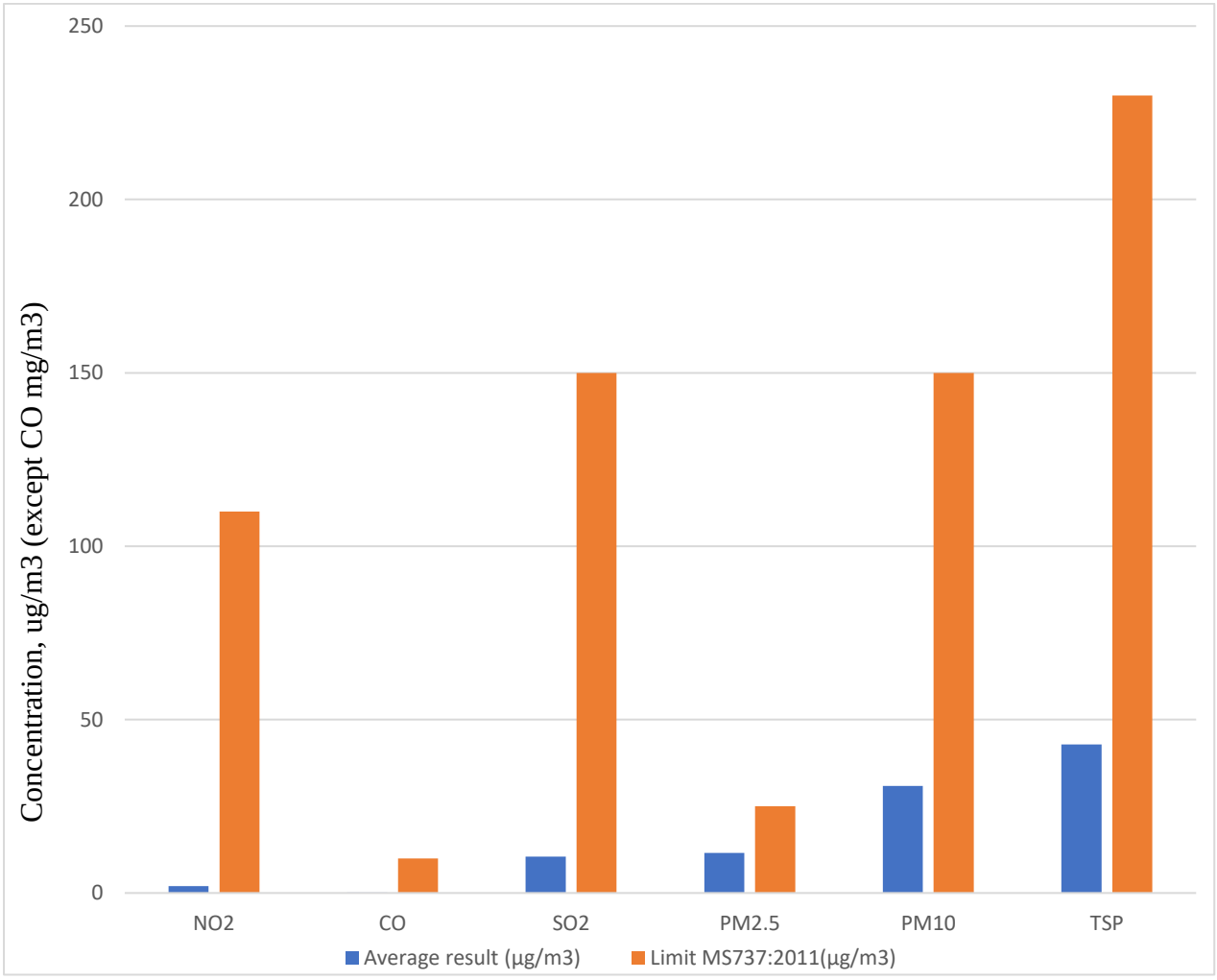


Figure 3: Graphical representation of average results at Water Intake area

$PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 results obtained at Water Intake assessment site were all below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi

5.3 Air Quality at Kapichira Bridge area

The average results of air quality at Kapichira Bridge area are presented in Table 5 while Figure 4 shows graphical representation of the results in comparison to maximum limits set in MS737:2011.

Table 5: Average result of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 at Kapichira Bridge area

Parameter	**Average result (µg/m^3)**	**Limit MS737:2011(µg/m^3)**	**Exposure period**
$PM_{2.5}$	11.1	25	24 hours
PM_{10}	17.5	150	24 hours
TSP	19.8	230	24 hours
CO	0.02	10	8 hours
SO_2	10.0	150	24 hours
NO_2	2.0	110	24 hours

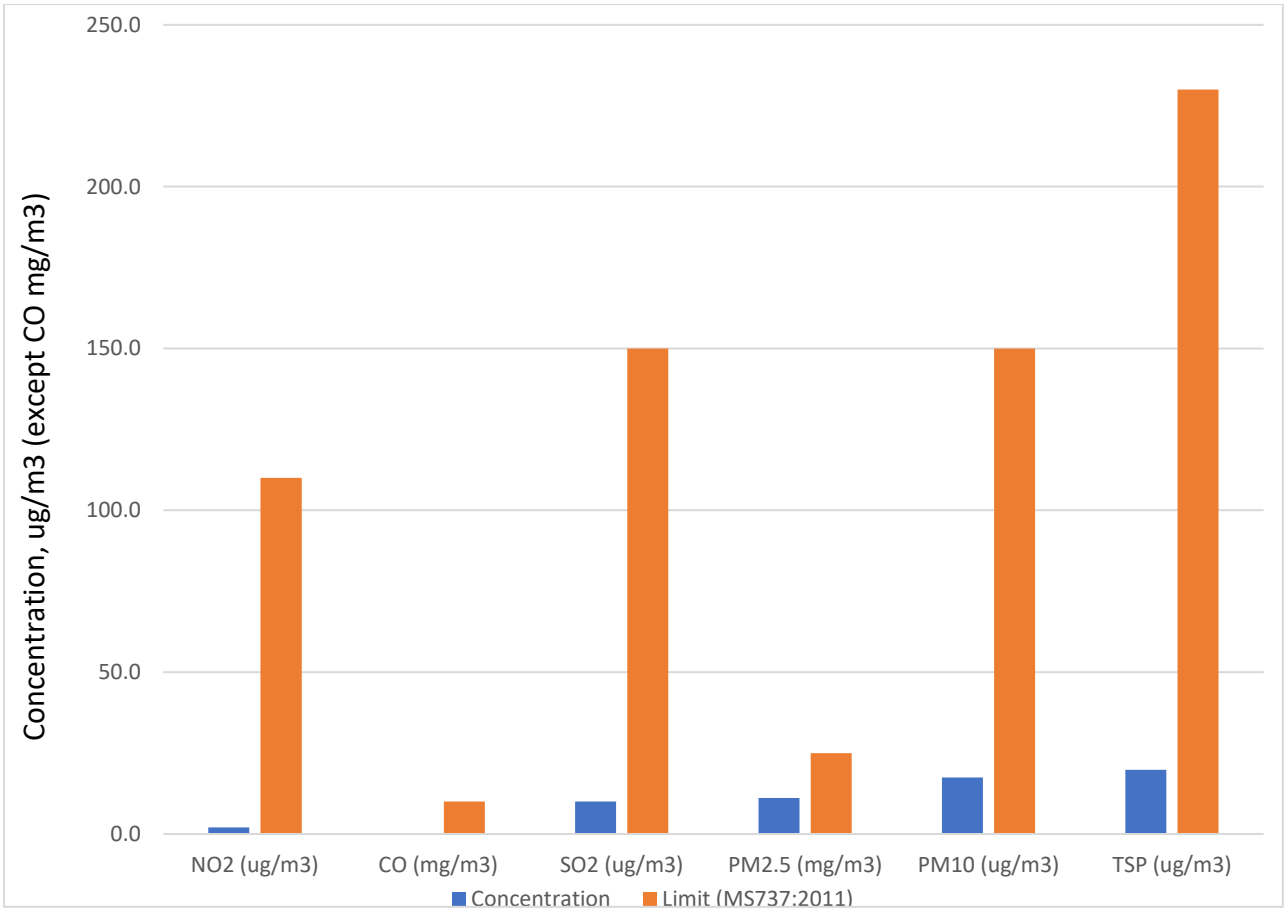


Figure 4: Graphical representation of average results at Kapichira Bridge area

All the results of $PM_{2.5}$, PM_{10}, TSP, CO, SO_2 and NO_2 obtained at Kapichira Bridge assessment site were below the maximum limits provided in MS737:2021. This shows that the current air quality at the site is within the expected normal range for ambient air in Malawi.

6.0 CONCLUSION AND RECOMMENDATION

The results of air quality assessment at all assessment sites constituting the study area show that the baseline air quality is within acceptable limit as specified in MS737:2021. It is recommended that proper control measures should be put in place to minimize negative impact on air quality once the project activities begin.

7.0 REFERENCES

Malawi Bureau of Standards. (2021). *Industrial emissions-Emissions from mobile and stationary sources-Specification.* Blantyre: Malawi Standards Board.

Manhas, S. (2013). *The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon- A Health Analysis and Recommendations for Further Action.* Multnomah County : Multnomah County Health Department.

US EPA. (2001). *Air Quality Criteria for Particulate Matter.* Washington DC.

APPENDICES

Appendix 1: Air quality assessment at Main Dam area



Appendix 2: Assessment at Water Intake site



Appendix 3: Data collection in progress at Kapichira Bridge area



APPENDIX E.NOISE LEVEL ASSESSMENT

MALAWI BUREAU OF STANDARDS

Promoting Standardization and Quality Assurance in Malawi

CONSULTANCY REPORT

Consultancy Title: Assessment of baseline noise levels at Kapichira site in Chikwawa

Client/Sponsor: Ruo Consultants Limited

Executing Officer: Arthur Kafanikhale

Supervisor: Steve Afuleni (Deputy Director of Testing Services)

Date: October 2025

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EXECUTIVE SUMMARY

A baseline noise level assessment was conducted to obtain baseline noise level data at Kapichira project site in Chikwawa that would be used as a benchmark for any anticipated changes that might occur in future due to any activities that might be implemented at the site. The assessment was done on the 18th and the 19th of September 2025. The result would also feed into the environmental management plan for proper monitoring of the changes. To obtain the noise level data, a Brannan Sound Level meter was used. Data was recorded at Quarry Site, Batching Plant Area, African Parks Camp, Contractor's Temporary Camp, Bwalo, Clay Site Junction and Borrow Site. The following results were obtained at each assessment point: 27.3 dBA at Quarry Site, 27.2 dBA at Batching Plant Area, 27.8 dBA at African Parks Camp, 27.1 dBA at Contractor's Temporary Camp, 28.0 at Bwalo, 27.3 at Clay Site Junction and 27.3 at Borrow Site. Malawi Standard for Acoustics –Noise Pollution – Tolerance Limits (MS 173), specifies 55dBA and 45dBA as maximum limits during day time and night time respectively for residential areas. Literature also provides various limits of exposure to certain levels of noise in relation to exposure period in various work environments. The results of the assessment indicate that the daytime baseline noise levels at the site are within allowable limits.

1. BACKGROUND AND INTRODUCTION

Assessment of baseline noise level helps to check current noise level characteristics of the area. Baseline data acts as a bench mark and reference point once project activities are implemented. It can also be used to design an Environmental Management Plan (EMP) of the project in anticipation of changes that may occure due to movement of machinery and several other activities that are undertaken during construction and operation. In view of this, a noise level assessment was conducted at Kapichira site in Chikwawa in September 2025 and this report presents the results of the assessment.

2. OBJECTIVES

The objective of the study was to conduct baseline noise assessment in order to obtain current noise characteristics of the site. The baseline data would act as a benchmark during the implementation of the project activities to monitor changes in noise levels brought about by the project.

3. LITERATURE REVIEW

Noise is any unwanted sound that has both physical and psychological effects on human beings (and other creatures). Noise affects efficiency by inducing stress and mask communication, temporary hearing loss and instantaneous permanent hearing loss depending on the amount of noise level that one is exposed to. In human beings, noise affects them psychologically by increasing blood pressure, heart rate, breathing rate and increased sweating. It also cased giddiness, nausea and fatigue in some cases.

Noise becomes hazardous when it exceeds certain levels or when one is exposed to a certain level of noise continuously exceeding a specified recommended period as shown in Table 1. Noise levels should be checked as stipulated in Section 63 of the Occupational safety, Health and Welfare Act of Malawi.

Noise is measured in decibels (dB) by using a sound level meter. The dB represents a logarithmic conversion of air pressure level variations from Pascal to a scale that accurately relates to how the human ear reacts to changes in air pressure. Mathematically, sound level pressure is denoted by L_p in dB is 20 times the ratio of the measured pressure, P, to the static pressure, P_0, where P is 20 micro Pascal.

$$L_p = 10\log(P/P_0)^2$$

Audible sound pressure ranges from 20microPascal to 100 Pascal relative to static air pressure. 3dB is the lowest sound level that a perfect human ear is able to detect. Where there is no reflections or additional alterations, sound tends to decrease at a rate of 6dB for every doubling of distance from its source.

Since human ears have limited hearing response in the upper and in the lower frequency bands, sound reading with a compensated A-weighted filter is used to account for

responses in the stated frequency ranges. Such measurements are denoted dBA. For short term and impulsive noises (e.g. blasting), a C-Weighted filter is used. This filter assists to account for short time period and frequency of impulses of noise.

From various research done, it has been found that noise levels can be controlled to acceptable levels by following some good engineering design and practice of which some are stated below:

(a) Replacing very noise machinery, equipment or processes by less noise machinery, equipment or processes.

(b) Locating noise sources away from hard walls or corners.

(c) Isolating noise sources such that a minimum number of persons employed or working in the factory are exposed to the noise.

(d) Constructing suitable acoustic enclosures to contain noise emitted by machinery, equipment or processes.

(e) Erecting an effective noise barrier larger, in size, than noise sources to provide noise shielding.

(f) Operating pneumatic machinery, equipment or tools at optimum air pressure to minimize noise emission and installing silencers at pneumatic line outlets.

(g) Installing mufflers at inlet and exhaust outlets that emit noise.

(h) Mounting vibrating machinery on vibration isolators or separate foundations.

(i) Isolating persons employed or working in the factory in an acoustically shielded rooms or enclosures where reducing of noise at the noise source is not practicable.

(j) Lining hard surfaces with acoustically absorbent materials to reduce noise reverberation.

(k) Isolating or reducing the size and vibration of vibrating surfaces or applying dumping materials to vibrating surfaces.

(l) Maintaining machinery and equipment at regular intervals to reduce noise emission.

Table 1: Permissible noise exposure limits (as per IEC 60804)

Sound Level pressure (dBA)	**Maximum Duration Per Day (hr)**
85	8
86	6, 21 min
87	5, 02 min
88	4
89	3, 11 min
90	2, 31 min
91	2
92	1, 35 min
93	1, 16 min
94	1
	Maximum Duration Per Day (min)
95	48
96	38
97	30
98	24
99	19
100	15
101	12
102	9
103	7.59
104	6
105	5
106	4
107	3
108	2.5
109	2
110	1.5
111	1
	Maximum Duration Per Day (Sec)
112	56
113	45
114	35
115	30

4. METHODOLOGY

The site was divided into seven sections namely Quarry Site, Batching Plant Area, African Parks Camp, Contractor's Temporary Camp, Bwalo, Clay Site Junction and Borrow Site. Data on baseline noise levels was collected using a Brannan Sound Level Meter.

The noise level meter was operated while set on 'A' Scale weighing in accordance with MS697:2005 Malawi Standard. Data was recorded after every 5 minutes and the results were averaged.

5. RESULTS AND DISCCUSIONS

The average noise level readings from the seven locations are presented in Table 2. Figure 1 provides graphical presentation of the results.

Table 2: Results of noise level at Kapichira site in Chikwawa

Location Name	Latitude	Longitude	Noise levels (dbA)			
			Minimum	Average	Maximum	Acceptable limit
Quarry Site	-15.9055556	34.7688889	26.9	27.3	27.9	85 maximum
Batching Plant Area	-15.9019444	34.7569444	27.0	27.2	27.5	85 maximum
African Parks Camp	-15.9008333	34.7527778	27.0	27.8	31.7	85 maximum
Contractor's Temporary Camp	-15.9275000	34.7497222	26.5	27.1	27.5	85 maximum
Bwalo	-15.9350000	34.7502778	27.0	28.0	29.0	85 maximum
Clay Site Junction	-15.9830556	34.7786111	27.0	27.3	27.9	85 maximum
Borrow Site	-15.9825000	34.7633333	27.1	27.3	27.8	85 maximum

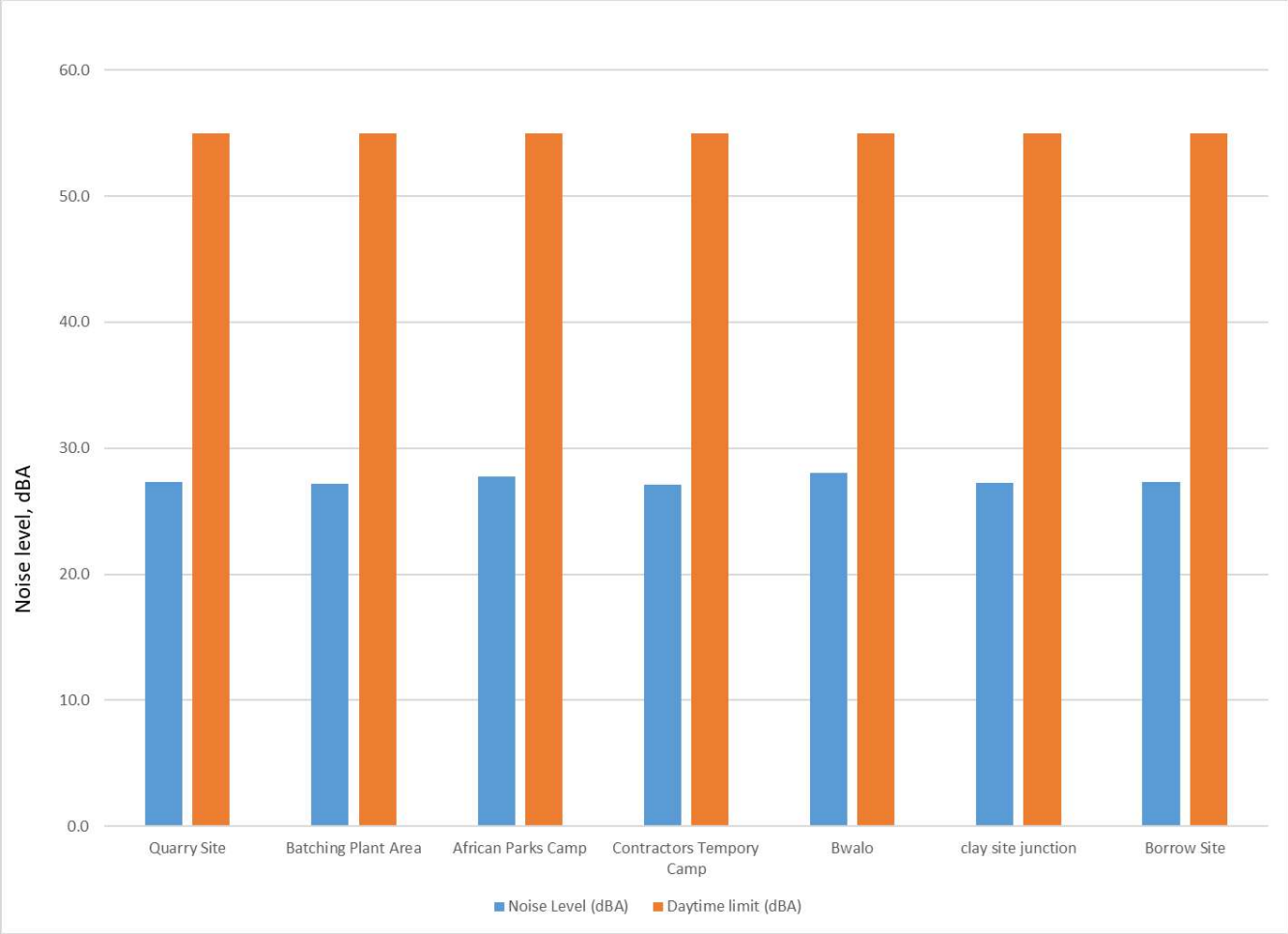


Figure 1: Graph of noise levels at the seven assessment locations of the Kapichira site

The results of the assessment show that noise level ranged from 26.9 to 27.9 dBA at Quarry Site, 27.0 to 27.5 dBA at Batching Plant Area, 27.0 to 31.7 dBA at African Parks Camp, 26.5 to 27.5 dBA at Contractor's Temporary Camp, 27.0 to 29.0 dBA at Bwalo, 27.0 to 27.9 dBA at Clay Site Junction and 27.1 to 27.8 dBA at Borrow Site. Malawi standard (MS) 173, Malawi Standard for Acoustics – Noise Pollution – Tolerance Limits stipulates 55 dBA as maximum allowable limit for day time and 45 dBA as the maximum allowable limit for daytime at residential areas. On the other hand, time limits have been recommended by other literature for noise exceeding 85dBA. The current noise levels at the site are all below the 55 dBA for residential areas and the 85dBA for other work environment. Thus, the average values of noise level at the site are within acceptable limit for ambient environment.

6. CONCLUSION AND RECOMMENDATIONS

The baseline noise level at the Kapichira site in Chikwawa was successfully measured and established. Currently, noise level at the site is compliant to the standard requirements based on MS 173 and IEC 60804. It is therefore recommended that proper measures be put in place to prevent noise rising above recommended limits during the implementation stages of the project.

7. REFERENCES

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[2] THORN, Building Code of Australia, A Contractor's Guide

[1] Lewis M and Waller G (1980) Thinking Chemistry, Oxford University Press

APPENDIX F. FLORA AND FAUNA BASELINE – FIRST SURVEY

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APPENDIX F

Our ref. : W002248-RAP-0003
Entity : CRE/WATER
Imputation : W.002248.0001

RESTRICTED

Client : EGENCO
Project : Kapichira Dam Rehabilitation Project
Country/State: MALAWI

Title : Fauna and Flora Baseline Report - First survey
Subtitle : Environmental and Social Impact Assessment for the Design and Construction Supervision of Kapichira Dam Rehabilitation Project
Author(s) : Maxon Ngochera
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1. SUMMARY

This report presents findings on biodiversity inventory which was carried out from 7th to 19th August 2024. The biodiversity assessment exercise was part of the Environmental and Social Impact Assessment for Kapichira Dam Rehabilitation Project Phase 2. The inventory involved flora and fauna investigations in the upstream and downstream of the Kapichira dam. The assessments were also undertaken in the Chikwawa floodplain. This write-up therefore contains the baseline information on the following biological aspects: Fisheries diversity, invertebrates, herpetofauna, birds, mammals and plant biodiversity.

The fish biodiversity assessment conducted in the upstream and downstream areas of the Kapichira dam and the Chikwawa floodplain provides valuable insights into the species composition, ecological significance, and potential risks posed by the rehabilitation of the dam. During the inventory, a total of 20 fish species from eight families were identified, with the Cyprinidae family being the most dominant. The study highlights the importance of wetland and aquatic habitats for numerous migratory and non-migratory species, including those listed as vulnerable or critically endangered on the IUCN Red List. Sampling limitations, such as difficult terrain and seasonal constraints, suggest that further surveys are necessary to fully capture the biodiversity dynamics across different seasons. It is thus crucial to consider these ecological risks in future planning and management of the Kapichira dam and its surrounding areas to ensure the preservation of aquatic biodiversity and the sustainability of local fisheries.

In terms of invertebrates, the survey reveals a diverse range of species, with a total of 21 invertebrate orders, 74 families, and 219 species identified. While no critically endangered species were recorded, the near-threatened *Hirudo medicinalis* (Leech) was mentioned by locals as being encountered in the area. The survey highlights the ecological importance of invertebrates, particularly in processes such as pollination, nutrient recycling, and food web dynamics, which contribute to the stability of the local ecosystems. It was revealed during the study that the invertebrates were of significant economic value to surrounding communities, particularly through their role in supporting agricultural and fishing activities.

Herpetofauna assessment covered a range of habitats, including wetlands, riverine areas, and forests. The assessment recorded a total of 36 species, with one species, *Python sebae*, classified as Near Threatened on the IUCN Red List, while the rest are of Least Concern. The findings generally highlight that the proposed project area supports a rich diversity of species, with certain sites exhibiting higher species richness due to more stable ecosystems and abundant ecological niches. However, areas such as Chikwawa floodplain showed lower species abundance possibly due to environmental instability. The survey stresses the importance of preserving riparian vegetation, riverine ecosystems, and wetlands to prevent species loss, as any degradation of these habitats could disrupt crucial ecological functions.

The bird species assessment revealed a diverse range of bird species, with a total of 137 species recorded. Although none of the species encountered were classified as endangered, most were of least concern according to the IUCN/CITES list. The study highlighted the ecological significance of these species, which play vital roles in ecosystem processes such as pollination, nutrient recycling, and food chain maintenance. The project area, with its variety of habitats, supports stable ecosystems that benefit local biodiversity. However, potential risks such as habitat loss, water pollution, and changes in water levels could negatively impact these bird populations. Therefore, it is crucial to implement sustainable project activities and mitigation

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strategies to protect these species and their ecological contributions, ensuring the long-term ecological balance of the area.

Just as it was the case with the other taxa, the mammal assessment highlighted the proposed project area's rich biodiversity, with 61 mammal species recorded, including species of conservation concern such as the vulnerable hippopotamus and giraffe, the Endangered African elephant, and the Nearly Threatened buffalo. The study utilized various sampling methods and community consultations which revealed a diverse mammal population across habitats like wetlands, forests, and riverine areas. The findings emphasize the ecological significance of the area, indicating that any disruption to water sources or habitats could jeopardize the local mammal populations. However, the assessment was affected by the dry season conditions, which hindered effective sampling and trapping. It is therefore recommended that future surveys be conducted throughout all seasons for more comprehensive results.

Finally, the plant biodiversity assessment survey conducted across the upstream and downstream areas of the Kapichira Dam, as well as the Chikwawa floodplain, has provided critical insights into the composition and distribution of plant species within the Majete Wildlife Reserve. The survey has highlighted a diverse range of plant species, with a significant dominance of terrestrial species, particularly trees. The study has also revealed significant presence of invasive alien species (IAS), both terrestrial and aquatic, which pose potential ecological risks, especially to native biodiversity and water quality. Notably, invasive species like *Lantana camara* and *Eichhornia crassipes* could disrupt the local ecosystem by outcompeting native plants and affecting aquatic environments. While most species in the study area were categorized as Least Concern, the detection of Near Threatened species, such as *Dalbergia melanoxylon*, underlines the importance of continuous monitoring and conservation efforts. The findings underscore the need for targeted management strategies to mitigate the impact of invasive species, safeguard biodiversity, and ensure the long-term sustainability of the project area.

2. BIOLOGICAL BASELINE

The biological baseline was conducted to analyse the fauna and flora found within the vicinity of the proposed Kapichira Dam Rehabilitation Project site. The area surrounding the project site is of great interest owing to its sensitivity as a wildlife reserve along with its associated biological diversity. This information forms the basis for the determination of the changes and impacts that may result following the implementation of the proposed project. This write-up therefore contains the baseline information on the following biological aspects: Fisheries diversity, invertebrates, herptofauna, birds, mammals and plant diversity.

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2.1. Fisheries biodiversity

2.1.1. Study Area

The fish biodiversity assessment survey was conducted in the upstream and downstream of Kapichira dam and the Chikwawa floodplain (Figures 2-1 and 2-2).

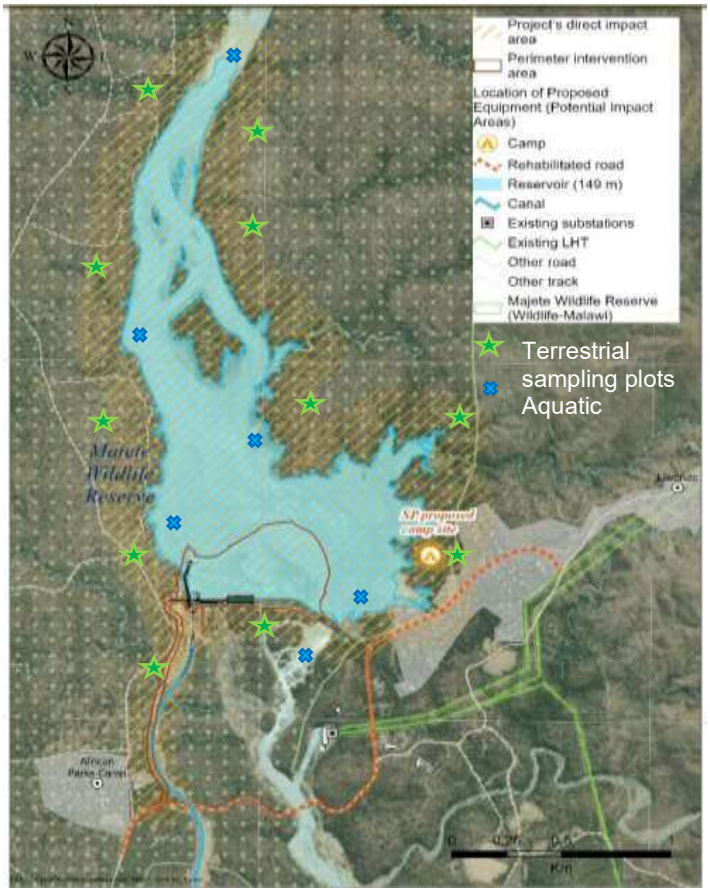


Figure 2-1: Sampling plots in the upstream of the dam area

The direct footprint area is situated in the Majete Wildlife Reserve. Several sampling points were planned in this area.

To do these investigations in Majete Wildlife Reserve, RUO with EGENCO got the authorisation from African Parks to perform flora and fauna inventories; one critical point was to discuss the sampling methodology for fish. This was a catch-and-release type of sampling where the fish were released into the water once identification and other parameters were collected and requested for the latest inventory results of flora and fauna so that the impacted environment is properly understood

<u>Downstream of the dam</u>

Several sampling points were planned around the area immediately downstream of the dam and the Chikwawa floodplain (see figure below). The Elephant marsh area was inventoried only upstream of the site. Due to the fact that the sites proposed for the camps and the quarry sites were not yet identified downstream to enable the sensitivity of these different sites, sampling was not done.

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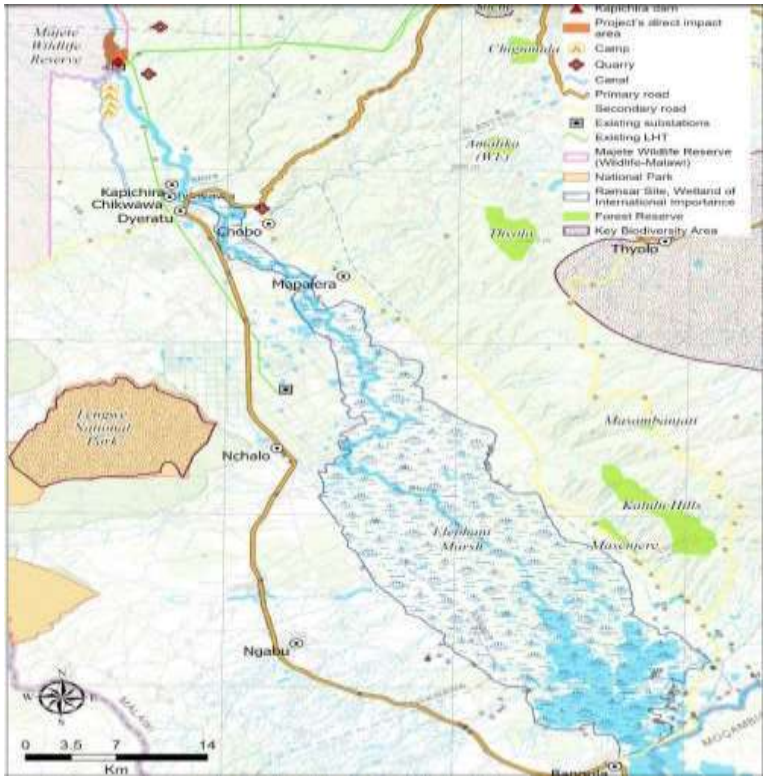


Figure 2-2: Sampling plots in the downstream of the dam area

2.1.1.1. FISH DIVERSITY ASSESSMENT

Data collection involved sampling for fish diversity using an independent and the dependent surveys methods. The approaches supplement each other as there is no perfect method of attaining maximum results in fish sampling.

2.1.1.2. FISHERY INDEPENDENT APPROACH

The team hired an experienced fisher from Maganga 1 village (a village that is located a few meters from Ng'ona lodge) with a cast net to conduct fish sampling from various locations upstream and downstream the Kapichira dam. The fisher was guided on where to cast the net. The cast net was deployed three (3) times per site. All sampling stations were georeferenced using a handheld Garmin eTrex 20.

2.1.1.3. HANDLING OF SAMPLED FISH

The team followed the catch-and-release type of sampling. Before the sampling work, the fisher was informed and oriented on the best handling techniques for the sampled fish to reduce mortality. After each cast, fish were placed in a bucket with water, once identification and other parameters were collected, the fish that were still in very good condition, were released into the water. Fish catch data was collected following the modified guidelines by Pauly (1983) and Sparre and Venema (1989) as outlined below:

- All non-fish materials were initially removed from the fish catch.
- All bigger fish were separated from smaller fish and individual length/weight data collected

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- For the remaining smaller fish, total weight was collected, then a sample was collected where individual length/weight data was collected
- The total weight of the small catch was used to extrapolate numbers of the sampled fish to the total catch

Fish were identified using published identification keys by Paul Skelton - A Complete Guide to the Freshwater Fishes of Southern Africa-Struik (2001). After sorting the fish to the lowest level of taxa, individual length in mm and weight in grams data were captured using the structured data forms**.** Extra caution was taken to minimize stressing the fish through handling by speeding up the process. After recording all the necessary data, live and strong fish were returned to the water.

2.1.1.4. FISHERY DEPENDENT SURVEY

We consulted the Chikwawa District Fisheries Office field staff to identify sites within the downstream and Chikwawa floodplain areas for sampling. Sampling time varied according to the fishing and landing time of individual fishers. The study targeted existing fishing gears and methods in each particular landing site. The most common gears included, cast net, handline, fish trap, beach seine and batting. Fishers were asked for consent before proceeding to get samples from their catch. At each landing site, the beach village committee (BVC) chair or representative was informed and accompanied the sampling team to also assist in explaining the objective of the sampling and procedure. Sampling procedure and fish identification were performed in a similar manner as outlined in the previous section of fishery independent survey.

2.1.1.5. CRITICAL HABITAT (CH)

CH identification is required by PS6 to manage risks and avoid, mitigate, and offset impacts to areas with high biodiversity value including:

- habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species;
- habitat of significant importance to endemic and/or restricted-range species;
- habitat supporting significant global concentrations of migratory species and/or congregator species;
- highly threatened and/or unique ecosystems; and/or
- areas associated with key evolutionary processes.

CH exists independent of a project and can be identified without reference to a project; a project may be proposed in CH, but the CH is present under baseline conditions and is not defined by the size of the project footprint, or other project effects. CH should be determined on a case-by-case basis according to the concepts of irreplaceability and vulnerability.

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2.1.2. Data collected

This is the general information that was used to collect aquatic fauna in order to have as much detail as possible on the species and habitats (Table 2-1).

Table 2-1: Data form that was used to collect aquatic fauna

Date	Weather	GPS point	Target taxon	Type of habitat surveyed	Level of degradation of the habitat Natural / Modifier habitat	Species observed							
						Common name	Scientific name	Abundance (Number)	Protected species (YES/NO)	Endemic species / Restricted range species (YES/NO)	Migratory species (YES/NO)	IUCN Category	Favorable habitat for the species contacted

Date	Inventory date DD/MM/YY
Weather	Inventory day weather
GPS point	GPS coordinates (x; y)
Target taxon	type of taxon targeted on the day of the survey: birds, mammals (+ chiropterans), reptiles
Type of habitat surveyed	Wetland, aquatic, forest, riverine, thicket, etc.
Level of degradation of the habitat **Natural / Modifier habitat**	Intact natural habitat, almost intact natural habitat, modified habitat
Scientific name	Latin name of species inventoried
Common name	Common name of the species inventoried and local name if any
Abundance	Number of occurrences of the species contacted (mention if the species is gregarious)
Protected species	According to Malawi regulations
Endemic species / Restricted range species	Is the species restricted in its range? Is it nationally/regionally/locally endemic?
IUCN Category	DD / LC / NT / VU / EN / CR / EX
Favourable habitat for the species contacted	Presence of breeding, feeding and resting habitats, etc.

*It will also be important to consider whether any species have been identified that are likely to trigger critical habitat according to the NP6 criteria.

** It will also be important to note whether species on the move have been observed on sites

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2.1.3. Survey limitations and constraints

The survey was conducted during the dry season when some tributary rivers to the Shire River had no water flowing. Some of the sampling places were difficult to reach due to bad roads and terrain. In some fish landing sites, local fishers were not willing to have their fish examined as just a few weeks back, the Enforcement team had just confiscated illegal gears. Our recommendation is that two more field trips need to be conducted to capture the wet and hot; December to April, and the cold and dry: May to August for better results.

2.1.4. Photos during the survey

Fishing in Shire River, the Kapichira dam and the Chikwawa floodplain was done using a cast net, fish traps, handlines, gillnets and seine nets (Figures from 2-3 to 2- 9).



Figure 2-3: A fisher downstream the kapichira bridge inspecting a gillnet



Figure 2-4: The terrain between Kapichira dam and the Kapichira bridge

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Figure 2-5: Shire River fishing ground downstream



Figure 2-6: A fisherman from Maganga 1 village casting a castnet gear (chabvi) along the Kapichira dam

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Figure 2-7: A fish trap that was used as part of the sampling gear



Figure 2-8: The fishing ground at Gumbwa landing site, downstream of the Chikwawa flood plain

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2.1.5. Results

2.1.5.1. SPECIES COMPOSITION

A total of twenty (20) fish species belonging to eight (8) families namely; Alestidae, Cichlidae, Clariidae, Cyprinidae, Distichodontidae, Mochokidae, Mormyridae and Schilibeidae and 13 genera were identified (Table 7.2) during the study. Most of the fish species encountered belonged to the Cyprinidae family (61%) followed by Cichlidae (24%), Mormyridae (6%) while the rest of the families, collectively made up a total of 9% (Figure 2-10).

At species level, *Enteromius paludinosus* (28%) dominated followed by *Labeo cylindricus* (26%), *Oreochromis mossambicus* (9%), *Oreochromis shiranus* (8%), *Labeobarbus eurystomus* (7%), *Marcusenius macrolepidotus* (6%), and *Astatotilapia calliptera* (6%). The remaining species contributed less than 4% individually (Table 2-2). Although sampling took for a period of two weeks, we did not encounter the predatory fish species *Hydrocynus vittatus* (tiger fish). However, we were meant to understand that this species is migratory and seasonal especially during the warm season (October to December).

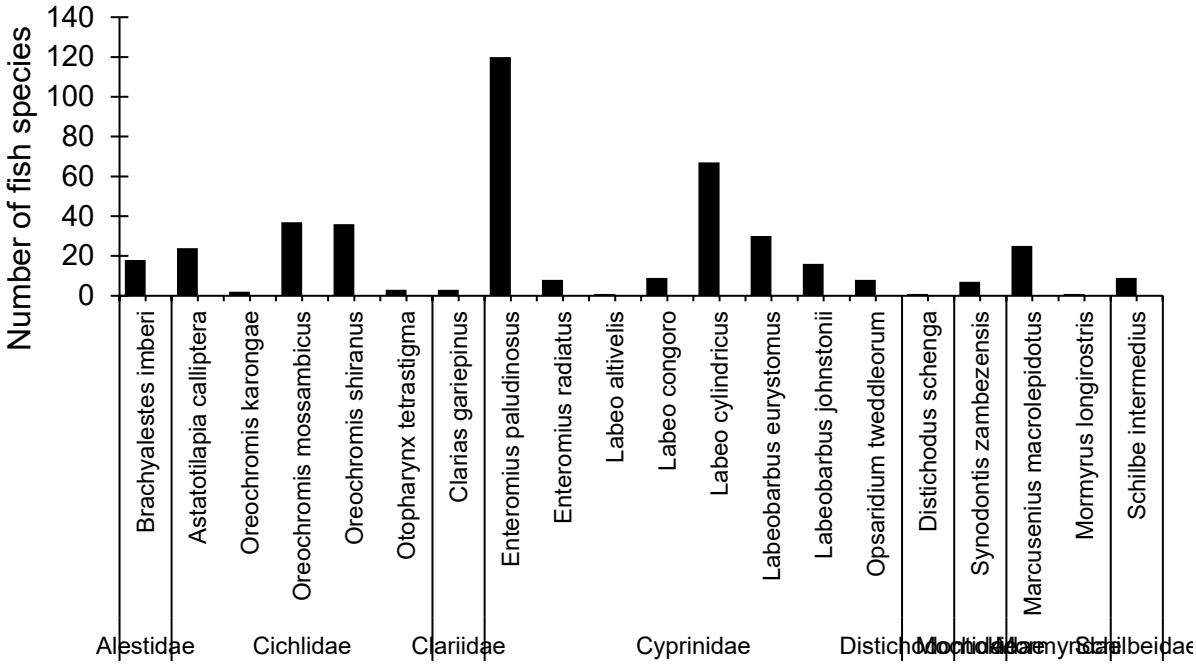


Figure 2-9: Contribution of fish species by family from all the sampled sites in Lower Shire

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Table 2-2: Number of fish species recorded during the survey by genus and family

Family	Genus	Scientific name	Local Name	Total number of species	Percent Contribution by species
Alestidae	Brycinus	*Brachyalestes imberi*	Bwezele	18	4.2
Cichlidae	Astatotilapia	*Astatotilapia calliptera*	Kambuzi	24	5.6
	Oreochromis	*Oreochromis karongae*	Chambo	2	0.5
		Oreochromis mossambicus	Makakana	37	8.7
		Oreochromis shiranus	Makumba	36	8.5
	Otopharynx	*Otopharynx tetrastigma*	Kambuzi	3	0.7
Clariidae	Clarias	*Clarias gariepinus*	Mlamba	3	0.7
Cyprinidae	Enteromius	*Enteromius paludinosus*	Matemba	120	28.2
		Enteromius radiatus	Manyame	8	1.9
	Labeobarbus	*Labeo altivelis*	Nzizi	1	0.2
		Labeo congoro	Gundamwala Nkhongolo	9	2.1
		Labeo cylindricus	Gale	67	15.8
		Labeobarbus eurystomus	Gale	30	7.1
		Labeobarbus johnstonii	Sanjika/Njole	16	3.8
	Opsaridium	*Opsaridium tweddleorum*	Matemba	8	1.9
Distichodontidae	Distichodus	*Distichodus schenga*	Tchenga	1	0.2
Mochokidae	Synodontis	*Synodontis zambezensis*	Nkholokolo	7	1.6
Mormyridae	Marcusenius	*Marcusenius macrolepidotus*	Mphuta	25	5.9
	Mormyrus	*Mormyrus longirostris*	Nkhoti	1	0.2
Schilbeidae	Schilbe	*Schilbe intermedius*	Dande	9	2.1

Spatially, the highest number of families were found downstream of the dam (7) with a total number of 14 fish species followed by the Chikwawa floodplain with 6 families and 9 fish species. The upstream dam area had 3 families with 9 fish species while the dam area also registered 3 families and 5 fish species (Figure 2-11 and Table 2-3). The low number of fish species recorded in the dam area may be due to difficulties in sampling the area as the cast net kept getting stuck in tree branches that were deposited during the cyclone Freddy era and the pebbles that were used to reinforce the dam wall. There was no boat to be used to sample inside the dam which may lead to the low number of species at the dam site. Fish in the downstream area were mostly found in deep pools between the dam area and the Kapichira bridge.

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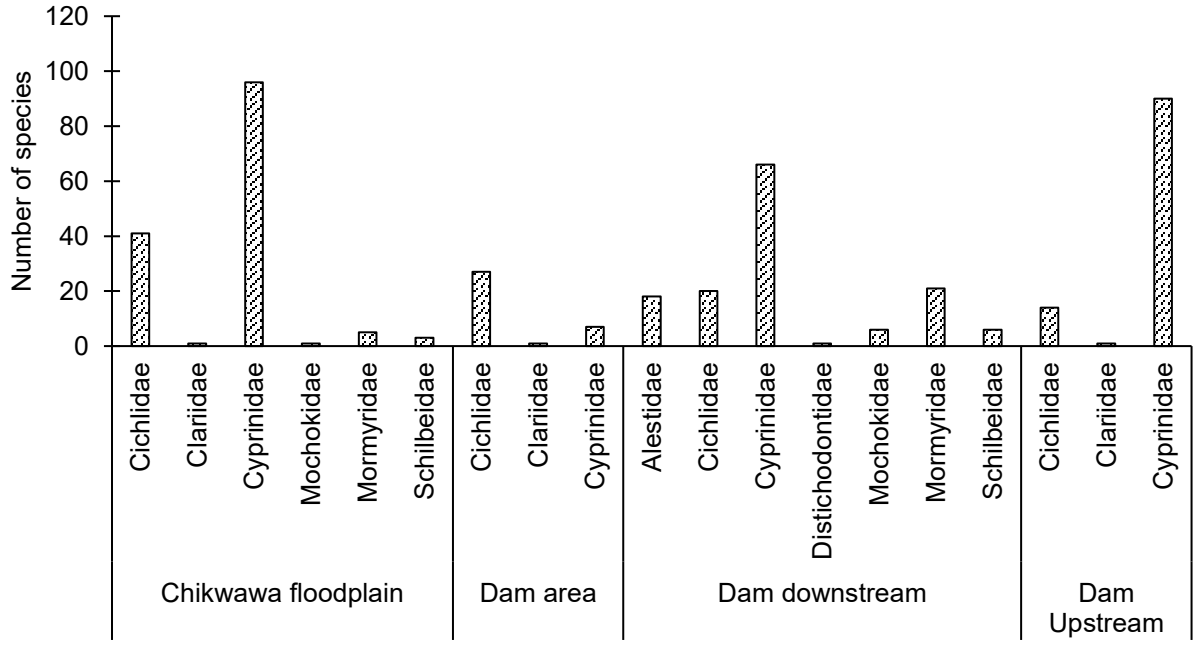


Figure 2-10: Spatial distribution of fish species by family from all the sampled sites

Table 2-3: Results of the aquatic fauna field survey by location i.e. Upstream dam area, Dam area, Downstream dam area and Chikwawa floodplain

Station name (Upstream, dam area, downstream, below bridge, Chikwawa floodplain)	Family	Genus	Scientific name	Local name	Total Number of species
Chikwawa floodplain	Cichlidae	Astatotilapia	*Astatotilapia calliptera*	Kambuzi	17
		Oreochromis	*Oreochromis mossambicus*	Makakana	24
	Clariidae	Clarias	*Clarias gariepinus*	Mlamba	1
	Cyprinidae	Enteromius	*Enteromius paludinosus*	Matemba	87
			Enteromius radiatus	Matemba	8
		Labeobarbus	*Labeo cylindricus*	Gundamwala/Nkhongolo	1
	Mochokidae	Synodontis	*Synodontis zambezensis*	Nkholokolo	1
	Mormyridae	Marcusenius	*Marcusenius macrolepidotus*	Mphuta	5
	Schilbeidae	Schilbe	*Schilbe intermedius*	Dande	3
Dam area	Cichlidae	Oreochromis	*Oreochromis karongae*	Chambo	2
			Oreochromis mossambicus	Makakana	9
			Oreochromis shiranus	Makumba	16
	Clariidae	Clarias	*Clarias gariepinus*	Mlamba	1
	Cyprinidae	Labeobarbus	*Labeobarbus johnstonii*	Gale	7
Downstream the dam	Alestidae	Brycinus	*Brachyalestes imberi*	Bwezele	18
	Cichlidae	Astatotilapia	*Astatotilapia calliptera*	Kambuzi	4
		Oreochromis	*Oreochromis mossambicus*	Makakana	4
			Oreochromis shiranus	Makumba	11
		Otopharynx	*Otopharynx tetrastigma*	Kambuzi	1
	Cyprinidae	Enteromius	*Enteromius paludinosus*	Matemba	33
		Labeobarbus	*Labeo congoro*	Nzizi	8
			Labeo cylindricus	Gundamwala/Nkhongolo	17
		Opsaridium	*Opsaridium tweddleorum*	Sanjika/Njole	8
	Distichodontidae	Distichodus	*Distichodus schenga*	Tchenga	1
	Mochokidae	Synodontis	*Synodontis zambezensis*	Nkholokolo	6

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Station name (Upstream, dam area, downstream, below bridge, Chikwawa floodplain)	Family	Genus	Scientific name	Local name	Total Number of species
	Mormyridae	Marcusenius	*Marcusenius macrolepidotus*	Mphuta	20
		Mormyrus	*Mormyrus longirostris*	Nkhoti	1
	Schilbeidae	Schilbe	*Schilbe intermedius*	Dande	6
Upstream the dam	Cichlidae	Astatotilapia	*Astatotilapia calliptera*	Kambuzi	3
		Oreochromis	*Oreochromis shiranus*	Makumba	9
		Otopharynx	*Otopharynx tetrastigma*	Kambuzi	2
	Clariidae	Clarias	*Clarias gariepinus*	Mlamba	1
	Cyprinidae	Labeobarbus	*Labeo congoro*	Nzizi	1
			Labeo cylindricus	Gundamwala/Nkhongolo	49
			Labeobarbus eurystomus	Gale	30
			Labeobarbus johnstonii	Gale	9
			Labeo altivelis	Manyame	1

2.1.5.2. IUCN RED LIST ASSESSMENT

The fish species sampled in all four areas i.e upstream the dam, dam area, downstream the dam and the Chikwawa floodplane were subjected to the IUCN Red List Assessment. The assessment helps in understanding the conservational status of the fish species for proper and species-specific interventions. Out of the 20 identified fish species, *Oreochromis karongae* is listed as critically threatened/endangered (CR) while *Oreochromis mossambicus* is listed as vulnerable (VU) and *Opsaridium tweddleorum* is listed as data deficient (DD) according to the IUCN. The remaining seventeen (17) species were under the least concern category (LC) as presented in Table 2-4. Most of the fish species sampled are not endemic, not protected and 40% are non-migratory and hence have a localized habitat while 60% are migratory.

Table 2-4: Results of the aquatic fauna field survey

Family	Scientific name	Common name	Protected species (YES/NO)	Endemic species / Restricted range species (YES / NO)	Migratory species (YES/NO)	IUCN Category	Favorable habitat for the species contacted
Alestidae	*Brachyalestes imberi*	Bwezele	NO	NO	NO	LC	Wetlands
Cichlidae	*Astatotilapia calliptera*	Kambuzi	NO	NO	NO	LC	Wetland/Aquatic
	Oreochromis karongae	Chambo	YES	YES	NO	CR	Wetlands
	Oreochromis mossambicus	Makakana	NO	NO	YES	VU	Wetland/Aquatic
	Oreochromis shiranus	Chambo	NO	NO	NO	LC	Wetland/Aquatic
	Otopharynx tetrastigma	Kambuzi	NO	NO	NO	LC	Wetlands
Clariidae	*Clarias gariepinus*	Mlamba	NO	NO	NO	LC	Wetlands
Cyprinidae	*Enteromius paludinosus*	Matemba	NO	NO	YES	LC	Wetland/Aquatic
	Enteromius radiatus	Matemba	NO	NO	YES	LC	Wetland/Aquatic

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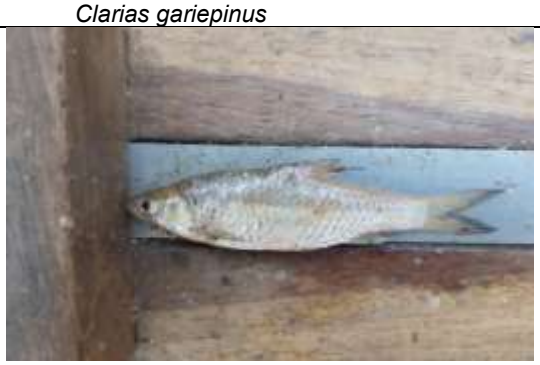
Family	Scientific name	Common name	Protected species (YES/NO)	Endemic species / Restricted range species (YES / NO)	Migratory species (YES/NO)	IUCN Category	Favorable habitat for the species contacted
	Labeo congoro	Nzizi	NO	NO	YES	LC	Wetlands
	Labeo cylindricus	Gundamwala /Nkhongolo	NO	NO	YES	LC	Wetlands
	Labeobarbus eurystomus	Gale	NO	NO	YES	LC	Wetlands
	Labeobarbus johnstonii	Gale	NO	NO	YES	LC	Wetlands
	Opsaridium tweddleorum	Sanjika / Njole	NO	NO	NO	DD	Wetlands
	Labeo altivelis	Manyame	NO	NO	YES	LC	Wetlands
Distichodontidae	*Distichodus schenga*	Tchenga	NO	NO	YES	LC	Wetlands
Mochokidae	*Synodontis zambezensis*	Nkholokolo	NO	NO	YES	LC	Wetlands
Mormyridae	*Mormyrus longirostris*	Nkhoti	NO	NO	NO	LC	Wetlands
	Marcusenius macrolepidotus	Mphuta	NO	NO	YES	LC	Wetlands
Schilbeidae	*Schilbe intermedius*	Dande	NO	NO	YES	LC	Wetland/Aquatic

Family	Pictures
Cyprinidae	 *Labeo congoro*  *Labeo cylindricus*  *Labeobarbus johnstonii*  *Labeo altivelis*

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Family	Pictures
Cichlidae	   *Oreochromis mossambicus* *Oreochromis karongae* *Oreochromis shiranus*   *Astatotilapia calliptera* *Otopharynx tetrastigma*
Mormyridae	  *Mormyrus longirostris* *Marcusenius macrolepidotus*
Distichodontidae	 *Distichodus schenga*

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Family	Pictures
Schilbeidae	 *Schilbe intermedius*
Clariidae	 *Clarias gariepinus*
Alestidae	 Brachyalestes imberi (formerly as: Brycinus imberi)
Mochokidae	 *Synodontis zambezensis*

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2.1.6. Potential Project Impacts on fish biodiversity

The rehabilitation of a dam at Kapichira may have ecological impacts, particularly on fish biodiversity, by modifying the natural flow of the Shire River, destroying permanent habitats for aquatic fauna example deep pools, and disrupting overall ecological processes. Many fish species, such as Cyprinidae, Distichodontidae and Schilbeidae, rely on migration upstream and downstream reaches for breeding, feeding, and survival. Dams create a physical barrier that prevent fish from reaching their spawning or feeding grounds, which may severely affect population recruitments. Discussion with fishers downstream the Kapichira bridge, take note that upstream of Kapichira bridge forms part of the Majete Wildlife Reserve and therefore no fishing is allowed along that stretch, indicates that the fisheries continue to be a vital component of the local livelihood and economy in this area and that the fisheries are seasonal and migratory. Dams trap sediments that would otherwise flow downstream, during de-silting leading to aquatic animal choking, death considering the high-water discharge flow rates. The sediment transported during this exercise may reduce or affect spawning grounds for fish downstream. The slower-moving waters of reservoirs tend to accumulate pollutants, such as agricultural runoff and industrial waste, which can affect the health of aquatic species. Dams can isolate fish populations, preventing gene flow between different groups. This isolation can lead to inbreeding and reduced genetic diversity, which makes species more vulnerable to environmental changes and disease outbreaks. Dams disrupt ecosystem services that are provided by free-flowing rivers, such as nutrient cycling, sediment distribution, and the natural flood regime, which are vital for maintaining diverse and resilient fish populations.

2.1.7. Aquatic Biodiversity Offsets

Aquatic biodiversity offsets are conservation measures designed to compensate for the loss of aquatic biodiversity caused by development projects, such as dam construction. These offsets aim to ensure that any adverse impacts on aquatic ecosystems are counter-balanced by ecological gains elsewhere, achieving a "no net loss" or even a "net gain" for biodiversity.

The Kapichira Dam Rehabilitation Project will aim to deal with impacts on aquatic biodiversity according to the mitigation hierarchy as a lasting solution if efforts to avoid, minimize and rehabilitate and restore the affected ecosystems have not been successful. Specifically, the project will aim to provide a “net gain” for critical habitat-qualifying features and “no net loss” for natural habitat where residual biodiversity impacts occur.

During an earlier assessment of the biodiversity, some seven freshwater fish species from the Lower Shire River basin were identified as ‘potentially’ qualifying for critical habitat (under International Finance Corporation Performance Standard 6 (IFC PS6; TBC 2019a). The seven species of fish that qualified as critical habitat were; *Labeo mesops* (CR), *Oreochromis karongae* (CR), *Oreochromis squamipinnis* (CR). *Bagrus meridionalis* (CR), *Serranochromis robustus* (CR), *Labeobarbus johnstonii* (LC), *Opsaridium microcephalum* (LC). However, further analysis of the data and expert review concluded otherwise i.e. that none of the fish species indeed qualified as critical habitat (TBC 2023b). The natural range of these species is in Lake Malawi and the Upper Shire basin, and not in the Middle Shire. Because of this, they are not present in the Middle Shire in minimum viable populations. The species are not fully reliant on migration to successfully complete their life cycle and the % of their range in the aquatic EAAA (Ecological Appropriate Area of Analysis) is less than the threshold (>1%) to qualify under Criterion 3a.

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This first field assessment identified two (2) specimens of *Oreochromis* karongae (CR), in the dam area. As previously observed and discussed by others, *Oreochromis karongae* does not occur in minimum viable population. It is probably found in this habitat due to being washed by flooding waters from the Upper Shire basin and as such is not qualified as critical habitat.

2.2. Invertebrates

This section presents findings on invertebrates surrounding the proposed Kapichira Dam rehabilitation project site. The field surveys on invertebrates focused on the following aims: to investigate the invertebrates in terms of local Malawian conservation-significant species, as well as the IUCN/CITES -listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas and to produce a species list of invertebrates sampled.

2.2.1. Survey methods

Prior to the survey, a review on the invertebrates of the Kapichira dam project area was carried out. The review was mainly aimed at having a list of invertebrates found in the Kapichira dam area as well as a list of species of local Malawian conservation-significance, as well as the IUCN/CITES -listed ones (threatened i.e. Critically Endangered, Endangered, and Vulnerable or near threatened). Interviews with local fishermen or villagers were also done to find out from them what invertebrates do they meet as they carry out their normal day to day fishing and farming activities.

2.2.2. Survey site selection, locations and descriptions

Sampling of the invertebrates was conducted on 13 target sampling points: Site 1 (Downstream Lower Bridge West), Site 2 (Downstream Lower Bridge East), Site 3 (Kapichira Dam Construction Site), Site 4 (Upper Egenco Bridge Area), Site 5 (Majete Wildlife Reserve Shire River West), Site 6 (Majete Wildlife Reserve Shire River East), Site 7 (Access Road to Dam), Site 8 (Chikwawa Sampling 1), Site 9 (Chikwawa Sampling3), Site 10 (Chikwawa Sampling 5), Site 11 (Chikwawa Sampling 2), Site 12 (Chikwawa Sampling4), and Site13 (Elephant Marsh 2). The details of the locations are shown in Appendices 1 and 2.

2.2.3. Sampling methods

Sampling of invertebrates was done using opportunistic sampling (sampling on as encountered basis), systematics and semi systematics methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as different species as possible present within the Kapichira dam proposed project reconstruction area. Within each of the habitat types, invertebrates were collected by scooping, using traps, hand picking, photographing, shrubs shaking and observations (Figure 2-12). We also did some interviews with local community people we met in the survey sites. All the habitats were sampled by using suitable method(s) appropriate to the habitats. The habitats sampled were wetlands, forests, riverine and some cultivated farmland areas.

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Invertebrate specimens were also stored and labelled appropriately for later identification in a laboratory/museum since it is expected that not all taxa can be identified in the field, hence, the appropriate storage of samples was crucial.



Invertebrate encountered



Observations



Community interviews



Baited Trap

Figure 2-11: Images depicting some methods employed during the study

2.2.4. Identification of the invertebrates encountered

Collected invertebrates specimens (usually adults) which were easily identified in the field were recorded in data collecting forms and the ones which were not easily identified were put into transparent envelopes and collecting bottles to be identified using invertebrate field guides and other books at the Museums of Malawi { Tarboton, W and Tarboton, M (2002), Tarboton, W and Tarboton, M (2005), Picker, M et al. (2002), Dijkstra, K-D.B (2007), Harde, K.W. (1984), Scholtz, C.H. and Holm, E (1985), Mandahl -Barth, G. (1962), Gerber, A and Gabriel, M.J.M. (2002), Raymond Murphy (F.R.E.S) and Top Mandala museum collections. Those that were identified easily were released while those that needed further checking were taken to the museum for sorting, setting and then identification. The species were identified to their order level, family level, genus and some to species level.

2.2.5. Data analysis

Data was cleaned using Openrefine version 3.2 for windows (Google Inc. and Contributors, 2010). Microsoft Excel and Word were used to come up with summaries of the sampled invertebrate data.

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2.2.6. Survey limitations and constraints.

The survey was conducted during dry season. In the dry season some rivers had no water flowing and most of the sampling places were difficult to reach due to bad roads and terrain. Butterfly traps stayed for only few hours or a night reducing chances of encountering more invertebrates. Therefore, sampling was mainly concentrated on opportunistic sampling, observations and few trapped ones. The local people consulted on invertebrates only gave general terms for groups of invertebrates rather than specifics though being probed to do so. This dry season field survey was an attempt to try to sample all the three seasons within a year (dry and hot seasons; August to November), the wet and hot; December to April), and the cold and dry: May to August) for better results.

2.2.7. Results on invertebrate assessment

The invertebrates encountered have be presented in Table 4 where invertebrate orders, families, species and abundance have been shown. In addition, Figures 2-13 and 2-14 show invertebrate order comparison data per site and invertebrate families comparison data per site, respectively. Further, Figures 2-15 and 2-16 show invertebrate species comparison data per site and invertebrate abundance (count) comparison data per site.

Table 2-5: Orders, families, species and abundance data per target site

Site	Site	Order	Families	Species	Abundance
1	Site1 (Downstream Lower Bridge East)	9	34	≥ 76	831
2	Site2 (Downstream Lower Bridge West)	10	26	≥ 61	329
3	Site3 (Kapichira Dam Construction Site)	14	37	≥ 87	559
4	Site4 (Upper Egenco Bridge Area)	10	20	≥ 42	139
5	Site5 (Majete Wildlife Reserve Shire River West)	13	27	≥ 52	587
6	Site6 (Majete Wildlife Reserve Shire River East)	13	25	≥ 64	441
7	Site7 (Access Road to Dam)	8	13	≥ 30	82
8	Site8 (Chikwawa Sampling1)	11	28	≥ 59	274
9	Site9 (Chikwawa Sampling3)	8	23	≥ 47	542
10	Site910(Chikwawa Sampling5)	6	13	≥ 29	140
11	Site11 (Chikwawa Sampling2)	9	23	≥ 43	130
12	Site12 (Chikwawa Sampling4)	9	14	≥ 32	101
13	Site13 (Elephant Marsh2)	13	25	≥ 45	153
14	Site14 (Elephant Marsh1)	7	13	≥ 35	84
	TOTAL	21	74	219	4392

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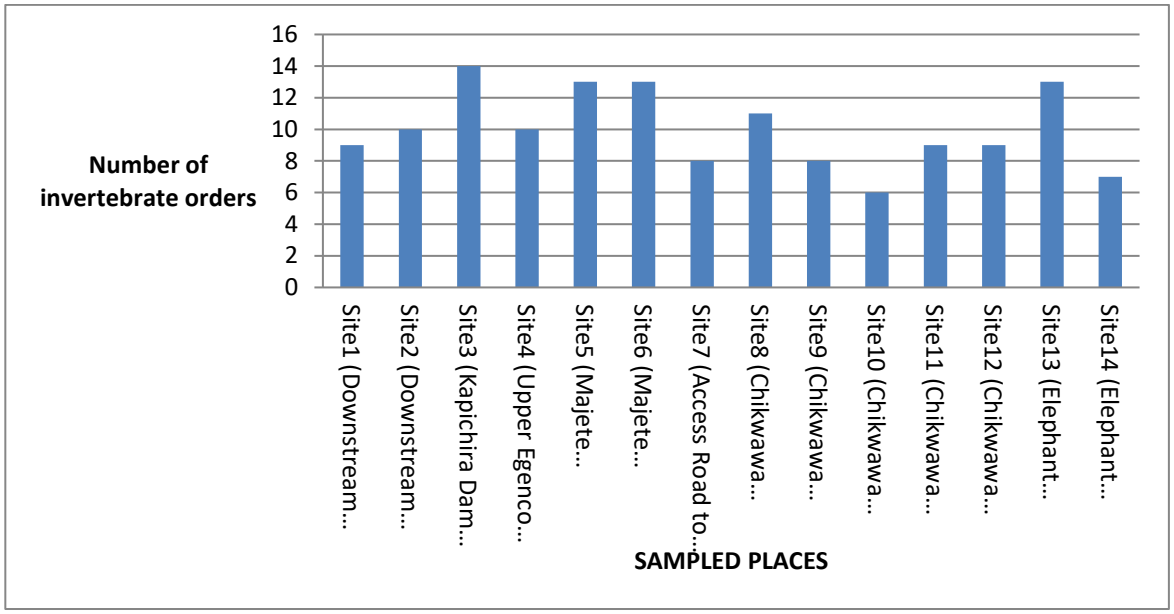


Figure 2-12: Invertebrate order comparison data per site

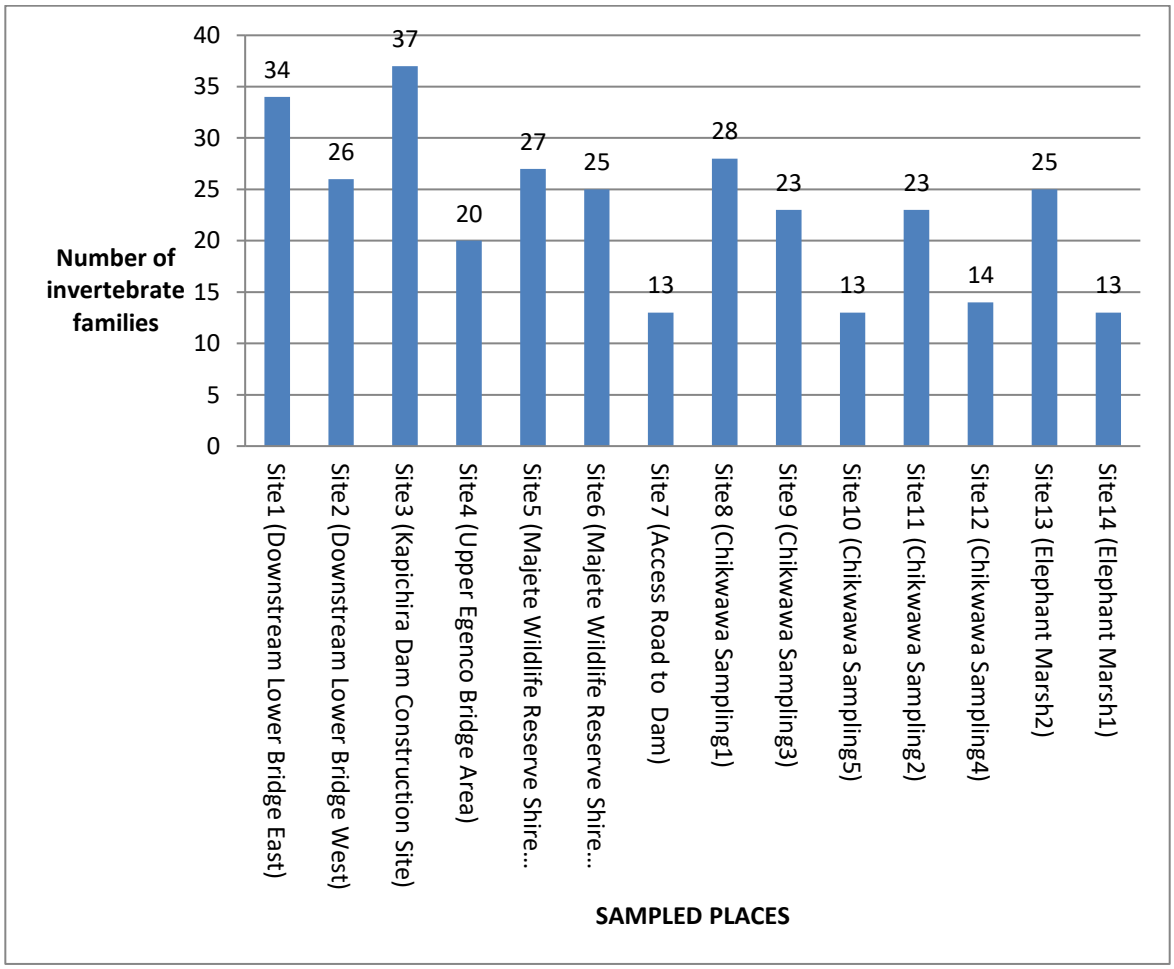


Figure 2-13: Invertebrate families comparison data per site

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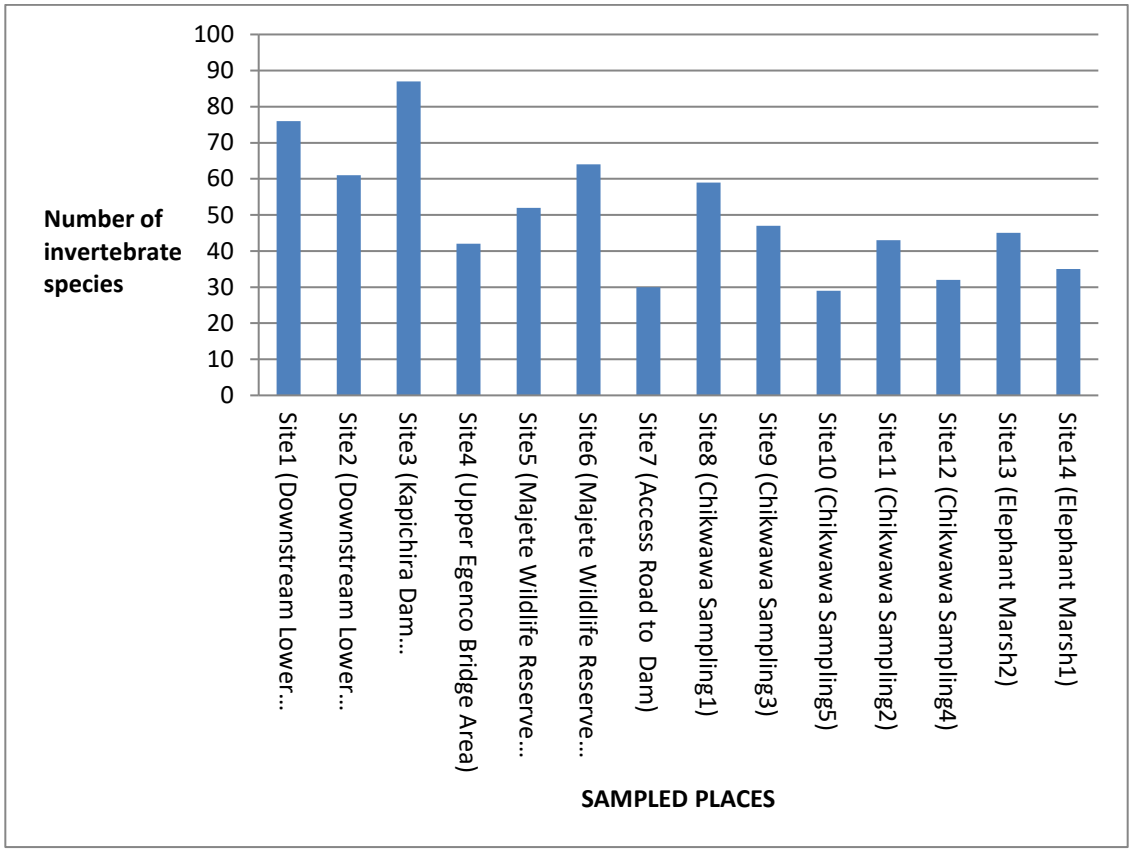


Figure 2-14: Invertebrate species comparison data per site

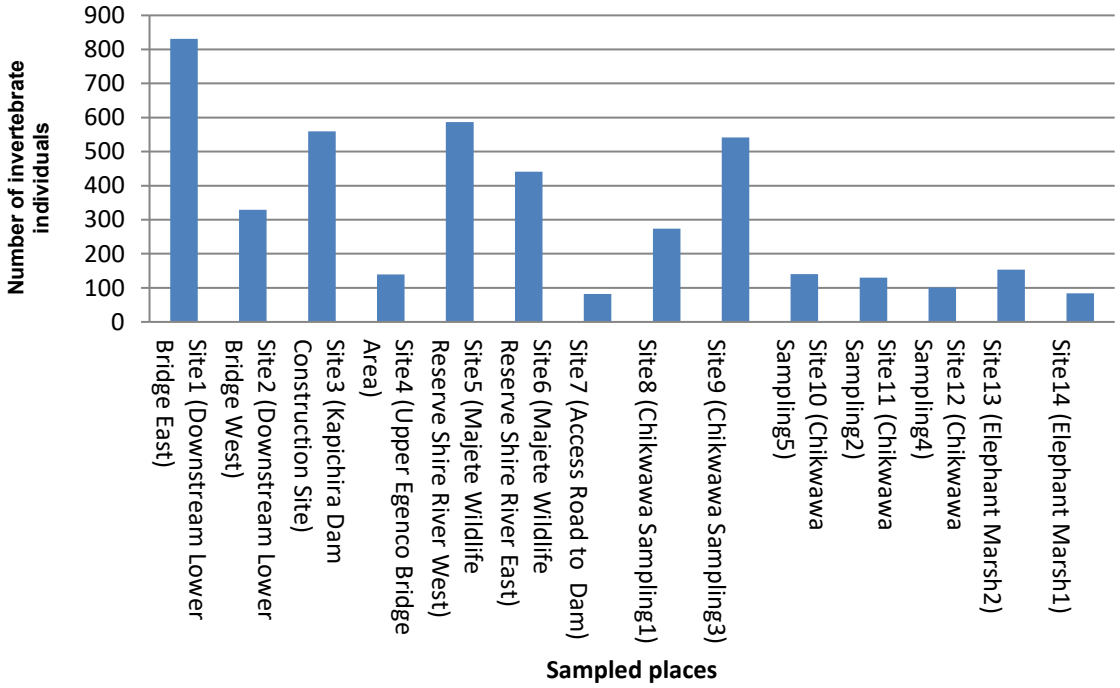


Figure 2-15: Invertebrate abundance (count) comparison data per site

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2.2.8. Findings on invertebrates

In general, the high abundance of species and number of families for an area sampled, can be attributed to the fact that the area during the survey had greater numbers of successful species. The area had more stable ecosystems and that more ecological niches were available and the environment was likely to be pleasant to the ecosystem as a whole. This means that the Kapichira Dam Construction Site had a very wide range of habitats. While the low number of species and number of families for an area sampled in this case Chikwawa Sampling5 is mainly because of fewer numbers of successful species and unstable environment within the area hence less ecological niches were available.

Therefore, any activity that will lead to the loss of riparian vegetation, drying of riverine, pollution and augment reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of species of invertebrates. These invertebrates play crucial roles in maintenance of ecosystems process like pollination, nutrient recycling and food chains and food webs.

2.2.9. Conservation of significant species

Table 2-5 presents invertebrates that were identified to order level, family level, genus level and some to species level, that were encountered during the survey and have been assessed for the IUCN red list status (Version 2024-1 IUCN red list) in the Kapichira dam area. The results indicate that no endangered species of invertebrates were encountered in the sampled sites during the surveyed period.

Only Hirudo medicinalis (Leech) which was not recorded during the survey but was mentioned by fishermen and villagers as being seen after being bitten by it when fishing is a near threatened species recoded under IUCN red data list (Version, 2024 - 1) among the aquatic invertebrates. Most of the species were either not evaluated or assessed by IUCN or were under Least Concern.

In summary, during the study, a total of 21 invertebrate orders, 74 families and 219 species were recorded for terrestrial and aquatic invertebrates. Only Hirudo medicinalis (Leech) which was not recorded during the survey but was mentioned by fishermen/villagers as being seen after being bitten by it when fishing is a near threatened species recoded under IUCN red data list (Version, 2024 - 1) among the aquatic invertebrates.

The other invertebrates sampled during this survey seem not to be classified as threatened at national and international levels. These invertebrates are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important tomorrow. Therefore, considerations should be taken to protect these invertebrates through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project.

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2.3. Herpetofauna

2.3.1. Introduction

One part of the biodiversity assessment focused on herpetofauna. This involved assessment of herpetofauna species found in the proposed project area in order to develop a list of species of local Malawian conservation-significance on the IUCN/CITES -listed ones (threatened i.e. Critically Endangered and Vulnerable or near threatened). Interviews with local communities were also done to determine what herpetofauna species they encounter during their normal day to day activities within the project area.

For this study, 14 sampling points were targeted as follows: Site 1 (Downstream Lower Bridge East), Site 2 (Downstream Lower Bridge West), Site 3 (Majete Wildlife Reserve –Shire West Site), Site 4 (Majete Wildlife Reserve –Shire East), Site 5 (Construction site), Site 6 (Upper Egenco Bridge site), Site 7 (Ng'ona Lodge towards Egenco bridge), Site 8 (Access road to the Dam), Site 9 (Chikwawa Food plain 1), Site 10 (Chikwawa flood plain 3), Site 11 (Chikwawa Flood plain 5), Site 12 (Chikwawa Flood plain 2), Site 13 (Chikwawa Flood plain 4), and Site 14 (Elephant Marsh).

2.3.2. Sampling for Herpetofauna

The sampling exercise for Herpetofauna was conducted as follows:

- Opportunistic sampling method
- Direct observation in various habitats and active searches underneath leaf and grass litters, rock crevices, rotting wood, in grass, water bodies and pools, riverine and marshy areas, in holes and caves.
- Conducting face-to-face interviews with the local communities found in the project area.

The habitats targeted for sampling were wetlands, forest areas, riverine and some cultivated farmland areas. Most of the encountered hepertofauna species were easily identified in the field and recorded in data collecting forms. However, for some specie which were not easily identified, were photographed and later identified at the Museums of Malawi. The species were identified based on their order, family, genus and species levels.

2.3.3. Limitations during the study of herpertofauna

The survey was conducted during dry season when some rivers had no water flowing and most of the sampling places were difficult to reach due to challenges in accessibility and steep terrain. Sampling was mainly concentrated on opportunistic sampling and active searches.

2.3.4. Findings on herpetofauna assessments

Results in Table 2-6 show site name where assessments were conducted, targeted taxa, and local and scientific names of species encountered. Species abundance and species percentage have also been presented.

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Table 2-6: Combined data collected for Dam and construction sites

Sr. #	Target Taxa	Local name	Scientific name	Abundance	%
1	Reptile	African Python	Python sebae	4	3.33%
2	Reptile	Common Dwarf Gecko	Lygodactylus capensis	12	10.00 %
3	Reptile	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	3	2.50%
4	Reptile	Crocodile	Crocodylus niloticus	5	4%
5	Reptile	Eastern Forest Cobra	Naja subfulva	1	0.83%
6	Reptile	Eastern Yellow-bellied Sand Snake	Psammophis orientalis	3	2.50%
2	Reptile	Green Water snake	Philothamnus hoplogaster	3	2.50%
7	Reptile	Mossambique spitting Cobra	Naja mosambicus	1	0.83%
10	Amphibian	Mozambique ridged Frog	Ptychadena mossmbica	4	3.33%
8	Reptile	Oate's Vine Snake	Thelotornis capensis oatesii	3	2.50%
9	Reptile	Olive Grass Snake	Psammophis mossambicus	5	4%
4	Reptile	Peter's Ground Agama	Agama amrmata	1	0.83%
10	Reptile	Puff adder	Bitis arietans	12	10.00 %
11	Reptile	Rainbow Skink	Trachylepis margaritifer	23	19.17 %
12	Reptile	Rock Monitor	Varanus albigularis albigularis	14	12%
13	Reptile	Rofous-beaked Snake	Rhamphiophis oxyrhynchus rostatus	1	0.83%
8	Reptile	Southern Tree Agama	Acanthrocercus atricollis atricollis	2	2%
14	Reptile	Stripped Grass snake	Psammophylax tritaeniatus	5	4%
15	Reptile	Stripped Skink	Trachylepis striata	1	0.83%
16	Reptile	Variable Skink	Trachylepis varia	14	12%
8	Reptile	Water Monitor	Varanus niloticus	2	2%
11	Reptile	Yellow-throated plated Lizard	Gerrhosaurus flavigularis	1	0.83%

The species richness was also assessed during the biological diversity assessments. Figure 2-17 shows the species richness of the Dam and the proposed project construction site.

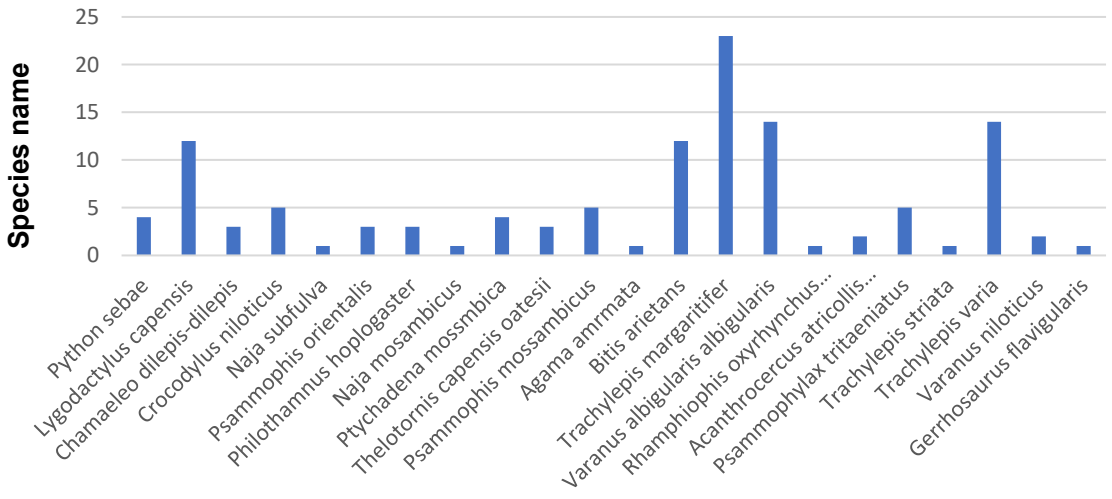


Figure 2-16: Species name and abundance

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Results in Table 2-7 and Figure 2-18 show that *Trachylepis margaritifer* was recorded as being dominant among the species encountered. From the above table; 23 Hepertofauna species were encountered during the dry season survey in the Kapichira Hydro Power project area and 1 is nearly threatened and 21 are of least concern on the IUCN status

Table 2-7: Combined data collected from downstream sites

Site Name	Sr. #	Target Taxa	Local name	Scientific name	Abundance	%
Chikwawa flood plain 1	1	Amphibian	Mababe puddle frog	Phrynobatrachus mababiensis	3	0.90%
Lower Egenco bridge eastern	1	Reptile	African Python	Python sebae	2	0.60%
Lower Egenco bridge eastern	2	Amphibian	Anchieta;s Rigged Frog	Ptychadena anchietae	54	16.12 %
Lower Egenco bridge western	1	Reptile	Bronze Rock Skink	Trachylepis lacertiformis	1	0.30%
Chikwawa flood plain 1	3	Amphibian	Bull frog	Pyxicephalus adspersus	3	0.90%
Ngona Lodge towards Egenco bridge	2	Reptile	Common Dwarf Gecko	Lygodactylus capensis	26	7.76%
Lower Egenco bridge western	2	Reptile	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	2	0.60%
Lower Egenco bridge western	4	Reptile	Crocodile	Crocodylus niloticus	33	9.85%
Upper Egenco bridge	1	Reptile	Eastern Vine Snake	Thelornis mossambicanus	3	0.90%
Lower Egenco bridge eastern	3	Reptile	Eastern Yellow-bellied Sand Snake	Psammophis orientalis	4	1.19%
Chikwawa flood plain 1	6	Amphibian	Fornasin's Spiny reed frog	Afrixalus fornasini	7	2.09%
Lower Egenco bridge western	3	Reptile	Green Water snake	Philothamnus hoplogaster	32	9.55%
Lower Egenco bridge eastern	4	Reptile	Kirk's Agama	Agama kirkii	2	0.60%
Chikwawa Flood Plain 5	4	Amphibian	Long reed frog	Hyperolius nasutus	2	0.60%
Lower Egenco bridge eastern	5	Amphibian	Mababe Puddle Frog	Phrynobatrachus mababiensis	5	1.49%
Elephant Marsh 1	3	Amphibian	Marbled reed Frog	Hyperolius marmoratus	7	2.09%
Lower Egenco bridge eastern	6	Reptile	Mossambique spitting Cobra	Naja mosambicus	3	0.90%
Lower Egenco bridge western	5	Amphibian	Mozambique ridged Frog	Ptychadena mossambica	4	1.19%
Upper Egenco bridge	4	Reptile	Olive Grass Snake	Psammophis mossambicus	1	0.30%
Ngona Lodge towards Egenco bridge	6	Reptile	Pan Hinged terrapins	Pelusios subniger	29	8.66%
Upper Egenco bridge	5	Reptile	Peter's Ground Agama	Agama armata	2	0.60%
Lower Egenco bridge eastern	7	Reptile	Puff adder	Bitis arietans	8	2.39%
Lower Egenco bridge eastern	8	Reptile	Rainbow Skink	Trachylepis margaritifer	26	7.76%
Lower Egenco bridge eastern	9	Reptile	Rock Monitor	Varanus albigularis albigularis	7	2.09%
Upper Egenco bridge	8	Reptile	Rofous-beaked Snake	Rhamphiophis oxyrhynchus rostatus	5	1.49%
Chikwawa flood plain 1	9	Amphibian	Short-legged Spiny reed frog	Afrixalus brachycnemis	5	1.49%
Upper Egenco bridge	9	Reptile	Spotted Bush Snake	Philothamnus semivariegatus	8	2.39%
Lower Egenco bridge western	8	Reptile	Striped Flat Lizard	Platysaurus torquatus	1	0.30%
Lower Egenco bridge eastern	10	Reptile	Stripped Grass snake	Psammophylax tritaeniatus	2	0.60%
Lower Egenco bridge eastern	11	Reptile	Stripped Skink	Trachylepis striata	17	5.07%

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Site Name	Sr. #	Target Taxa	Local name	Scientific name	Abundance	%
Lower Egenco bridge eastern	12	Reptile	Variable Skink	Trachylepis varia	7	2.09%
Chikwawa Flood Plain 5	5	Amphibian	Water lily frog	Hyperolius pusilus	4	1.19%
Lower Egenco bridge western	7	Reptile	Water Monitor	Varanus niloticus	20	5.97%

From the above graph 33 Hepertofauna species that were encountered, 1 (*Python seba*) is nearly threatened and 32 are of least concern.

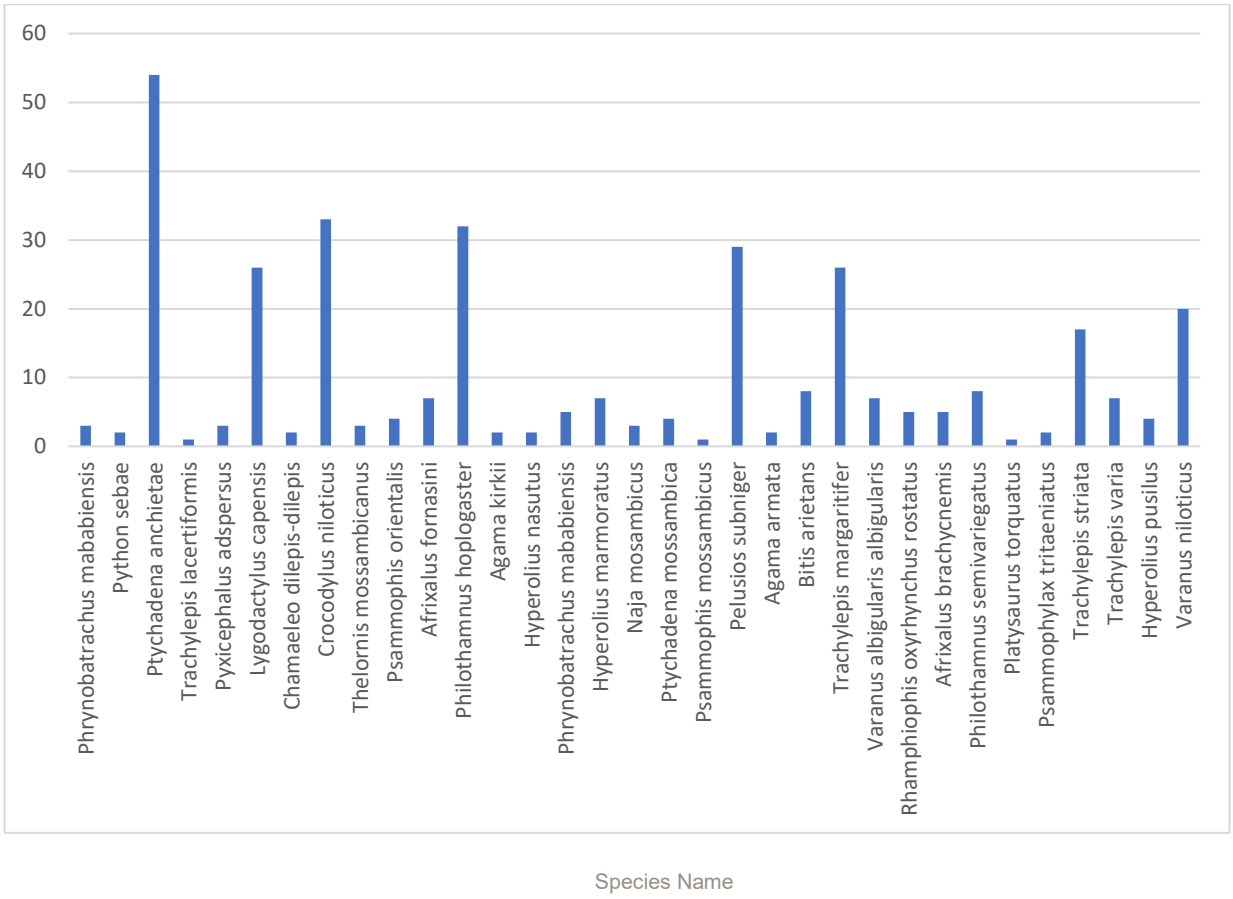


Figure 2-17: Species richness of the downstream sites

Thirty-three Herpetofauna species were encountered during the dry season survey in the Kapichira Hydro Power project area and all are of least concern on the IUCN status whereby *Ptychadena anchieta* is dominant. 36 Herpetofauna species were encountered from all the sites in the project area during the survey in the Kapichira Hydro Power project area and all are of least concern except one (*Python seba*) is Nearly threatened on in the IUCN status.

In general, the high abundance of herpetofauna species and number of families for an area sampled can be attributed to the fact that the area during the time of the assessment had greater numbers of successful species. The area had more stable ecosystems and that more ecological niches were available and the environment was likely to be suitable to the ecosystem as a whole. This means that the Kapichira Dam Construction Site has a very wide range of habitats. While the low number of species and number of families for an area sampled particularly Chikwawa Sampling 5 is mainly because of fewer numbers of successful species and unstable environment within the area hence less ecological niches were available.

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Therefore, any activity that will lead to the loss of riparian vegetation, drying of riverine, pollution and augment reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of species of herpetofauna. These species play crucial roles in maintenance of ecosystems processes. Therefore, considerations should be taken to protect them through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project.

2.3.5. Conservation significance of herpetofauna species

Herpetofauna species which were identified to order level, family level, genus level and species level, were assessed for the IUCN red list status. The results indicate that no endangered species were encountered in the sampled sites during the surveyed period. Only *Python sebae* which was recorded during the survey and was also reported to be found in the area by the local informants is a near threatened species recoded under IUCN red data list among the reptiles. While most of the species sampled were under Least Concern.

2.4. Birds

2.4.1. Introduction

The other part of biodiversity assessment focused on developing a list of bird species found in the proposed project area as well as to identify bird species of local Malawian conservation-significance on the IUCN/CITES - listed ones (threatened i.e. Critically Endangered and Vulnerable or near threatened). The main aim of the investigation was to investigate the birds in terms of local Malawian conservation-significant species, as well as the IUCN/CITES - listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas. Apart from field surveys, interviews with local communities were also conducted to find out what bird species they encountered during their normal day to day activities within the project site

2.4.2. Sampling for bird assessment

Sampling for the bird assessments was conducted in the same sites where assessment for invertebrates and herpetofauna was carried out (Appendix C). Sampling of birds was done using opportunistic sampling (sampling on as encountered basis), systematic and semi systematic methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as different species as possible present within the Kapichira dam proposed project reconstruction area. We also did some interviews with local community people we met in the survey sites. The habitats sampled were composed of wetlands, forests, riverine and some cultivated farmland areas.

Sampling of birds was conducted as follows:

- Opportunistic and semi-systematic criss-cross transect walks methods
- Direct observation in riparian areas, sandbars, feeding and resting areas, breeding areas, water bodies and pools.
- Listening to bird calls

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- Mist netting (Figure 2-19) riverine areas and woodland in the Majete wildlife Reserve
- Conducting face-to-face interviews with relevant stakeholders in the project area.



Figure 2-18: Mist netting for birds during the study

Most of the encountered bird species were easily identified in the field and recorded in data collection forms. However, for the ones which were not easily identified, the were photographed and later identified at the Museums of Malawi. Those that were identified easily (mist netted birds) were released. The species were identified to their order, family, genus and species levels.

2.4.3. Limitations of the bird study

The survey was conducted during dry season whereby some rivers had no water flowing and most of the sampling places were difficult to reach due to bad roads and terrain. Mist nets stayed for only few hours therefore reducing chances of encountering more birds. Sampling was mainly concentrated on bird calls, opportunistic sampling, observations and few mist netted ones.

2.4.4. Findings of the bird study

A total 137 bird species were encountered during the field assessments (Appendix D). It was further noted that all the bird species sited were of least concern. Just like the other taxa, the high abundance of species and number of families recorded can be attributed to the fact that the area during this time had greater numbers of successful species. The area has more stable ecosystems and that more ecological niches were available and the environment was likely to be pleasant to the ecosystem as a whole. This means that the Kapichira Dam Construction Site has a very wide range of habitats.

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Conversely, the low number of species and families for an area sampled in Chikwawa Sampling 5 is mainly because of fewer numbers of successful species and unstable environment within the area hence less ecological niches were available. The figure below shows that among the bird species encountered, ***Spermestes cucullatta*** was the most dominant species. Appendix D of the report provides details on the bird species encountered during the assessment while Appendix F presents the birds encountered in each of the locations which were assessed.

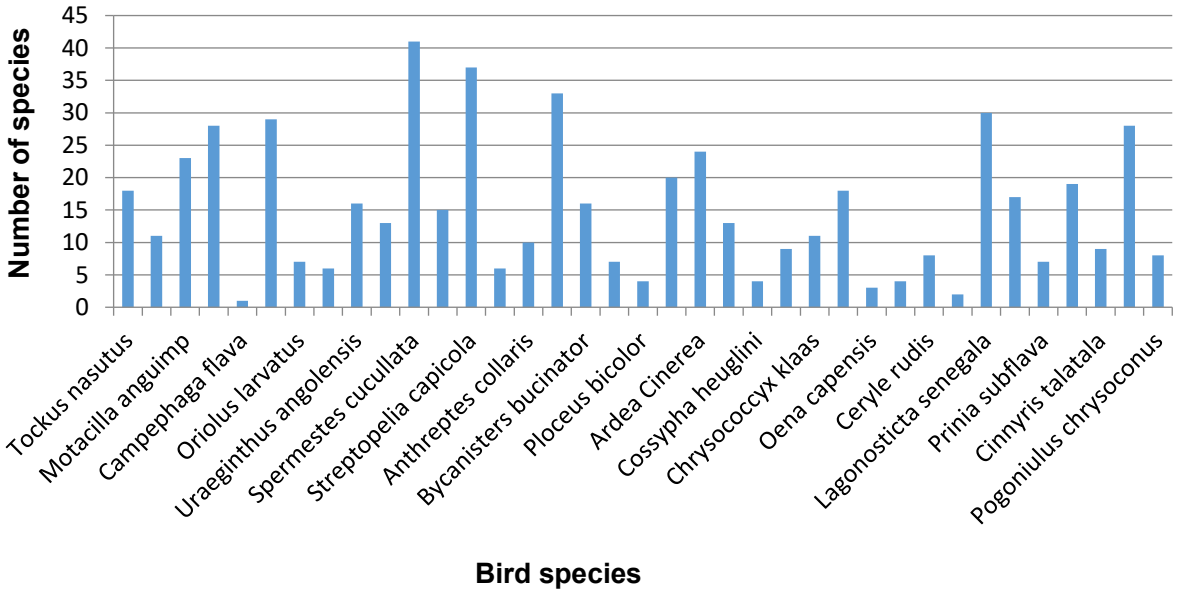


Figure 2-19: Number of birds species during the survey

In sum, it implies therefore that any activity that will lead to loss of riparian vegetation, drying of riverine, pollution and augment reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of species of the bird species. These species play a crucial role in maintenance of ecosystems process like pollination, nutrient recycling and food chains and food webs.

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2.4.5. Bird species richness

The table below shows the species richness from all the sampled sites of the projects area with Majete having more bird species diversity.

Table 2-8: Bird species richness by location

Name of a Site/Species	No of birds identified	Species richness	Migratory	Endemic	Threatened
Downstream Lower Egenco bridge Shire east	37	7.92%	1	0	
Downstream Lower Egenco bridge Shire West	26	5.57%	0	0	1
Majete wildlife Reserve-shire west	59	12.63%	0	0	
Majete wildlife Reserve-shire east	53	11.35%	0	0	
Cosntruction Site	25	5.35%	0	0	
Upper Egenco bridge	39	8.35%	0	0	
Ngona Lodge towards Egenco bridge	30	6.42%	0	0	
Access road to the Dam	21	4.50%	0	0	
Chikwawa Flood plain 1	26	5.57%	0	0	
Chikwawa Flood plain 3	22	4.71%	0	0	
Chikwawa Flood plain 5	24	5.14%	1	0	
Chikwawa Flood plain 2	24	5.14%	1	0	
Chikwawa Flood Plain 4	29	6.21%	8	0	
Elephant Marsh 2 Prescane	31	6.64%	1	0	
Elephant Marsh 1	21	4.50%	3	0	

All bird species that were sampled during the survey were identified to the species level.

2.4.6. Conservation significant bird species

The results indicate that no endangered species were recorded in the sampled sites during the field assessments. This entails that most of the species sampled were under Least Concern based on the IUCN/CITES –list. These birds are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important tomorrow. Therefore, considerations should be taken to protect them through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project.

2.4.7. Challenges impacting on bird species

The Chikwawa flood plain and Elephant Marsh in Malawi are crucial habitats for migratory bird species. However, these areas face several challenges that can impact the birds and the ecosystem as a whole:

- Flooding and Waterlogging: The flood plain and marsh areas are prone to flooding, which can lead to waterlogging, causing difficulties for birds to forage and breed. This issue is exacerbated by the 5th year circle of excessive flooding in the Shire River Basin.

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- Habitat Degradation: The Elephant Marsh, a Ramsar site, is vulnerable to ecosystem services and functions changes due to various factors, including human activities and climate change.
- Disease and Animal Health Issues: The floods can also lead to outbreaks among animals, including those that coexist with migratory birds. For instance, in 2015, n estimated 37% of animals in the poor farming households in Chikwawa succumbed to disease due to flooding.
- Climate Change and Hydrodynamic Modelling: Climate change affects the hydrodynamic modelling of flat areas like the Elephant Marsh, making it challenging to predict and manage floods risks.
- Human-Wildlife Conflict: As the flood plain and marsh areas are also home to human settlements and agricultural activities, there is a risk of human-wildlife conflict, which can impact migratory bird species.

These issues highlight the need for conservation efforts and sustainable management practices to protect the Chikwawa flood plain and Elephant marsh ecosystems, ensuring the well-being of migratory bird species and the local communities.

Habitat-related Issues

1) Habitat destruction and degradation: Human activities such as deforestation, urbanization, and agriculture may lead to habitat loss and degradation, affecting nesting bird population.

2) Invasive Species: Non-native species may outcompete native birds for resources, alter habitats, and disrupt ecosystem balance.

3) Climate Change: Changes in temperature and precipitation patterns may alter the availability of food resource, breeding habitats, and migratory patterns.

Nesting-Specific Issues

1) Nest predation: Predators such as snakes, raccoons and other birds may threaten nesting bird population.

2) Nest disturbances: Human activities such as construction, recreation and agriculture may disturb nesting birds causing them to abandon their nests.

3) Nesting site scarcity: Limited availability of suitable nesting sites may lead to competition among bird species and reduced breeding success.

Human-Related Issues

1) Human disturbance: Increased human presence in nesting areas may disrupt bird behaviour, causing them to avoid the area or abandon their nests.

2) Pollution: Pollution from human activities such as agriculture, industry, and transportation may impact bird populations and their habitats.

3) Lack of awareness and education: Insufficient knowledge and awareness about nesting bird conservation may lead to unintentional harm and habitat destruction.

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Conservation-Related Issues

1) Inadequate conservation efforts: Insufficient conservation measures, such as habitat protection and restoration, may fail to address the needs of nesting bird populations.

2) Limited funding and resources: Inadequate funding and resources may hinder conservation effort and research initiatives.

3) Need for community engagement and participation: Effective conservation requires community involvement and participation, which may be lacking in some areas.

Research-Related Issues

1) Limited data and research: Insufficient data and research on nesting bird population may hinder conservation efforts and informed decision- making.

2) Methodological limitations: Survey methods and techniques may have limitations, such as bias or accuracy issues which can impact the reliability of data.

3) Need for long-term monitoring: Long term monitoring and research are essential for understanding population trends, habitat needs, and conservation effectiveness.

Ecological Niches in Majete Wildlife Reserve.

The Majete wildlife Reserve is a protected area with diverse range of habitats, including forest, grassland and wetlands. This diversity supports a wide variety of ecological niches, which are the specific roles and environments that different species occupy. However, the reserve's ecological niches face numerous conservation challenges.

Comparison with other Surveyed Areas.

In contrast the other surveyed areas have fewer ecological niches and less conservation challenges

Several factors contribute to this difference:

- Habitat uniformity
- Lower human impact
- Fewer invasive species
- Less climate change impact.

In conclusion the Majete Wildlife Reserve ecological niches face more conservation challenges due to habitat fragmentation, human-wildlife conflict, climate change, and invasive species. In contrast, the other surveyed areas have fewer ecological niches and less conservation challenges due to habitat uniformity, lower human impact, fewer invasive species and less climate change impact.

Migratory birds Conservation Measures

1) Habitat protection and restoration

2) Bird- friendly infrastructure

3) Migratory bird monitoring

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4) Community Engagement and Educations

Threatened Birds (including Vultures) Conservation Measures

1) Vulture safe zone

2) Poisoning prevention

3) Artificial nesting platforms

4) Bird trade regulation.

2.5. Mammals

2.5.1. Introduction

Another component that was assessed during the biological assessment was related to mammals. The assessment focused on identification of active animals; investigating burrows; recording tracks, diggings, feces/scat and other signs such as trophy and using live traps to check for available small mammal species. The study was undertaken in order to explore the mammals in terms of local Malawian conservation-significant species, as well as the IUCN red data list for the listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas. During the investigation, a description of the habitats of the mammals was done, burrows were investigated while tracks, diggings, scat/feces, trophies were also photographed.

During the survey, we observed that these surveyed sites provided different ecosystems suitable for the survival of these mammal species. The habitat within the protected areas of **Majete Wildlife reserve shire east** consisted of a grassland marshy plain which provides a grazing ground for most of the mammal species in the park. The presence of shire river provides a great water source for both cooling of animals bodies as evidenced by Loxodonta Africana swimming within the shire river and drinking. Around this plain there is very good forests of mixed woodland almost intact in which a lot of Cyncerus caffer were hiding. The **construction site area** has a riverine type of vegetation with mixed grassland and other vegetative cover, but the most of its habitat is modified. This site was rich in evidence of small mammals which could be the main reason for the presence of wildcats. The area to the eastern part has a riverine forest through which other mammals find comfort. Some of these mammals have been recorded in Figure 2-20.

Areas around lower bridge east and west, upper bridge and across it the habitat is still mixed woodland suitable for different animals as listed in the same table with most of its habitat almost intact. In the upper flood plain (access road to the dam) the forest isn't as much as it is in the other sites already discussed. This could be as a result of the trees which were harvested to pave way for the canal that runs along with the access road to the dam.

Outside and further from the protected area the habitat consists of lost vegetation in most places and much of it in places reserved as graveyards along the shire river. The habitat outside the protected area of Chikwawa floodplain is mostly reeds and different glasses growing along the river almost intact while most places are modified as they are cultivated at small scale level, however in such places traces of the vulnerable species, tracks, calls and scat of *Hippopotamus amphibious* was evidenced.

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2.5.2. Sampling for mammal assessment

Sampling for mammal assessments was conducted in the same sites where assessment of other taxa was carried out. The habitats identified for mammal assessment included the wetlands, forests, riverine and some cultivated farmland and impacted areas ranging from the project site to areas along the Shire Valley. Mammals were sampled using opportunistic sampling method (which involved sighting live animals on chance encounter basis), systematic sampling method which involved using live traps/Sherman and later releasing the mammal. The traps were for small mammals and the cages were for medium sized mammals. These methods of sampling were used in order to have a clear knowledge of species distribution and abundance within the proposed project area. In each of the habitat types, mammals were sighted, active burrows were investigated and recorded, tracks, diggings, faeces/scat and other signs such as trophy were recorded and photographs were captured.

In addition, local communities were consulted through interviews. During the interviews, the local communities were presented with images of the mammals be it small, medium and large from the pocket guide so that they would tell us what kind of animals they could sight on an encounter basis around the proposed project site.

The data collection operations involved the following activities: Recording tracks, diggings, faeces/scat and other signs such as trophy, etc and capturing photographs; use of live traps to check for available small mammal species and later releasing them; and Investigating the mammals in terms of local conservation-significant species, such as those that were Vulnerable (VU), Endangered (EN), Nearly threatened (NT) and Least Concern (LC) as inscribed by the IUCN red data list.

Most live mammals and some footprints were identified in the field and recorded on data collecting forms. Scat were photographed to be identified at the office using pocket field guide and other books at the Museums of Malawi which have been cited under references. The species were identified to their species level. Figure 2-20 depicts images that were collected during the mammal assessments.

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Spiny mouse (*Acomys spinosssimus*)



Checking the traps



Baited trap



Interview with local informant



Hippopotumus amphibius



Saccostomys capensis - Released

Figure 2-20: Images collected during mammal assessments

2.5.3. Limitations of the mammal study

The survey was conducted during dry season. In the dry season some rivers had no water flowing and most of the sampling places were difficult to reach due to bad roads and terrain. Small mammals' traps stayed for few days in some places (two nights instead of three to five nights) and in other sites not at all reducing chances of capture. In most habitats it was cumbersome to catch small mammals because it was too dry to support both food and water for the said mammals. Therefore, sampling was mainly concentrated on opportunistic sampling, observations and few trapped ones. It is very essential to do these field surveys in all the three seasons within a year (dry and hot season; August to November), the wet and hot; December to April), and the cold and dry: May to August) for better results.

2.5.4. Findings of the mammal study

The study has shown that the proposed project area has high species richness and species abundance. During the study, 61 different species have been recorded and presented with 25 sightings (Table 5.1) of either individuals or groups of three animal species Listed as Vulnerable (VU) and these are *Hippopotamus amphibius*, *Giraffe camelopardalis* and *Panthera leo*, 23 sightings of either individuals or groups of one animal species Listed as Endangered (EN), and this is *Loxodonta Africana*, 11 sightings of either individuals or groups of one animal species Listed as Nearly threatened (NT), this is *Cyncerus caffer* and 389 sightings of either individuals or groups of 52 animal species Listed as Least Concern (LC).

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The laws of Malawi, the National Parks and Wildlife Act chapter 66:07 which commenced on 1 April 1994 at 31 December 2017 which was the fifth revised edition of the Laws of Malawi(L.R.O 1/2018), by the Solicitor General and Secretary for Justice under the authority of the revision of the Laws and act; whose purpose among others is (a) the conservation of selected examples of wildlife communities in Malawi; (b) the protection of rare, endangered and endemic species of wild plants and animals; (c) the sustainable use of wildlife and minimization of conflict between human beings and animals, e.t.c provides that "where there are threats of serious irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent degradation of wildlife. Where any person is found committing or is reasonably suspected of having committed or being about to commit an offense under this act, any officer may without warrant arrest such person. (2) any person arrested pursuant to section (1) shall, as soon as possible, through police officers be charged with the appropriate offence and be taken before court, and shall not be detained longer than is necessary". (https://malawi.org/akn/mw/act/1992/11/ng@2017-12-31)

This entails that any individual found to have violated the laws in terms of whatever it entails be punished by the same laws.

The major conservation measure required for these sites including the protected area is reforestation. However we need efforts that aim at protecting encroachment of any kind if this is to be better achieved. The surrounding communities must be empowered to take active participation in the protection of wildlife by putting in place deliberate measures that aims at protecting wildlife. Again in order to aid animals with food during dry periods we need deliberately to plant fruit trees which are suitable to wild animals however this process must be considered with caution in terms of cost of protecting such trees until they can begin fruiting. This could be ideal mainly in places where the forest is not densely covered with vegetative cover and this effort would reduce poaching of other Nearly threatened and least concern animals that prey in park's boundaries near villages in search of such food as they too requires our protection from poaching. If this can be implemented it may offer opportunity to the community members surrounding the park that will be employed and escorted by a game ranger to look after these fruits trees. Some of these trees will help even other species that forms part of this ecosystem together with mammals.

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Table 2-9: Sampled and recorded mammal species

DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
7-Aug-24	lower bridge East	-15.90386	34.752577	-15.90728	34.754875	Chacma baboon	*Papio hamadryas ursinus*	6	15	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Aardvark	*Orycteropus afer*	1	2.5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Acacia rat	*Thallomys paedulcus*	1	2.5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Black tailed tree rat	*Thallomys nigricauda*	1	2.5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Bushbuck	*Tragelaphus scriptus*	2	5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Bushveld gerbrbil	*Tatera leucogaster*	6	15	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Common duiker	*Sylvicapra grimmia*	5	12.5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Eastern rock Elephant shrew	*Elephantulus myurus*	1	2.5	LC
7-Aug-24		-15.90386	34.752577	-15.90728	34.754875	Greater cane rat	*Thryonomys swinderiunus*	1	2.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Ground pangolin	*Manis temminckii*	1	2.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Large-Spotted Genet	*Genetta maculata*	1	2.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Namaqua rock mouse	*Micaelamys namaquaensis*	3	7.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Porcupine	*Hystrix africaeaustralis*	1	2.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Rock hyrax	*Procavia capensis*	1	2.5	LC
7-Aug-24		-15.9064	34.753664	-15.90728	34.754875	Sable antelope	*Hippotragus niger*	2	5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Scrub hare	*Lepus saxatilis*	1	2.5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Single-strippedgrass mouse	*Lemincomys rosaria*	1	2.5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Slender mongoose	*Galerella saguinea*	1	2.5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Southern Giant Pouched Rat	*Cricetomys gambianus*	2	5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Tree squirrel	*Paraxerus cepapi*	1	2.5	LC
7-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Velvet monkey	*Cercopithecus aethiops*	1	2.5	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								40	**100**	

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
9-Aug-24	lower bridge across West	-15.90441	34.751308	-15.90735	34.751628	Aardvark	*Orycteropus afer*	1	3.2258065	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Chacma baboon	*Papio hamadryas ursinus*	4	12.903226	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Common warthog	*Phacocoerus aethiopicus*	2	6.4516129	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Four-toed Sengi	*Petrodromus tetradactylus*	2	6.4516129	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Namaqua rock mouse	*Micaelamys namaquaensis*	1	3.2258065	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Serval	*Laptailurus serval*	1	3.2258065	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Spotted hyaena	*Crocuta crocuta*	1	3.2258065	LC
9-Aug-24		-15.90441	34.751308	-15.90735	34.751628	Velvet monkey	*Cercopithecus aethiops*	19	61.290323	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**31**	**100**	
10-Aug-24	Majete wildlife reserve - Shire East	-15.89145	34.755926	-15.88552	34.752724	African bush Elephant	*Loxodonta africana*	35	16.746411	EN
10-Aug-24		-15.89145	34.755926	-15.88552	34.752724	Buffalo	*Cyncerus caffer*	14	6.6985646	NT
10-Aug-24		-15.89145	34.755926	-15.88552	34.752724	Bushbuck	*Tragelaphus scriptus*	4	1.9138756	LC
10-Aug-24		-15.89145	34.755926	-15.88552	34.752724	Bushveld gerbrbil	*Tatera leucogaster*	1	0.4784689	LC
10-Aug-24		-15.89145	34.755926	-15.88552	34.752724	Chacma baboon	*Papio hamadryas ursinus*	1	0.4784689	LC
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Common warthog	*Phacocoerus aethiopicus*	12	5.7416268	LC
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Four-toed Sengi	*Petrodromus tetradactylus*	1	0.4784689	LC
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Greater kudu	*Tragelaphus strepsiceros*	8	3.8277512	LC
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Hippopotamus	*Hippopotamus amphibius*	2	0.9569378	VU
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Impala	*Aepyceros melampus*	16	7.6555024	LC
10-Aug-24		-15.89724	34.756297	-15.88552	34.752724	Lion	*Panthera leo*	2	0.9569378	VU
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Namaqua rock mouse	*Micaelamys namaquaensis*	1	0.4784689	LC
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Nyala	*Tragelaphus angasii*	1	0.4784689	LC
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Plains zebra	*Equas quagga*	2	0.9569378	LC
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Sable antelope	*Hippotragus niger*	1	0.4784689	LC
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Spotted hyaena	*Crocuta crocuta*	1	0.4784689	LC

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
10-Aug-24		-15.8836	34.753795	-15.87442	34.74642	Waterbuck	*Kobus ellipsiprymnus*	107	51.196172	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**209**	**100**	
10-Aug-24	Majete Wildlife reserve - Shire west	-15.89743	34.753535	-15.89951	34.7525	African bush Elephant	*Loxodonta africana*	48	19.917012	EN
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	African wild cat	*Felis silvestris lybica*	1	0.4149378	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Blue wildebeest	*Connochaetes taurinus*	2	0.8298755	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Buffalo	*Cyncerus caffer*	2	0.8298755	NT
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Bushbuck	*Tragelaphus scriptus*	1	0.4149378	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Bushveld gerbrbil	*Tatera leucogaster*	5	2.0746888	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Chacma baboon	*Papio hamadryas ursinus*	5	2.0746888	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Common duiker	*Sylvicapra grimmia*	1	0.4149378	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Common warthog	*Phacocoerus aethiopicus*	15	6.2240664	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Eland	*Tragelaphusoryx*	2	0.8298755	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Four-toed Sengi	*Petrodromus tetradactylus*	1	0.4149378	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Giraffe	*Giraffe camelopardalis*	7	2.9045643	VU
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Greater kudu	*Tragelaphus strepsiceros*	20	8.2987552	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Hippopotamus	*Hippopotamus amphibius*	13	5.3941909	VU
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Impala	*Aepyceros melampus*	45	18.672199	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Leopard	*Panthera pardus*	1	0.4149378	LC
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Lion	*Panthera leo*	6	2.4896266	VU
10-Aug-24		-15.89743	34.753535	-15.89951	34.7525	Nyala	*Tragelaphus angasii*	23	9.5435685	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Plains zebra	*Equas quagga*	1	0.4149378	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Porcupine	*Hystrix africaeaustralis*	5	2.0746888	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Pouched mouse	*Saccostomys capensis*	2	0.8298755	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Sable antelope	*Hippotragus niger*	2	0.8298755	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Sharpe's grysbok	*Raphicerus sharpei*	2	0.8298755	LC
10-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Side-striped jackal	*Canis adustus*	1	0.4149378	LC

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
11-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Southern Giant Pouched Rat	*Cricetomys gambianus*	1	0.4149378	LC
11-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Spotted hyaena	*Crocuta crocuta*	3	1.2448133	LC
11-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Suni	*Neotragus maschatus*	1	0.4149378	LC
11-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Tree squirrel	*Paraxerus cepapi*	1	0.4149378	LC
11-Aug-24		-15.87487	34.742942	-15.87095	34.746429	Waterbuck	*Kobus ellipsiprymnus*	24	9.9585062	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**241**	**100**	
12-Aug-24	Construction site	-15.89535	34.748912	-15.89622	34.747582	African wild cat	*Felis silvestris lybica*	1	2	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Bushbuck	*Tragelaphus scriptus*	3	6	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Bushveld gerbrbil	*Tatera leucogaster*	1	2	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Chacma baboon	*Papio hamadryas ursinus*	7	14	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Common warthog	*Phacocoerus aethiopicus*	1	2	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Hippopotamus	*Hippopotamus amphibius*	1	2	VU
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Honeybadger	*Mellivora capensis*	1	2	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Impala	*Aepyceros melampus*	2	4	LC
12-Aug-24		-15.89655	34.748827	-15.89622	34.747582	Least Spiny Mouse	*Acomys spinosissimus*	8	16	LC
12-Aug-24		-15.89535	34.748912	-15.89622	34.747582	Nyala	*Tragelaphus angasii*	10	20	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Plains zebra	*Equas quagga*	1	2	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Porcupine	*Hystrix africaeaustralis*	1	2	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Rock hyrax	*Procavia capensis*	2	4	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Scrub hare	*Lepus saxatilis*	1	2	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Serval	*Laptailurus serval*	4	8	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Velvet monkey	*Cercopithecus aethiops*	2	4	LC
12-Aug-24		-15.89792	34.749241	-15.89469	34.750289	Waterbuck	*Kobus ellipsiprymnus*	4	8	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**50**	**100**	

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
13-Aug-24	Upper Bridge (construction site towards the bridge)	-15.89682	34.747544	-15.90141	34.746574	Buffalo	*Cyncerus caffer*	2	2.8985507	NT
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Bushbuck	*Tragelaphus scriptus*	5	7.2463768	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Bushveld gerbrbil	*Tatera leucogaster*	1	1.4492754	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Chacma baboon	*Papio hamadryas ursinus*	33	47.826087	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Common duiker	*Sylvicapra grimmia*	3	4.3478261	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Greater cane rat	*Thryonomys swinderiunus*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Greater kudu	*Tragelaphus strepsiceros*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Least Spiny Mouse	*Acomys spinosissimus*	4	5.7971014	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Multimammate Mouse	*Mustomys atalensis*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Nyala	*Tragelaphus angasii*	3	4.3478261	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Porcupine	*Hystrix africaeaustralis*	1	1.4492754	LC
13-Aug-24		-15.90313	34.750341	-15.90397	34.751042	Rock hyrax	*Procavia capensis*	4	5.7971014	LC
13-Aug-24		-15.89673	34.748825	-15.89703	34.74857	Serval	*Laptailurus serval*	4	5.7971014	LC
13-Aug-24		-15.9023	34.748266	-15.90397	34.751042	Waterbuck	*Kobus ellipsiprymnus*	5	7.2463768	LC
13-Aug-24		-15.89703	34.74857	-15.89703	34.74857	Woodland Thicket rat	*Grammomys dolichurus*	1	1.4492754	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**69**	**100**	
13-Aug-24	Upper Bridge (construction site towards the bridge)	-15.89682	34.747544	-15.90141	34.746574	Buffalo	*Cyncerus caffer*	2	2.8985507	NT
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Bushbuck	*Tragelaphus scriptus*	5	7.2463768	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Bushveld gerbrbil	*Tatera leucogaster*	1	1.4492754	LC
13-Aug-24		-15.89682	34.747544	-15.90141	34.746574	Chacma baboon	*Papio hamadryas ursinus*	33	47.826087	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Common duiker	*Sylvicapra grimmia*	3	4.3478261	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Greater cane rat	*Thryonomys swinderiunus*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Greater kudu	*Tragelaphus strepsiceros*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Least Spiny Mouse	*Acomys spinosissimus*	4	5.7971014	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Multimammate Mouse	*Mustomys atalensis*	1	1.4492754	LC
13-Aug-24		-15.90171	34.745964	-15.90397	34.751042	Nyala	*Tragelaphus angasii*	3	4.3478261	LC

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
13-Aug-24		-15.90313	34.750341	-15.90397	34.751042	Porcupine	*Hystrix africaeaustralis*	1	1.4492754	LC
13-Aug-24		-15.89673	34.748825	-15.89703	34.74857	Rock hyrax	*Procavia capensis*	4	5.7971014	LC
13-Aug-24		-15.89683	34.74879	-15.89703	34.74857	Serval	*Laptailurus serval*	4	5.7971014	LC
13-Aug-24		-15.89684	34.748821	-15.89703	34.74857	Waterbuck	*Kobus ellipsiprymnus*	5	7.2463768	LC
13-Aug-24		-15.89703	34.74857	-15.89703	34.74857	Woodland Thicket rat	*Grammomys dolichurus*	1	1.4492754	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								69	**100**	
14-Aug-24	Towards Ng'ona Lodge, from Bridge	-15.89926	34.755607	-15.89926	34.755607	Chacma baboon	*Papio hamadryas ursinus*	11	47.826087	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Bushveld gerbrbil	*Tatera leucogaster*	2	8.6956522	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Cattle	*Bos taurus*	1	4.3478261	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Common duiker	*Sylvicapra grimmia*	1	4.3478261	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Hippopotamus	*Hippopotamus amphibius*	1	4.3478261	VU
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Leopard	*Panthera pardus*	1	4.3478261	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Rock hyrax	*Procavia capensis*	1	4.3478261	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Velvet monkey	*Cercopithecus aethiops*	1	4.3478261	LC
14-Aug-24		-15.89926	34.755607	-15.89926	34.755607	Waterbuck	*Kobus ellipsiprymnus*	4	17.391304	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**23**	**100**	
14-Aug-24	Upper floodplain (Access road to the dam)	-15.91052	34.742485	-15.91451	34.746628	Antbear	*Orycteropus afer*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Bushveld gerbrbil	*Tatera leucogaster*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Chacma baboon	*Papio hamadryas ursinus*	7	46.666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Common duiker	*Sylvicapra grimmia*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Porcupine	*Hystrix africaeaustralis*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Serval	*Laptailurus serval*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Southern Giant Pouched Rat	*Cricetomys gambianus*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Tiny Musk Shrew	*Crocidura fuscomurina*	1	6.6666667	LC
14-Aug-24		-15.91052	34.742485	-15.91451	34.746628	Waterbuck	*Kobus ellipsiprymnus*	1	6.6666667	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**15**	**100**	

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
15-Aug-24	Chikwawa floodplain, sampling point 1	-16.03022	34.812565	-16.03022	34.812565	Tiny Musk Shrew	*Crocidura fuscomurina*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Bushveld gerbrbil	*Tatera leucogaster*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Multimammate Mouse	*Mustomys atalensis*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Greater Cane-rat	*Thryonomys swinderiunus*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	African Marsh rat	*Dasymys incomtus*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Cape Clawless otter	*Aonyx capensis*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Scrub hare	*Lepus saxatilis*	1	12.5	LC
15-Aug-24		-16.03022	34.812565	-16.03022	34.812565	Meller's mongoose	*Rhynchogale melleri*	1	12.5	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**8**	**100**	
15-Aug-24	Chikwawa floodplain, sampling point 5	-16.0882	34.813946	-16.00674	34.797333	Bushveld gerbrbil	*Tatera leucogaster*	1	16.666667	LC
15-Aug-24		-16.0882	34.813946	-16.00674	34.797333	Common duiker	*Sylvicapra grimmia*	1	16.666667	LC
15-Aug-24		-16.0882	34.813946	-16.00674	34.797333	Hippopotamus	*Hippopotamus amphibius*	1	16.666667	VU
15-Aug-24		-16.0882	34.813946	-16.00674	34.797333	Tiny Musk Shrew	*Crocidura fuscomurina*	1	16.666667	LC
15-Aug-24		-16.0882	34.813946	-16.00674	34.797333	Velvet monkey	*Cercopithecus aethiops*	2	33.333333	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**6**	**100**	
16-Aug-24	Elephant Marh sampling point 2	-16.03813	34.815752	-16.0882	34.813946	Tree squirrel	*Paraxerus cepapi*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	African Marsh rat	*Dasymys incomtus*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	African wild cat	*Felis silvestris lybica*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Bushbaby	*Galago moholi*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Bushveld gerbrbil	*Tatera leucogaster*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Cape Clawless otter	*Aonyx capensis*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Four-toed Sengi	*Petrodromus tetradactylus*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Greater cane rat	*Thryonomys swinderiunus*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Hippopotamus	*Hippopotamus amphibius*	1	7.6923077	VU
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Marsh Mongoose	*Atilax palundinosus*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Multimammate Mouse	*Mustomys atalensis*	1	7.6923077	LC

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Tiny Musk Shrew	*Crocidura fuscomurina*	1	7.6923077	LC
16-Aug-24		-16.03813	34.815752	-16.0882	34.813946	Velvet monkey	*Cercopithecus aethiops*	1	7.6923077	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**13**	**100**	
16-Aug-24	Chikwawa sampling point 4	-16.03022	34.812565	-15.99222	34.805253	African Marsh rat	*Dasymys incomtus*	1	14.285714	LC
16-Aug-24		-16.03022	34.812565	-15.99222	34.805253	Bushveld gerbrbil	*Tatera leucogaster*	1	14.285714	LC
16-Aug-24		-16.03022	34.812565	-15.99222	34.805253	Cape Clawless otter	*Aonyx capensis*	1	14.285714	LC
16-Aug-24		-16.03022	34.812565	-15.99222	34.805253	Four-toed Sengi	*Petrodromus tetradactylus*	1	14.285714	LC
16-Aug-24		-16.03022	34.812565	-15.99222	34.805253	Greater cane rat	*Thryonomys swinderiunus*	1	14.285714	LC
16-Aug-24		-16.03022	34.812565	-15.99222	34.805253	Hippopotamus	*Hippopotamus amphibius*	2	28.571429	VU
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**7**	**100**	
16-Aug-24	Elephant Marh sampling point 2	-16.03022	34.812565	-15.96803	34.784291	Tree squirrel	*Paraxerus cepapi*	1	7.6923077	
16-Aug-24		-16.93336	34.749045	-15.96803	34.784291	African Marsh rat	*Dasymys incomtus*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	African wild cat	*Felis silvestris lybica*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Bushbaby	*Galago moholi*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Bushveld gerbrbil	*Tatera leucogaster*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Cape Clawless otter	*Aonyx capensis*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Four-toed Sengi	*Petrodromus tetradactylus*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Greater cane rat	*Thryonomys swinderiunus*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Hippopotamus	*Hippopotamus amphibius*	1	7.6923077	VU
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Marsh Mongoose	*Atilax palundinosus*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Multimammate Mouse	*Mustomys atalensis*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Tiny Musk Shrew	*Crocidura fuscomurina*	1	7.6923077	LC
16-Aug-24		-16.03022	34.812565	-15.96803	34.784291	Velvet monkey	*Cercopithecus aethiops*	1	7.6923077	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**13**	**100**	

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DATE	SITE	GPS Point at Start of transect		GPS Point at End of Transect		COMMON NAME	SCIENTIFIC NAME	ABUNDANCE	% RICHNESS	IUCN Category
16-Aug-24	Elephant Marh sampling point 1	-16.03236	34.819812	-16.03054	34.82397	Four-toed Sengi	*Petrodromus tetradactylus*	1	20	LC
16-Aug-24		-16.03236	34.819812	-16.03054	34.82397	Bushveld gerbrbil	*Tatera leucogaster*	1	20	LC
16-Aug-24		-16.03236	34.819812	-16.03054	34.82397	Fat Mouse	*Steatomys pratensis*	1	20	LC
16-Aug-24		-16.03236	34.819812	-16.03054	34.82397	Greater cane rat	*Thryonomys swinderiunus*	1	20	LC
16-Aug-24		-16.03236	34.819812	-16.03054	34.82397	Multimammate Mouse	*Mustomys atalensis*	1	20	LC
TOTAL NUMBER OF SPECIES, LEFT ON THIS SITE, AND PERCENTAGE SPECIES RICHNESS TO THE RIGHT								**5**	100	

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Results (Figure 2-21) illustrates the abundance of the mammal species as categorised by the IUCN. The high abundance of mammal species of the area can be attributed to the fact that the area during the time of the assessment had greater numbers of successful species. The results show that the area had more stable ecosystems and that more ecological niches were available and the environment was likely to be pleasant to the ecosystem as a whole. This means that the proposed project area had a very wide range of habitats.

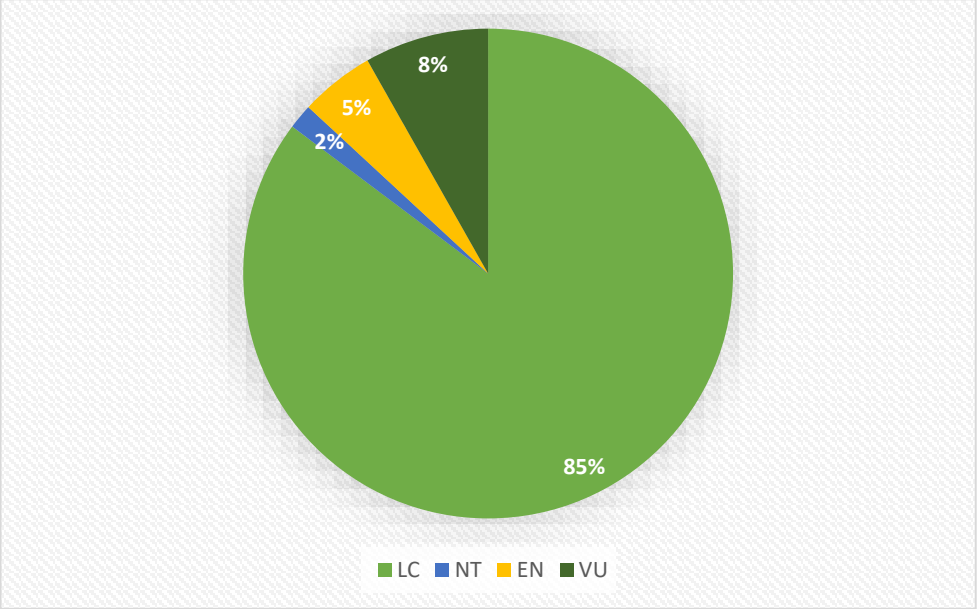


Figure 2-21: Mammal species as categorised by the IUCN

In addition, while the low number of species and number of families for an area sampled in this case Chikwawa floodplain Sampling point 2 and 4 as well as the Elephant Marsh sampling point 1 is mainly due to fewer numbers of successful species and unstable environment within the area hence less ecological niches were available. As such, any activity that will lead to the loss of riparian vegetation, drying of riverine, pollution and increase in reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of mammals' species

2.6. Plant biodiversity assessment

During the biodiversity assessments, a survey was conducted by plant specialists to determine plant species compositions within the project influence area. This was based on the methodologies submitted to EGENCO following the scoping phase on both flora and fauna investigations in the upstream / downstream of the Kapichira dam including the Chikwawa floodplain and the Elephant Marsh area. The survey efforts focused on sampling the ecological habitats for plants identified based on present taxa and zones found. This section presents an account of the plant flora recorded and the general vegetation of the survey area and the species found within the project influence area.

The aims of the floristic inventories were:

- To identify the natural and modified habitats present,
- To identify the general specific diversity of these habitats and;

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- To identify the species presenting conservation challenges regarding the IUCN lists

The floral assessment covered different habitats comprising natural forests and wooded habitats, including mopane and miombo forests, riparian forests and native thickets.

2.6.1. Methodology and sampling for plant assessments

In order to assess the flora of the area, transect method was used during the assessment. Every effort was made to cover the full range of habitats present, combining semi-random surveys targeted by habitat type with quadrat surveys. Transects were used during the study where quadrats of 10m by 10m were established at an interval of 100m from one quadrant to the other along a gradient or perpendicular to the slope. At least 2 to 3 quadrats (sample plots) were established in each site/habitat. The rationale was to ensure a representative and unbiased sample of the study area while maintaining some level of structure in the sampling process.

Photographs (Figures from 2-22 to 2-25) were also taken and a field survey sheet prepared, giving the name of the locality, the habitat concerned, a description of the plant formation, the percentage of canopy cover, shrubs and grasses, the GPS position of the quadrat, the numbers of the photographs taken, specifying the direction in which they were taken and the altitude. For species that could not be identified in the field, specimens were photographed and identified at a later date using appropriate literature or by consulting scientific partners such as botanists at the National Herbarium and Botanical Gardens of Malawi.



Figure 2-22: Plant specimen for further identification



Figure 2-23: At the construction area

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Figure 2-24: Laying out a sample plot-Chikwawa floodplain area



Figure 2-25: Cyperus Dives within the floodplain area

2.6.2. Study Area

The plant biodiversity assessment survey was conducted in the upstream and downstream of Kapichira dam and the Chikwawa floodplain. The direct footprint area is situated in the Majete Wildlife Reserve. Several sampling points were planned in this area as well. To do these investigations in Majete Wildlife Reserve, RUO with EGENCO;

- got the authorisation from African Parks to perform flora and fauna inventories;
- •requested for the latest inventory results of flora and fauna so that the impacted environment is properly understood.
- asked for the latest inventory results to be made available so that the impacted environment could be properly understood.

2.6.3. Equipment required

The equipment for the assessments included a linear tape for laying out the 10 m by 10 m sample plots, a camera for taking photographs, a field survey sheet and a GPS for positioning the quadrat, habitats or species of interest. Figure 2-9 shows the data collection form used for the plant biodiversity inventory.

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Table 2-10: Data collection form for the plant diversity inventory

Date	Weather	GPS point	Target taxon	Type of habitat surveyed	Level of degradation of the habitat Natural / Modifier habitat	Habitat threats	Species observed							
							Common name	Scientific name	Species layer	% of plant cover	Protected species	Endemic species / Restricted range species)	IUCN Category	Local use of the species

Date	Inventory date DD/MM/YY
Weather	Inventory day weather
GPS point	GPS coordinates (x; y)
Type of habitat surveyed	Wetland, aquatic, forest, riverine, thicket, etc.
Level of degradation of the habitat **Natural / Modifier habitat**	Intact natural habitat, almost intact natural habitat, modified habitat
Threats to the habitat	Anthropogenic, invasive alien species, *etc*
Scientific name	Latin name of species inventoried
Common name	Common name of the species inventoried and local name if any
Species layer	Herbaceous, shrub and tree strata
% of plant cover	Proportion / dominance of the species in the habitat surveyed
Protected species	According to Malawi regulations
Endemic species / Restricted range species	Is the species restricted in its range? Is it nationally/regionally/locally endemic?
IUCN Category	DD / LC / NT / VU / EN / CR / EX
Local use of the species	Medicinal, heating and food species, etc.

2.6.4. Limitations of the flora study

The physical landscape of some parts within the proposed project area particularly within the periphery of the Shire river (Eastern and Western parts) is rugged interspaced with steep slopes. These natural barriers posed some significant challenges to access certain parts of the proposed site. As a result, the experts took more time to access these areas during data collection.

Phenology of plants (changes in flowering, fruiting, and leafing) can vary significantly with changes in seasons. The floral assessments for this study were conducted during the dry season when most plant species had lost the flowers, leaves and fruits. This made plant identification difficult in some instances during the study.

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2.6.5. Finding of plant biodiversity assessments

The major habitats for the plant species in the project influence area are the terrestrial and aquatic habitats. Ninety-six (96%) of the plants recorded were terrestrial, while 3.4% were aquatic plants. Field observations of the terrestrial vegetation types comprised largely of mixed deciduous forests, patches of dry miombo woodlands and some dense thickets of dry savanna woodlands (Wildlife Society of Malawi 2005). Within the open deciduous forest woodlands, two classes of vegetation compositions were distinct specifically along the corridor of Majete wildlife reserve.

These comprise of:

A= low-lying deciduous savanna forest with isolated islands of forest patches that are dominated by *Acacia nigrescens and Ziziphus mucronata*. Grasses and herbs cover approximately 50-60% of the open areas between the forest patches.

B=Low-lying open savanna woodland dominated by *Colophospermum mopane* mixed with *Acacia nilotica*. Grasses and herbs cover approximately 30 to 40% of the open areas.

C= Riverine thickets along the passage of shire river dominated by trees and herbs. Other plants recorded along the riverbanks includes Alien plant species such as *Azolla nilotica, Eichornia crassipes*

2.6.5.1. FAMILIES OF PLANTS AND SPECIES DOCUMENTED

A total of five (5) major plant lifeforms were recorded in the entire project area as shown in Table 2-10. These are Grasses, herbs, lianas/climbers, shrubs and trees. The most dominant life form found were the trees (98), followed by herbs (42) and grasses (20). While the grasses were low (Table 7.8). Fifty-eight (58) plant Families were identified from 182 plant species. Fabaceae (11.0%) was the dominant Genera followed by *Poaceae (8.8%), Euphorbiaceae (8.8%), Combretaceae (5.5%) Asteraceae (4.9%)* respectively (Appendix E).

Table 2-11: Summary of plant groups and the corresponding number of families and species found

Life form of plant species	Number of plant families	Number of Species
Grass	1	20
Herbs	26	42
Liana	7	10
Shrub	8	11
Trees and palms	31	98
Total plant records	**58**	**182**

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2.6.5.2. RELATIVE PERCENT (%) OF THE PLANT FAMILIES RECORDED ACROSS THE SITES

Table 2-11 presents an overview of plant family distribution recorded across the four different sites: the dam area, downstream area, construction site area, and Chikwawa flood plain area. Each plant family is represented by the frequency of species present and their relative dominance in percentage terms. For instance, Fabaceae, which has the highest frequency at 20, is the most dominant family in the study area, constituting 10.99% of the plant species. This family is most abundant in the Chikwawa flood plain area, with 10 species recorded, followed by the construction site area with 5 species. The dam and downstream areas show fewer species of this family.

The distribution of plant species across the four areas varies considerably. Some families were more concentrated in particular sites, while others show a more even distribution. For instance, *Euphorbiaceae and Poaceae* both have a frequency of 16, each contributing 8.79% to the total relative dominance. *Euphorbiaceae* is more prevalent in the downstream area with 5 species recorded, while *Poaceae* is predominantly found in the Downstream Area as well, with 8 species present. This suggests that some plant families might thrive better in certain environmental conditions, such as moisture availability or soil type, which could vary across the different sites.

Table 2-12: Relative percent (%) of the plant families recorded across sites

No.	Plant Family	Frequency of Species	Relative Dominance (%)	Dam Area	Downstream Area	Construction Site Area	Chikwawa Flood Plain Area
1	Fabaceae	20	10.99	2	3	5	10
2	Euphorbiaceae	16	8.79	2	5	2	7
3	Poaceae	16	8.79	2	8	2	4
4	Combretaceae	10	5.49	3	3	2	2
5	Asteraceae	9	4.95	2	3	2	2
6	Ebenaceae	6	3.30	2	2	1	1
7	Annonaceae	5	2.75	1	2	1	1
8	Apocynaceae	5	2.75	2	1	1	1
9	Mimosoideae	5	2.75	1	1	2	1
10	Bignoniaceae	4	2.20	1	1	1	1
11	Capparaceae	4	2.20	1	1	1	1
12	Cyperaceae	4	2.20	1	1	1	1
13	Lamiaceae	4	2.20	1	1	1	1
14	Malvaceae	4	2.20	1	1	1	1
15	Anacardiaceae	3	1.65	1	1	0	1
16	Boraginaceae	3	1.65	1	0	1	1
17	Burseraceae	3	1.65	1	1	0	1
18	Celastraceae	3	1.65	0	1	1	1
19	Rubiaceae	3	1.65	1	1	0	1
20	Sapindaceae	3	1.65	0	1	1	1
21	Sapotaceae	3	1.65	1	0	1	1
22	Solanaceae	3	1.65	1	1	0	1
23	Vitaceae	3	1.65	1	1	0	1
24	Amaranthaceae	2	1.10	1	1	0	0
25	Meliaceae	2	1.10	0	1	1	0
26	Moraceae	2	1.10	1	0	1	0
27	Musaceae	2	1.10	0	1	1	0
28	Olacaceae	2	1.10	1	0	1	0
29	Onagraceae	2	1.10	0	1	1	0
30	Tiliaceae	2	1.10	1	0	1	0
31	Verbenaceae	2	1.10	0	1	1	0
32	Acanthaceae	1	0.55	0	1	0	0
33	Araceae	1	0.55	1	0	0	0
34	Aristolochiaceae	1	0.55	0	1	0	0

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No.	Plant Family	Frequency of Species	Relative Dominance (%)	Dam Area	Downstream Area	Construction Site Area	Chikwawa Flood Plain Area
35	Asclepiadaceae	1	0.55	0	1	0	0
36	Azollaceae	1	0.55	1	0	0	0
37	Bombacaceae	1	0.55	0	0	1	0
38	Cactaceae	1	0.55	0	1	0	0
39	Caesalpinioideae	1	0.55	1	0	0	0
40	Commelinaceae	1	0.55	0	1	0	0
41	Convolvulaceae	1	0.55	0	1	0	0
42	Crassulaceae	1	0.55	1	0	0	0
43	Curcubitaceae	1	0.55	0	1	0	0
44	Dracaenaceae	1	0.55	0	1	0	0
45	Flacourtiaceae	1	0.55	1	0	0	0
46	Liliaceae	1	0.55	0	1	0	0
47	Loganiaceae	1	0.55	1	0	0	0
48	Mimosaceae	1	0.55	0	1	0	0
49	Nyctaginaceae	1	0.55	1	0	0	0
50	Oxalidaceae	1	0.55	0	1	0	0
51	Palmae	1	0.55	0	0	1	0
52	Papaveraceae	1	0.55	1	0	0	0
53	Papilionoideae	1	0.55	0	0	1	0
54	Polygonaceae	1	0.55	0	0	1	0
55	Pontederiaceae	1	0.55	0	0	1	0
56	Rhamnaceae	1	0.55	1	0	0	0
57	Simaroubaceae	1	0.55	0	0	1	0
58	Sterculiaceae	1	0.55	0	0	1	0

2.6.5.3. CONSERVATION STATUS OF PLANT SPECIES

The conservation status of a species indicates whether the species still exists and how likely it is to become extinct in the near future. Many factors are used to assess a species' conservation status, including the number remaining, the overall increase or decrease in the population over time, breeding success rates, and known threats. The conservation status of a species may differ depending on the scale at which it is assessed (global, regional, or national). A species may be endangered in one region and common in other and hence not listed at that level.

The International Union for Conservation of Nature's (IUCN) Red List of Threatened Species is the world's most comprehensive information source on the global conservation status of animal, fungi, and plant species. It is a worldwide conservation status listing and ranking system which recognizes seven categories; extinct (EX), extinct in the wild (EW), critically endangered (CR), endangered (EN), vulnerable (VU), near threatened (NT) and least concern (LC) (IUCN website). Species in the critically endangered, vulnerable, and near threatened categories are collectively referred to as threatened. In this study, over 182 species were identified around the project impact areas. Data used to assign the species identified in this study was extracted from the existing IUCN red list database and the Global Biodiversity Information Facility (GBIF).

Table 2-12 provides an overview of the number of species by sampled sites based on IUCN category at global level. High species counts (179) were recorded within the dam area (Majete wildlife reserve) at the west side of the Shire River followed by the Eastern side (147). The construction site recorded the second highest species counts (123), while lowest species counts were recorded down stream of Likhubula River (15). From a total of one hundred and eighty-two (182) species recorded around the proposed project area, 74 species representing 40.6% are categorized as of Least Concern (LC) and 58.4% of the species found were ranked as not evaluated (NE) at global scale. One Near Threatened (NT) (Dalbergia melanoxylon) and one data deficient (DD) which is Strophanthus kombe Oliv. both ranked under the IUCN Red Data List (Appendix E). Dalbergia melanoxylon, commonly known as African blackwood is classified as Near

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Threatened by the IUCN. The species faces significant threats from overharvesting due to its valuable timber, which is highly sought after (IUCN, 1998). The data deficient species was recorded within the downstream area (Lower bridge across west site) while the near threatened (NT) was found to occur within 6 of the 9 survey sites. These are the Upper Floodplain with 7 occurrences, followed by the Dam area (Shire west) (2). Other sites recorded to host the species includes, construction site area, downstream area and the Chikwawa floodplain.

In sum, the majority of species recorded across the sites are classified as Least Concern and Not Evaluated. The insignificant number of Near Threatened species suggests that while there could be some plant species at risk, overall the proposed project site may not be facing immediate large-scale threats.

Table 2-13: IUCN Conservation status of plant species found in the survey sites

Name of site	Global IUCN conservation status occurrences: showing the number of times individual species was recorded				Total species frequencies
	Data Deficient (DD)	Least Concern (LC)	Not evaluated (NE)	Near Threatened (NT)	
Downstream (Likhubula River)		5	10		15
Upper flood plain		41	41	7	89
Lower floodplain		22	65		87
Downstream (Lower bridge, eastern side)		35	49	1	85
Downstream (Lower bridge, western side)	1	19	16	1	37
Downstream, western side		34	49	1	84
Dam area, Majete wildlife reserve (Shire east		84	63		147
Dam area, Majete wildlife reserve (Shire west)		92	85	2	179
Construction site		48	74	1	123
Total number of species	**1**	**74**	**106**	**1**	**182**

2.6.5.4. PROTECTED SPECIES IN MALAWI

The National Parks and Wildlife (Protected, Endangered and Listed Species) Declaration (Order, 2017) of the National Parks and Wildlife Act provides a schedule of protected species in three parts, namely: Part I - Any plant or fungi species in a protected area that is not already defined as either endangered species or a listed species within the order); Part II - Any plant or fungi species categorized as Endangered by the IUCN, any plant or fungi species listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and a prescribed list of additional species; and Part III - Any plant or fungi species categorized as Critically Endangered by the IUCN, any plant or fungi species listed in Appendix I of CITES (GoM, 2017).

Four protected tree species were confirmed to be present during the plant biodiversity assessment. These include, *Terminalia sericea, Cordyla Africana, Dalbergia melanoxylon* and *Pterocarpus angolensis* (Table 2-13). All these species fall under Part II of the plant protected species schedule. *Terminalia sericea* was recorded within the dam area, downstream area and the upper Chikwawa flood plain. *Cordyla Africana* was recorded within dam area in Majete wildlife reserve. *Pterocarpus angolensis* was

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recorded within the dam area and upper Chikwawa flood plain while *Dalbergia melanoxylon* was observed within the downstream area, construction area and the flood plain.

Table 2-14: Protected species in the proposed project area

Species	Common name	Local name	Protected status	Location			
				Dam area	Down stream area	Construction area	Chikwawa flood plain
Terminalia sericea	Silver cluster-leaf	Naphini	Part II	+	+		+
Cordyla Africana	Wild mango	Mtondo	Part II	+			
Dalbergia melanoxylon	Zebrawood,	Phingo	Part II		+	+	+
Pterocarpus angolensis	Bloodwood	Mlombwa	Part II	+			+

Overall, these species are considered vulnerable or rare, and most of them seemed to thrive in Majete wildlife reserve's protected environment. The reserve offers a sanctuary for these plants, where conservation efforts such as reforestation, habitat restoration, and the management of invasive species are carried out to ensure their survival. These plants not only support the local wildlife but also play a critical role in maintaining ecological balance. The reason these protected species are more abundant in Majete Wildlife Reserve compared to the surrounding areas probably lies in the effective conservation management within the reserve. Strict anti-poaching regulations, limited human interference, and ongoing monitoring allow the plants to grow and reproduce without the pressure of agricultural expansion or deforestation, which are prevalent in surrounding areas.

2.6.6. Invasive alien species (IAS) found

Invasive Alien Species (IAS) are exotic, non-native, non-indigenous or foreign plant or animal species that have been introduced into Malawi, both intentionally and accidentally, where they have established, and subsequently proliferated to the detriment of native biodiversity, local livelihoods, and economic activities (Witt *et al.* 2021). Invasive species can cause extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats. Their management can only be possible once their occurrences and impacts are known. The Global Register of Introduced and Invasive Species was used to assign identified species into their appropriate status (invasive and not invasive species) at global level while the 2021 Guide to the Naturalized and Invasive Plants of Malawi and Zambia and database on Invasive Alien Plant Species of Malawi-GBIF identifies key IAS at national level. Species were registered not invasive if they are not listed on the invasive species databases mentioned above.

Table 2-14 provides data on invasive species encountered at various survey sites, categorizing the species into terrestrial and aquatic groups. The survey sites include areas along the Likhubula River, the Upper Floodplain, the Lower Bridge (east and west), the Western side of the river, a construction site, and both the eastern and western sides of the Majete Wildlife Reserve Dam area. The data includes both the specific invasive species found at each site and their counts, showing the prevalence of certain species in different environments.

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In this study, invasive alien species (IAS) were recorded both in terrestrial and aquatic habitats. Fifteen (15) species found were the invasive species (Table 2-1'). Out of the total invasive species found, 80% are terrestrial while 20% are aquatic species. The aquatic species are; Potederia crassipes (Water hyacinth), *Pistia stratiotes*, and *Azolla filiculoides*. Furthermore, some of the terrestrial IAS found include; *Opuntia vulgaris*, *Lantana camara* (Figure 2-26)., *Ageratum houstonianum*, Datura stramonium, *Xanthium strumarium* Figure 2-27), *Luffa aegytiana*, and *Ricinus communis* (Table 12) are among the known invasive species that were recorded in this study. Ageratum conyzoides and Lantana camara are the most common invasive species found in almost all the project impact sites.

In terms of terrestrial species, the upper floodplain had the highest number of invasive species, with 10 species recorded. These include common invasive plants like *Lantana camara* (3 occurrences), *Ageratum houstoniana* (1), and *Calotropis procera* (2). Other sites with notable terrestrial invasives include the Downstream (Likhubula River) with *Argemone mexicana* and *Ageratum houstoniana* both appearing once, and the Dam Area (Shire East), where was found 5 times, along with other species like *Calotropis procera* and *Lantana camara*. This suggests that the Upper Floodplain and Dam Areas are heavily affected by invasive terrestrial plants, which could have ecological implications for native flora and fauna.

Aquatic invasive species were also recorded across some sites, though they were less frequent (Appendix E). The upper floodplain showed the highest presence of aquatic invasives, with species like *Potederia crassipes* and *Eichhornia crassipes* (water hyacinth), both known for their environmental impact. The Likhubula River also had a small number of aquatic invasives, including *Ageratum houstoniana*, although the presence of these species was limited in aquatic environments overall. The spread of aquatic invasives, particularly in the upper floodplain, could potentially alter water quality and aquatic biodiversity, highlighting the need for targeted management strategies in these areas.



Figure 2-26: *Lantana camara*

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Figure 2-27: *Xanthium strumarium*

In conclusion, the data reveals that invasive terrestrial species are more widespread across the survey sites, with some locations like the upper floodplain and dam areas showing significant numbers. Thus, the occurrence of aquatic invasives, while lower, is still notable in proposed project area, suggesting that both terrestrial and aquatic ecosystems are vulnerable to invasive species pressures. Of major concern are aquatic species that can affect power generation and affect project sustainability, such species include *Potederia crassipes* and *Eichhornia crassipes* (Table 12).

Table 2-15: Invasive species recorded in the survey sites

Survey sites	Terrestrial species	Number of invasive species	Aquatic spectes	Number of invasive species
Downstream (Likhubula river)	*Argemone mexicana*	1	-	
	Ageratum houstoniana	1		
Total count		**2**		
Upper flood plain	*Luffa cylindrica*	1	*Potederia crassipes*	**1**
	Lantana camara	3	*Eichhornia crassipes*	**1**
	Ricinus communis	1	*Azolla filiculoide*	**1**
	Ageratum houstoniana	1		
	Caelsalpinia bonduc	1		
	Datura stramonium	1		
	Calotropis procera	2		
Total count		**10**		
Downstream (Lower bridge east)	*Ricinus communis*	1		
	Argemone mexicana	1		
Total count		**2**		
Downstream (Lower bridge west)	*Trichodesma zeylanicum*	1		
Total count		1		
Downstream (western side)	*Argemone mexicana*	1		
	Ageratum houstoniana	1		
	Xanthium strumarium	1		

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Survey sites	Terrestrial species	Number of invasive species	Aquatic species	Number of invasive species
	Heliotropium indicum	1		
	Lantana camara	1		
	Datura stramonium	1		
Total count		**6**		
Construction site	*Lantana camara*	1		
Total count		1		
Dam area (Shire eastern side)	*Xanthium strumarium*	5		
	Calotropis procera	2		
	Lantana camara	1		
	Datura stramonium	1		
	Opuntia vulgaris	1		
Total count		**5**		
Dam area (Shire western side)	*Lantana camara*	1		
	Datura stramonium	1		
	Xanthium strumarium	1		
Total count		**3**		

2.6.7. Natural and modified habitats

Natural habitats are environments which remain largely undisturbed by human activities, providing a home for native wildlife and supporting ecological processes without significant alteration. On the other hand, modified habitats refer to environments which have been altered by various processes leading to changes in the natural landscape and potentially affecting the species that inhabit it (Goslinga et al., 2020). The plant biodiversity assessment reveals notable variations in the level of habitat modifications across different locations within the proposed project area (Table 2-15).

Table 2-16: Habitat modifications across different locations within the proposed project area

Type of habitat	Number of sites per location				
	Construction Site	Down stream	Flood plain	Upstream	Total
Natural habitat	14	30	10	37	91
Modified through flooding	1	11	0	1	13
Modified by being cultivated area	0	4	0	0	4
Modified through deposition	0	2	0	1	3

The plant biodiversity assessment recorded majority of natural habitats in the upstream and downstream locations of the proposed project area with 37 sites within the upstream area and 30 within the downstream area. These locations recorded a high number of undisturbed or minimally affected habitats, such as forests, thickets, wetlands, and riparian zones, providing a healthy environment for wildlife. Construction sites and flood plains, on the other hand, recorded fewer natural habitat plots with 14 and 10 sites, respectively, indicating a higher degree of alteration or disruption in these areas.

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The sites that were recorded as modified through flooding included the habitats that were seen to be altered due to flooding events. This entailed changes in vegetation, sediment deposition, and water flow patterns. Table 6.5 shows that downstream areas experienced the highest number of sites modified through flooding, with 11 sites, while construction site area and upstream areas recorded 1 plot each. Flood plains did not record any plots in this category, suggesting that they may be more naturally suited to handle flooding occurrences.

The areas which appeared to have been modified by being cultivated refers to habitats that had been altered through farming activities (old farm ridges could be observed). Only 4 plots in total were classified in this category, all of which being located downstream. This suggests that agricultural activity was most concentrated in the downstream areas, likely due to the suitability of the land for farming or irrigation in these regions. Nevertheless, this low number reflects the limited impact of cultivation in the other locations.

The sites which were recorded as being modified through deposition represent areas where habitat modifications had occurred due to sediment deposition, which had occurred largely after flooding. The study recorded 3 sites which were modified by deposition, with 2 in the downstream area and 1 in the upstream area. These alterations can result in changes to the topography and vegetation, which can have significant impacts on the biodiversity and ecological functions of these habitats. Overall, these findings illustrate the varied impacts of natural processes and human activities on habitats across different locations. In addition, the data in Table 13 illustrate the complex interplay of natural and human-induced factors in shaping the plant biodiversity across different areas, with the Majete wildlife area generally showing better preservation compared to other more disturbed sites.

2.6.8. Critical habitat (CH)

CH identification is required by PS6 to manage risks and avoid, mitigate, and offset impacts to areas with high biodiversity value including: 1) habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species; 2) habitat of significant importance to endemic and/or restricted-range species; 3) habitat supporting significant global concentrations of migratory species and/or congregator species; 4) highly threatened and/or unique ecosystems; and/or 5) areas associated with key evolutionary processes. CH was identified by delineating spatial units of analysis, screening plant biodiversity features and evaluating the distribution of CH).

The majority of the 182 species identified within the proposed project area are categorized as Least Concern (LC) or Not Evaluated (NE). However, there are notable exceptions, such as Dalbergia melanoxylon, a Near Threatened species, which faces significant threats due to overharvesting for its valuable timber. The presence of a limited number of Near Threatened species suggests that while some plant species in the area may be at risk, the overall conservation situation is not dire. However, four species; *Terminalia sericea, Cordyla Africana, Dalbergia melanoxylon*, and *Pterocarpus angolensis* are classified under Part II of the National Parks and Wildlife Act, indicating their vulnerable status. These species thrive in the Majete wildlife reserve's protected environment. Thus, the presence of these vulnerable species particularly within the dam area and the construction site area calls for targeted management strategies to prevent further ecological damage and preserve native biodiversity.

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2.6.9. Potential impacts of invasive plant species recorded

Invasive plant species are non-native plants that are introduced to a new environment, either accidentally or intentionally, and have the potential to spread aggressively (Armon *et al*., 2015). These plants can outcompete native species for resources such as water, sunlight, and nutrients, often disrupting local ecosystems. Invasive species may lack natural predators or diseases in their new habitat, allowing them to thrive unchecked. Their rapid growth and spread can lead to a decline in biodiversity, alter habitats, and even affect the economy and human health in some cases.

Invasive species can have significant ecological and environmental impacts on native ecosystems, and the data presented in Table 2-14 highlights the presence of numerous invasive terrestrial and aquatic species across different survey sites. One of the key effects of these invasive species is their ability to outcompete native plants for resources such as light, nutrients, and space. For example, species like *Lantana camara* and *Ageratum houstoniana*, found in multiple sites like the Upper Floodplain and Downstream (Western Side), can form dense thickets that crowd out native vegetation. This disruption can lead to a reduction in plant diversity, affecting the entire food web, as native herbivores, pollinators, and other species that depend on native plants for survival may struggle to adapt or even face population declines.

Invasive species like *Eichhornia crassipes* (water hyacinth) and *Azolla filiculoide* (aquatic fern), which are present in the upper floodplain, pose serious threats to aquatic ecosystems. These aquatic invasives can rapidly spread across water bodies, forming dense mats that block sunlight, deplete oxygen levels, and hinder the growth of native aquatic plants (Sepulveda *et a*l., 2020). The resulting changes in water quality can significantly impact fish and other aquatic organisms, disrupting the balance of the ecosystem. Table 2-16 presents some of the potential impacts of invasive plant species within the proposed project area.

Table 2-17: Impacts of selected Invasive Alien Species recorded in the study

No.	Species Name	Known Impacts	Proposed Mitigation measure
		Aquatic species	
1	*Pontederia crassipes* Mart.- Previously known as *Eichhornia crassipes*	This aquatic weed can form thick mats which hamper water transport; inhibit or even prevent fishing-related activities; block waterways and canals, and hamper hydroelectricity generation, while also providing breeding sites for vectors of human and animal diseases, increasing the incidence of malaria, encephalitis, schistosomiasis, filariasis, river blindness and possibly cholera. The thick mats reduce light penetration into the water, causing declines in the concentrations of the phytoplankton which support the zooplankton–fish food chain.	Cultural control; mechanical control; biological control and chemical control.

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No.	Species Name	Known Impacts	Proposed Mitigation measure
2	*Pistia stratiotes* L. (Water lettuce)	Water lettuce infestations contribute to "increased rates of siltation, the slowing of water flow rates, the degradation of fish nesting sites, increased nutrient loading, thermal stratification, increased alkalinity and mortality among fish and macro-invertebrates" (Dray and Center, 2002). Mats of water lettuce block waterways, making navigation difficult. Dense mats also hamper fishing activities, interfere with hydroelectricity generation and hinder flood-control efforts. They also provide habitats for vectors of disease and can interfere with rice production.	Mechanical control through physical harvesting of the plants; chemical control through use of appropriate herbicides; and biological control through use of appropriate host-specific living organisms/agents to feed on the plant.
3	*Azolla filiculoides* Lam.	This aquatic weed forms thick mats that reduce light penetration into the water, causing declines in the concentrations of the phytoplankton which support the zooplankton–fish food chain	Mechanical control through physical harvesting of the plants; chemical control through use of appropriate herbicides; and biological control through use of appropriate host-specific living organisms/agents to feed on the plant.
	TERRESTRIAL		
4	*Ageratum conyzoides* L.	This weed is allelopathic and so readily displaces native plant species. It excludes native grasses and medicinally important plants, reduces native plant abundance, and creates homogenous monospecific stands.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
5	*Ricinus communis* L.	Displaces native plant species and reduces the abundance and diversity of birds and other animal species. Can also have negative impact on ground water which is key in replenishing surface water.	Mechanical control, biological and chemical control.
6	*Ageratum houstoniana* Mill.	This weed is allelopathic and so readily displaces native plant species. It excludes native grasses and medicinally important plants, reduces native plant abundance, and creates homogenous monospecific stands.	Mechanical control, biological and chemical control Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
7	*Argemone mexicana* L.	Argemone mexicana is considered an invasive species in many areas, particularly in regions like India, Australia, and parts of Africa. It has the ability to spread quickly and outcompete native plants for resources like water, sunlight, and nutrients. Its rapid growth and prolific seed production (with up to 40,000 seeds per plant) enable it to dominate large areas, potentially displacing native vegetation and reducing biodiversity. This leads to habitat loss for local wildlife that depend on native plant species.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
8	*Caelsalpinia bonduc* (L) Roxb.	Caesalpinia bonduc is often considered invasive. It can spread rapidly and outcompete native vegetation for space, light, and nutrients. This can lead to a reduction in biodiversity, as it may crowd out native plants that have evolved with local ecosystems, affecting the plant community structure.	Mechanical control, biological and chemical control.

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No.	Species Name	Known Impacts	Proposed Mitigation measure
9	*Calotropis procera* (Aiton) W.T. Aiton	It competes with native plants, reduces biodiversity, and poses a threat to livestock and other animals due to its toxicity. While it can provide some benefits in certain ecosystems (such as supporting pollinators), its invasive spread and ability to alter soil and water conditions make it a problematic species in many areas.	Mechanical control, biological and chemical control.
10	*Datura stramonium* L.	While the plant has medicinal uses in certain cultures and can support some pollinators, its environmental impacts are generally harmful, especially in regions where it is not native. Its invasive nature allows it to dominate disturbed areas, displace native plants, and pose serious risks to livestock, wildlife, and humans due to its toxicity. It also disrupts soil health, agricultural productivity, and local ecosystems.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
11	*Heliotropium indicum* L.	This plant is considered an invasive species in certain regions, especially in tropical and subtropical areas. It can spread rapidly and outcompete native vegetation, disrupting local ecosystems. The plant has aggressive growth habits and can form dense mats that displace native flora, thereby reducing biodiversity.	Mechanical control, biological and chemical control.
12	*Lantana camara* L.	Damages ecosystem services; ecosystem change/ habitat alteration; modification of fire regime; negatively impacts agriculture; negatively impacts forestry; reduces native biodiversity; reduces biodiversity; and causes loss of native biodiversity species.	Mechanical control, biological and chemical control.
13	*Luffa cylindrica* (L.) M.Roem.	This plant has the potential to become invasive which can disrupt local ecosystems, outcompeting native plants for resources and potentially harming local biodiversity.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
14	*Opuntia stricta* (Haw.) Haw	It has the ability to displace native plants, compete for resources, and disrupt ecosystems makes it a threat to biodiversity in areas where it is not controlled.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
15	*Trichodesma zeylanicum* (Burm. F.) R. Br.	Damages ecosystem services; ecosystem change/ habitat alteration; negatively impacts agriculture; negatively impacts tourism; increases vulnerability to new invasions; negatively impacts forestry; negatively impacts animals/plants collections; and reduce native biodiversity.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.
16	*Xanthium strumarium* L.	Damages ecosystem services; ecosystem change/ habitat alteration; negatively impacts agriculture; negatively impacts tourism; increases vulnerability to new invasions; negatively impacts forestry; negatively impacts animals/plants collections; and reduce native biodiversity.	Cultural control (e.g. repetitive burning); mechanical control; biological control and chemical control.

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2.6.10. Potential Project Impacts on Plant Biodiversity

The rehabilitation of the dam at Kapichira could have environmental impacts, particularly on plant biodiversity surrounding the proposed project site by modifying and even destroying permanent terrestrial and aquatic habitats.

The construction site could be subjected to direct, immediate impact on plant biodiversity due to the clearing of vegetation, excavation, and the potential disturbance of soils and local microhabitats. Heavy machinery and construction activities could likely destroy the native plant communities e.g. *Karomia tettensis* and Dalbergia melanoxylon (Figures 2-31 and 2-31 in the immediate vicinity. Moreover, there could be a chance that introduction of construction materials and workforce-related activities may inadvertently bring invasive species, which can outcompete the native vegetation. Soil compaction and changes in local hydrology due to the construction process can further degrade plant habitats, making it more difficult for native species to recolonize post-construction. While some areas may be restored or rehabilitated after the construction phase, the impacts in the short term could be quite significant, leading to considerable reduction in plant biodiversity.

The Chikwawa floodplain area is home to a diverse range of plant species such as *Phragmites australis* and *Cyperus* species that thrive in the seasonal inundation provided by the natural flow of the river. The alteration of sediment deposition and water flow may affect the fertility of the soil in the floodplain, further stressing plant species that rely on these conditions for growth. Additionally, invasive plant species could find their way into the floodplain, disrupting the delicate balance of native flora in this important ecosystem.



Figure 2-28: Cyperus textilis within downstream area

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Figure 2-29: Schoenoplectus corymbosus within flood plain area



Figure 2-30: Karomia tettensis-construction area

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Figure 2-31: Dalbergia melanoxylon-Construction area

2.6.11. Flora Biodiversity Offsets

This study has identified a rich diversity of flora in some areas of the project area including those which are threatened and listed as near threatened and those protected both at national and global level. The project should refrain from clearing protected species at all cost. Such species include *Pterocarpus angolensis, Pericorpsis angolensis*, and *Dalbergia melanoxylon*. In addition, efforts must be taken to reduce the amount of vegetation clearing during all stages of the proposed Kapichira dam construction project. Another offset measure will include ecological restoration. Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (Roberts *et al*, 2005). Afforestation with native species and allowing coppicing of cut trees are examples of *in situ* restoration initiatives that need to be considered. Lastly, management of invasive alien plants should also be implemented. Some of the invasive plants may need mechanical control through physical harvesting of the plants (for example *Lantana camara*); others demand chemical control through use of appropriate herbicides; and biological control through use of appropriate host-specific living organisms/agents to feed on the plant i.e. the Water Hyacinth, and water lettuce.

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3. CONCLUSION

The biodiversity inventory conducted as part of the Kapichira Dam Rehabilitation Project Phase 2 reveals the area's ecological richness and highlights the importance of preserving diverse species across multiple taxa. The findings underscore the critical need for sustainable development practices to mitigate the potential negative impacts of the dam's construction on aquatic and terrestrial ecosystems. Specific species, including those of conservation concern, were identified across fish, invertebrates, herpetofauna, birds, mammals, and plants. The presence of vulnerable and near-threatened species, such as the African elephant and Python sebae, emphasizes the significance of protecting the habitats that support these animals. Additionally, the survey results indicate the challenges posed by invasive species, water quality degradation, and habitat loss, which could threaten local biodiversity.

Given the ecological significance of the area, future planning for the Kapichira Dam must incorporate strategies that safeguard species diversity and ecosystem health. The study's limitations, including sampling constraints and seasonal variations, suggest that further research is necessary to fully understand the biodiversity dynamics of the region. The recommendations emphasize the importance of adaptive management and continuous monitoring to address emerging ecological threats and ensure the long-term sustainability of both the environment and the livelihoods of local communities dependent on the area's natural resources.

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APPENDIX A.TERRESTRIAL AND AQUATIC SAMPLING PLACES

TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
1	Site1 (Downstream Lower Bridge East)	15° 54.752´S	34° 45.136´E	98	07/08/2024 and 08/08/2024
		15° 54.237´S	34° 45.132´E	94	
		15° 54.222´S	34° 45.123´E	94	
		15° 54.204´S	34° 45.112´E	98	
		15° 54.186´S	34° 45.107´E	99	
		15° 54.295´S	34° 45.191´E	103	
		15° 54.296´S	34° 45.162´E	93	
		15° 54.277´S	34° 45.156´E	92	
		15° 54.275´S	34° 45.153´E	91	
		15° 54.166´S	34° 45.158´E	95	
		15° 54.353´S	34° 45.222´E	99	
		15° 54.373´S	34° 45.227´E	96	
		15° 54.392´S	34° 45.236´E	94	
		15° 54.358´S	34° 45.221´E	100	
		15° 54.365´S	34° 45.162´E	106	
		15° 54.278´S	34° 45.191´E	104	
		15° 54.213´S	34° 45.119´E	90	
		15° 54.398´S	34° 45.231´E	96	
		15° 54.406´S	34° 45.234´E	97	
		15° 54.411´S	34° 45.233´E	99	
		15° 54.416´S	34° 45.235´E	101	
		15° 54.421´S	34° 45.237´E	100	
		15° 54.265´S	34° 45.154´E	105	
		15° 54.987´S	34° 45.168´E	104	
		15° 54.292´S	34° 45.179´E	106	
		15° 54.399´S	34° 45.292´E	94	
2	Site2 (Downstream Lower Bridge West)	15° 54.273´S	34° 45.077´E	115	07/08/2024 and 14/08/2024
		15° 54.271´S	34° 45.097´E	107	
		15° 54.281´S	34° 45.101´E	107	
		15° 54.292´S	34° 45.101´E	105	
		15° 54.290´S	34° 45.108´E	108	
		15° 54.296´S	34° 45.106´E	99	
		15° 54.314´S	34° 45.064´E	114	
		15° 54.019´S	34° 45.020´E	128	
		15° 54.090´S	34° 45.042´E	150	
		15° 54.403´S	34° 45.066´E	146	
		15° 54.419´S	34° 45.076´E	135	
		15° 54.461´S	34° 45.090´E	134	
		15° 54.464´S	34° 45.142´E	110	
		15° 54.454´S	34° 45.112´E	120	
		15° 54.465´S	34° 45.159´E	111	
		15° 54.495´S	34° 45.151´E	93	
		15° 54.455´S	34° 45.181´E	94	
		15° 54.491´S	34° 45.194´E	99	
		15° 54.519´S	34° 45.189´E	94	
		15° 54.575´S	34° 45.168´E	99	
		15° 54.619´S	34° 45.160´E	100	
		15° 54.840´S	34° 45.166´E	101	
		15° 54.719´S	34° 45.729´E	101	
		15° 54.696´S	34° 45.159´E	114	
		15° 54.709´S	34° 45.156´E	110	
		15° 54.712´S	34° 45.204´E	106	
		15° 54.747´S	34° 45.208´E	102	
3	Site3 (Kapichira Dam Construction Site)	15° 53.689´S	34° 44.942´E	151	08/08/2024, 11/08/2024, 12/08/2024, 13/08/2024 and 14/08/2024
		15° 53.706´S	34° 44.925´E	148	
		15° 53.732´S	34° 44.952´E	136	
		15° 53.684´S	34° 44.941´E	151	
		15° 53.706´S	34° 44.925´E	149	
		15° 53.701´S	34° 44.940´E	153	
		15° 53.710´S	34° 44.944´E	157	
		15° 53.717´S	34° 44.958´E	154	
		15° 53.715´S	34° 44.926´E	151	
		15° 53.695´S	34° 44.949´E	157	

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TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
		15° 53.738´S	34° 44.962´E	153	
		15° 53.751´S	34° 44.979´E	146	
		15° 53.651´S	34° 44.884´E	142	
		15° 53.644´S	34° 44.865´E	142	
		15° 53.692´S	34° 44.866´E	140	
		15° 53.639´S	34° 44.863´E	141	
		15° 53.637´S	34° 44.861´E	140	
		15° 53.635´S	34° 44.845´E	141	
		15° 53.824´S	34° 44.904´E	127	
		15° 53.711´S	34° 44.941´E	157	
		15° 53.712´S	34° 44.950´E	158	
		15° 53.767´S	34° 44.923´E	159	
		15° 53.687´S	34° 44.982´E	142	
		15° 53.691´S	34° 45.941´E	141	
		15° 53.701´S	34° 45.045´E	138	
		15° 53.703´S	34° 45.056´E	138	
		15° 53.708´S	34° 45.065´E	139	
		15° 53.710´S	34° 45.058´E	140	
		15° 53.729´S	34° 45.123´E	138	
		15° 53.729´S	34° 45.124´E	140	
		15° 53.718´S	34° 44.936´E	153	
		15° 53.709´S	34° 44.457´E	153	
		15° 54.200´S	34° 45.037´E	105	
		15° 54.218´S	34° 45.060´E	104	
		15° 53.795´S	34° 44.925´E	131	
		15° 54.230´S	34° 45.069´E	103	
		15° 54.240´S	34° 45.076´E	104	
		15° 53.810´S	34° 44.919´E	128	
		15° 53.815´S	34° 44.915´E	127	
		15° 53.809´S	34° 44.909´E	127	
		15° 54.164´S	34° 44.989´E	118	
		15° 54.158´S	34° 44.983´E	116	
		15° 54.174´S	34° 45.008´E	109	
		15° 54.174´S	34° 45.012´E	110	
		15° 54.190´S	34° 45.031´E	102	
4	Site4 (Upper Egenco Bridge Area)	15° 53.860´S	34° 44.822´E	160	13/08/2024
		15° 53.806´S	34° 44.834´E	160	
		15° 53.801´S	34° 45.850´E	156	
		15° 53.814´S	34° 44.870´E	149	
		15° 53.850´S	34° 44.875´E	149	
		15° 53.544´S	34° 44.869´E	152	
		15° 53.875´S	34° 44.873´E	146	
		15° 53.899´S	34° 44.854´E	133	
		15° 53.925´S	34° 44.883´E	137	
		15° 53.988´S	34° 44.945´E	116	
		15° 54.025´S	34° 44.969´E	108	
		15° 53.989´S	34° 44.947´E	117	
		15° 53.992´S	34° 44.960´E	118	
		15° 54.099´S	34° 44.754´E	140	
		15° 54.119´S	34° 44.895´E	137	
		15° 54.005´S	34° 44.967´E	120	
		15° 54.008´S	34° 44.973´E	114	
		15° 54.151´S	34° 44.923´E	134	
		15° 54.011´S	34° 44.978´E	113	
		15° 54.020´S	34° 44.974´E	111	
		15° 54.023´S	34° 44.969´E	108	
		15° 54.032´S	34° 44.922´E	126	
		15° 54.065´S	34° 44.811´E	138	
		15° 54.088´S	34° 44.756´E	141	
		15° 54.114´S	34° 44.855´E	134	
		15° 54.144´S	34° 44.906´E	136	
		15° 54.149´S	34° 44.924´E	134	
		15° 54.109´S	34° 44.892´E	141	
		15° 54.109´S	34° 44.892´E	140	
5	Site5 (Majete Wildlife Reserve Shire River West)	15° 53.660´S	34° 44.759´E	154	08/08/2024, 09/08/2024, and 11/08/2024
		15° 53.620´S	34° 44.753´E	159	
		15° 53.620´S	34° 44.735´E	160	
		15° 53.601´S	34° 44.763´E	161	
		15° 53.588´S	34° 44.727´E	162	

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TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
		15° 53.527´S	34° 44.726´E	150	
		15° 53.510´S	34° 44.732´E	155	
		15° 53.501´S	34° 44.791´E	156	
		15° 53.485´S	34° 44.786´E	154	
		15° 53.435´S	34° 44.772´E	153	
		15° 53.413´S	34° 44.769´E	153	
		15° 53.389´S	34° 44.751´E	158	
		15° 53.345´S	34° 44.775´E	158	
		15° 53.328´S	34° 44.769´E	157	
		15° 53.144´S	34° 44.747´E	152	
		15° 53.535´S	34° 44.672´E	159	
		15° 53.209´S	34° 44.770´E	148	
		15° 53.533´S	34° 44.675´E	159	
		15° 53.297´S	34° 44.769´E	157	
		15° 52.528´S	34° 44.673´E	159	
		15° 52.563´S	34° 44.667´E	152	
		15° 52.451´S	34° 44.698´E	162	
		15° 52.325´S	34° 44.766´E	161	
		15° 52.305´S	34° 44.735´E	164	
		15° 52.290´S	34° 44.785´E	163	
		15° 52.282´S	34° 44.801´E	164	
		15° 52.265´S	34° 44.811´E	161	
		15° 53.589´S	34° 44.323´E	163	
		15° 53.518´S	34° 44.810´E	161	
		15° 53.511´S	34° 44.802´E	163	
		15° 53.544´S	34° 44.336´E	162	
6	Site6 (Majete Wildlife Reserve Shire River East)	15° 53.663´S	34° 45.278´E	159	10/08/2024
		15° 53.650´S	34° 45.291´E	158	
		15° 53.655´S	34° 45.304´E	158	
		15° 53.664´S	34° 45.317´E	151	
		15° 53.586´S	34° 45.306´E	153	
		15° 53.610´S	34° 45.287´E	153	
		15° 53.593´S	34° 45.303´E	154	
		15° 53.467´S	34° 45.303´E	155	
		15° 53.584´S	34° 45.306´E	153	
		15° 53.553´S	34° 45.317´E	155	
		15° 53.474´S	34° 45.289´E	157	
		15° 53.478´S	34° 45.288´E	155	
		15° 52.960´S	34° 45.112´E	155	
		15° 52.885´S	34° 45.051´E	158	
		15° 52.858´S	34° 45.038´E	159	
		15° 52.801´S	34° 45.002´E	161	
		15° 52.767´S	34° 44.952´E	154	
		15° 52.702´S	34° 44.928´E	162	
		15° 52.639´S	34° 44.163´E	159	
		15° 52.612´S	34° 44.986´E	161	
		15° 52.601´S	34° 45.027´E	165	
		15° 52.124´S	34° 44.970´E	163	
		15° 52.113´S	34° 44.717´E	160	
		15° 52.114´S	34° 44.980´E	159	
		15° 52.122´S	34° 44.979´E	165	
		15° 52.128´S	34° 44.970´E	163	
		15° 52.158´S	34° 44.957´E	158	
		15° 52.161´S	34° 44.953´E	156	
		15° 52.203´S	34° 44.946´E	164	
		15° 52.221´S	34° 44.926´E	162	
		15° 52.161´S	34° 44.952´E	157	
		15° 52.224´S	34° 44.934´E	161	
7	Site7 (Access Road to Dam)	15° 54.722´S	34° 44.548´E	158	14/08/2024
		15° 54.717´S	34° 44.558´E	158	
		15° 54.712´S	34° 44.576´E	161	
		15° 54.722´S	34° 44.594´E	154	
		15° 54.730´S	34° 44.604´E	159	
		15° 54.730´S	34° 44.617´E	157	
		15° 54.749´S	34° 44.647´E	156	
		15° 54.668´S	34° 44.806´E	157	
		15° 54.574´S	34° 44.847´E	158	
		15° 54.762´S	34° 44.646´E	157	
		15° 54.763´S	34° 44.685´E	152	

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TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
		15° 54.752′S	34° 44.726′E	154	
		15° 54.735′S	34° 44.756′E	156	
		15° 54.706′S	34° 44.801′E	157	

APPENDIX B.TERRESTRIAL AND AQUATIC SAMPLING PLACES

TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
8	Site8 (Chikwawa Sampling	15° 57.840′S	34° 46.557′E	88	15/08/2024
		15° 57.847′S	34° 46.860′E	89	
		15° 57.849′S	34° 46.561′E	83	
		15° 57.854′S	34° 46.562′E	86	
		15° 57.860′S	34° 46.562′E	86	
		15° 57.874′S	34° 46.567′E	89	
		15° 57.888′S	34° 46.575′E	86	
		15° 57.894′S	34° 46.565′E	86	
		15° 57.850′S	34° 46.533′E	87	
		15° 57.867′S	34° 46.508′E	85	
		15° 57.895′S	34° 46.485′E	87	
		15° 57.899′S	34° 46.453′E	89	
		15° 57.904′S	34° 46.444′E	88	
		15° 57.891′S	34° 46.469′E	89	
		15° 57.881′S	34° 46.471′E	90	
		15° 57.844′S	34° 46.566′E	92	
		15° 57.852′S	34° 46.572′E	92	
		15° 57.885′S	34° 46.575′E	92	
9	Site9 (Chikwawa Sampling3)	15° 58.893′S	34° 46.872′E	90	15/08/2024
		15° 58.869′S	34° 46.872′E	89	
		15° 58.861′S	34° 46.910′E	90	
		15° 58.835′S	34° 46.936′E	92	
		15° 58.817′S	34° 46.950′E	90	
		15° 58.805′S	34° 46.948′E	84	
		15° 58.816′S	34° 46.929′E	89	
		15° 58.810′S	34° 46.939′E	94	
		15° 58.818′S	34° 46.904′E	88	
		15° 58.833′S	34° 46.892′E	89	
		15° 58.855′S	34° 46.868′E	89	
10	Site10 (Chikwawa Sampling5)	16° 00.223′S	34° 47.646′E	95	15/08/2024
		16° 00.237′S	34° 47.657′E	90	
		16° 00.230′S	34° 47.674′E	88	
		16° 00.214′S	34° 47.669′E	88	
		16° 00.206′S	34° 47.667′E	87	
		16° 00.201′S	34° 47.657′E	87	
		16° 00.202′S	34° 47.647′E	87	
		16° 00.185′S	34° 47.636′E	86	
		16° 00.201′S	34° 47.637′E	87	
		16° 00.241′S	34° 47.671′E	83	
		16° 00.270′S	34° 47.693′E	86	
		16° 00.289′S	34° 47.703′E	83	
		16° 00.315′S	34° 47.711′E	89	
		16° 00.324′S	34° 47.724′E	85	
		16° 00.248′S	34° 47.683′E	87	
		16° 00.129′S	34° 47.652′E	92	
11	Site11 (Chikwawa Sampling2)	15° 58.096′S	34° 47.387′E	103	16/08/2024
		15° 58.106′S	34° 47.878′E	102	
		15° 58.106′S	34° 47.378′E	101	

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TARGET SITE	SAMPLED PLACE	SOUTHINGS	EASTINGS	ELEVATION (m)	DATE
		15° 58.116′S	34° 47.328′E	98	
		15° 58.103′S	34° 47.740′E	101	
		15° 58.110′S	34° 47.321′E	102	
		15° 58.117′S	34° 47.323′E	95	
		15° 58.054′S	34° 47.238′E	87	
		15° 58.086′S	34° 47.292′E	94	
		15° 58.083′S	34° 47.289′E	93	
		15° 58.053′S	34° 47.258′E	87	
		15° 58.057′S	34° 47.215′E	93	
		15° 58.038′S	34° 47.187′E	92	
		15° 59.595′S	34° 48.315′E	92	
		15° 58.059′S	34° 47.115′E	91	
		15° 59.590′S	34° 48.301′E	90	
		15° 58.064′S	34° 47.077′E	87	
		15° 59.573′S	34° 48.305′E	93	
		15° 58.089′S	34° 47.041′E	87	
		15° 58.110′S	34° 47.043′E	90	
		15° 59.551′S	34° 48.310′E	88	
		15° 59.610′S	34° 48.429′E	92	
		15° 58.114′S	34° 47.044′E	94	
		15° 59.819′S	34° 48.444′E	92	
12	Site12 (Chikwawa Sampling4)	15° 59.830′S	34° 48.232′E	85	16/08/2024
		15° 59.857′S	34° 48.220′E	85	
		15° 59.809′S	34° 48.211′E	86	
		15° 59.785′S	34° 48.215′E	86	
		15° 59.740′S	34° 48.188′E	92	
		15° 59.715′S	34° 48.177′E	91	
		15° 59.689′S	34° 48.218′E	91	
		15° 59.665′S	34° 48.261′E	94	
13	Site13 (Elephant Marsh2)	16° 02.298′S	34° 48.942′E	112	16/08/2024
		16° 02.398′S	34° 48.942′E	112	
		16° 02.262′S	34° 48.952′E	109	
		16° 02.220′S	34° 48.971′E	102	
		16° 02.183′S	34° 48.984′E	108	
		16° 02.184′S	34° 48.893′E	107	
		16° 02.193′S	34° 49.012′E	96	
		16° 02.199′S	34° 49.101′E	92	
		16° 02.184′S	34° 49.092′E	98	
		16° 02.170′S	34° 49.085′E	102	
		16° 02.180′S	34° 49.085′E	104	
14	Site14 (Elephant Marsh1)	16° 01.599′S	34° 49.559′E	87	16/08/2024
		16° 01.623′S	34° 49.554′E	86	
		16° 01.639′S	34° 49.562′E	85	
		16° 01.656′S	34° 49.589′E	90	
		16° 01.696′S	34° 49.642′E	86	
		16° 01.676′S	34° 49.595′E	86	
		16° 01.706′S	34° 49.582′E	90	
		16° 01.696′S	34° 49.642′E	90	
		16° 01.701′S	34° 49.533′E	92	
		16° 01.832′S	34° 49.458′E	90	

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APPENDIX C.SAMPLING SITES FOR INVERTEBRATES, HEPERTOFAUNA AND BIRDS

Target site	Sampled place	Date	Coordinates at start		Coordinates at end	
1	Downstream Lower Egenco bridge East	7/8/2024	-15.90386	34.752577	-15.907277	34.754875
2	Downstream Lower Egenco bridge West	7/8/2024	-15.90441	34.751308	-15.907373	34.751628
		9/8/2024	-15.897426	34.753535	-15.899513	34.7525
3	Majete wildlife Reserve-shire west	9/8/2024	-15.885416	34.745335	-15.878725	34.742942
		9/8/2024	-15.87487	34.742942	-15.870947	34.746429
4	Majete wildlife Reserve- Shire east	10/8/2024	-15.891449	34.755926	-15.885519	34.752724
		10/8/2024	-15.883602	34.753795	-15.87442	34.74642
5	Cosntruction	12/8/2024	-15.895346	34.748912	-15.896216	34.747582
6	Upper Egenco bridge	13/08/2024	-15.89682	34.747544	-15.900415	34.749542
		13/08/2024	-15.901709	34.745964	-15.903974	34.751042
7	Ngona Lodge towards Egenco bridge	14/08/2024	-15.899262	34.755607		
8	Access road to the Dam	14/08/2024	-15.910519	34.742483	-15.914507	34.746628
9	Chikwawa flood plain 1	15/08/2024	-16.030221	34.812565		
10	Chikwawa flood plain 3	15/08/2024	-15.993333	34.9233333	-16.210333	36.03444444
11	Chikwawa Flood Plain 5	15/08/2024	-16.088201	34.813946	-16.006739	34.797328
12	Chikwawa Flood Plain 2	16/08/2024	-16.933364	34.74945	-15.967837	34.784217
13	Chikwawa Flood Plain 4	16/08/2024	-16.039671	34.795654	-15.992223	34.805253
14	Elephant Marsh 2 Prescane	16/08/2024	-16.038132	34.815752	-16.088201	34.813946
15	Elephant Marsh 1	16/08/2024	-16.032364	34.819812	-16.030543	34.82397

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APPENDIX D.BIRD DATA LIST RECORDED DURING THE ASSESSMENTS

Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
1	Suliformes	Anhingidae	African Darter	*Anhinga ruta*	2	0.04%	Least Concern
2	Accipitriformes	Accipitridae	African Fish Eagle	*Hallaeetus vocifer*	15	0.33%	Least Concern
3	Bucerotiformes	Bucerotidae	African Gray Hornbill	*Tockus nasutus*	69	1.51%	Least Concern
4	Charadriiformes	Jacanidae	AFrican Jacana	*Actophilornis africanus*	21	0.46%	Least Concern
5	Passeriformes	Ploceidae	African Masked Weaver	*Ploceus velatus*	4	0.09%	Least Concern
6	Columbiformes	Columbidae	African Morning Dove	*Streptopelia decipiens*	9	0.20%	Least Concern
7	Ciconiiformes	Ciconiidae	African Open Bill	*Anastomus lamelligerus*	56	1.22%	Least Concern
8	Passeriformes	Mornarchidae	African Parasdise Flycatcher	*Terpsiphone viridis*	24	0.52%	Least Concern
9	Passeriformes	Motacillidae	African pied wagtail	*Motacilla anguimp*	161	3.52%	Least Concern
10	Passeriformes	Motacillidae	African Pipit	*Anthus cinnmomeus*	15	0.33%	Least Concern
11	Pelecaniformes	Threskiornithidae	African Sacred Ibis	*Threskiornis aethiopicus*	9	0.20%	Least Concern
12	Passeriformes	Hirundinidae	African Sand Martin	*Riparia paludicola*	5	0.11%	Least Concern
13	Charadriiformes	Laridae	African Skimmer	*Rynchops flavirostris*	6	0.13%	Least Concern
14	Charadriiformes	Charadriidae	African Wattled Lapwing	*Vanellus senegallus*	38	0.83%	Least Concern
15	Bucerotiformes	Upupidae	African Whoopoe	*Upu[a africana*	2	0.04%	Least Concern
16	Gruiformes	Rallidae	Allens Gallinule	*Porphyrula alleni*	4	0.09%	Least Concern
17	Passeriformes	Timaliidae	Arrow-marked babbler	*Turdoides jardineii*	7	0.15%	Least Concern
18	Passeriformes	Hirundinidae	Barn Swallow	*Hirundo rustica*	67	1.46%	Least Concern
19	Piciformes	Picidae	Beaded Wood Pecker	*Dendropicos namaquus*	2	0.04%	Least Concern
20	Pelecaniformes	Ardeidae	Black - headed Heron	*Ardea melanocephala*	10	0.22%	Least Concern
21	Gruiformes	Rallidae	Black Crake	*Amaurornis flavirostra*	5	0.11%	Least Concern
22	Passeriformes	Campephagidae	Black Cuckooshike	*Campephaga flava*	1	0.02%	Least Concern
23	Passeriformes	Oriolidae	Black Headed Oriole	*Oriolus larvatus*	17	0.37%	Least Concern
24	Pelecaniformes	Ardeidae	Black Heron	*Egretta ardesiaca*	9	0.20%	Least Concern
25	Passeriformes	Hirundinidae	Black Saw-wing	*Psalidoprocne pristoptera*	7	0.15%	Least Concern

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Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
26	Passeriformes	Nectarinidae	Black Sunbird	*Chalcomitra amethystina*	45	0.98%	Least Concern
27	Passeriformes	Malaconotinidae	Black-backed Puffback	*Dryoscopus cubla*	17	0.37%	Least Concern
28	Piciformes	Lybiidae	Black-collared Barbet	*Lybius torquatus*	21	0.46%	Least Concern
29	Pelecaniformes	Ardeidae	Black-crowned Night Heron	*Nycticorax*	4	0.09%	Least Concern
30	Passeriformes	Malaconotinidae	Black-crowned Tchagra	*Tchagra senegalensis*	34	0.74%	Least Concern
31`	Passeriformes	Pycnonotidae	Black-eyed Bulbul	*Pycnonotus tricolor*	183	1.81%	Least Concern
32	Charadriiformes	Recurvirostridae	Black-winged Stilt	*Himantopus*	9	0.20%	Least Concern
33	Passeriformes	Estrildidae	Blue cordonblu	*Uraeginthus angolensis*	188	4.11%	Least Concern
34	Columbiformes	Columbidae	Blue Spotted Wood Dove	*Turtur afer*	212	4.63%	Least Concern
35	Passeriformes	Estrildidae	Blue-billed Fire Finch	*Lagonosticta lubricata*	119	2.60%	Least Concern
36	Accipitriformes	Accipitridae	Booted Eagle	*Hieraaetus pennatus*	6	0.13%	Least Concern
37	Passeriformes	Estrildidae	Bronze Manikin	*Spermestes cucullata*	172	3.76%	Least Concern
38	Psittaciformes	Psittacidae	Brown- headed Parrot	*Poicephalus cryptoxanthus*	7	0.15%	Least Concern
39	Coraciiformes	Alcedinidae	Brown -hooded Kingfisher	*Halcyon albiventris*	1	0.02%	Least Concern
40	Passeriformes	Malaconotinidae	Brown-headed Tchagra	*Tchagra australis*	52	1.14%	Least Concern
41	Cuculiformes	Cuculidae	Burchell's Coucal	*Centropus superciliosus*	6	0.13%	Least Concern
42	Columbiformes	Columbidae	Cape Turtle Dove	*Streptopelia capicola*	202	4.41%	Least Concern
43	Passeriformes	Platysteiridae	Chinspot Batis	*Batis molitor*	45	0.98%	Least Concern
44	Passeriformes	Muscicapidae	Collared Palm Thrush	*Cichladusa aequata*	4	0.09%	Least Concern
45	Passeriformes	Nectarinidae	collerd Sunbird	*Hedydipna collaris*	35	0.76%	Least Concern
46	Accipitriformes	Accipitridae	Common Buzzard	*Buteo*	1	0.02%	Least Concern
47	Charadriiformes	Charadriidae	Common Ringed Plover	*Charadrius hiaticula*	3	0.07%	Least Concern
48	Bucerotiformes	Phoeniculidae	Common Scimitar Bill	*Sylvicapra grimmia*	5	0.11%	Least Concern
49	Pelecaniformes	Ardeidae	Common Squacco Heron	*Ardeola ralloides*	10	0.22%	Least Concern
50	Passeriformes	Estrildidae	Common Waxbill	*Estrilda astrild*	127	2.78%	Least Concern
51	Passeriformes	Cisticolidae	Croacking Cisticola	*Cisticola natalensis*	2	0.04%	Least Concern
52	Bucerotiformes	Bucerotidae	Crowned Hornbill	*Tockus alboterminatus*	24	0.52%	Least Concern
53	Passeriformes	Oriolidae	Eastern Black-headed Oriole	*Oriolus larvatus*	2	0.04%	Least Concern

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Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
54	Anseriformes	Anatidae	Egyptian Goose	*Alopochen aegyptiaca*	28	0.61%	Least Concern
55	Columbiformes	Columbidae	Emerald-spotted Wood Dove	*Turtur chalcospilos*	24	0.52%	Least Concern
56	Caprimulgiformes	Caprimulgidae	Fiery-necked Nightjar	*Caprimulgus pectoralis*	20	0.44%	Least Concern
57	Passeriformes	Dicruidae	Folk-tailed Drongo	*Dicrurus adsimilis*	68	1.49%	Least Concern
58	Passeriformes	Ploceidae	Forest Weaver	*Ploceus bicolor*	9	0.20%	Least Concern
59	Anseriformes	Anatidae	Fulvvous Tree Duck	*Dendrocygna bicolor*	4	0.09%	Least Concern
60	Passeriformes	Sylviidae	Garden Warbler	*Sylvia borin*	5	0.11%	Least Concern
61	Coraciiformes	Alcedinidae	Giant Kingfisher	*Megaceryle maxima*	4	0.09%	Least Concern
62	Pelecaniformes	Ardeidae	Goliath Heron	*Ardea goliath*	2	0.04%	Least Concern
63	Pelecaniformes	Ardeidae	Great White Egret	*Egretta alba*	61	1.33%	Least Concern
64	Passeriformes	Stunidae	Greater Blue-eared Starling	*Lamprotornis chalybaeus*	62	1.35%	Least Concern
65	Passeriformes	Estrildidae	Green Twinspot	*Mandingoa nitidula*	2	0.04%	Least Concern
66	Bucerotiformes	Phoeniculidae	Green Woodhoopoe	*Phoeniculus purpureus*	9	0.20%	Least Concern
67	Passeriformes		Green-backed Camaroptera	*Camaroptera brachyura*	22	0.48%	Least Concern
68	Bucerotiformes	Bucerotidae	Grey Headed Hornbill	*Tockus nasutus*	16	0.35%	Least Concern
69	Pelecaniformes	Ardeidae	Grey Heron	*Ardea Cinerea*	45	0.98%	Least Concern
70	Pelecaniformes	Threskiornithidae	Grossy Ibis	*Plegadis falcinellus*	63	1.38%	Least Concern
71	Pelecaniformes	Scopidae	Hamerkop	*Scopus umbretta*	68	1.49%	Least Concern
72	Galliformes	Numidae	Helmeted Guinea Fowl	*Numida meleagris*	155	3.39%	Least Concern
73	Passeriformes	Muscicapidae	Heuglin Robin	*Cossypha heuglini*	11	0.24%	Least Concern
7	Passeriformes	Estrildidae	Jameson's Firefinch	*Logonosticta rhodopareia*	26	0.57%	Least Concern
4	Cuculiformes	Cuculidae	Klaas's Cuckoo	*Chrysococcyx klaas*	16	0.35%	Least Concern
75	Passeriformes	Stunidae	Lesser Blue-eared Starling	*Lamprotornis chloropterus*	3	0.07%	Least Concern
76	Passeriformes	Ploceidae	Lesser Masked Weaver	*Ploceus intermedius*	3	0.07%	Least Concern
77	Coraciiformes	Coraciidae	Lilac -breasted Roller	*Coracias caudatus*	4	0.09%	Least Concern
78	Coraciiformes	Meropidae	Little Bee Eater	*Melops pusilus*	134	2.93%	Least Concern
79	Pelecaniformes	Ardeidae	Little Egret	*Egretta garzetta*	5	0.11%	Least Concern
80	Accipitriformes	Accipitridae	Lizard Buzzard	*Kaupifalco monogrammicus*	1	0.02%	Least Concern

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Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
81	Coraciiformes	Alcedinidae	Malachite Kingfisher	*Alcedo cristata*	2	0.04%	Least Concern
82	Columbiformes	Columbidae	Namaqua Dove	*Oena capensis*	7	0.15%	Least Concern
83	Passeriformes	Estrildidae	Peter's Twinspot	*Hypargos niveoguttatus*	4	0.09%	Least Concern
84	Passeriformes	Corvidae	Pied Crow	*Corvus albus*	8	0.17%	Least Concern
85	Coraciiformes	Alcedinidae	Pied kingfisher	*Ceryle rudis*	40	0.87%	Least Concern
86	Pelecaniformes	Ardeidae	Purple Heron	*Ardea purpurea*	2	0.04%	Least Concern
87	Coraciiformes	Coraciidae	Recket -tailed Roller	*Coracias spatulatus*	4	0.09%	Least Concern
88	Passeriformes	Ploceidae	Red Bishop	*Euplectes orix*	12	0.26%	Least Concern
89	Passeriformes	Cisticolidae	Red Faced Cisticola	*Cisticola erythrops*	28	0.61%	Least Concern
90	Passeriformes	Estrildidae	Red-billed Firefinch	*Lagonosticta senegala*	59	1.29%	Least Concern
91	Columbiformes	Columbidae	Red-eyed Dove	*Streptopelia semitorquata*	56	1.22%	Least Concern
92	Passeriformes	Cisticolidae	Red-faced Cisticola	*Cisticola erthrops*	43	0.94%	Least Concern
93	Passeriformes	Macrosphenidae	Red-faced Crombec	*Sylvietta whytii*	124	2.71%	Least Concern
94	Coliiformes	Coliidae	Red-faced Mousebird	*Urocolius indicus*	21	0.46%	Least Concern
95	Passeriformes	Estrildidae	Red-throated Twinpot	*Hypargos niveoguttatus*	5	0.11%	Least Concern
96	Passeriformes	Stunidae	Red-winged Starling	*Onychognathus morio*	7	0.15%	Least Concern
97	Sliformes	Phalacrocoracidae	Reed Commorant	*Phalacrocorax africanus*	8	0.17%	Least Concern
98	Passeriformes	Motacillidae	Rixchard's Pipit	*Anthus richardi*	2	0.04%	Least Concern
99	Passeriformes	Nectarinidae	Scarlet Chested Sunbird	*Chalcomitra senegalensis*	14	0.31%	Least Concern
100	Passeriformes	Acrocephalidae	Sedge Warbler	*Acrocephalus schoenobaenus*	3	0.07%	Least Concern
101	Passeriformes	Cisticolidae	singing Cisticola	*Cisticola cantans*	2	0.04%	Least Concern
102	Passeriformes	Paridae	Southern Black Tit	*Parus niger*	77	1.68%	Least Concern
103	Passeriformes	Laniidae	Southern lesser Fiscal	*Lanius collaris*	1	0.02%	Least Concern
104	Passeriformes	Malaconotinidae	Black-backed Puffback	*Dryoscopus cubla*	86	1.88%	Least Concern
105	Bucerotiformes	Bucerotidae	Southern Yellow-billed Hornbill	*Tockus leucomelas*	2	0.04%	Least Concern
106	Coliiformes	Coliidae	Speckled Mousebird	*Colius striatus*	10	0.22%	Least Concern
107	Strigiformes	Strigidae	Spotted Eagle Owl	*Bubo africanus*	1	0.02%	Least Concern
108	Anseriformes	Anatidae	Spur-winged Goose	*Plectropterus gambensis*	10	0.22%	Least Concern

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Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
109	Piciformes	Picidae	Stierling's Woodpecker	*Dendropicos stierlini*	1	0.02%	Least Concern
110	Coraciformes	Alcedinidae	Striped Kingfisher	*Halcyon chelicuti*	7	0.15%	Least Concern
111	Passeriformes	Cisticolidae	Tawny-flanked Prinia	*Prinia subflava*	103	2.25%	Least Concern
112	Passeriformes	Pycnonotidae	Terrestrial Brownbul	*Phyllaphus terrestris*	2	0.04%	Least Concern
113	Passeriformes	Ploceidae	Thick-billed Weaver	*Amblyospiza albifrons*	2	0.04%	Least Concern
114	Charadriiformes	Charadriidae	Three-banded Plover	*Charadrius tricollaris*	4	0.09%	Least Concern
115	Passeriformes	Malaconotinidae	Tropical Boubou	*Laniarius aethiopicus*	59	1.29%	Least Concern
116	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	*Bycanistes bucinator*	124	2.71%	Least Concern
117	Passeriformes	Nectarinidae	Variable Sunbird	*Cinnyris venustus*	33	0.72%	Least Concern
118	Strigiformes	Viduidae	Village Indigo bird	*Vidua chalybeata*	47	1.03%	Least Concern
119	Accipitriformes	Accipitridae	Walberg's Eagle	*Aquila wahlbergi*	2	0.04%	Least Concern
120	Accipitriformes	Accipitridae	Western Banded Snake Eagle	*Circaetus cinerascens*	1	0.02%	Least Concern
121	Charadriiformes	Laridae	Whiskered Terns	*Chlidonias hybrida*	5	0.11%	Least Concern
122	Passeriformes	Vangidae	White Helmetshrike	*Prionops plumatus*	40	0.87%	Least Concern
123	Passeriformes	Nectarinidae	White-bellied Sunbird	*Cinnyris talatala*	9	0.20%	Least Concern
124	Sliformes	Phalacrocoracidae	White-breasted Commorant	*Phalacrocorax carbo*	1	0.02%	Least Concern
125	Passeriformes	Muscicapidae	White-browed Scrub Robin	*Erythropygia leucophrys*	7	0.15%	Least Concern
126	Anseriformes	Anatidae	White-faced Tree Duck	*Dendrocygna viduata*	168	3.67%	Least Concern
127	Apodiformes	Apodidae	White-rumped Swift	*Apus caffer*	9	0.20%	Least Concern
128	Charadriiformes	Laridae	White-winged Black Tern	*Chlidonias leucopterus*	5	0.11%	Least Concern
129	Coraciformes	Alcedinidae	Woodland Kingfisher	*Halycon senegalensis*	5	0.11%	Least Concern
130	Passeriformes	Ploceidae	Yellow rumped Bishop	*Euplectes capensis*	60	1.31%	Least Concern
131	Passeriformes	Pycnonotidae	Yellow-bellied Bulbul	*Chlorocichla flaviventris*	11	0.24%	Least Concern
132	Pelecaniformes	Ardeidae	Yellow-bellied Egret	*Egretta intermedia*	4	0.09%	Least Concern
133	Passeriformes	Fringillidae	Yellow-fronted Canary	*Serinus mosambicus*	177	3.87%	Least Concern
134	Piciformes	Lybiidae	Yellow-fronted Tinker bird	*Pononiulus chrysoconus*	19	0.42%	Least Concern
1`35	Passeriformes	Ploceidae	Yellow-Rumped Bishop	*Euplectes capensis*	57	1.25%	Least Concern
136	Passeriformes	Motacillidae	Yellow-throated Longcraw	*Macronyx croceus*	2	0.04%	Least Concern

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Sr.#	Order	Family Name	Common name	Scientific name	Abundance	Species %	IUCN status
137	Passeriformes	Ploceidae	Yellow-throated Petronia	*Petronia superciliaris*	3	0.07%	Least Concern

APPENDIX E.LIST OF PLANT SPECIES FOUND, CONSERVATION STATUS AND THE STATE OF CATEGORY OF INVASIVENESS OF THE SPECIES

SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Acacia hockii (De Wild.) Seigler & Ebinger.	Tree	Mimosoideae	LC	LC	
Acacia nigrescens(Oliv.) P.J.H.Hurter	Tree	Mimosoideae	LC	LC	
Acacia nilotica (L.) P.J.H.Hurter & Mabb	Tree	Mimosoideae	LC	LC	
Acacia seyal Dell.	Tree	Mimosoideae	LC	LC	
Acacia tortilis (Forssk.) Galasso & Banfi	Tree	Mimosoideae	LC	LC	
Achyranthus aspera L.	Herb	Amaranthaceae	NE	NE	
Adansonia digitata L.	Tree	Bombacaceae	LC	LC	
Ageratum houstoniana Mill.	Herb	Asteraceae	NE	NE	Invasive
Albizia anthelmintica Brongn	Tree	Fabaceae	LC	LC	
Albizia glaberrima (Schum. & Thonn.) Benth.	Tree	Fabaceae	LC	LC	
Allophylus africanus P. Beauv.	Tree	Sapindaceae	LC	LC	
Amaranthus spinosa L.	Herb	Amaranthaceae	NE	NE	
Antidesma venosum E. Mey	Tree	Euphorbiaceae	LC	LC	
Argemone mexicana L.	Herb	Papaveraceae	NE	NE	Invasive
Aristolochia albida Duch	Liana	Aristolochiaceae	LC	LC	
Asparagus spp	Herb	Liliaceae	NE	NE	
Azolla filiculoides Lam.	Herb	Azollaceae	NE	NE	Invasive
Bauhinia petersiana Bolle	Tree	Caesalpinioideae	LC	LC	
Blumea crispata (Vahl) Merxm.	Herb	Asteraceae	NE	NE	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Boerhavia diffusa Linn.	Herb	Nyctaginaceae	NE	NE	
Boscia corymbosa Gilg.	Tree	Capparaceae	LC	LC	
Boscia salicifolia Oliv.	Tree	Capparaceae	LC	LC	
Brachiaria brizantha (A.Rich.) Stapf	Grass	Poaceae	NE	NE	
Caelsalpinia bonduc (L) Roxb.	Liana	Fabaceae	NE	NE	Invasive
Calotropis procera (Aiton) W.T. Aiton	Tree	Apocynaceae	NE	NE	Invasive
Capparis erythrocarpos Isert.	Tree	Capparaceae	NE	NE	
Cissus integrifolia (Baker) Planch.	Liana	Vitaceae	NE	NE	
Cissus quadrangularis L.	Liana	Vitaceae	NE	NE	
Cissus rotundifolia (Forssk.) Vahl	Liana	Vitaceae	NE	NE	
Cladostemon kirkii (Oliv.) Pax & Gilg	Tree	Capparaceae	LC	LC	
Cleistochlamys kirkii (Benth.) Oliv.	Tree	Annonaceae	LC	LC	
Combretum apiculatum Sond.	Tree	Combretaceae	LC	LC	
Combretum collinum Fresen	Tree	Combretaceae	LC	LC	
Combretum fragrans F. Hoffm.	Tree	Combretaceae	NE	LC	
Combretum hereroense Schinz	Tree	Combretaceae	LC	NT	
Combretum imberbe Wawra	Tree	Combretaceae	LC	NT	
Combretum mossambicensis (Klotzsch) Engl.	Tree	Combretaceae	LC	LC	
Combretum paniculatum (HECP)	Tree	Combretaceae	LC	LC	
Combretum zeyheri Sond.	Tree	Combretaceae	LC	LC	
Commelina banghalensis L.	Herb	Commelinaceae	NE	NE	
Commiphora africana (A.Rich.) Engl.	Tree	Burseraceae	NE	NE	
Commiphora mossambicensis (Oliv.) Engl.	Tree	Burseraceae	NE	NE	
Commiphora pyracanthoides Engl.	Tree	Burseraceae	LC	NE	
Conyza stricta Willd.	Herb	Asteraceae	NE	NE	
Corchorus olitorius L.	Herb	Tiliaceae	NE	NE	
Cordyla africana Lour.	Tree	Fabaceae	LC	LC	
Crossoptyrx febrifuga (Afzel. Ex G Don) Benth.	Tree	Rubiaceae	NE	LC	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Crotalaria pallida Blanco	Herb	Fabaceae	NE	NE	
Croton macrostachyus Hochst. ex Delile	Tree	Euphorbiaceae	LC	LC	
Cynodon dactylon (L.) Pers	Grass	Poaceae	NE	NE	
Cyperus dives Delile	Grass	Cyperaceae	LC	NE	
Cyperus papyrus L.	Grass	Cyperaceae	LC	NE	
Cyperus textilis Thunb	Grass	Cyperaceae	LC	NE	
Dalbergia lactea Vatke.	Tree	Fabaceae	LC	NE	
Dalbergia melanoxylon Guill. & Perr.	Tree	Fabaceae	NT	EN	
Datura stramonium L.	Herb	Solanaceae	NE	NE	Invasive
Deinbollia xanthocarpa Klotzsch Radlk	Tree	Sapindaceae	LC	LC	
Dichrostachys cinerea (L.) Wight et Arn.	Tree	Mimosaceae	LC	LC	
Digitaria milanjiana (Rendle) Stapf	Grass	Poaceae	NE	NE	
Diospyros kirkii Hiern	Tree	Ebenaceae	LC	LC	
Diospyros lycioides (Desf) A. DC.	Tree	Ebenaceae	LC	LC	
Diospyros mesipiliformis Hochst ex A. DC.	Tree	Ebenaceae	NE	LC	
Diospyros quiloensis (Hiern) F.White	Tree	Ebenaceae	LC	LC	
Diospyros senensis Klotzsch	Tree	Ebenaceae	LC	LC	
Diospyros squrrosa Klotzsch	Tree	Ebenaceae	LC	LC	
Diplorhynchus condylocarpon (Mull.Arg.) Pichon	Tree	Apocynaceae	NE	NE	
Drypetes gerrardii Hutch	Tree	Euphorbiaceae	LC	LC	
Ehretia amoena Klotzsch	Tree	Boraginaceae	LC	LC	
Ensete ventricosa (Welw.) Cheesman	Herb	Musaceae	NE	NE	
Eragrostris ciliaris (L.) R. Br.	Grass	Poaceae	NE	NE	
Eichhornia crassipes (Mart.) Solms	Herb	Pontederiaceae	NE	NE	Invasive
Euphorbia heterophylla L.	Herb	Euphorbiaceae	NE	NE	
Euphorbia hirta L.	Tree	Euphorbiaceae	NE	NE	
Euphorbia kibwenzensis N. E. Br.	Herb	Euphorbiaceae	NE	NE	
Euphorbia matabalensis Pax.	Tree	Euphorbiaceae	NE	NE	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Ficus sycomorus L.	Tree	Moraceae	NE	LC	
Flacourtia indica (Burm. F.) Merr.	Tree	Flacourtiaceae	NE	NE	
Flueggea virosa (Roxb. ex Willd.) Royle.	Tree	Euphorbiaceae	NE	NE	
Friesoldielsia obovata (Benth) Verdc.	Tree	Annonaceae	LC	LC	
Gomphocarpus physocarpus E. Mey.	Herb	Asclepiadaceae	NE	NE	
Grewia bicolor Juss.	Tree	Euphorbiaceae	NE	NE	
Grewia flavescens Juss.	Tree	Euphorbiaceae	NE	NE	
Grewia forbesii Harv. ex Mast.	Tree	Euphorbiaceae	NE	NE	
Grewia inaequilatera Garcke	Tree	Euphorbiaceae	NE	NE	
Heliotropium indicum L.	Herb	Boraginaceae	NE	NE	Invasive
Hexalobus monopetalus A. Rich Engl.& Diels	Tree	Annonaceae	LC	LC	
Hippocratea parviflora N.E. Br.	Tree	Celastraceae	NE	NE	
Holarrhena pubescens (Buch.-Ham.) Wall. ex G.Don	Tree	Apocynaceae	NE	LC	
Hyparrhenia rufa (Nees) Stapf.	Grass	Poaceae	NE	NE	
Hyphaene ventricosa Kirk.	Palm	Palmae	LC	LC	
Indigofera homblei Baker f. & Martin	Herb	Fabaceae	NE	NE	
Ipomea aquatica Forssk.	Liana	Convolvulaceae	NE	NE	
Jatropha carcus L.	Tree	Euphorbiaceae	NE	NE	
Kalanchoe spp	Herb	Crassulaceae	NE	NE	
Karomia tettensis (Klotzsch) R. Fern	Tree	Lamiaceae	LC	LC	
Kigelia africana (Lam.) Benth.	Tree	Bignoniaceae	LC	LC	
Kirkia acuminata Oliv	Tree	Simaroubaceae	LC	LC	
Lannea stuhlmannii (Engl.) Engl.	Tree	Anacardiaceae	NE	NE	
Lantana camara L.	Shrub	Verbenaceae	NE	NE	Invasive
Lecaniodiscus fraxinifolius Baker	Tree	Sapindaceae	NE	NE	
Leersia hexandra Sw.	Grass	Poaceae	NE	NE	
Ludwigia erecta (L.) Hara	Herb	Onagraceae	NE	NE	
Ludwigia stolonifera (Guill. & Perr.) P.H.Raven	Herb	Onagraceae	NE	NE	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Luffa cylindrica (L.) M.Roem.	Liana	Curcubitaceae	NE	NE	Invasive
Maclura africana (Bureau) Corner.	Shrub	Moraceae	LC	LC	
Mangifera indica L	Tree	Anacardiaceae	NE	NE	
Manilkara mochisia (Baker) Dubard	Tree	Sapotaceae	NE	NE	
Markhamia obtusifolia (Baker) Sprague	Tree	Bignoniaceae	NE	NE	
Markhamia zanzibarica (DC.) Engl.	Tree	Bignoniaceae	LC	LC	
Maytenus heterophylla (Eckl. & Zeyh.) N.Robson	Tree	Celastraceae	LC	LC	
Melinis ambigua Hack.	Grass	Poaceae	NE	NE	
Mimusops zeyheri Sond	Tree	Sapotaceae	LC	LC	
Monodora junodii Engl. & Diels	Tree	Annonaceae	NE	LC	
Mucuna stans Welw. ex Baker	Liana	Fabaceae	NE	NE	
Musa paradisiaca L.	Shrub	Musaceae	NE	NE	
Nelsonia carnescens (Lam.) Spreng.	Herb	Acanthaceae	NE	NE	
Neojeffreya decurrens (L.) Cabrera	Herb	Asteraceae	NE	NE	
Nidorella auriculata DC.	Herb	Asteraceae	NE	NE	
Ocimum canum Sims.	Herb	Lamiaceae	NE	NE	
Opuntia vulgaris Mill.	Herb	Cactaceae	NE	NE	Invasive
Ormocarpum kirkii S.Moore	Tree	Papilionoideae	NE	LC	
Oryza longistaminata Chev.& Roehr.	Grass	Poaceae	LC	LC	
Oxalis corniculata L.	Herb	Oxalidaceae	NE	NE	
Pachystella spp	Tree	Sapotaceae	NE	NE	
Paederia bojeriana (A.Rich.) Drake	Liana	Rubiaceae	NE	NE	
Panicum maximum Jacq.	Grass	Poaceae	NE	NE	
Penisetum unisetum (Nees.) Benth.	Grass	Poaceae	NE	NE	
Philenoptera bussei (Harms.) Schrire.	Tree	Fabaceae	NE	LC	
Philenoptera violaceae (Klotzsch.) Schrire.	Tree	Fabaceae	LC	LC	
Phragmites australis (Cav.) Trin. ex Steud.	Grass	Poaceae	NE	NE	
Phragmites mauritianus Kunth	Grass	Poaceae	NE	NE	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Phyllanthus guineensis Pax.	Shrub	Euphorbiaceae	NE	NE	
Physalis peruviana L.	Herb	Solanaceae	NE	NE	
Pistia stratiotes L.	Herb	Araceae	NE	NE	Invasive
Plectranthus spp	Herb	Lamiaceae	NE	NE	
Pleurostylia africana Loes	Tree	Celastraceae	NE	LC	
Premna senensis Klotzsch	Shrub	Lamiaceae	LC	LC	
Pseudolachnostylis maprouneifolia Pax.	Tree	Euphorbiaceae	LC	LC	
Pteleopsis myrtifolia (M.a. Lawson.) Engl.& Diels.	Tree	Combretaceae	NE	LC	
Pterocarpus angolensis DC.	Tree	Fabaceae	LC	EN	
Pterocarpus rotundifolius (Sond.) Druce	Tree	Fabaceae	LC	LC	
Ricinus communis L.	Tree	Euphorbiaceae	NE	NE	Invasive
Rumex bequaertii De Wild.	Herb	Polygonaceae	NE	NE	
Saccharum officinale L.	Grass	Poaceae	NE	NE	
Sanseviera aethiopica Thunb	Herb	Dracaenaceae	NE	NE	
Schoenoplectus corymbosus (Roth ex Roem. & Schult) J. Raynal.	Grass	Cyperaceae	LC	NE	
Sclerocarya birrea (A. Rich)Hochst	Tree	Anacardiaceae	LC	NE	
Senna alata (L.) Roxb.	Shrub	Fabaceae	LC	NE	
Senna occidentalis (L.) Link.	Shrub	Fabaceae	LC	NE	
Senna siamea (Lam) H. S. Irwin & Barneby.	Tree	Fabaceae	LC	NE	
Sesban Linn.	Shrub	Fabaceae	NE	NE	
Sida acuta (Burm) F.	Herb	Malvaceae	NE	NE	
Sida rhombifolia L.	Herb	Malvaceae	NE	NE	
Solanum incanum L.	Herb	Solanaceae	NE	NE	
Sporobolus fimbriatus (Trin.) Nees.	Grass	Poaceae	NE	NE	
Sterculia appendiculata Engl.	Tree	Sterculiaceae	NE	NE	
Stereospermum kunthianum Cham	Tree	Bignoniaceae	LC	LC	
Strophanthus kombe Oliv.	Liana	Apocynaceae	DD	LC	

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SCIENTIFIC NAME	SPECIES LIFEFORM	FAMILY	IUCN CATEGORY (GLOBAL)	IUCN CATEGORY (NATIONAL)	STATE INVASIVENESS
Strychnos madagascariensis Poir.	Tree	Loganiaceae	LC	LC	
Tamarindus indica L.	Tree	Fabaceae	LC	LC	
Tephrosia purpurea (L.) Pers.	Shrub	Fabaceae	NE	NE	
Terminalia sericea Burch. ex DC.	Tree	Combretaceae	LC	EN	
Thespesia garckeana F . Hoffm.	Tree	Malvaceae	LC	LC	
Tricalysia acocanthiroides K. Schum	Tree	Rubiaceae	NE	NE	
Trichilia capitata Klotzsch.	Tree	Meliaceae	LC	LC	
Trichodesma zeylanicum (Burm. F.) R. Br.	Herb	Boraginaceae	NE	NE	Invasive
Tridax procumbens (L.)	Herb	Asteraceae	NE	NE	
Triumfetta rhomboidea Jacq.	Herb	Tiliaceae	NE	NE	
Turraea nilotica Kotschy & Peyr.	Tree	Meliaceae	LC	LC	
Urena lobata L.	Shrub	Malvaceae	NE	NE	
Vernonia glabra (Steetz) Vatke.	Herb	Asteraceae	NE	NE	
Vernonia oxyura (O.Hoffm) C. Jeffrey.	Shrub	Asteraceae	NE	NE	
Vitex payos (Lour) Merr.	Tree	Verbenaceae	LC	LC	
Voacanga thouarsii Roem. & Schult.	Tree	Apocynaceae	LC	NE	
Voscia cuspidata (Roxb.) & Griff.	Grass	Poaceae	NE	NE	
Xanthium strumarium L.	Herb	Asteraceae	NE	NE	Invasive
Xeroderris stuhlmannii (Taub.) Mendonca& EP Sousa	Tree	Fabaceae	NE	NE	
Ximenia americana L.	Tree	Olacaceae	LC	LC	
Ximenia caffra Sond	Tree	Olacaceae	LC	LC	
Xylopia parviflora (A.Rich.) Benth.	Tree	Annonaceae	LC	LC	
Zea mays L.	Grass	Poaceae	LC	NE	
Ziziphus mauritiana Lam.	Tree	Rhamnaceae	LC	NE	

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APPENDIX F.BIRD SPECIES RICHNESS BASED ON LOCATIONS ASSESSED

Lower Egenco bridge Shire east

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Bucerotiformes	Bucerotidae	African Gray Hornbill	Tockus nasutus	18	3.24%
2	Ciconiiformes	Ciconiidae	African Open Bill	Anastomus lamelligerus	11	1.98%
3	Passeriformes	Motacillidae	African pied wagtail	Motacilla anguimp	23	4.14%
4	Passeriformes	Motacillidae	Barn Swallow	Hirundo rustica	28	5.05%
5	Passeriformes	Campephagidae	Black Cuckooshike	Campephaga flava	1	0.18%
6	Passeriformes	Pycnonotidae	Black eyed bulbul	Pycnonotus barbartus	29	5.23%
7	Passeriformes	Oriolidae	Black Headed Oriole	Oriolus larvatus	7	1.26%
8	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	6	1.08%
9	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	16	2.88%
10	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	13	2.34%
11	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	41	7.39%
12	Passeriformes	Malaconotinidae	Brown-headed Tchagra	Tchagra australis	15	2.70%
13	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	37	6.67%
14	Passeriformes	Platysteiridae	Chinspot Batis	Batis molitor	6	1.08%
15	Passeriformes	Nectarinidae	Collared Sunbird	Anthreptes collaris	10	1.80%
16	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	33	5.95%
17	Bucerotiformes	Bucerotidae	Crowned Hornbill	Bycanisters bucinator	16	2.88%
18	Caprimulgiformes	Caprimulgidae	Fiery-necked Nightjar	Caprimulgus pectoralis	7	1.26%
19	Passeriformes	Ploceidae	Forest Weaver	Ploceus bicolor	4	3.60%
20	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	20	3.60%
21	Pelecaniformes	Ardeidae	Grey Heron	Ardea Cinerea	24	4.32%
22	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	13	2.34%
23	Passeriformes	Muscicapidae	Heuglin's Robin	Cossypha heuglini	4	0.72%
24	Passeriformes	Estrildidae	Jamson Firefinch	Lagonosticta rhodopareira	9	1.62%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
25	Cuculiformes	Cuculidae	Klaas's Cuckoo	Chrysococcyx klaas	11	1.98%
26	Coraciiformes	Meropidae	Little Bee Eater	Melops pusilus	18	3.24%
27	Columbiformes	Columbidae	Namaqua Dove	Oena capensis	3	0.54%
28	Passeriformes	Estrildidae	Peter's Twinspot	Hypargos niveoguttatus	4	0.72%
29	Coraciiformes	Alcedinidae	Pied kingfisher	Ceryle rudis	8	1.44%
30	Coraciiformes	Coraciidae	Recket -tailed Roller	Coracias spatulatus	2	0.36%
31	Passeriformes	Estrildidae	Red-billed Firefinch	Lagonosticta senegala	30	5.41%
32	Passeriformes	Macrosphenidae	Red-capped Crombec	Sylvietta ruficapilla	17	3.06%
33	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	7	1.26%
34	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	Bycanistes bucinator	19	3.42%
35	Passeriformes	Nectarinidae	White-bellied Sunbird	Cinnyris talatala	9	0.16%
37	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	28	5.05%
38	Passeriformes	Fringillidae	Yellow-fronted Tinker bird	Pogoniulus chrysoconus	8	1.44%

Lower Egenco bridge Shire West

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Bucerotiformes	Bucerotidae	African Gray Hornbill	Tockus nasutus	9	3.28%
2	Passeriformes	Motacillidae	African pied wagtail	Motacilla anguimp	6	2.19%
3	Passeriformes	Pycnonotidae	Black eyed bulbul	Pycnonotus barbartus	3	1.09%
4	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	7	2.55%
5	Passeriformes	Malaconotinidae	Black-backed Puffback	Dryoscopus cubla	17	6.20%
6	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	29	10.58%
7	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	20	7.30%
8	Passeriformes	Malaconotinidae	Brown-headed Tchagra	Tchagra australis	5	1.82%
9	Passeriformes	Estrildidae	Bue-billed Firefinch	Lagonisticta lubricata	23	8.39%
10	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	28	10.22%
11	Passeriformes	Nectarinidae	Collared Sunbird	Anthreptes collaris	4	1.46%
12	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	5	1.82%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
13	Bucerotiformes	Bucerotidae	Crowned Hornbill	Tockus alboterminatus	8	2.92%
14	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	6	2.19%
15	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	8	2.92%
16	Passeriformes	Muscicapidae	Heuglin's Robin	Cossypha heuglini	3	1.09%
17	Passeriformes	Estrildidae	Jamson Firefinch	Lagonosticta rhodopareira	5	1.82%
18	Cuculiformes	Cuculidae	Klaas's Cuckoo	Chrysococcyx klaas	5	1.82%
19	Coraciiformes	Meropidae	Little Bee Eater	Melops pusilus	9	3.28%
20	Passeriformes	Corvidae	Pied Crow	Corvus albus	6	2.19%
21	Passeriformes	Corvidae	Red-billed Firefinch	Lagonosticta senegala	25	9.12%
22	Passeriformes	Paridae	Southern Black Tit	Parus niger	11	4.01%
23	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	8	2.92%
24	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	Bycanistes bucinator	7	2.55%
25	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	14	5.11%
26	Passeriformes	Fringillidae	Yellow-fronted Tinker bird	Pogoniulus chrysoconus	3	1.09%

Majete wildlife Reserve-shire west

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Accipitriformes	Accipitridae	African Fish Eagle	Hallaeetus vocifer	7	0.46%
2	Bucerotiformes	Bucerotidae	African Gray Hornbill	Tockus nasutus	28	1.93%
3	Passeriformes	Mornarchidae	African Parasdise Flycatcher	Terpsiphone viridis	19	1.24%
4	Passeriformes	Motacillidae	African pied wagtail	Motacilla anguimp	51	3.33%
5	Passeriformes	Motacillidae	African Pipit	Anthus cinnmomeus	4	0.26%
6	Charadriiformes	Laridae	African Skimmer	Rynchops flavirostris	6	0.39%
7	Charadriiformes	Charadriidae	African wattled Lapwing	Venellus senegallus	37	2.41%
8	Piciformes	Picidae	Beaded Wood Pecker	Dendropicos namaquus	2	0.13%
9	Passeriformes	Pycnonotidae	Black eyed bulbul	Pycnonotus barbartus	49	3.20%
10	Passeriformes	Oriolidae	Black Headed Oriole	Oriolus larvatus	10	0.65%
11	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	15	0.98%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
12	Piciformes	Lybiidae	Black-collared Barbet	Lybius torquatus	10	0.65%
13	Passeriformes	Malaconotinidae	Black-crowned Tchagra	Tchagra senegalensis	18	1.17%
14	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	78	5.09%
15	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	103	6.71%
16	Passeriformes	Estrildidae	Blue-billed Fire Finch	Lagonosticta lubricata	65	4%
17	Accipitriformes	Accipitridae	Booted Eagle	Hieraaetus pennatus	6	0.39%
18	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	7	0.46%
19	Psittaciformes	Psittacidae	Brown- headed Parrot	Poicephalus cryptoxanthus	5	0.33%
20	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	60	3.01%
21	Passeriformes	Platysteiridae	Chinspot Batis	Batis molitor	28	1.83%
22	Passeriformes	Muscicapidae	Collared Palm Thrush	Cichladusa aequata	4	0.26%
23	Passeriformes	Nectarinidae	Collared Sunbird	Anthreptes collaris	19	1.24%
24	Anseriformes	Anatidae	Egyptian Goose	Alopochen aegyptiaca	19	1.24%
25	Caprimulgiformes	Caprimulgidae	Fiery-necked Nightjar	Caprimulgus pectoralis	9	0.59%
26	Passeriformes	Dicruidae	Folk-tailed Drongo	Dicrurus adsimilis	51	3.33%
27	Passeriformes	Ploceidae	Forest Weaver	Ploceus bicolor	5	0.33%
28	Coraciiformes	Alcedinidae	Giant Kingfisher	Megaceryle maxima	3	0.20%
29	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	8	0.52%
30	Passeriformes	Stunidae	Greater Blue-eared Starling	Lamprotornis chalybaeus	28	1.83%
31	Bucerotiformes	Phoeniculidae	Green Woodhoopoe	Phoeniculus purpureus	9	0.59%
32	Passeriformes	Cisticolidae	Green-backed Camaroptera	Camaroptera brachyura	22	1.44%
33	Pelecaniformes	Ardeidae	Grey Heron	Ardea Cinerea	4	0.26%
34	Pelecaniforme	sScopidae	Harmecop	Scopus umbretta	30	1.96%
35	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	102	6.65%
36	Coraciiformes	Meropidae	Little Bee-eater	Merops pusillus	39	2.54%
37	Coraciiformes	Alcedinidae	Pied kingfisher	Ceryle rudis	17	0.01%
38	Passeriformes	Cisticolidae	Red Faced Cisticola	Cisticola erythrops	49	3.20%
39	Columbiformes	Columbidae	Red-eyed Dove	Streptopelia semitorquata	20	1.30%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
40	Passeriformes	Macrosphenidae	Red-faced Crombec	Sylvietta whytii	82	5.35%
41	Coliiformes	Coliidae	Red-faced Mousebird	Urocolius indicus	12	0.78%
42	Passeriformes	Paridae	Southern Black-Tit	Melaniparus niger	40	2.61%
43	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	47	3.07%
44	Anseriformes	Anatidae	Spur-winged Goose	Plectropterus gambensis	10	0.65%
45	Piciformes	Picidae	Stierling's Woodpecker	Dendropicos stierlini	1	0.07%
46	Coraciformes	Alcedinidae	Striped Kingfisher	Halcyon chelicuti	5	0.33%
47	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	45	2.94%
48	Passeriformes	Malaconotinidae	Tropical Boubou	Laniarius aethiopicus	38	2.48%
49	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	Bycanisters bucinator	56	3.65%
50	Passeriformes	Nectarinidae	Variable Sunbird	Cinnyris venustus	27	1.76%
51	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	23	1.50%
52	Accipitriformes	Accipitridae	Walberg's Eagle	Aquila wahlbergi	2	0.13%
53	Passeriformes	Vangidae	White Helmetshrike	Prionops plumatus	27	1.76%
54	Coraciformes	Alcedinidae	Woodland Kingfisher	Halycon senegalensis	5	0.33%
55	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	54	3.52%
56	Piciformes	Lybiidae	Yellow-fronted Tinker bird	Pogoniulus chrysoconus	6	0.39%
57	Passeriformes	Ploceidae	Yellow-Rumped Bishop	Euplectes capensis	5	0.33%

Majete wildlife Reserve-shire east

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Suliformes	Anhingidae	African Darter	Anhinga ruta	2	0.32%
2	Accipitriformes	Accipitridae	African Fish Eagle	Haliaeetus vocifer	3	0.49%
3	Columbiformes	Columbidae	African Morning Dove	Streptopelia decipiens	3	0.49%
4	Passeriformes	Motacillidae	African pied Wagtail	Motacilla aguimp	28	4.54%
5	Passeriformes	Motacillidae	African Pipit	Anthus cinnmomeus	4	0.65%
6	Bucerotiformes	Upupidae	African Whoopoe	Upu[a africana	2	0.32%
7	Gruiformes	Rallidae	Allens Gallinule	Porphyrula alleni	4	0.65%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
8	Passeriformes	Hirundinidae	Barn Swallow	Hirundo rustica	23	3.73%
9	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	9	1.46%
10	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	17	2.76%
11	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	13	2.11%
12	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	23	3.73%
13	Passeriformes	Estrildidae	Blue-billed Fire Finch	Lagonosticta lubricata	31	5.02%
14	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	41	6.65%
15	Passeriformes	Malaconotinidae	Brown-headed Tchagra	Tchagra australis	25	4.05%
16	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	43	6.97%
17	Passeriformes	Platysteiridae	Chinspot Batis	Batis molitor	8	1.30%
18	Cuculiformes	Cuculidae	Claas's Cuckoo	Chrysococcyx klaas	6	0.97%
19	Bucerotiformes	Phoeniculidae	Common Scimitar Bill	Sylvicapra grimmia	5	0.81%
20	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	44	7.13%
21	Passeriformes	Cisticolidae	Croacking Cisticola	Cisticola natalensis	2	0.32%
22	Anseriformes	Anatidae	Egyptian Goose	Alopochen aegytiaca	6	0.97%
23	Columbiformes	Columbidae	Emerald-spotted Wood Dove	Turtur chalcospilos	5	0.81%
24	Caprimulgiformes	Caprimulgidae	Fiery-necked Nightjar	Caprimulgus pectoralis	4	0.65%
25	Passeriformes	Dicruidae	Folk-tailed Drongo	Dicrurus adsimilis	9	1.46%
26	Passeriformes	Sylviidae	Garden Warbler	Sylvia borin	5	0.81%
27	Passeriformes	Stunidae	Greater-blue Eared Starling	Lamprotornis chalybaeus	20	3.24%
28	Passeriformes	Estrildidae	Green Twinspot	Mandingoa nitidula	2	0.32%
29	Bucerotiformes	Bucerotidae	Grey Headed Hornbill	*Tockus nasutus*	16	2.59%
30	Pelecaniformes	Ardeidae	Grey Heron	Ardea Cinerea	2	0.32%
31	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	16	2.59%
32	Coraciiformes	Meropidae	Little Bee Eater	Merops pusillus	15	2.43%
33	Columbiformes	Columbidae	Namaqua Dove	Oena capensis	2	0.32%
34	Passeriformes	Corvidae	Pied Crow	Corvus albus	2	0.32%
35	Coraciiformes	Alcedinidae	Pied Kingfisher	Ceryle rugis	2	0.32%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
36	Columbiformes	Columbidae	Red-eyed Dove	Streptopelia semitorquata	9	1.46%
37	Passeriformes	Cisticolidae	Red-faced Cisticola	Cisticola erthrops	6	0.97%
38	Passeriformes	Macrosphenidae	Red-faced Crombec	Sylvietta whytii	17	2.76%
39	Passeriformes	Nectarinidae	Scarlet Chested Sunbird	Chalcomitra senegalensis	2	0.39%
40	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	14	2.27%
41	Bucerotiformes	Bucerotidae	Southern Yellow-billed Hornbill	Tockus leucomelas	2	0.32%
42	Strigiformes	Strigidae	Spotted Eagle Owl	Bubo africanus	1	0.16%
43	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	14	2.27%
44	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	Bycanistes bucinator	5	0.81%
45	Passeriformes	Nectarinidae	Variable Sunbird	Cinnyris venustus	6	0.97%
46	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	12	1.94%
47	Charadriiformes	Laridae	Whiskered Terns	Chlidonias hybrida	5	0.97%
48	Passeriformes	Vangidae	White Hhelmetshrike	Prionops plumatus	8	1.30%
49	Passeriformes	Muscicapidae	White-browed Scrub Robin	Erythropygia leucophrys	3	0.49%
50	Apodiformes	Apodidae	White-rumped Swift	Apus caffer	9	1.46%
51	Piciformes	Lybiidae	Yellow fronted Tinkerbird	Pogoniulus chrysoconus	4	0.65%
52	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	26	4.21%
53	Passeriformes	Ploceidae	Yellow-Rumped Bishop	Euplectes capensis	32	5.19%

Construction Site

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Accipitriformes	Accipitridae	African Fish Eagle	Haliaeetus vocifer	3	2.01%
2	Passeriformes	Motacillidae	African pied Wagtail	Motacilla aguimp	13	8.72%
3	Piciformes	Lybiidae	Black-collared Barbet	Lybius torquatus	2	1.34%
4	Pelecaniformes	Ardeidae	Black-crowned Night Heron	Nycticorax nycticorax	2	1.34%
5	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	5	3.36%
6	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	5	3.36%
7	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	16	10.74%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
8	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	17	11.41%
9	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	8	5.37%
10	Columbiformes	Columbidae	Emerald-spotted Wood Dove	Turtur chalcospilos	2	1.34%
11	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	7	4.70%
12	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	7	4.70%
13	Passeriformes	Estrildidae	Jamson's Firefinch	Lagonosticta rhodopareira	5	3.36%
14	Coraciiformes	Meropidae	Little Bee-eater	Merops pusillus	12	8.05%
15	Coraciiformes	Coraciidae	Racket -tailes Roller	Coracias spatulatus	2	1.34%
16	Passeriformes	Macrosphenidae	Red -faced Crombec	Sylvietta whytii	2	1.34%
17	Passeriformes	Estrildidae	Red-billed Firefinch	Lagonosticta senegala	4	2.68%
18	Passeriformes	Nectarinidae	Scarlet Chested Sunbird	Chalcomitra senegalensis	1	0.67%
19	Passeriformes	Cisticolidae	singing Cisticola	Cisticola cantans	2	1.34%
20	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	6	4.03%
21	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	5	3.36%
22	Bucerotiformes	Bucerotidae	Trumpeter Hornbill	Bycanistes bucinator	10	6.71%
23	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	5	3.36%
24	Passeriformes	Muscicapidae	White-browed Scrub Robin	Erythropygia leucophrys	3	2.01%
25	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	5	3.36%

Upper Egenco Bridge

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Accipitriformes	Accipitridae	African Fish Eagle	Haliaeetus vocifer	1	0.50%
2	Bucerotiformes	Bucerotidae	African Grey Hornbill	Tockus nasutus	5	2.51%
3	Passeriformes	Mornarchidae	African Parasdise Flycatcher	Terpsiphone viridis	2	1.18%
4	Passeriformes	Motacillidae	African pied Wagtail	Motacilla aguimp	4	2.01%
5	Passeriformes	Hirundinidae	African Sand Mrtin	Riparia paludicola	5	2.51%
6	Passeriformes	Nectarinidae	Amathyst Sunbird	Nectarinia amethystina	4	2.01%
7	Passeriformes	Hirundinidae	Barn Swallow	Hirundo rustica	6	3.02%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
8	Piciformes	Lybiidae	Black- collared Barbet	Lybius torquatus	2	1.18%
9	Pelecaniformes	Ardeidae	Black-crowned Night Heron	Nycticorax nycticorax	2	1.18%
10	Passeriformes	Malaconotinidae	Black-crowned Tchagra	Tchagra senegalensis	7	3.51%
11	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	5	2.51%
12	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	12	6.03%
13	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	8	4.02%
14	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	8	4.02%
15	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	5	2.51%
16	Passeriformes	Platysteiridae	Chinspot Batis	Batis molitor	3	1.51%
17	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	5	2.51%
18	Columbiformes	Columbidae	Emerald-spotted Wood Dove	Turtur chalcospilos	2	1.18%
19	Passeriformes	Dicruidae	Folk-tailed Drongo	Dicrurus adsimilis	4	2.01%
20	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	3	1.51%
21	Pelecaniformes	Ardeidae	Grey Heron	Ardea Cinerea	1	0.50%
22	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	4	2.01%
23	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	14	7.04%
24	Passeriformes	Estrildidae	Jameson's Firefinch	Logonosticta rhodopareia	4	2.01%
25	Passeriformes	Stunidae	Lesser Blue-eared Starling	Lamprotornis chloropterus	3	1.51%
26	Coraciiformes	Meropidae	Little Bee-eater	Merops pusillus	5	2.51%
27	Columbiformes	Columbidae	Namaqua Dove	Oena capensis	2	1.18%
28	Ciconiiformes	Ciconiidae	African Open Bill	Anastomus lamelligerus	20	10.05%
29	Columbiformes	Columbidae	Red-eyed Dove	Streptopelia semitorquata	9	4.52%
30	Passeriformes	Cisticolidae	Red-faced Cisticola	Cisticola erthrops	3	1.51%
31	Passeriformes	Macrosphenidae	Red-faced Crombec	Sylvietta whytii	7	3.51%
32	Passeriformes	Estrildidae	Red-throated Twinpot	Hypargos niveoguttatus	5	2.51%
33	Passeriformes	Nectarinidae	Scarlet Chested Sunbird	Chalcomitra senegalensis	6	3.02%
34	Passeriformes	Laniidae	Southern lesser Fiscal	Lanius collaris	1	0.50%
35	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	7	3.51%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
36	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	6	3.02%
37	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	3	1.51%
38	Sliformes	Phalacrocoracidae	White-breasted Commorant	Phalacrocorax carbo	1	0.50%
39	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	5	2.51%

Ngona Lodge towards Egenco bridge

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Bucerotiformes	Bucerotidae	African Grey Hornbill	Tockus nasutus	6	4.20%
2	Piciformes	Lybiidae	Black- collared Barbet	Lybius torquatus	2	1.40%
3	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	1	0.70%
4	Passeriformes	Malaconotinidae	Black-crowned Tchagra	Tchagra senegalensis	4	2.80%
5	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	3	2.10%
6	Charadriiformes	Recurvirostridae	Black-winged Stilt	Himantopus himantopus	6	4.20%
7	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	5	3.50%
8	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	4	2.80%
9	Passeriformes	Estrildidae	Blue-billed Firefinch	Lagonosticta rubricata	5	3.50%
10	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	7	4.90%
11	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	5	3.50%
12	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	6	4.20%
13	Columbiformes	Columbidae	Emerald-spotted Wood Dove	Turtur chalcospilos	3	2.10%
14	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	4	2.80%
15	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	3	2.10%
16	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	9	6.29%
17	Passeriformes	Estrildidae	Jameson's Firefinch	Logonosticta rhodopareia	3	2.10%
18	Coraciiformes	Coraciidae	Lilac -breasted Roller	Coracias caudatus	2	1.40%
19	Coraciiformes	Meropidae	Little Bee-eater	Merops pusillus	15	10.49%
20	Accipitriformes	Accipitridae	Lizard Buzzard	Kaupifalco monogrammicus	1	0.70%
21	Coraciiformes	Alcedinidae	Pied Kingfisher	Ceryle rugis	4	2.80%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
22	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	4	2.80%
23	Passeriformes	Cisticolidae	Red-faced Cisticola	Cisticola erthrops	3	2.10%
24	Passeriformes	Macrosphenidae	Red-faced Crombec	Sylvietta whytii	4	2.80%
25	Passeriformes	Nectarinidae	Scarlet Chested Sunbird	Chalcomitra senegalensis	3	2.10%
26	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	6	4.20%
27	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	3	2.10%
28	Passeriformes	Malaconotinidae	Tropical Boubou	Laniarius aethiopicus	3	2.10%
29	Anseriformes	Anatidae	White-faced Tree Duck	Dendrocygna viduata	12	8.39%
30	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	7	4.90%

Access road to the Dam

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Bucerotiformes	Bucerotidae	African Grey Hornbill	Tockus nasutus	3	3.45%
2	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	5	5.75%
3	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	9	10.34%
4	Passeriformes	Estrildidae	Blue-billed Firefinch	Lagonosticta rubricata	3	3.45%
5	Psittaciformes	Psittacidae	Brown- headed Parrot	Poicephalus cryptoxanthus	2	2.30%
6	Passeriformes	Malaconotinidae	Brown-headed Tchagra	Tchagra australis	1	1.15%
7	Accipitriformes	Accipitridae	Common Buzzard	Buteo buteo	1	1.15%
8	Columbiformes	Columbidae	Emerald-spotted Wood Dove	Turtur chalcospilos	6	6.90%
9	Passeriformes	Dicruidae	Folk-tailed Drongo	Dicrurus adsimilis	2	2.30%
10	Galliformes	Numidae	Helmeted Guinea Fowl	Numida meleagris	7	8.05%
11	Coraciiformes	Meropidae	Little Bee-eater	Merops pusillus	3	3.45%
12	Passeriformes	Macrosphenidae	Red-faced Crombec	Sylvietta whytii	3	3.45%
13	Passeriformes	Paridae	Southern Black Tit	Parus niger	8	9.20%
14	Passeriformes	Malaconotinidae	Southern Puffback	Dryoscopus cubla	6	6.90%
15	Coliiformes	Coliidae	Speckled Mousebird	Colius striatus	5	5.75%
16	Passeriformes	Malaconotinidae	Tropical Boubou	Laniarius aethiopicus	3	3.45%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
17	Strigiformes	Viduidae	Village Indigo bird	Vidua chalybeata	1	1.15%
18	Passeriformes	Vangidae	White Helmetshrike	Prionops plumatus	5	5.75%
19	Passeriformes	Pycnonotidae	Yellow-bellied Bulbul	Chlorocichla flaviventris	6	6.90%
20	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	6	6.90%
21	Piciformes	Lybiidae	Yellow-fronted tinkerbird	Pononiulus chrysoconus	2	2.30%

Chikwawa Flood plain

Sr #	Order	Family	Spicies	Common Name	Abundance	%
1	Passeriformes	Motacillidae	Africa Pipit	Anthus cinnamomeus	5	4.31%
2	Passeriformes	Malaconotinidae	Black-crowned Tchagra	Tchagra senegalensis	5	4.31%
3	Passeriformes	Pycnonotidae	Black-eyed Bulbul	Pycnonotus tricolor	3	2.59%
4	Passeriformes	Estrildidae	Blue cordonblu	Uraeginthus angolensis	7	6.03%
5	Columbiformes	Columbidae	Blue Spotted Wood Dove	Turtur afer	4	3.45%
6	Passeriformes	Nectarinidae	Black Sunbird	Chalcomitra amethystina	4	3.45%
7	Passeriformes	Estrildidae	Bronze Manikin	Spermestes cucullata	5	4.31%
8	Cuculiformes	Cuculidae	Butchell's Coucal	Centropus superciliosus	2	1.72%
9	Columbiformes	Columbidae	Cape Turtle Dove	Streptopelia capicola	3	2.59%
10	Passeriformes	Estrildidae	Common Waxbill	Estrilda astrild	6	5.17%
11	Pelecaniformes	Ardeidae	Great White Egret	Egretta alba	4	3.45%
12	Pelecaniformes	Scopidae	Harmecop	Scopus umbretta	3	2.59%
13	Passeriformes	Muscicapidae	Heuglin Robin	Cossypha heuglini	2	1.72%
14	Coraciiformes	Alcedinidae	Pied Kingfisher	Ceryle rugis	2	1.72%
15	Passeriformes	Ploceidae	Red Bishop	Euplectes orix	6	5.17%
16	Columbiformes	Columbidae	Red-eyed Dove	Streptopelia semitorquata	6	5.17%
17	Passeriformes	Cisticolidae	Red-faced Cisticola	Cisticola erthrops	3	2.59%
18	Sliformes	Phalacrocoracidae	Reed Commorant	Phalacrocorax africanus	3	2.59%
19	Passeriformes	Motacillidae	Rixchard's Pipit	Anthus richardi	2	1.72%
20	Coraciiformes	Alcedinidae	Striped Kingfisher	Halcyon chelicuti	1	0.86%

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Sr #	Order	Family	Spicies	Common Name	Abundance	%
21	Passeriformes	Cisticolidae	Tawny-flanked Prinia	Prinia subflava	4	3.45%
22	Passeriformes	Ploceidae	Thick-billed Weaver	Amblyospiza albifrons	2	1.72%
23	Passeriformes	Malaconotinidae	Tropical Boubou	Laniarius aethiopicus	4	3.45%
24	Anseriformes	Anatidae	White-faced Tree Duck	Dendrocygna viduata	20	17.24%
25	Passeriformes	Fringillidae	Yellow-fronted Canary	Serinus mosambicus	7	6.03%
26	Passeriformes	Ploceidae	Yellow-throated Petronia	Petronia superciliaris	3	2.59%

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APPENDIX G.FAUNA AND FLORA BASELINE – SECOND SURVEY

APPENDIX H.FAUNA AND FLORA BASELINE – COMPLEMENTARY SURVEY FOR THE BORROW SITE

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APPENDIX H

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Country : Malawi

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KAPICHIRA DAM REHABILITATION PROJECT
Flora and Fauna baseline for the borrow site

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Flora and Fauna baseline for the borrow site

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1. MAMMALS ASSESSMENT

1.1. Introduction

The Ruo Consultants in partnership with Tractebel consultants approached various specialists to do biodiversity surveys for flora and fauna within the areas that will be affected by the construction of Kapichira Dam; which includes, the Clay site, Access road to clay site, Access road to quarry site and the disposal site as part of a Kapichira dam renovations project in Chikwawa district southern part of Malawi.

A follow up survey on mammals was conducted in this dry season of September 2025 at and around areas that will be affected by the construction of Kapichira Dam; which includes, the Clay site, Access road to clay site, Access road to quarry site and the disposal site in Chikwawa district, southern region of Malawi.

The field surveys were carried from 9th September 2025 to 11th September 2025. The main objectives were as follows:

- To Sample through identification of active animals;
- Investigating borrows;
- Recording tracks, diggings, faeces/scat and other signs such as trophy, etc;
- Use of live traps to check for available small mammals species;
- Use of sweep nets and hap trap to check for available bat species;
- To investigate these mammals in terms of local Malawian conservation-significant species, as well as the IUCN red data list for the listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas;
- To produce a species list of Mammals sampled ad stating their IUCN Status for the species sampled;
- Writing a report stating the results of the field survey;

The description of the habitat of the mammals was done, borrows were investigated, tracks, diggings, scat/feaces, trophies were photographed. The Sampling of these mammals involved systematic and opportunistic sampling manner. Well detailed species list for the entire field survey has been presented in the Table 1 below.

1.2. Survey timing and location

Due to the study constraints, the survey was conducted during the dry season of 9th to 11th September 2025. This happens to be the first sampling in these areas.

In this Kapichira dam and project related targeted sites, mammal survey was conducted on 4 sampling points: the Clay site, Access road to clay site, Access road to quarry site and the disposal site.

The table below gives details of the sampled and recorded mammal species.

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Table 1-1: Sampled and recorded mammal species

Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Eastern rock elephant shrew	*Elephantulus myurus*	LC
09/09/2025	Sunny	- 15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Single-strippedgrass mouse	*Lemincomys rosaria*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Fat mouse	*Steatomys pratensis*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Velvet Monkey	*Cercopithecus pygerythrus*	LC
09/09/2025	Sunny	-15.963309	34.767414	Mammals	GVH Njereza - Clay site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
09/09/2025	Sunny	-15.964168	34.767737	Mammals	GVH Njereza - Clay site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
09/09/2025	Sunny	-15.964168	34.767737	Mammals	GVH Njereza - Clay site	Modified habitat	Tree Squirrel	*Paraxerus cepapi*	LC
09/09/2025	Sunny	-15.964168	34.767737	Mammals	GVH Njereza - Clay site	Modified habitat	Eastern rock elephant shrew	*Elephantulus myurus*	LC
09/09/2025	Sunny	-15.964168	34.767737	Mammals	GVH Njereza - Clay site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
09/09/2025	Sunny	-15.964283	34.769019	Mammals	GVH Njereza - Clay site	Modified habitat	Musk Shrews	*Crocidura olivieri*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
09/09/2025	Sunny	-15.964283	34.769019	Mammals	GVH Njereza - Clay site	Modified habitat	Four-toed Sengi	*Petrodromus tetradactylus*	LC
09/09/2025	Sunny	-15.964283	34.769019	Mammals	GVH Njereza - Clay site	Modified habitat	Highveld gerbil	*Tatera brantsii*	LC
09/09/2025	Sunny	-15.964283	34.769019	Mammals	GVH Njereza - Clay site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Fat mouse	*Steatomys pratensis*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Tree Squirrel	*Paraxerus cepapi*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Highveld gerbil	*Tatera brantsii*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Musk Shrews	*Crocidura olivieri*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Scrub hare	*Lepus saxatilis*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	African pygmy Mouse	*Mus minutoides*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	African Wild cat	*Felis silvestris cafra*	LC
09/09/2025	Sunny	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	White-bellied Hedgehog	*Atelerix albiventris*	LC
09/09/2025	Dusk	-15.965177	34.768726	Mammals	GVH Njereza - Clay site	Modified habitat	Whalberg's Epauletted Fruit-bat	*Epomophorous wahlbergi*	LC
09/09/2025	Dusk	-15.911676	34.447746	Mammals	GVH Njereza - Clay site	Modified habitat	Little Epauletted Fruit-bat	*Epomophorous labiatus*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
10/09/2025	Sunny	-15.963134	34.767249	Mammals	Access road to Clay site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
10/09/2025	Sunny	-15.963134	34.767249	Mammals	Access road to Clay site	Modified habitat	House rat	*Ratus ratus*	LC
10/09/2025	Sunny	-15.963134	34.767249	Mammals	Access road to Clay site	Modified habitat	Eastern rock elephant shrew	*Elephantulus myurus*	LC
10/09/2025	Sunny	-15.963134	34.767249	Mammals	Access road to Clay site	Modified habitat	Tree Squirrel	*Paraxerus cepapi*	LC
10/09/2025	Sunny	-15.961566	34.76785	Mammals	Access road to Clay site	Modified habitat	Musk Shrews	*Crocidura olivieri*	LC
10/09/2025	Sunny	-15.961566	34.76785	Mammals	Access road to Clay site	Modified habitat	Tinny Musk Shrew	*Crocidura fuscomurina*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Acacia rat	*Thallomys paedulcus*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Eastern rock elephant shrew	*Elephantulus myurus*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Four-toed Sengi	*Petrodromus tetradactylus*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Slender Mongoose	*Galerella sanguinea*	LC
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	Chacma baboon	*Papio hamadryas ursinus*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
11/09/2025	Sunny	-15.900228	34.75955	Mammals	Access road to Quarry site	Secondary forest intact	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Sunny	-15.899319	34.76095	Mammals	Access road to Quarry site	Secondary forest intact	Eastern rock elephant shrew	*Elephantulus myurus*	LC
11/09/2025	Sunny	-15.899319	34.76095	Mammals	Access road to Quarry site	Secondary forest intact	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Dusk	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Whalberg's Epauletted Fruit-bat	*Epomophorous wahlbergi*	LC
11/09/2025	Dusk	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Little Epauletted Fruit-bat	*Epomophorous labiatus*	LC
11/09/2025	Dusk	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Egyptian free-tailed bat	*Tardarida aegyptiaca*	LC
11/09/2025	Dusk	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Bushveld Horseshoe bat	*Rhinolophus simulator*	LC
11/09/2025	Sunny	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Sharpes's Grysbok	*Raphicerus sharpei*	LC
11/09/2025	Sunny	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Sunny	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Slender Mongoose	*Galerella sanguinea*	LC
11/09/2025	Sunny	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Velvet Monkey	*Cercopithecus pygerythrus*	LC
11/09/2025	Sunny	-15.900891	34.761828	Mammals	Access road to Quarry site	Secondary forest intact	Banded Mongoose	*Mungo Mungo*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	White-bellied Hedgehog	*Atelerix albiventris*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Side-Stripped Jackal	*Canis adustus*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Common Large-spotted Genet	*Genetta maculata*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Serval	*Laptailurus serval*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Common duiker	*Sylvicapra grimmia*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Large Grey Mongoose	*Herpestes inchneumon*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Musk Shrews	*Crocidura olivieri*	LC
11/09/2025	Sunny	-15.901264	34.763204	Mammals	Access road to Quarry site	Secondary forest intact	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Eastern rock elephant shrew	*Elephantulus myurus*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Scrub hare	*Lepus saxatilis*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Spotted Hyaena	*Crocuta crocuta*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Banded Mongoose	*Mungo Mungo*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Tree Squirrel	*Paraxerus cepapi*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Velvet Monkey	*Cercopithecus pygerythrus*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Fat mouse	*Steatomys pratensis*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Side-Stripped Jackal	*Canis adustus*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Highveld gerbil	*Tatera brantsii*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Scrub hare	*Lepus saxatilis*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Scrub hare	*Lepus saxatilis*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Spotted Hyaena	*Crocuta crocuta*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Serval	*Laptailurus serval*	LC
11/09/2025	Sunny	-15.901581	34.764068	Mammals	Access road to Quarry site	Secondary forest intact	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	Four-toed Sengi	*Petrodromus tetradactylus*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	Pouched mouse	*Succostomus campestris*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	Eastern rock elephant shrew	*Elephantulus myurus*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	Sharpes's Grysbok	*Raphicerus sharpei*	LC
11/09/2025	Sunny	-15.902539	34.766837	Mammals	Access road to Quarry site	Secondary forest intact	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Dusk	-15.944794	34.774679	Mammals	Disposal site	Modified habitat	Whalberg's Epauletted Fruit-bat	*Epomophorous wahlbergi*	LC
11/09/2025	Dusk	-15.911791	34.774679	Mammals	Disposal site	Modified habitat	Little Epauletted Fruit-bat	*Epomophorous labiatus*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
11/09/2025	Sunny	-15.911881	34.774442	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.911824	34.774347	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.911896	34.77416	Mammals	Disposal site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC
11/09/2025	Sunny	-15.911896	34.77416	Mammals	Disposal site	Modified habitat	Slender Mongoose	*Galerella sanguinea*	LC
11/09/2025	Sunny	-15.911765	34.773941	Mammals	Disposal site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.911472	34.772354	Mammals	Disposal site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.911115	34.771322	Mammals	Disposal site	Regrowth forest intact	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.911115	34.771322	Mammals	Disposal site	Regrowth forest intact	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Sunny	-15.911115	34.771322	Mammals	Disposal site	Regrowth forest intact	Scrub hare	*Lepus saxatilis*	LC
11/09/2025	Sunny	-15.911487	34.774033	Mammals	Disposal site	Modified habitat	Tinny Musk Shrew	*Crocidura fuscomurina*	LC
11/09/2025	Sunny	-15.911487	34.774033	Mammals	Disposal site	Modified habitat	Slender Mongoose	*Galerella sanguinea*	LC
11/09/2025	Sunny	-15.911304	34.77403	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.911304	34.77403	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.911468	34.773211	Mammals	Disposal site	Modified habitat	Four-toed Sengi	*Petrodromus tetradactylus*	LC
11/09/2025	Sunny	-15.911468	34.773211	Mammals	Disposal site	Modified habitat	Common Large-spotted Genet	*Genetta maculata*	LC

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Date	Weather	GPS Point		Target taxon	Site	Level of degradation of the habitat Natural / Modified habitat	Species observed		
							Common name	Scientific Nam	IUCN Category
11/09/2025	Sunny	-15.911084	34.771922	Mammals	Disposal site	Modified habitat	Eastern rock elephant shrew	*Elephantulus myurus*	LC
11/09/2025	Sunny	-15.911084	34.771922	Mammals	Disposal site	Modified habitat	Tree Squirrel	*Paraxerus cepapi*	LC
11/09/2025	Sunny	-15.910685	34.772419	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.910685	34.772419	Mammals	Disposal site	Modified habitat	Four-toed Sengi	*Petrodromus tetradactylus*	LC
11/09/2025	Sunny	-15.910132	34.772701	Mammals	Disposal site	Modified habitat	Slender Mongoose	*Galerella sanguinea*	LC
11/09/2025	Sunny	-15.910132	34.772701	Mammals	Disposal site	Modified habitat	African Wild cat	*Felis silvestris cafra*	LC
11/09/2025	Sunny	-15.910207	34.773225	Mammals	Disposal site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.910207	34.773225	Mammals	Disposal site	Modified habitat	Bushveld gerbrbil	*Tatera leucogaster*	LC
11/09/2025	Sunny	-15.912736	34.774008	Mammals	Disposal site	Modified habitat	Namaqua rock mouse	*Micaelamys namaquaensis*	LC
11/09/2025	Sunny	-15.912736	34.774008	Mammals	Disposal site	Modified habitat	Tree Squirrel	*Paraxerus cepapi*	LC
11/09/2025	Sunny	-15.910899	34.775448	Mammals	Disposal site	Modified habitat	Scrub hare	*Lepus saxatilis*	LC
11/09/2025	Sunny	-15.910899	34.775448	Mammals	Disposal site	Modified habitat	Natal Multimammate Mouse	*Mastomys natalnsis*	LC

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1.3. Sampling methodology

Mammals were sampled using opportunistic sampling method (which involved sighting live animals on as encountered basis), systematic sampling method (which involved using live traps/Sherman and Mist nets then releasing the small animal) respectively. The traps were for small mammals and the cages were for medium sized mammals. The mist nets were for bat species. These methods of sampling were used in order to have a clear knowledge of species distribution and abundance within the dam project area. In each of the habitat types, Mammals were sighted, active borrows were investigated and recorded, tracks, diggings, faeces/scat and other signs such as trophy were recorded and photographs were captured. Local communities were again consulted through interviews. They were presented with images of these mammals be it small, medium and large from the pocket guide so that they would tell us what kind of animals they sight on encounter basis during their life time around the project site from which they could show us. These habitats were sampled by using suitable method(s) appropriate and these are forests and some cultivated farmland and impacted areas ranging from the Clay site, Access road to clay site, Access road to quarry site and the disposal site.

The photos of the sampled habitats and the evidences presented above have been included in the zip folder and would be sent through means of whatsapp.

The sampling activities involved the above methods which have also been listed below;

- Recording tracks, diggings, faeces/scat and other signs such as trophy, etc and capturing photographs;
- Use of live traps to check for available small mammals species and later releasing them;
- Investigating these mammals in terms of local conservation-significant species, such as those that and Least Concern (LC) as inscribed by the IUCN red data list;
- To produce a species list of Mammals sampled, and to state their IUCN Status for the species sampled;

Methodologies pictures and possible outcomes



Photographed small mammal - African pygmy Mouse- Mus minutoides



Checking Traps

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Mist net with captured specimen
Whalberg's Epauletted Fruit-bat
Epomophorous wahlbergi



Mist net with captured specimen



Captured on the mist net
Whalberg's Epauletted Fruit-bat –
Epomophorous wahlbergi



Baited Trap

Evidence of mammals were identified in the field and recorded in data collecting forms. Scats were photographed to be identified at the office using pocket field guide and other books at the Museums of Malawi which have been cited under references. The species were identified to their species level.

1.4. Survey limitations and constraints

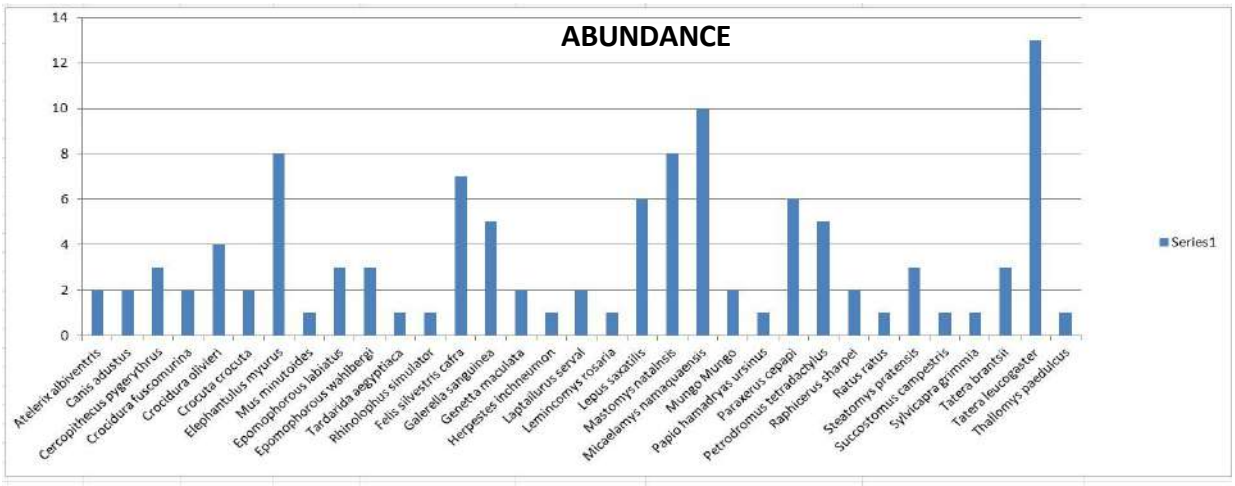
The survey was conducted during dry season. In the dry season most places were too dry and had no water flowing. Small mammals' traps stayed for few days in some places (one night instead of three to five nights) reducing chances of capture. In most habitats it was cumbersome to catch small mammals because it was too dry to support both food and water for the said mammals. Therefore sampling was mainly concentrated on opportunistic sampling, observations and few trapped ones. It is very essential to do these field surveys in all the three seasons within a year: dry and hot season, from August to November; the wet and hot from December to April; and the cold and dry, from May to August for better results.

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1.5. Results

The data which has been presented in the long table above shows the sites richness in species abundance. From it a number of 30 different species have been recorded and presented with animal species Listed as Least Concern (LC).

Below is a chart showing the Mammal species abundance against each species scientific name as recorded in all the given sites.



1.6. Discussions

The high abundance of mammal species of the area sampled can be attributed to the fact that the area during this time had greater numbers of successful species. The area around the access road to the quarry site has more stable ecosystems and that more ecological niches were available and the environment was likely to be pleasant to the ecosystem as a whole. This means that the access road to the quarry Site had a very wide range of habitats. While the low number of species and number of families for an area sampled in this case access road to clay site, the clay site and the disposal area had fewer numbers of successful species and unstable environment with a lot of land modified for settlement at clay site and presence of evidence of fire which gates most parts of the disposal site area hence less ecological niches were available.

Therefore, any activity that will lead to the loss of riparian vegetation, drying of riverine, pollution and increase in reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of mammals' species.

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1.7. Potential impacts of the proposed project on mammals

The proposed Kapichira Dam rehabilitation project and its associated infrastructure—including the clay borrow site, disposal site, and access roads—are expected to exert a range of direct and indirect impacts on mammalian species and their habitats. The mammal survey recorded a total of 30 species across the project sites, all of which are currently listed as Least Concern (LC) under the IUCN Red List. However, despite the absence of globally threatened species, the project area supports a diverse assemblage of small and medium-sized mammals such as the Eastern rock elephant shrew (*Elephantulus myurus*), African wild cat (*Felis silvestris* cafra), Slender mongoose (*Galerella sanguinea*), and various rodent and bat species, which play important ecological roles in seed dispersal, pollination, and trophic dynamics. Construction activities could disrupt these ecological processes through habitat clearance, soil compaction, and vegetation loss, leading to reduced food availability and nesting or borrowing sites for small mammals.

The access road to the quarry site exhibited the highest mammal diversity, supported by relatively stable and intact secondary forest ecosystems that offer a range of ecological niches. In contrast, the clay borrow site, access road to the clay site, and disposal site were characterized by more modified and degraded habitats, which already showed signs of anthropogenic disturbance, including settlement expansion, fire damage, and reduced vegetation cover. Project-related activities such as heavy machinery operation, material extraction, and waste disposal are likely to intensify these pressures. Consequently, species that depend on dense vegetation or undisturbed ground cover, such as the bushveld gerbil (Tatera leucogaster), fat mouse (*Steatomys pratensis*), and various shrew species, may experience local displacement or population decline due to further habitat fragmentation and loss of shelter.

Indirect impacts are also anticipated through changes in hydrology, noise and light pollution, and increased human-wildlife interactions. The drying of streams and reduction of riparian vegetation, particularly around the Kapichira Dam and its catchment, could significantly affect mammals that rely on these areas for water and foraging, such as the chacma baboon (*Papio hamadryas ursinus*), duiker (*Sylvicapra grimmia*), and serval (*Leptailurus serval*). Increased vehicular traffic along access roads may also heighten the risk of wildlife roadkills and behavioral disturbances among nocturnal species like bats and small carnivores. Therefore, mitigation measures such as minimizing vegetation clearance, maintaining buffer zones along riparian corridors, implementing controlled construction schedules, and conducting follow-up seasonal surveys are essential to safeguard mammal diversity and ecosystem integrity within the Kapichira Dam project area.

REFFERENCES

1) Stuarts' Field Guide to Mammals of Southern Africa, including Angola, Zambia and Malawi by Chris & Mathilde Stuart.

2) Pocket Guide to Mammals of Southern Africa by Burger Cillie.

3) Smithers' Mammals of Southern Africa. A Field Guide edited by Petter Apps.

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2. HERPETOFAUNA ASSESSMENT

2.1. Introduction

The herpetofauna assessment for the clay site, dumping site and access to routes to these sites was conducted during dry season by Ruo Consultants in partnership with Tractebel Consultants. Biodiversity surveys Specialist for flora and animals were approached to carry out biodiversity work within the area of Kapichira Dam as part of a Kapichira dam renovations project in Chikwawa district southern part of Malawi. This is a report on herpetofauna survey conducted during the dry season as part of the Kapichira Dam project works and associated structures in some parts of Kapichira in Chikwawa district southern region of Malawi.

The scope of work whose field surveys were carried in September 2025 was as follows:

1) To Sample mainly Herpetofauna of the Kapichira Dam area.
2) To investigate these herpetofauna in terms of local Malawian conservation-significant species, as well as the IUCN/CITES -listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas.
3) To produce a species list of herpetofauna sampled.
4) Write a report stating the results of the field survey

2.2. Survey methods

2.2.1. Desktop studies and pilot survey

A review of the Kapichira dam project area was carried out prior to the survey. The review was mainly aimed at having a list of herpetofauna species found in the area of survey as well as a list of species of local Malawian conservation-significance on the IUCN/CITES -listed ones (threatened i.e. Critically Endangered and Vulnerable or near threatened). Interviews with local communities were also done to find out from them what herpetofauna species does they meet as they carry out their normal day to day activities within the project site.

2.2.2. Survey timing

The survey which was conducted in these three sites (Clay borrow, Quarry access road and Disposal) during the dry season from September 2025 was the first time of sampling hence a more comprehensive wet or then winter season surveys will be appropriate in order to cover almost all the places and thorough Avifauna sampling for better results.

2.2.3. Survey Site Selection, Locations and Descriptions

Sampling of herpetofauna was conducted on 3 target sampling points: Site1 (Clay), Site 2 (Quarry access road) and Site 3 (dumping site). These locations are shown in Table 2-1.

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Table 2-1: Sampling points for the assessment

Sites	1	2	3	4
Site 1 GPS	36L 689138,8234348, 78 m	36L 689308, 8234112, 89 m	36L 689136, 8234027, 75 m	36L 689107, 8234129, 87 m
Site 2 GPS	36L 688386, 8241319, 137m	36L 688938, 824113, 143 m	36L 689144, 8241053, 141 m	
Site 3 GPS	36L 689630, 8240093, 164 m	36L 689912, 8239911, 169 m	36L 690065, 8240113, 182 m	36L 689962, 8240392, 182 m

2.2.4. Sampling Methods

Sampling herpetofauna was done using opportunistic sampling (sampling on as encountered basis), systematic and semi systematic methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as different species as possible present within the Kapichira dam proposed project reconstruction area. We also did some interviews with local community people we met in the survey sites.

Sampling of Herpetofauna was conducted as follows:

a. Opportunistic sampling method

b. Direct observation in various habitats and active searches underneath leaf and grass litters, rock crevices, rotting wood, in grass, water bodies and pools, riverine and marshy areas, in holes and caves.

c. Conducting face-to-face interviews with the local communities found in the project area.



Active search for Hepertofauna

2.2.5. Identification of herpetofauna encountered

Most of the encountered herpetofauna species were easily identified in the field and recorded on data collecting forms but for the ones which were not easily identified, with the availability of photos were later identified at the Museums of Malawi. The species were identified to their order level, family level, genus level and species level.

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2.2.6. Survey limitations and constraints

The survey was conducted during dry season whereby some rivers had no water flowing and most of the sampling places were difficult to reach due to bad roads and terrain. Sampling was mainly concentrated on opportunistic sampling and active searches. This dry season field survey was an attempt to try to sample all the three seasons within a year: dry and hot season from August to November, the wet and hot from December to April, and the cold and dry: from May to August for better results.

2.3. Results of the herpetofauna assessment

The herpetofauna encountered during the assessment have been presented in below tables with a brief summary on habitat, behaviour, locations, GPS coordinates, Species summaries and the conservation status of the herpetofauna encountered during the survey period in the respective sites. Table 2-2 presents a summary on the number of species per site, species abundance/ richness and percentage at the clay site.

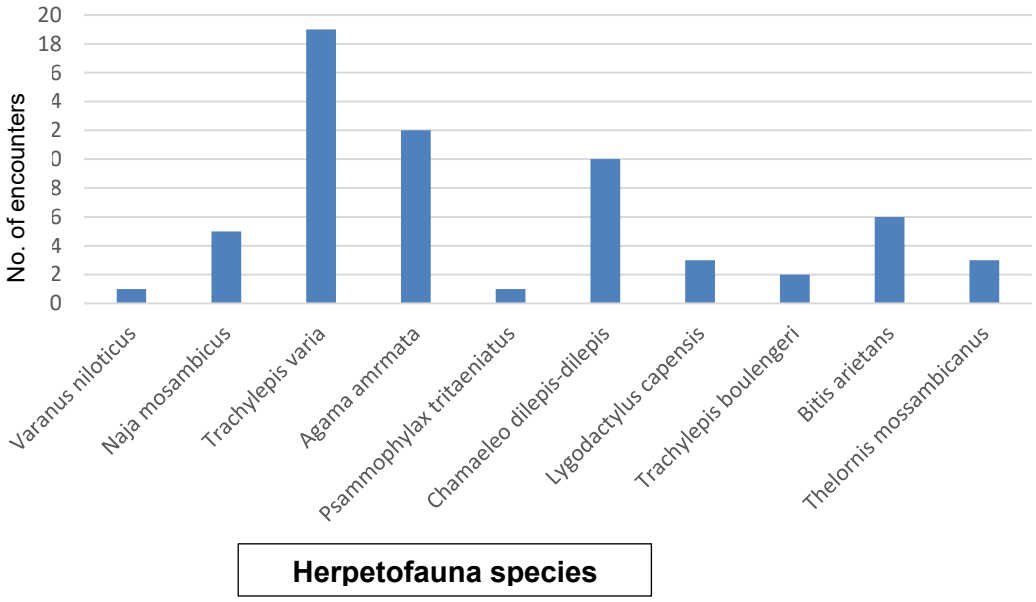
Table 2-2: Species abundance and richness at the clay site

Site Name	Sr.#	Target Taxa	Local name	Scientific name	Abundance	% per species
Clay barrow	1	Reptiles	Water Monitor	*Varanus niloticus*	1	1.61%
Clay barrow	2	Reptiles	Mozambique spitting Cobra	*Naja mossambicus*	5	8.06%
Clay barrow	3	Reptiles	Variable Skink	*Trachylepis varia*	19	30.64%
Clay barrow	4	Reptiles	Peter's Ground Agama	*Agama amrmata*	12	19.35%
Clay barrow	5	Reptiles	Stripped Grass snake	*Psammophylax tritaeniatus*	1	1.61%
Clay barrow	6	Reptiles	Common Flap-necked Chameleon	*Chamaeleo dilepis-dilepis*	10	16.13%
Clay barrow	7	Reptiles	Common Dwarf Gecko	*Lygodactylus capensis*	3	4.64%
Clay barrow	8	Reptiles	Boulenger's Skink	*Trachylepis boulengeri*	2	3.23%
Clay barrow	9	Reptiles	Puff adder	*Bitis arietans*	6	9.68%
Clay barrow	10	Reptiles	Eastern Vine Snake	*Thelornis mossambicanus*	3	9.68%

Findings in Table 2-2 shows that 10 herpetofauna species were encountered during the dry season survey at the Clay borrow site of the project area and all are of least concern on the IUCN status.

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In addition, the following figure shows the species richness of herpetofauna at the proposed clay site. Findings show that among the herpetofauna species that were encountered, *Trachylepis varia* was found to be dominant.



In terms of the access road to quarry site, results (Table 2-3) show that 13 herpetofauna species were encountered during the dry season survey at the access road to quarry site of the project area and all are of least concern on the IUCN status.

Table 2-3: Species encountered within the access road to the quarry site

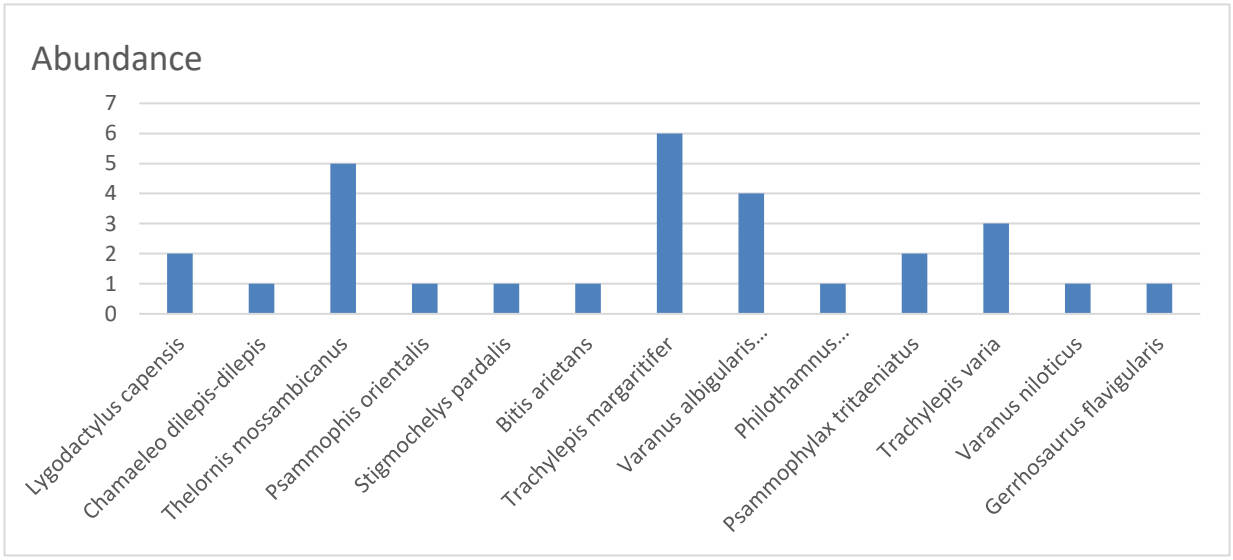
Sr.#	Local name	Scientific name	Abundance	% per species
1	Common Dwarf Gecko	*Lygodactylus capensis*	2	6.90%
2	Common Flap-necked Chameleon	*Chamaeleo dilepis-dilepis*	1	3.45%
3	Eastern Vine Snake	*Thelornis mossambicanus*	5	17.24%
4	Eastern Yellow-bellied Sand Snake	*Psammophis orientalis*	1	3.45%
5	Leopard Tortoise	*Stigmochelys pardalis*	1	3.45%
6	Puff adder	*Bitis arietans*	1	3.45%
7	Rainbow Skink	*Trachylepis margaritifer*	6	20.69%
8	Rock Monitor	*Varanus albigularis albigularis*	4	13.79%
9	Spotted Bush Snake	*Philothamnus semivariegatus*	1	3.45%

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Sr.#	Local name	Scientific name	Abundance	% per species
10	Stripped Grass snake	*Psammophylax tritaeniatus*	2	6.90%
11	Variable Skink	*Trachylepis varia*	3	10.34%
12	Water Monitor	*Varanus niloticus*	1	3.45%
13	Yellow-throated plated Lizard	*Gerrhosaurus flavigularis*	1	3.45%

Regarding species abundance, results in From the above graph, 13 Hepertofauna species that were encountered, *Trachylepis margaritifer* is dominant.

The Graph below showing species richness of the area of survey



At the disposal site:

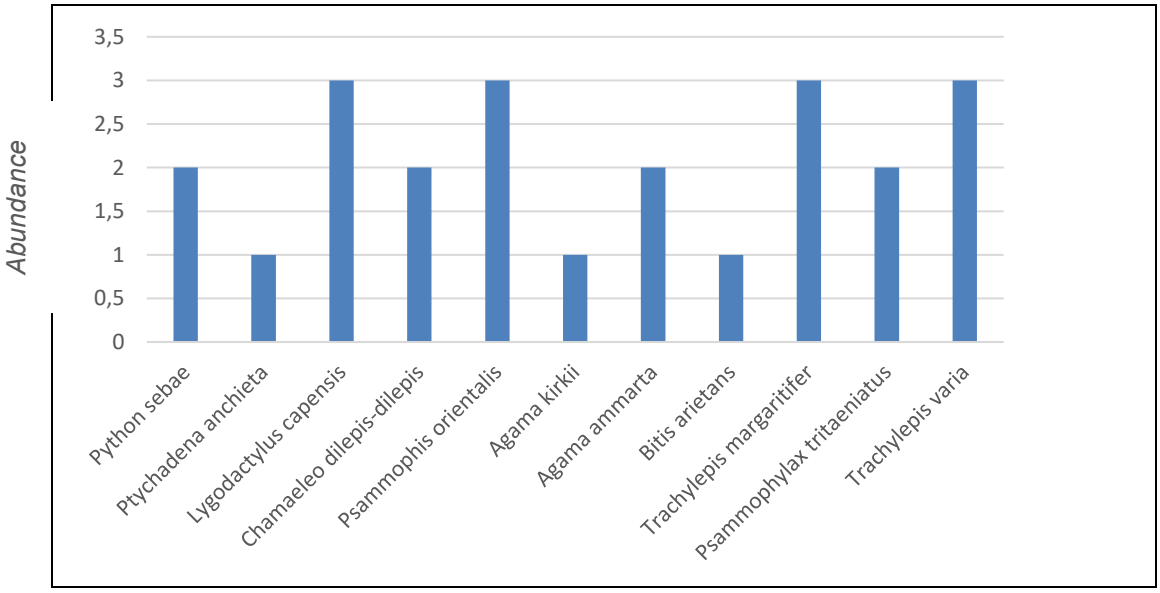
Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Disposal	1	Reptile	African Python	*Python sebae*	2	8.70%
Disposal	2	Reptile	Anchietas' rigged frog	*Ptychadena anchieta*	1	4.35%
Disposal	3	Reptile	Common Dwarf Gecko	*Lygodactylus capensis*	3	13.04%
Disposal	4	Reptile	Common Flap-necked Chameleon	*Chamaeleo dilepis-dilepis*	2	8.70%

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Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Disposal	5	Reptile	Eastern Yellow-bellied Sand Snake	*Psammophis orientalis*	3	13.04%
Disposal	6	Reptile	Kirk's Agama	*Agama kirkii*	1	4.35%
Disposal	7	Reptile	Peter's Ground Agama	*Agama ammarta*	2	8.70%
Disposal	8	Reptile	Puff adder	*Bitis arietans*	1	4.35%
Disposal	9	Reptile	Rainbow Skink	*Trachylepis margaritifer*	3	13.04%
Disposal	10	Reptile	Stripped Grass snake	*Psammophylax tritaeniatus*	2	8.70%
Disposal	11	Reptile	Variable Skink	*Trachylepis varia*	3	4.35%

From the above table, 11 Herpetofauna species were encountered during the dry season survey at the Disposal site of the project area, one specie is nearly threatened and the rest are of least concern on the IUCN status.

The Graph below showing species richness of the area of survey



From the above graph, 11 Herpetofauna species were encountered.

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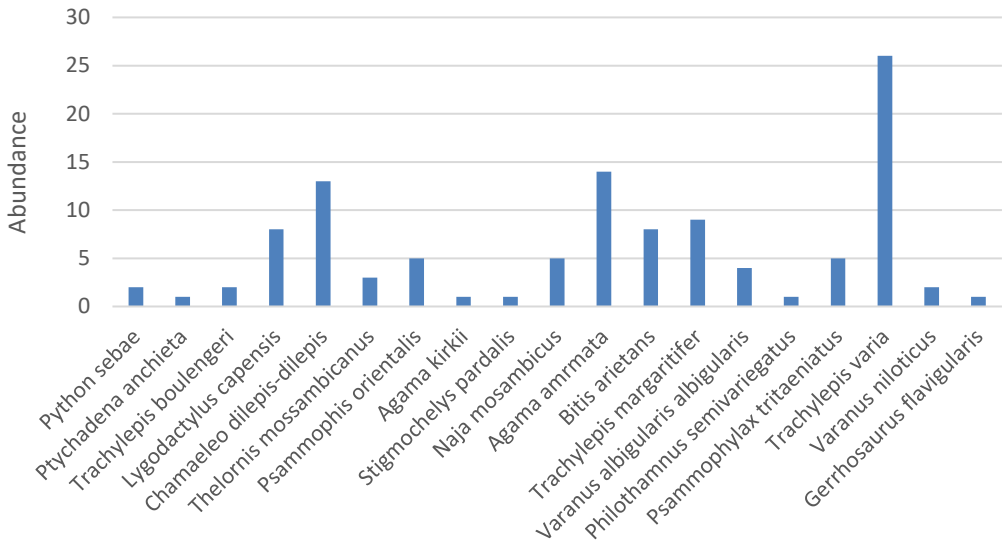
Below is a table showing Herpetofauna data list for the three project sites (Clay, Quarry access road and Disposal)

Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
1	Reptile	African Python	*Python sebae*	2	1.80%
2	Amphibian	Anchietas' rigged frog	*Ptychadena anchieta*	1	0.90%
3	Reptile	Boulenger's Skink	*Trachylepis boulengeri*	2	1.80%
4	Reptile	Common Dwarf Gecko	*Lygodactylus capensis*	8	7.20%
5	Reptile	Common Flap-necked Chameleon	*Chamaeleo dilepis-dilepis*	13	11.71%
6	Reptile	Eastern Vine Snake	*Thelornis mossambicanus*	3	2.70%
7	Reptile	Eastern Yellow-bellied Sand Snake	*Psammophis orientalis*	5	4.50%
8	Reptile	Kirk's Agama	*Agama kirkii*	1	0.90%
9	Reptile	Leopard Tortoise	*Stigmochelys pardalis*	1	0.90%
10	Reptile	Mozambique spitting Cobra	*Naja mosambicus*	5	4.50%
11	Reptile	Peter's Ground Agama	*Agama amrmata*	14	12.61%
12	Reptile	Puff adder	*Bitis arietans*	8	7.20%
13	Reptile	Rainbow Skink	*Trachylepis margaritifer*	9	8.11%
14	Reptile	Rock Monitor	*Varanus albigularis albigularis*	4	3.60%
15	Reptile	Spotted Bush Snake	*Philothamnus semivariegatus*	1	0.90%
16	Reptile	Stripped Grass snake	*Psammophylax tritaeniatus*	5	4.50%
17	Reptile	Variable Skink	*Trachylepis varia*	26	23.42%
18	Reptile	Water Monitor	*Varanus niloticus*	2	1.80%
19	Reptile	Yellow-throated plated Lizard	*Gerrhosaurus flavigularis*	1	0.90%

From the table above 19 Herpetofauna species were encountered during the survey in dry season one is Nearly threatened and all of them are of Least concern on the IUCN status.

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The graph below is showing the species richness for the three project sites



Species

From the graph above *Trachylepis varia* is dominant species' in all the site that were sampled during the dry season.

2.4. Discussions

In general, the high abundance of species and number of families recorded along the access road to the quarry site can be attributed to the presence of a greater number of successful species during the survey period. This indicates that the area had relatively stable ecosystems, a wide range of ecological niches, and an overall favorable environment for biodiversity. The findings suggest that the proposed road network to the quarry site traverses habitats with diverse ecological characteristics.

In contrast, the low number of species and families recorded at the clay barrow site is mainly due to the presence of fewer successful species and an unstable environment, resulting in limited ecological niches.

Therefore, any activities that may result in the loss of riparian vegetation, drying of riverine systems, pollution, or significant reduction of water levels in streams, rivers, and associated wetlands within the Kapichira Dam and surrounding areas could lead to the loss of invertebrate species. These invertebrates play vital roles in maintaining essential ecosystem processes such as pollination, nutrient cycling, and the stability of food chains and food webs.

2.5. Conservation significant species

Herpetofauna species identified to the genus and species level were recorded during the survey and subsequently assessed in relation to their conservation status as per the IUCN Red List within the Kapichira Dam project area. The results indicate that no endangered species were encountered at any of the sampled sites during the survey period.

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However, *Python sebae* (African rock python), which was observed during the survey and reported by local informants to occur widely across the project area, is classified as Near Threatened on the IUCN Red List of Threatened Species. All other recorded reptile and amphibian species were categorized as Least Concern, indicating that they are currently not at significant risk of extinction.

2.6. Potential impacts of the proposed project on herpetofauna

The proposed Kapichira Dam rehabilitation works and associated infrastructure — including the clay borrow site, disposal site, and access roads — are expected to cause both direct and indirect impacts on herpetofauna species and their habitats. Although the survey identified no endangered species, with most species classified as Least Concern under the IUCN Red List and only *Python sebae* (African Rock Python) listed as Near Threatened, construction activities are likely to cause localized ecological disturbances. These disturbances may affect the diversity, abundance, and distribution of reptiles and amphibians in the project area through habitat degradation, increased human interference, and alteration of natural ecological processes.

Site clearance, excavation, and earthmoving works for the dam and its associated facilities will inevitably result in the removal of vegetation cover, topsoil, and natural microhabitats such as leaf litter, borrows, fallen logs, and wetland fringes. This will lead to habitat loss and fragmentation, limiting the movement and breeding of species such as *Trachylepis varia, Bitis arietans*, and *Agama armata*. In addition, construction activities involving heavy machinery, vehicular traffic, and human presence may cause direct mortality of slow-moving reptiles like tortoises, snakes, and chameleons. Noise, vibration, and artificial lighting may further disturb nocturnal and diurnal species, altering their natural behavior and potentially displacing them from their habitats.

Furthermore, changes in hydrological and microclimatic conditions resulting from site excavation, vegetation removal, and waste disposal could adversely affect amphibian breeding grounds and moisture-dependent reptile populations such as Varanus niloticus and *Ptychadena anchieta*. Pollution risks, including fuel and oil spills and sediment runoff, may contaminate soils and water bodies, threatening amphibians that are highly sensitive to toxins due to their permeable skin. Over time, these combined pressures — along with potential increases in human–wildlife conflicts and the collection of reptiles for food or traditional uses — may lead to a gradual decline in herpetofauna diversity. The long-term loss of these species could disrupt key ecosystem functions such as pest control, nutrient cycling, and food web stability, ultimately affecting the ecological integrity of the Kapichira Dam area.

2.7. Conclusion

From this dry season survey of the September, recorded data and then its analysis, has shown that 19 herpetofauna species were encountered. *Python sebae* which was recorded during the survey was mentioned by the local informants to be present in some of the project area is a near threatened species recoded under IUCN red data list among the reptiles. While most of the species sampled were under Least Concern.

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These herpetofauna are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important tomorrow. Therefore, considerations should be taken to protect them through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project.

2.8. References

1. A photographic Guide to Reptiles of Malawi by Gary Brown's with Rupert Wilkey.
2. Amphibians of Central and Southern Africa by Alan Channing.
3. Amphibians of Malawi by Vincenzo Mercurior

3. INVERTEBRATES ASSESSMENT

This report presents findings on invertebrates surrounding the proposed Kapichira Dam construction project site. The field surveys on invertebrates focused on the following aims: to investigate the invertebrates in terms of local Malawian conservation-significant species, as well as the IUCN/CITES -listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas and to produce a species list of invertebrates sampled.

3.1. Survey methods

Prior to the survey, a review on the invertebrates of the Kapichira dam project area was carried out. The review was mainly aimed at having a list of invertebrates found in the Kapichira dam area as well as a list of species of local Malawian conservation-significance, as well as the IUCN/CITES -listed ones (threatened i.e. Critically Endangered, Endangered, and Vulnerable or near threatened). Interviews with local fishermen or villagers were also done to find out from them what invertebrates do they meet as they carry out their normal day to day fishing and farming activities.

3.1.1. Survey site selection, locations and descriptions

Sampling of the invertebrates was conducted on 4 target sampling points: Site 1 (Clay Site Kapichira Dam Construction), Site 2 (Access Road Clay Site Kapichira Dam Construction), Site 3 (Access Road Quarry Site Kapichira Dam Construction) and Site 4 (Disposal Site Kapichira Dam Construction).

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3.1.2. Sampling methods

Sampling of invertebrates was done using opportunistic sampling (sampling as encountered basis), systematics and semi systematics methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as different species as possible present within the Kapichira dam proposed project reconstruction area. Within each of the habitat types, invertebrates were collected by scooping, using traps, hand picking, photographing, shrubs shaking and observations (Figure 3-1). We also did some interviews with local community people we met in the survey sites. All the habitats were sampled by using suitable method(s) appropriate to the habitats. The habitats sampled were wetlands, forests, riverine and some cultivated farmland areas.

Invertebrate specimens were also stored and labelled appropriately for later identification in a laboratory/museum since it is expected that not all taxa can be identified in the field, hence, the appropriate storage of samples was crucial.



Invertebrate encountered



Observations



Transect Walks



Community engagement

Figure 3-1: Images depicting some methods employed during the study

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3.1.3. Identification of the invertebrates encountered

Collected invertebrates specimens (usually adults) which were easily identified in the field were recorded in data collecting forms and the ones which were not easily identified were put into transparent envelopes and collecting bottles to be identified using invertebrate field guides and other books at the Museums of Malawi { Tarboton, W and Tarboton, M (2002), Tarboton, W and Tarboton, M (2005), Picker, M et al. (2002), Dijkstra, K-D.B (2007), Harde, K.W. (1984), Scholtz, C.H. and Holm, E (1985), Mandahl -Barth, G. (1962), Gerber, A and Gabriel, M.J.M. (2002), Raymond Murphy (F.R.E.S) and Top Mandala museum collections. Those that were identified easily were released while those that needed further checking were taken to the museum for sorting, setting and then identification. The species were identified to their order level, family level, genus and some to species level.

3.1.4. Data analysis

Data was cleaned using Openrefine version 3.2 for windows (Google Inc. and Contributors, 2010). Microsoft Excel and Word were used to come up with summaries of the sampled invertebrate data.

3.2. Survey limitations and constraints

The survey was conducted during dry season. During the time of the study, some rivers had no water flowing and most of the sampling places were difficult to reach due to bad roads and terrain. Butterfly traps stayed for only few hours or a night reducing chances of encountering more invertebrates. Therefore, sampling was mainly concentrated on opportunistic sampling, observations and few trapped ones. The local people consulted on invertebrates only gave general terms for groups of invertebrates rather than specifics though being probed to do so. This dry season field survey was an attempt to try to sample all the three seasons within a year: dry and hot season from August to November, the wet and hot from December to April, and the cold and dry: from May to August for better results.

3.3. Results on invertebrate assessment

The invertebrates encountered have been presented in the following table where invertebrate orders, families, species and abundance have been shown. The data show variations in biodiversity across four sites associated with the Kapichira Dam construction area. Overall, 15 orders, 44 families, and at least 157 species were recorded, with a total abundance of 862 individuals. The quarry access road site had the highest diversity and abundance (11 orders, 28 families, ≥82 species, and 332 individuals), indicating it supports a richer and more populated ecological community compared to the other sites. In contrast, the access road to the clay site recorded the lowest diversity and abundance (6 orders, 16 families, ≥42 species, and 94 individuals), suggesting higher disturbance or less favorable conditions for species survival. The clay site and disposal site showed intermediate diversity and abundance levels, implying moderate ecological richness within those areas.

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Site	Site	Order	Families	Species	Abundance
1	Clay Site Kapichira Dam Construction	9	27	≥ 73	264
2	Access Road to Clay Site Kapichira Dam construction	6	16	≥ 42	94
3	Access Road to Quarry Site Kapichira Dam construction	11	28	≥ 82	332
4	Disposal Site Kapichira Dam Construction	11	24	≥ 53	172
-	TOTAL	15	44	≥ 157	862

Table 3-1: Orders, families, species and abundance data per target site

In addition, Figures 3-2, 3-3, 3-4 and 3-5 show invertebrate order comparison data per site, invertebrate families comparison data per site, invertebrate species comparison data per site and invertebrate abundance (count) comparison data per site, respectively.

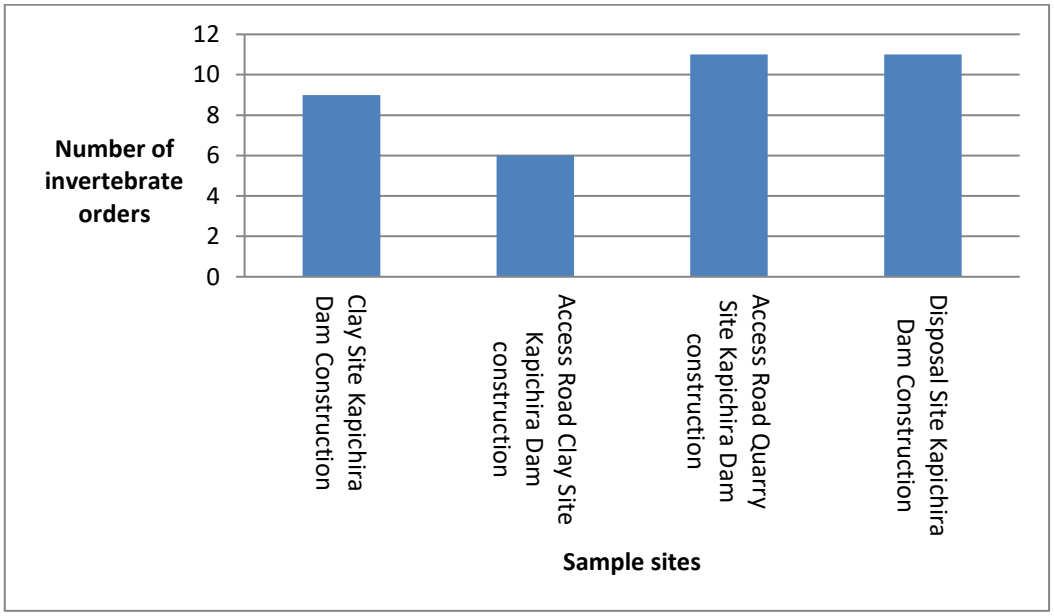


Figure 3-2: Invertebrate Order comparison data per site

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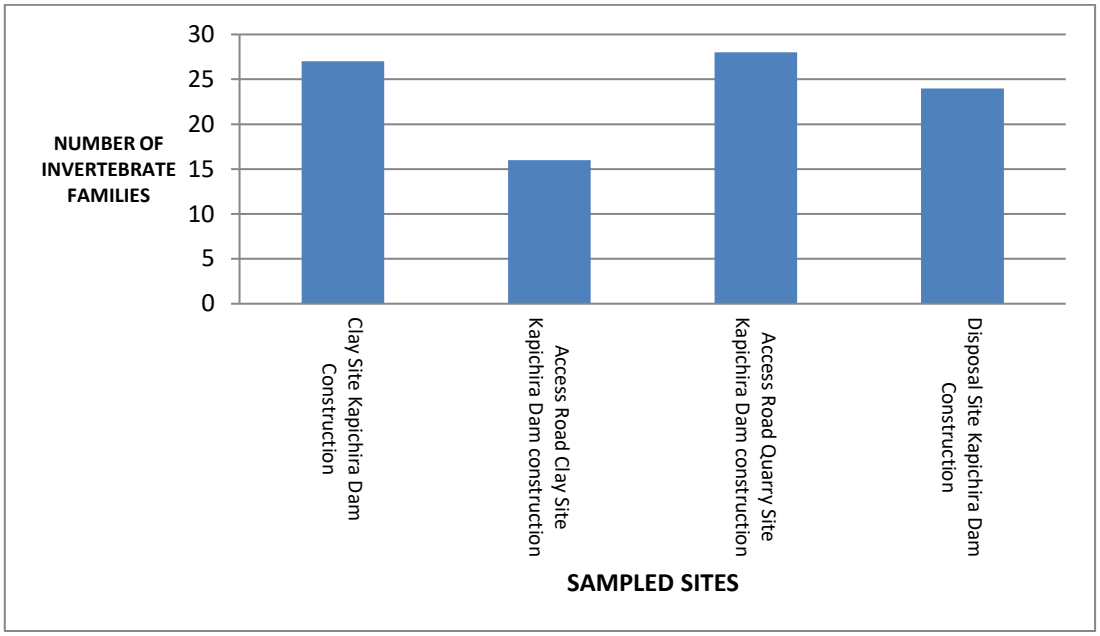


Figure 3-3: Invertebrate Families' comparison data per site

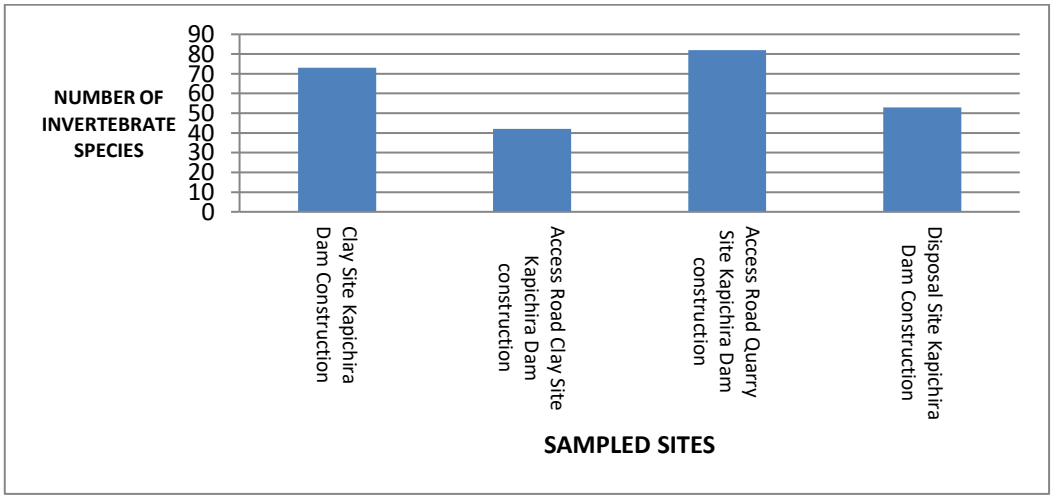


Figure 3-4: Invertebrate species comparison data per site

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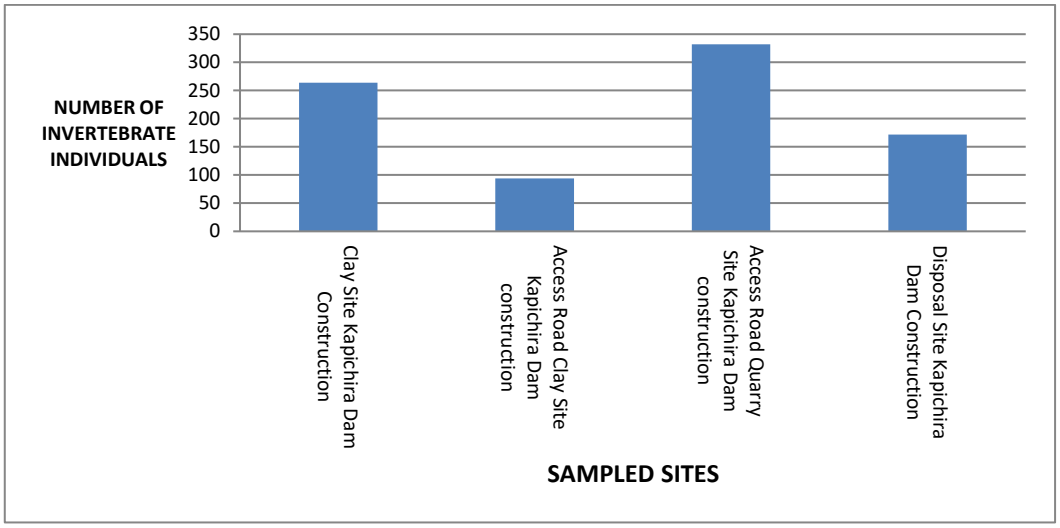


Figure 3-5: Invertebrate abundance (count) comparison data per site

In general, the findings reveal that the high abundance of species and number of families for an area sampled can be attributed to the fact that the area during the survey had greater numbers of successful species. The area had more stable ecosystems and that more ecological niches were available. This means that the Access Road to the Quarry Site had a very wide range of habitats. In contrast, the low number of species and number of families for an area sampled in this case Access Road Clay Site Kapichira Dam construction is mainly because of fewer numbers of successful species and unstable environment within the area hence less ecological niches were available. This is supported by their level of habitat degradation, where Access Road to Quarry Site Kapichira Dam construction is an almost intact natural habitat whereas Access Road Clay Site Kapichira Dam construction is a modified habitat,

Therefore, any activity that will lead to the loss of riparian vegetation either by harmful bush fires or wanton cutting down of trees, drying of riverine, pollution and augment reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of species of invertebrates. These invertebrates play crucial roles in maintenance of ecosystems process like decomposition, nutrient recycling, pollination, seed dispersal, pests and disease control, food chains and food webs, nutritional and economic importance to the local communities.

3.4. Conservation of significant species

Table 2 (see excel file attached) presents invertebrates that were identified to order level, family level, genus level and some to species level, that were encountered during the survey and have been assessed for the IUCN red list status (Version 2025-1 IUCN red list) in the Kapichira dam area. The results indicate that no endangered species of invertebrates were encountered in the sampled sites during the surveyed period.

Only *Hirudo medicinalis* (Leech) which was not recorded during the survey but was mentioned by fishermen and villagers as being seen after being bitten by it when fishing is a near threatened species recoded under IUCN red data list (Version, 2025 - 1) among the aquatic invertebrates. Most of the species were either not evaluated or assessed by IUCN or were under Least Concern.

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In summary, during the study, a total of 15 invertebrate orders, 44 families and 157 species with total abundance of 862 were recorded for terrestrial and aquatic invertebrates. Only *Hirudo medicinalis* (Leech) which was not recorded during the survey but was mentioned by fishermen/villagers as being seen after being bitten by it when fishing is a near threatened species recoded under IUCN red data list (Version, 2025 - 1) among the aquatic invertebrates.

The other invertebrates sampled during this survey seem not to be classified as threatened at national and international levels. These invertebrates are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important tomorrow. Therefore, considerations should be taken to protect these invertebrates through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project.

3.5. Potential impacts of the proposed project

Based on the findings, the proposed Kapichira Dam project is likely to have varying ecological impacts across the quarry site, access roads, and dumping site areas. At the quarry site and the access road to the quarry site, where biodiversity and ecosystem stability were found to be high, project activities such as vegetation clearance, excavation, and heavy machinery movement could lead to significant habitat loss and fragmentation. This would disrupt the currently stable ecological niches, reduce the abundance of successful species, and negatively affect vital ecosystem processes such as nutrient cycling, decomposition, and pollination. Similarly, the dumping site may experience habitat degradation through the accumulation of waste materials, pollution, and alteration of soil structure, leading to reduced species diversity and abundance. The access road to the dumping site, which is already somewhat disturbed, could face further ecological stress from increased vehicular movement, dust generation, and soil compaction, thereby limiting the regeneration of vegetation and further reducing ecological niches. Although no endangered invertebrate species were recorded, the disturbance of habitats could still threaten the survival of local species that contribute to ecological balance and the livelihoods of nearby communities. Therefore, the project should incorporate strict environmental management and mitigation measures, including the protection of riparian vegetation, prevention of pollution, and restoration of disturbed habitats to preserve ecosystem integrity and biodiversity.

4. BIRDS ASSESSMENT

4.1. Introduction

This is a report on birds assessment which was carried out at the Clay, Quarry and Disposal sites within Kapichira Dam surrounding area. The scope of work whose field surveys were undertaken in September 2025 with the following specific objectives:

1) To Sample mainly Birds of the Clay, Quarry and Disposal sites within Kapichira Dam surrounding area.

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2) To investigate these birds in terms of local Malawian conservation-significant species, as well as the IUCN/CITES -listed ones, sensitivity to Kapichira dam reconstruction project related activities, ecological significance and economic or livelihood importance to the people around the areas.

3) To produce a species list of birds sampled.

4) Write a report stating the results of the field survey

4.2. Survey methods

4.2.1. Desktop studies and pilot survey

A review on the of the Kapichira dam project area was carried out prior to the survey. The review was mainly aimed at having a list of bird species found in the area of survey as well as a list of species of local Malawian conservation-significance on the IUCN/CITES -listed ones (threatened i.e. Critically Endangered and Vulnerable or near threatened). Interviews with local communities were also done to find out from them what birds they encounter or see as they carry out their normal day to day activities within the project site.

4.2.2. Survey timing

The survey which was conducted during the dry season in September 2025 was the first time of sampling in these areas hence a more comprehensive wet or then winter season surveys will be appropriate in order to cover almost all the places and thorough bird sampling for better results.

4.2.3. Survey Site Selection, Locations and Descriptions

Sampling of birds was conducted on 3 targeted sampling points: Site1 (Clay barrow), Site2 (Access road to Quarry site), and Site3 (Disposal site) as depicted in Table 4-1.

Table 4-1: Sampling sites for the bird assessment

Sites	1	2	3	4
SITE 1 GPS	36L 689138,8234348, 78 m	36L 689308, 8234112, 89 m	36L 689136, 8234027, 75 m	36L 689107, 8234129, 87 m
SITE 2 GPS	36L 688386, 8241319, 137m	36L 688938, 824113, 143 m	36L 689144, 8241053, 141 m	
SITE 3 GPS	36L 689630, 8240093, 164 m	36L 689912, 8239911, 169 m	36L 690065, 8240113, 182 m	36L 689962, 8240392, 182 m

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4.3. Sampling Methods

Sampling of the birds was done using opportunistic sampling (sampling on as encountered basis), systematic and semi systematic methods. These methods of sampling were used in order to have a clear knowledge of species distribution within the sampling points/reaches and to collect as different species as possible present within the Kapichira dam proposed project reconstruction area. We also did some interviews with local community people we met in the survey sites.

In summary, the sampling exercise for the birds followed the following procedure:

- Opportunistic and semi-systematic criss-cross transect walks methods
- Direct observation in riparian areas, sandbars, feeding and resting areas, breeding areas, water bodies and pools.
- Listening to bird calls
- Mist netting riverine areas and woodland in the Majete wildlife Reserve
- Conducting face-to-face interviews with relevant stakeholders in the project area

The habitats sampled were wetlands, forests, riverine and some cultivated farmland areas. One of the sampling methods is shown below.

Mist netting for birds



Most of the encountered bird species were easily identified in the field and recorded in data collecting forms but for the ones which were not easily identified, with the availability of photos were later identified at the Museums of Malawi, Those that were identified easily (mist netted birds) were released while those that needed further checking photos were taken to the museum. The species were identified to their order level, family level, genus level and species level.

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4.4. Survey limitation and constraints

The survey was conducted during dry season whereby some Mist nets stayed for only few hours therefore reducing chances of encountering more birds. Sampling was mainly concentrated on bird calls, opportunistic sampling, observations and few mist netted ones. For better comparison it will be good to do the sampling again in wet season.

4.5. Results

Results on the avifauna encountered during the survey are presented in a number of tables shown below with brief summaries on habitats, locations, and GPS coordinates. Species summaries and the conservation status of the Avifauna encountered during the survey period in the respective sites have also been presented in the tables.

Table 4-2 shows a summary of species per site, species abundance/ richness and percentage at the clay site.

Table 4-2: Bird species and abundance at the clay borrow site

Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Njereza clay barrow	1	Bird	African Open Bill	*Anastomus lamelligerus*	8	3.07%
Njereza clay barrow	2	Bird	Black Sunbird	*Chalcomitra amethystina*	2	0.79%
Njereza clay barrow	3	Bird	Black-collared Barbet	*Lybius torquatus*	2	0.79%
Njereza clay barrow	4	Bird	Black-crowned Tchagra	*Tchagra senegalensis*	6	2.30%
Njereza clay barrow	5	Bird	Black-eyed Bulbul	*Pycnonotus tricolor*	17	6.51%
Njereza clay barrow	6	Bird	Blue cordonblu	*Uraeginthus angolensis*	23	8.81%
Njereza clay barrow	7	Bird	Bronze Manikin	*Spermestes cucullata*	39	14.94%
Njereza clay barrow	8	Bird	Burchell's Coucal	*Centropus burchellii*	4	1.53%
Njereza clay barrow	9	Bird	Cape Turtle Dove	*Streptopelia capicola*	13	4.98%
Njereza clay barrow	10	Bird	Cattle Egret	*Bubulcus ibis*	10	3.83%
Njereza clay barrow	11	Bird	Common Buttonquail	*Turnix sylvaticus*	6	2.30%
Njereza clay barrow	12	Bird	Flappet Lark	*Mirafra rufocinnamomea*	2	0.79%

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Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Njereza clay barrow	13	Bird	Folk-tailed Drongo	*Dicrurus adsimilis*	4	1.53%
Njereza clay barrow	14	Bird	Greater Blue-eared Starling	*Lamprotornis chalybaeus*	3	1.15%
Njereza clay barrow	15	Bird	Grey Heron	*Ardea Cinerea*	3	1.15%
Njereza clay barrow	16	Bird	Hegluin's Robin	*Cossypha heuglini*	6	2.30%
Njereza clay barrow	17	Bird	Klaas's Cuckoo	*Chrysococcyx klaas*	3	1.15%
Njereza clay barrow	18	Bird	Lesser Masked Weaver	*Ploceus intermedius*	4	1.53%
Njereza clay barrow	19	Bird	Little Bee-eater	*Merops pusillus*	16	6.13%
Njereza clay barrow	20	Bird	Namaqua Dove	*Oena capensis*	7	2.68%
Njereza clay barrow	21	Bird	Orange-winged Pytilia	*Pytilia afra*	14	5.36%
Njereza clay barrow	22	Bird	Racket-tailed Roller	*Coracias spatulatus*	5	1.92%
Njereza clay barrow	23	Bird	Red-eyed Dove	*Streptopelia semitorquata*	6	2.30%
Njereza clay barrow	24	Bird	Spectacled Weaver	*Ploceus ocularis*	7	2.68%
Njereza clay barrow	25	Bird	Tropical Boubou	*Laniarius aethiopicus*	7	2.68%
Njereza clay barrow	26	Bird	Variable Sunbird	*Cinnyris venusta*	5	1.92%
Njereza clay barrow	27	Bird	Village Weaver	*Ploceus cucullatus*	4	1.53%
Njereza clay barrow	28	Bird	Yellow rumped Bishop	*Euplectes capensis*	23	8.81%
Njereza clay barrow	29	Bird	Yellow-fronted Canary	*Serinus mosambicus*	12	4.60%

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Findings show that 29 bird species were encountered during the survey at clay borrow site of the project area. All the species encountered were found to be of least concern on the IUCN status. In addition, the figure shows species richness of the birds in the area during the survey. From the above graph Bird species that were encountered *Spermestes cucullatta* is dominant.

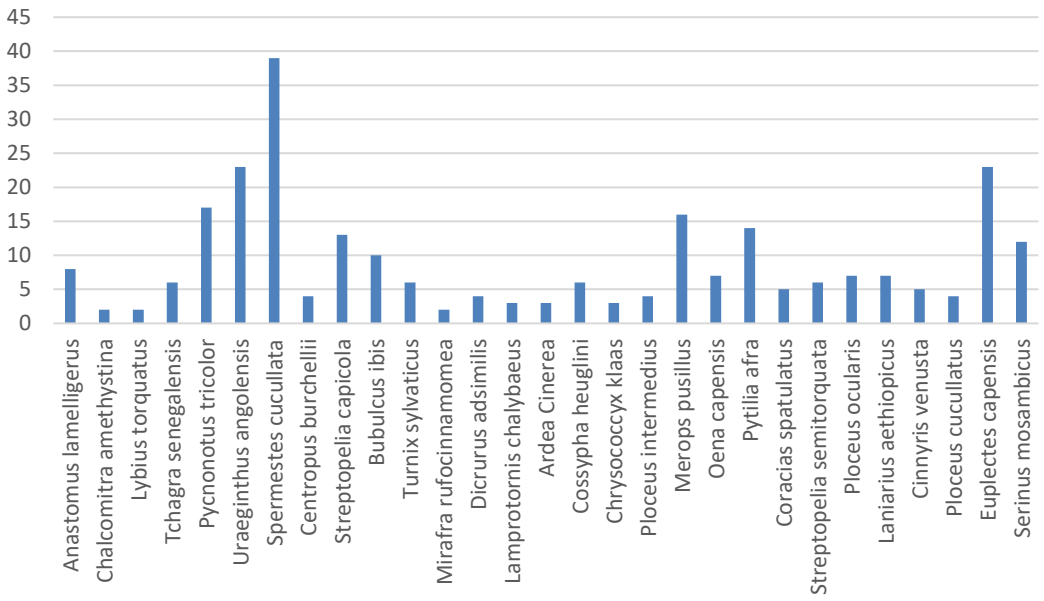


Figure 4-1: Birds species richness

In terms of the access road to the quarry site, findings shows that 39 bird species were recorded during the survey and all are of least concern on the IUCN status.

Table 4-3: Bird species and abundance at the access road to the quarry site

Sr.#	Common name	Scientific name	Abundance	% per species
1	African Gray Hornbill	*Tockus nasutus*	8	1.87%
2	African Parasdise Flycatcher	*Terpsiphone viridis*	12	2.80%
3	African pied wagtail	*Motacilla anguimp*	8	1.87%
4	Black eyed bulbul	*Pycnonotus tricolor*	17	3.97%
5	Black Sunbird	*Chalcomitra amethystina*	1	0.23%
6	Black-collared Barbet	*Lybius torquatus*	4	0.93%
7	Blue cordonblu	*Uraeginthus angolensis*	20	4.67%
8	Blue Spotted Wood Dove	*Turtur afer*	23	5.37%
9	Blue-billed Firefinch	*Lagonosticta rubricata*	5	1.17%
10	Brown -hooded Kingfisher	*Halcyon albiventris*	6	1.40%

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Sr.#	Common name	Scientific name	Abundance	% per species
11	Brown-headed Tchagra	*Tchagra australis*	4	0.93%
12	Cape Turtle Dove	*Streptopelia capicola*	18	4.21%
13	Common Waxbill	*Estrilda astrild*	16	3.73%
14	Crowned Hornbill	*Tockus alboterminatus*	9	2.10%
15	Emerald-spotted Wood Dove	*Turtur chalcospilos*	6	1.40%
16	Folk-tailed Drongo	*Dicrurus adsimilis*	14	3.27%
17	Grey-olive Greenbul	*Phyllastrephus cerviniventris*	13	3.04%
18	Helmeted Guinea Fowl	*Numida meleagris*	15	3.50%
19	Hildebrndt's Spurfowl	*Pternistes hildebrandti*	11	2.57%
20	Lesser Blue-eared Starling	*Lamprotornis chloropterus*	6	1.40%
21	Long-crested Eagle	*Laphoetus accipitalis*	1	0.23%
22	Namaqua Dove	*Oena capensis*	9	2.10%
23	Orange-breasted Waxbill	*Amandova subflova*	12	2.80%
24	Pied Crow	*Corvus albus*	6	1.40%
25	Racket-tailed Roller	*Coracias spatulatus*	3	0.70%
26	Red Bishop	*Euplectes orix*	17	3.97%
27	Red Faced Cisticola	*Cisticola erythrops*	10	2.34%
28	Red-faced Crombec	*Sylvietta whytii*	14	3.27%
29	Red-throated Twinspot	*Hypargos niveoguttatus*	18	4.21%
30	Southern Puffback	*Dryoscopus cubla*	9	2.10%
31	Spotted Eagle Owl	*Bubo africanus*	4	0.93%
32	Tawny-flanked Prinia	*Prinia subflava*	11	2.57%
33	Tropical Boubou	*Laniarius aethiopicus*	23	5.37%
34	Trumpeter Hornbill	*Bycanisters bucinator*	13	3.04%
35	Variable Sunbird	*Cinnyris venustus*	3	0.70%
36	Verreaux's Eagle Owl	*Buba lacteus*	6	1.40%
37	Western Banded Snake Eagle	*Circaetus cinerascens*	2	0.47%
38	Yellow rumped Bishop	*Euplectes capensis*	21	4.91%
39	Yellow-fronted Canary	*Serinus mosambicus*	30	7.00%

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Furthermore, the following figure shows the bird species richness within the access road to the quarry site. Among the species recorded, *serinus mosambicus* appeared to be the most dominant species.

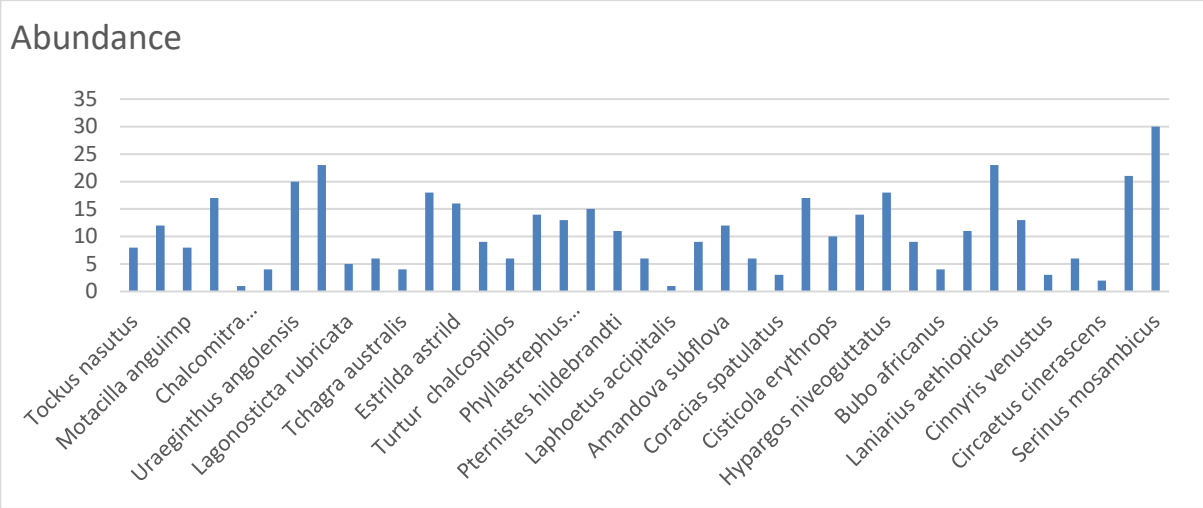


Figure 4-2: Bird species richness within the access road to the quarry site

Similar findings were recorded at the disposal site (Table 4-4). Fourteen (14) bird species were encountered during the dry season survey in the disposal site of the project area and all are of least concern on the IUCN status.

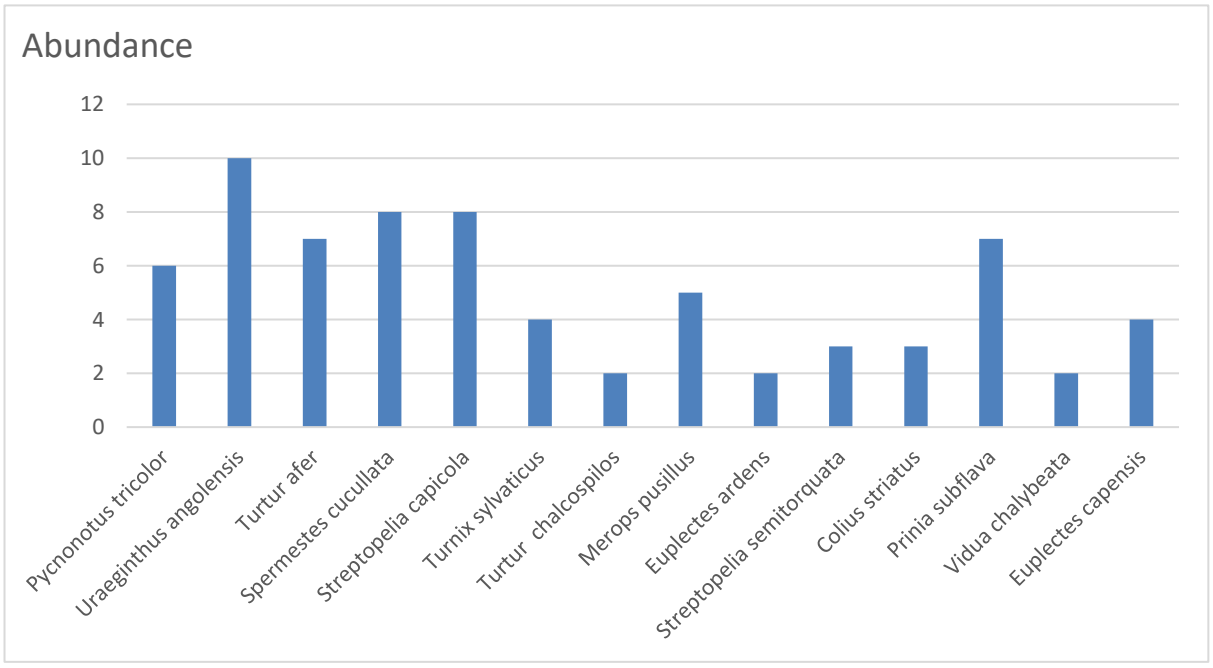
Table 4-4: Bird species and abundance at the proposed disposal site

Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Disposal Site	1	Bird	Black eyed bulbul	*Pycnonotus tricolor*	6	8.45%
Disposal Site	2	Bird	Blue cordonblu	*Uraeginthus angolensis*	10	14.08%
Disposal Site	3	Bird	Blue Spotted Wood Dove	*Turtur afer*	7	9.86%
Disposal Site	4	Bird	Bronze Manikin	*Spermestes cucullata*	8	11.27%
Disposal Site	5	Bird	Cape Turtle Dove	*Streptopelia capicola*	8	11.27%
Disposal Site	6	Bird	Common Buttonquail	*Turnix sylvaticus*	4	5.63%
Disposal Site	7	Bird	Emerald-spotted Wood Dove	*Turtur chalcospilos*	2	2.82%

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Site Name	Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
Disposal Site	8	Bird	Little Bee-eater	*Merops pusillus*	5	7.04%
Disposal Site	9	Bird	Red-collared Whydah	*Euplectes ardens*	2	2.82%
Disposal Site	10	Bird	Red-eyed Dove	*Streptopelia semitorquata*	3	4.23%
Disposal Site	11	Bird	Speckled Mousebird	*Colius striatus*	3	4.23%
Disposal Site	12	Bird	Tawny-flanked Prinia	*Prinia subflava*	7	9.86%
Disposal Site	13	Bird	Village Indigo bird	*Vidua chalybeata*	2	2.82%
Disposal Site	14	Bird	Yellow rumped Bishop	*Euplectes capensis*	4	5.63%

Further results the follow graph shows species richness of the dumping area.



From the above graph Bird species that were encountered *Uraeginthus angolensis* is dominant.

Below is a table (Table 4-5) showing bird data list for the three project sites (Clay, Quarry access road and Disposal)

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Table 4-5: Bird data list for the three project sites

Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
1	Bird	African Gray Hornbill	*Tockus nasutus*	8	1.05%
2	Bird	African Open Bill	*Anastomus lamelligerus*	8	1.05%
3	Bird	African Parasdise Flycatcher	*Terpsiphone viridis*	12	1.57%
4	Bird	African pied wagtail	*Motacilla anguimp*	8	1.05%
5	Bird	Black eyed bulbul	*Pycnonotus tricolor*	40	5.25%
6	Bird	Black Sunbird	*Chalcomitra amethystina*	3	0.39%
7	Bird	Black-collared Barbet	*Lybius torquatus*	6	0.79%
8	Bird	Black-crowned Tchagra	*Tchagra senegalensis*	6	0.79%
9	Bird	Blue cordonblu	*Uraeginthus angolensis*	53	6.96%
10	Bird	Blue Spotted Wood Dove	*Turtur afer*	30	3.94%
11	Bird	Blue-billed Firefinch	*Lagonosticta rubricata*	5	0.66%
12	Bird	Bronze Manikin	*Spermestes cucullata*	47	6.17%
13	Bird	Brown -hooded Kingfisher	*Halcyon albiventris*	6	0.79%
14	Bird	Brown-headed Tchagra	*Tchagra australis*	4	0.52%
15	Bird	Burchell's Coucal	*Centropus burchellii*	4	0.52%
16	Bird	Cape Turtle Dove	*Streptopelia capicola*	39	5.12%
17	Bird	Cattle Egret	*Bubulcus ibis*	10	1.31%
18	Bird	Common Buttonquail	*Turnix sylvaticus*	10	1.31%

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Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
19	Bird	Common Waxbill	*Estrilda astrild*	16	2.10%
20	Bird	Crowned Hornbill	*Tockus alboterminatus*	9	1.18%
21	Bird	Emerald-spotted Wood Dove	*Turtur chalcospilos*	8	1.05%
22	Bird	Flappet Lark	*Mirafra rufocinnamomea*	2	0.26%
23	Bird	Folk-tailed Drongo	*Dicrurus adsimilis*	18	2.36%
24	Bird	Greater Blue-eared Starling	*Lamprotornis chalybaeus*	3	0.39%
25	Bird	Grey Heron	*Ardea Cinerea*	3	0.39%
26	Bird	Grey-olive Greenbul	*Phyllastrephus cerviniventris*	13	1.71%
27	Bird	Hegluin's Robin	*Cossypha heuglini*	6	0.79%
28	Bird	Helmeted Guinea Fowl	*Numida meleagris*	15	1.96%
29	Bird	Hildebrndt's Spurfowl	*Pternistes hildebrandti*	11	1.44%
30	Bird	Klaas's Cuckoo	*Chrysococcyx klaas*	3	0.39%
31	Bird	Lesser Blue-eared Starling	*Lamprotornis chloropterus*	6	0.79%
32	Bird	Lesser Masked Weaver	*Ploceus intermedius*	4	0.52%
33	Bird	Little Bee-eater	*Merops pusillus*	21	2.76%
34	Bird	Long-crestedEagle	*Laphoetus accipitalis*	1	0.13%
35	Bird	Namaqua Dove	*Oena capensis*	16	2.10%
36	Bird	Orange-breasted Waxbill	*Amandova subflova*	12	1.57%
37	Bird	Orange-winged Pytilia	*Pytilia afra*	14	1.84%

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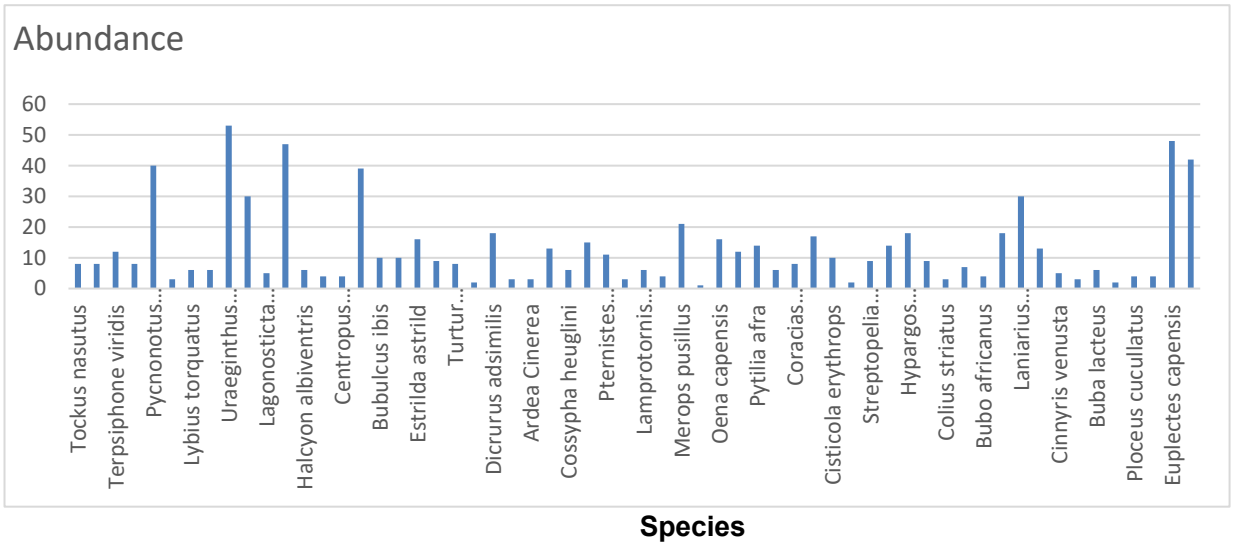
Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
38	Bird	Pied Crow	*Corvus albus*	6	0.79%
39	Bird	Racket-tailed Roller	*Coracias spatulatus*	8	1.05%
40	Bird	Red Bishop	*Euplectes orix*	17	2.23%
41	Bird	Red Faced Cisticola	*Cisticola erythrops*	10	1.31%
42	Bird	Red-collared Whydah	*Euplectes ardens*	2	0.26%
43	Bird	Red-eyed Dove	*Streptopelia semitorquata*	9	1.18%
44	Bird	Red-faced Crombec	*Sylvietta whytii*	14	1.84%
45	Bird	Red-throated Twinspot	*Hypargos niveoguttatus*	18	2.36%
46	Bird	Southern Puffback	*Dryoscopus cubla*	9	1.18%
47	Bird	Speckled Mousebird	*Colius striatus*	3	0.39%
48	Bird	Spectacled Weaver	*Ploceus ocularis*	7	1.31%
49	Bird	Spotted Eagle Owl	*Bubo africanus*	4	0.52%
50	Bird	Tawny-flanked Prinia	*Prinia subflava*	18	2.36%
51	Bird	Tropical Boubou	*Laniarius aethiopicus*	30	3.93%
52	Bird	Trumpeter Hornbill	*Bycanisters bucinator*	13	1.71%
53	Bird	Variable Sunbird	*Cinnyris venusta*	5	0.66%
54	Bird	Variable Sunbird	*Cinnyris venustus*	3	0.39%
55	Bird	Verreaux's Eagle Owl	*Buba lacteus*	6	0.79%
56	Bird	Village Indigo bird	*Vidua chalybeata*	2	0.26%
57	Bird	Village Weaver	*Ploceus cucullatus*	4	0.52%

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Sr.#	Target Taxa	Common name	Scientific name	Abundance	% per species
58	Bird	Western Banded Snake Eagle	*Circaetus cinerascens*	4	0.52%
59	Bird	Yellow rumped Bishop	*Euplectes capensis*	48	6.30%
59	Bird	Yellow-fronted Canary	*Serinus mosambicus*	42	6.51%

From the table above 59 bird species were encountered during the survey in dry season and all of them are of least concern on the IUCN status.

The graph below is showing the species richness for the three project sites



From the graph above *Uraeginthus angolensis* is the dominant species in all the surveyed sites.

4.6. Discussions

Any activity that will lead to the loss of riparian vegetation, drying of riverine, pollution and augment reduction of the water levels of streams, rivers and their wetlands in the Kapichira Dam and surrounding areas might lead to the loss of species of invertebrates therefore the situation need to be controlled in order not to lose them. These invertebrates play crucial roles in maintenance of ecosystems process like pollination, nutrient recycling and food chains and food webs.

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4.7. Conservation significant species

Birds and herpetofauna were identified to genus and species levels, as they were encountered during the survey and have been assessed for the IUCN red list status in the Kapichira dam area. The results indicate that no endangered species were encountered in the sampled sites during the surveyed period.

4.8. Sampling adequacy and survey effort

We sampled 3 Target Sites opportunistically and systematically Site1 (Clay site), Site 2 (Quarry access road) and site 3 (Disposal site).

4.9. Potential Impacts on Avifauna (Bird Species)

The proposed Kapichira Dam rehabilitation works and associated infrastructure including the clay borrow site, disposal site, and access roads are expected to exert several direct and indirect impacts on bird species and their habitats. The bird survey conducted in September 2025 recorded a total of 59 species across the three project sites, namely the clay borrow site, access road to the quarry site, and disposal site. All species encountered were classified as Least Concern under the IUCN Red List, indicating the absence of globally threatened or endangered species. Nonetheless, these bird species are ecologically significant as they contribute to critical ecosystem functions such as pollination, seed dispersal, pest control, and nutrient cycling. The loss or disturbance of habitats supporting these species may therefore have far-reaching implications for local ecosystem stability and biodiversity resilience.

Construction-related activities, including vegetation clearance, excavation, and earth movement, are likely to cause the loss of foraging, nesting, and breeding habitats for many terrestrial and riparian bird species. At the clay borrow site and disposal site, removal of grasses and shrubs may lead to the displacement of ground-nesting species such as the Common Buttonquail (Turnix sylvaticus) and Bronze Manikin (Spermestes cucullata). Similarly, noise, dust, and increased human presence could disrupt feeding and breeding patterns of species such as the Blue Cordon-bleu (Uraeginthus angolensis) and Yellow-fronted Canary (Serinus mosambicus), which were among the most dominant species in the survey. The clearing of riparian vegetation and changes to riverine hydrology around the dam and its tributaries could further reduce suitable habitats for water-dependent species like the African Openbill (Anastomus lamelligerus), Cattle Egret (Bubulcus ibis), and Grey Heron (Ardea cinerea).

Indirect impacts may include alteration of microclimatic conditions, reduction in food availability due to the loss of insects and other invertebrates, and potential pollution of wetlands through sedimentation and runoff. These effects could lead to reduced species richness and local population declines, particularly in areas near construction zones and haulage routes. Increased vehicular movement along access roads also heightens the risk of bird mortality through collisions and disturbance of sensitive species such as owls and raptors, including the Verreaux's Eagle Owl (Bubo lacteus) and Long-crested Eagle (Lophaetus accipitalis). Additionally, the cumulative disturbance from machinery, light, and noise may alter bird community composition over time, favoring generalist species over specialists.

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To minimize these potential impacts, it is recommended that vegetation clearance be strictly limited to designated areas and undertaken outside the main breeding season. Buffer zones should be maintained along riparian corridors, and pollution control measures must be implemented to prevent siltation and chemical contamination of wetlands. Re-vegetation with native plant species after construction, regular environmental monitoring, and seasonal follow-up bird surveys should also be undertaken to track recovery trends. Through these measures, the project can ensure that avifaunal diversity and ecosystem functions within the Kapichira Dam area are preserved.

4.10. Conclusion

From this dry season surveys of the September 2025 recorded data and its analysis has been shown that a total of 59 bird species were encountered. All of the species sampled were under Least Concern. These birds are involved in the balance of the ecosystem activities, nutritional and economic importance to the local communities hence they need to be considered important tomorrow. Therefore, considerations should be taken to protect them through sustainable project activities and mitigation measures in this Kapichira dam social economical and developmental project. References

For Birds:

i. A comprehensive illustrated field guide Birds of South of the Sahara by Ian Sinclair and Peter Ryan.

ii. Birds of Malawi by Franqoise Dowsett- Lemaire and Robert J. Dowsett'

iii. Museums of Malawi Storage and literatures.

5. FLORA ASSESSMENT

5.1. Introduction

The plant flora vegetation surveys were conducted in the Main proposed project impact area for the rehabilitation of the Kapichira Hydro Power Project impact areas. Four areas were key to the vegetation studies. These are the proposed Clay borrow site, The proposed access to the clay site, The damping site and the access to the quarry site. Floristic investigations within the proposed construction areas of the Kapichira rehabilitation Project were done for the following reasons.

The objectives are as follows:

1) To understand the vegetation types within the four proposed project impact areas,

2) To determine the species compositions, diversity, and distribution patterns of species in the proposed sites.

3) To also investigate presence of the rare, endemic and endangered plant species within the project. Further, to understand

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4)To determine other environmental modifying factors impacting on the vegetation within the proposed project impact areas.

5.2. Data Collection Methods

To undertake this exercise, 6 days were reserved for the entire course of the work. A reconnaissance survey was conducted to understand the nature of work and also estimate the sampling procedures before commencement of work. Due to rugged nature of some of the proposed sites, with seemingly different plant species habitats, specific survey plots targeted the proposed.

To understand the plant species compositions, Rapid Botanical Surveys (RBS) were employed for trees, shrubs, herbs and grasses in 10m-by-10m sampling plots that were distributed evenly at 40m along the entire route of the transect. All plant species found in the 100m2 quadrant including trees and herbs were identified and recorded including members of the family Poaceae and Cyperaceae (Hawthorne & Marshall, 2016).

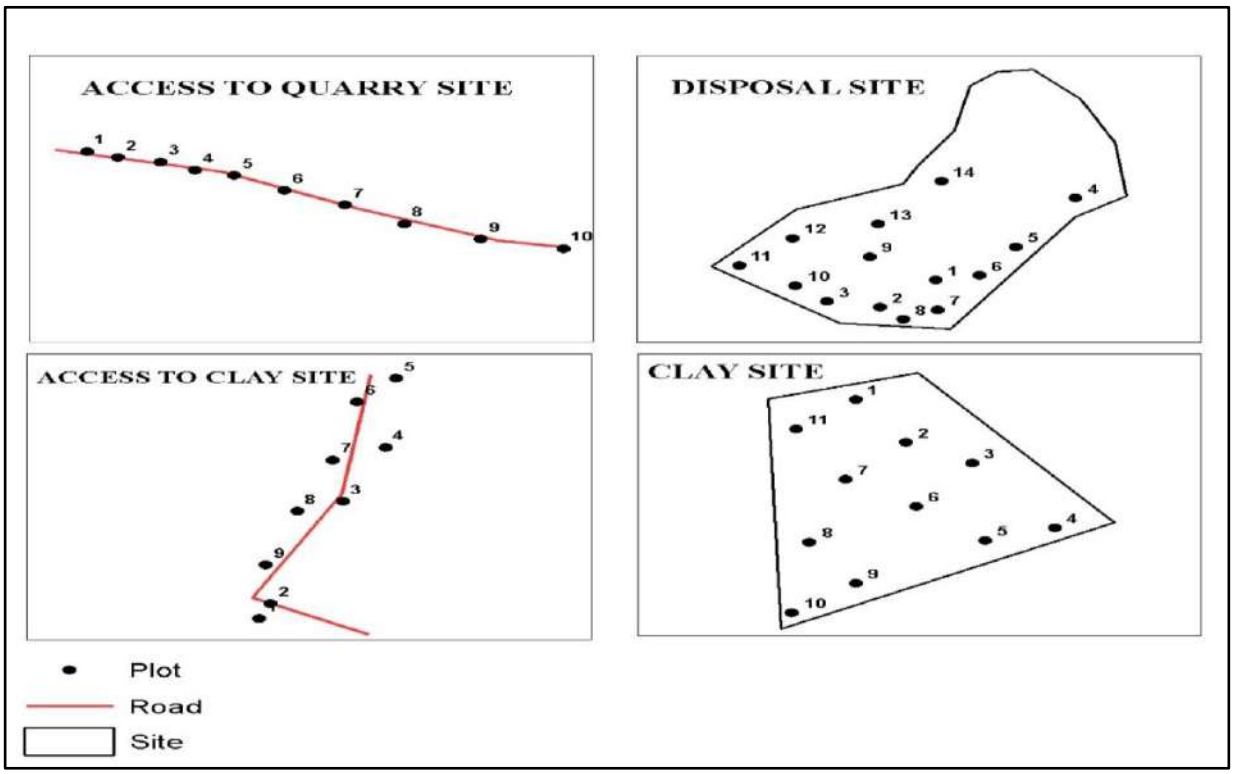


Figure 5-1: Distribution of study plots in each of the survey sites

To quantify the abundance of herbaceous plant species belonging to family Poaceae and Cyperaceae, a nested vegetation sampling method was employed. This is when a 1m2 quadrat is laid across a 100m2 quadrat to ensure the efficiency of quantification (method adapted from Whittaker, 1975). Onsite determinations and documentation were done for all herbaceous and grass species found in each of the 1m2 quadrats. Additional data collected includes; GPS coordinates for each sample point and the frequency of each species. All plant species that could not be identified in the field were collected and pressed for later identification and verification with assistance from resources such as field guides and botanical key specimens at the National Herbarium and Botanical Gardens (NHBG) in Zomba. RBS was chosen since the site was entirely devoid of mature trees.

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5.3. Data Analysis

5.3.1. Ecological analysis

Data on plant species found was entered in Microsoft Excel (2016) V1.0 for Personal Computers and prepared for analysis. Statistical software PC-ORD v.6.08, 2011 was used to analyse species richness and biodiversity indices (McCune and Mefford 2016). Species richness (S) was calculated and presented as the number of different species present in each study transect. The more species present in a sample the 'richer' the area. In terms of diversity, the Simpson's Diversity Index (D) and Shannon diversity Index (H) were both used as a measure of diversity in the study plots. While the abundance of invasive plants and other associated plants was determined as the total number of individual plants found in each study plot per hectare which was calculated and compared between study treatments.

5.3.2. Validation of Scientific Names

Print and online databases were used to verify plant names in order to follow the best practice in botanical nomenclature. Multiple botanical references exist online and in print to help researchers to check plant names. Since these reference sources vary in their purpose, scope and their degree of currency or maintenance. There was a need to use several databases to ensure that the name presented was current and valid bearing in mind that each reference has limitations: none is perfect. The main databases which were consulted for nomenclatural verifications are;

1. Binns, B. (1972) Dictionary of Plant Names in Malawi, The Government Printer, Zomba, Malawi

2. Flora of Malawi, https://www.malawiflora.com/: This site provides information about the flowering plants and ferns of Malawi. This is one of 6 e-floras which cover the Flora Zambesiaca area in south-central Africa.

3. World Checklist of Selected Plant Families (WCSP): the most up to date, actively curated taxonomy database, which is peer-reviewed by over 120 collaborators worldwide. It provides taxonomy and distributions for approximately 50% of plant families and is refreshed daily [http://apps.kew.org/wcsp/home.do].

4. The Plant List (TPL): was built in collaboration with the Missouri Botanical Garden and other systematists worldwide. It is a working list of all known plant species and is comprehensive for all species of vascular plants and bryophytes (mosses and liverworts). Though complete, TPL is a static list that was built from data sets, including WCSP, supplied before August 2012, and thus does not reflect subsequent additions and improvements to these data sets [http://www.theplantlist.org/].

5. Name Parser (https://www.gbif.org/tools/name-parser) is a free online tool listed on GBIF tools and it allows to divide scientific names into their components and to check them against the taxonomic backbone used by GBIF. It can be used to automate some processes while digitizing or curating lists of scientific names. Furthermore the identified samples were validated using the GBIF data validator (https://www.gbif.org/tools/data-validator/about), a service that allows anyone with a GBIF-relevant dataset to receive

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a report on the syntactical correctness and the validity of the content contained within the dataset.

6. World Flora Online "An Online Flora of All Known Plants" searchable by species, genus or family name, or any words describing the plant (https://wfoplantlist.org/plant-list/)

7. Tropicos Tropicos, is an online database which was originally created for internal research but has since been made available to the world's scientific community. This system has over 1.2 million scientific names and 4.0 million specimen records.

8. Name Parser (https://www.gbif.org/tools/name-parser) is a free online tool listed on GBIF tools and it allows to divide scientific names into their components and to check them against the taxonomic backbone used by GBIF. It can be used to automate some processes while digitizing or curating lists of scientific names. Furthermore the identified samples were validated using the GBIF data validator (https://www.gbif.org/tools/data-validator/about), a service that allows anyone with a GBIF-relevant dataset to receive a report on the syntactical correctness and the validity of the content contained within the dataset.

9. Plants Of the World Online (POWO) launched in 2017, POWO is an international collaborative programme that has as a primary aim to make available digitized data of the world's flora gathered from the past 250 years of botanical exploration and research. All data incorporated into POWO are attached to the currently accepted name from the WCVP names backbone. Plants of the World Online

10. naturalist a citizen science software was used to record some important protected species on GBIF online as well as to validate similar occurrences

5.4. Results of Plant Flora Survey

5.4.1. Habitat descriptions and level of degradation of the clay site and access the proposed access route to the clay site

The proposed clay borrow site is on dry deciduous woodland vegetation type is dominated by herbs and grasses with isolated pockets of tree/shrubs largely of *Diospyros sq*uarrosa. The common and preponderant herb layers are *Neojeflera deccumbens* and *Indigofera homblei*. Canopy cover range between 0 to 10% as the area remain open due to anthropogenic pressure and human usage of the site for cattle ranching. Within the proposed clay site, notable forest thickets of bush/scrubland occur along the seasonal riparian zones. However, due to anthropogenic pressure for wood and other uses, the area is largely maintained as an open woodland largely used for grazing animals. Part of the site was previously used as a kraal for cattle. Due to the notable vegetation loss, the site is somewhat unmanaged and has resulted in consequential soil erosion forming deep gullies in areas where there is serious vegetation loss. The notable keystone tree species recorded were *Adansonia digitata, Sterculia africana and Diospyros squarrosa*. Among the tree species found, *Diospyros squarrosa* was abundant.

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Figure 5-2: Clay site vegetation type with Diospyros squarrosa regenerants

The Access route to clay site was observed to have human modified habitats with a clear foot path along the passage of the proposed new road. The vegetation type is similar with that of the clay site but with 0-5%% canopy cover. The site is predominantly covered with herbs (70.3%) and grasses (21.6%) an indication of anthropogenic pressure used as a foot path and some areas cleared for settlement, hence there is significant loss of vegetation around the area. Common species are *Neojeflera deccumbens and Indigofera homblei.*



Figure 5-3: Proposed site of the access route to clay site

5.4.2. Habitat description of the access route to quarry site and the dumping site

Field observations of the vegetation cover along the proposed access route to the quarry site comprises of open dry deciduous forest type composed of mixed species with *Terminalia sericea, Bauhinia petersiana* and Acacia species as dominant species.

Western side: The western part of the access route is composed on the higher ground of hilly slope and stretch along the contour of the hill towards the near stream. The entire western part of the proposed access route is a hill with its natural vegetation that is intact and has previously been kept as a preserved buffer forest patch within Kapichira Hydropower. The common trees are *Terminalia sericea, Pterocarpus angolensis*,

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Dalbergia melanoxylon, Terminalia sericea and *Diospyros kirkii* amongst others. Tree canopy cover range between 50% to 70%. High canopy cover was observed near the passage of intersection with the stream.

Eastern side: The eastern part of the access route to quarry site is predominantly and *Diplorhincus condylocarpon, Combretum adenogonum, Diospyros kirkii* and *Terminalia sericea.* The eastern transect towards the quarry site has open spaces for tall grasses and Aloes. Distinct are isolated islands *Dalbergia melanoxylon*. Grasses and herbs cover approximately 50-60% of the open areas between the forest patches.



Figure 5-4: The proposed damping site view

5.4.3. Diversity and richness of plant life forms

Table 5-1 shows plant species lifeforms that were recorded in the entire study area. Within the Clay site, three life forms were recorded. These are the grasses, herbs and trees. The clay site is dominated by woody trees/shrubs species (68.18%), followed by herbs (28.79%) and grasses (3.03%) (Table 5-1). While the access to clay site had a average percentage cover of 70% herbs and grasses (20%) covered on both sides of the access route (Table 5-1).

Furthermore, the disposal area was observed to be dominated by trees (50.91%) and grass (40%) with no herbs (0%). The grasses ground covered in this area was recorded along the riparian zone, while the absence of herbs and grasses in some most part of the disposal area could be a result of fire that had already burnt the area before the survey.

The access route to quarry site was dominated by the trees (72.73%) followed by grasses (15.55%) and herbs (12.73%) lifeforms respectively. The observed high dominance of trees recorded in the access to quarry site is an indication of intactness of the proposed access route.

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Table 5-1: Percentage (%) distribution of life forms in project sites

PLANT LIFEFORM	Access to Clay site	Access to Quarry	Clay site	Disposal site
Grass (%)	21.6	14.55	3.03	40.00
Herb (%)	70.3	12.73	28.79	0.00
Liana (%)	0.0	0.00	0.00	9.09
Shrub (%)	0.0	0.00	0.00	0.00
Tree (%)	8.1	72.73	68.18	50.91

5.4.4. Species richness and diversity in survey sites

Table 5-2 and Figure 5-6 shows results of plant species richness in the entire survey sites. Diversity was the highest along the access to quarry site, followed by disposal area. High species richness was recorded at the Access to quarry (107) site followed by the Disposal site (104). The Access to Clay site (29) was the lowest.

Shannon Weinger Diversity (H) of revealed high differences in terms of plant structure in the survey sites. The Disposal site (H=3.889) and the Access to quarry site (H=3.861) were the highest, while the clay site (2.910) and the access to clay site (2.437) were on the lower site (Figure 5-5). This revelation in terms of low species richness and diversity in the Clay site as well as the access to clay site suggests that the impact of the project activities on the flora of the two sites is minimal.

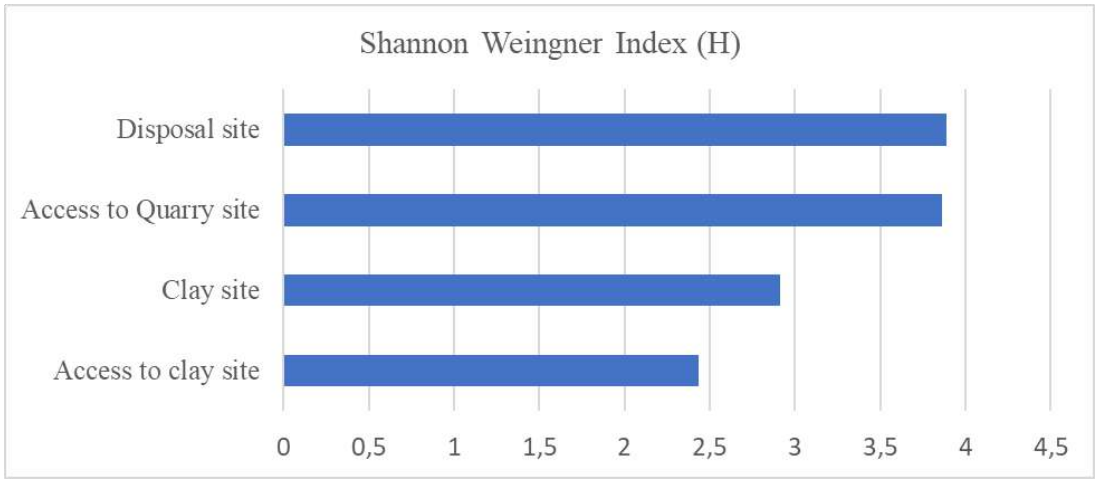


Figure 5-5: Shannon Weigner Diversity index of plants species found

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Table 5-2: Evenness and Simpsons diversity index of plants in the survey sites

	Species richness	*Evenness*	*Shannon Weigner Diversity index (H)*	*Simpson Diversity Index (D)*
Access to clay site	29	0.724	2.437	0.8586
Clay site	54	0.73	2.91	0.914
Access to quarry site	107	0.826	3.861	0.9675
Disposal site	104	0.837	3.888	0.9659



Figure 5-6: Plant species richness survey sites

5.4.5. Abundance of plant families and species (Ground cover percentage (%)

A total of 58 plant families from 178 plant species were inventoried in the entire flora survey (Table 5-3). The most dominant plant families recorded were; Fabaceae (20),Euphobiaceae (16), Poaceae (16), Combrateceae and Asteraceae (9) respectively.

Within the individual sites, species dominance differed. At the clay site, the five dominant plant species recorded during this survey were; *Maerua angolensis, Neojeffrera decurens, Indigofera homblei, Bricharia brizantha* (grass) and *Boerhavia diffusa* respectively. Among the tree species, Diospyros squarrosa was dominant. Similarly, the access route to the clay site on both sides of the route followed a similar pattern as the clay site. The observed trees, herbs and grasses recorded on the clay site and along the access route to the clay site are listed by IUCN as Least Concern (LC) or Not Evaluated (NE) hence may have no conservation concern during the project implementation phase.

While at the damping site, 104 species were recorded. *Bauhinia petersiana, Diplorrhynchus condylocarpon, Heteropogon conturtus, Brichiaria brizantha* and *Dalbergia melanoxylon* were the most abundant species found respectively. The trees lifeform layer was the most dominant followed by grasses. Furthermore, within the

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access route to quarry site, inventory finding displayed high dominance of the tree layer structure, quite similar to the disposal site. However, the most dominant plant species found along the proposed access route to the quarry site were *Philenoptera violaceae, D. condylocarpon, Diospyros kirkii, Combretum adenogonium and Dalbergia melanoxylon*. The tree species found except the *Dalbergia melanoxylon* are listed as Least Concern, while *D. melanoxylon* is listed as Near Threatened.



Figure 5-7: Diopyros squarosa and Helitropum indica

5.4.6. Conservation status of plants

5.4.6.1. Endemism of plants

Assessment of endemism was done based on Herbarium records and available literature of the endemic plants of Malawi (Goldings et al. 2000). No endemic plants species were recorded at the Access to clay site, the proposed Clay-borrow site as well as the quarry site and the disposal site Therefore, the project impact areas would have no tangible effect on the endemic plants of Malawi

5.4.6.2. Malawi protected plant species

Six (6) protected tree species were recorded during the entire plant flora survey. Out of the 6 species recorded, 4 were found along the proposed access route to quarry site. These are: *Dalbergia melanoxylon, Terminalia sericea, Afzelia quanzensis,* and *Pterocarpus angolensis*. While at the dumping site, 4 species were also inventoried. These are: *Burkea africana, Dalbergia melanoxylon, Terminalia sericea* and *Afzelia quanzensis*. The most preponderant of the protected species recorded is Dalbergia melanoxylon and Terminalia sericea in both the damping site and access to the quarry site. The project area will have a significant impact on the loss of the protected tree species. The protected species have been reported elsewhere in habitats near the proposed access route as well as the borrows site assuming that these other habitats will be intact, hence it is envisaged that there will be a buffer zone for these few protected species to thrive. However, to ensure proper mitigation measures, the project will be encouraged to plant some of the protected species to compensate for the loss of the

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tree species within the buffer areas of the project influence. No plant protected species were observed in the proposed clay borrow site and the access to the clay site.

5.4.6.3. Invasive alien species

A total of 5 invasive alien plants species were recorded during the flora survey. The disposal site recorded the highest number of 5 invasive alien plant species. These are; *Ricinus communis, Ageratum conyzoides, Senna alata, Luffa cylindrica, and Calotropis procera.* While 4 invasive alien species were found within the proposed clay site. The species found are *Opuntia stricta, Calotropis procera, Xanthium strumonium, and Senna alata*. Furthermore, along the access route to the clay site, 4 invasive alien plants were observed. These are *Agave sisalana, Calotropis procera, Senna alata and Opuntia stricta*. Lastly, at the proposed access to the quarry site, only *Ageratum conyzoides* was inventoried. The most common invasive plant was Calotropis procera and Senna alata. The observed high number of invasive alien species at the clay site, access to clay site as well as the damping site may require proper management prescriptions to avoid spread and contamination of the invasive species to nearby unaffected surrounding.

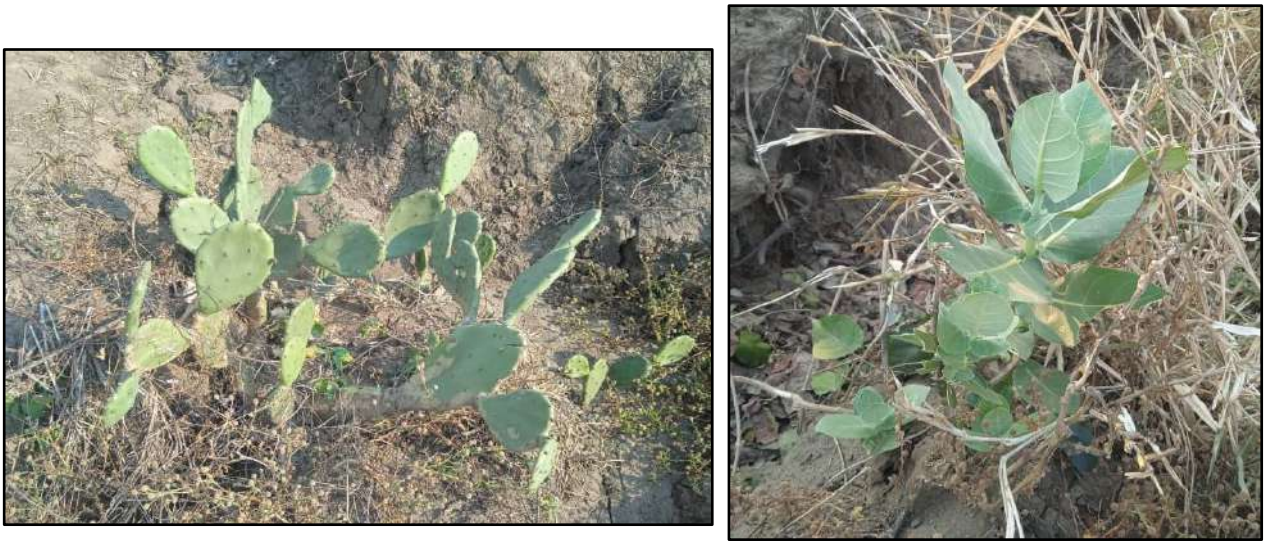


Figure 5-8: Opuntia stricta and Calotropis procera at the proposed clay site

5.5. Conclusion and recommendations

Based on the findings from the flora survey, the impacts of the project on plants diversity around the Clay borrow site and the proposed access to the clay site will be minimal. However, since the sites were presence of invasive alien plants recorded, proper disposal of the alien species need to be instituted to avoid spread and contamination.

Furthermore, along the access road to quarry site and the damping site, there will be a need for engineers to avoid unnecessary cutting down of trees especially away from the road reserve to ensure enough forest cover as well as encourage natural regeneration to go on to stabilize the soils around the access routes. Since there will be movement of soil, rocks and boulders in the construction of the new access road, it is recommended that to counteract the effects of loss of some important plant species; including protected species, planting of indigenous trees should include *Dalbergia melanoxylon (Phingo) and Lannea sthumananii and Pterocarpus angolensis (Mlombwa), Afzelia quanzensis (Msamabamafumu) and Terminalia sericea (Naphini) s*hould be encouraged amongst

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others near and around the proposed access route to quarry site to compensate for the loss from this disturbance.

For important herbaceous plants such as Aloes recorded, the project can support seeds collection and conservation efforts through the Forestry Research Institute of Malawi to ensure seeds or other associated plant species are conserved ex-situ and long-term.

Table 5-3: Plant species surveyed at the Kapichira proposed Clay site, Access to clay site, Access to quarry site and the damping site

o.	SCIENTIFIC NAME	SPECIES LAYER	FAMILY	IUCN CATEGORY GLOBALLY
1	*Abrus precatorius* L.	Liana	Fabaceae	NE
2	*Vachellia galpinii* (Burtt Davy) Seigler & Ebinger	Tree	Fabaceae	LC
3	*Acacia hockii* Meisn.	Shrub	Fabaceae	LC
4	*Acacia nigrescens*(Oliv.) P.J.H.Hurter	Tree	Mimosoideae	LC
5	*Acacia nilotica* (L.) P.J.H.Hurter & Mabb	Tree	Mimosoideae	LC
6	*Acacia polyacantha* Willd.	Tree	Fabaceae	LC
7	*Acacia tortilis* (Forssk.) Galasso & Banfi	Tree	Mimosoideae	LC
8	*Achyranthus aspera* L.	Herb	Amaranthaceae	NE
9	*Adansonia digitata* L.	Tree	Bombacaceae	LC
10	*Afzelia quanzensis* Welw.	Tree	Fabaceae	LC
11	*Agave siselana* Perrine.	Herb	Agavaceae	NE
12	*Ageratum conyzoides* L.	Herb	Asteraceae	LC
13	*Albizia amara* (Roxb.) Boiv.	Tree	Fabaceae	LC
14	*Albizia anthelmintica* Brongn	Tree	Fabaceae	LC
15	*Allophylus africanus* P. Beauv.	Tree	Sapindaceae	LC
16	*Aloe mzimbana* I.Verd. & Christian	Herb	Aloaceae	NE
17	*Amaranthus hybridus* L.	Herb	Amaranthaceae	NE
18	*Amaranthus spinosa* L.	Herb	Amaranthaceae	NE
19	*Asparagus setaeus* (Kunth.) Jessop.	Herb	Asparagaceae	NE
20	*Azadirachta indica* A. Juss.	Tree	Meliaceae	LC
21	*Barleria spinulosa* Klotzsch	Herb	Acanthaceae	LC
22	*Bauhinia petersiana* Bolle	Tree	Caesalpinioideae	LC
23	Blumea crispata (Vahl) Merxm.	Herb	Asteraceae	NE
24	*Bobgunia madagascariensis*	Tree	Fabaceae	NE
25	*Boerhavia diffusa* Linn.	Herb	Nyctaginaceae	NE
26	*Boscia salicifolia* Oliv.	Tree	Capparaceae	LC
27	*Brachiaria brizantha* (A.Rich.) Stapf	Grass	Poaceae	NE
28	*Bulbostyhis sp*	Grass	Cyperaceae	NE
29	*Burkea africana* Hook.	Tree	Fabaceae	LC
30	*Cadaba kirkii* Oliv.	Tree	Sterculiaceae	LC
31	*Calotropis procera* (Aiton) W.T. Aiton	Tree	Apocynaceae	NE

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o.	SCIENTIFIC NAME	SPECIES LAYER	FAMILY	IUCN CATEGORY GLOBALLY
32	*Capparis tomentosa* Lam.	Liana	Capparaceae	NE
33	*Carica papaya* L.	Tree	Caricaceae	DD
34	*Catunaregum spinosa* (Thunb..) Tirveng.	Tree	Rubiaceae	NE
35	*Celosia trygina* L.	Herb	Amaranthaceae	NE
36	*Chamaecrista mimosoides* (L.) Greene.	Herb	Fabaceae	LC
37	*Cissus integrifolia* (Baker) Planch.	Liana	Vitaceae	NE
38	*Cissus quadrangularis* L.	Liana	Vitaceae	NE
39	*Cissus rubiginosa* (Welw.) Planch.	Herb	Vitaceae	NE
40	*Cladostemon kirkii* (Oliv.) Pax & Gilg	Tree	Capparaceae	LC
41	*Cleistochlamys kirkii* (Benth.) Oliv.	Tree	Annonaceae	LC
42	*Coffea logustroides* S. Moore.	Tree	Rubiaceae	NE
43	*Combretum adenogonium* Steud. ex A.Rich.	Tree	Combretaceae	LC
44	*Combretum apiculatum* Sond.	Tree	Combretaceae	LC
45	*Combretum hereroense* Schinz	Tree	Combretaceae	LC
46	*Combretum mossambicensis* (Klotzsch) Engl.	Tree	Combretaceae	LC
47	*Combretum paniculatum* (HECP)	Tree	Combretaceae	LC
48	*Combretum zeyheri* Sond.	Tree	Combretaceae	LC
49	*Commelina africana* (A.Rich.) Engl.	Herb	Commelinaceae	LC
50	*Commiphora africana* (A.Rich.) Engl.	Tree	Burseraceae	NE
51	*Commiphora mossambicensis* (Oliv.) Engl.	Tree	Burseraceae	NE
52	*Conyza sumatrensis* (Retz.) E.Walker	Herb	Asteraceae	NE
53	*Corchorus olitorius* L.	Herb	Tiliaceae	NE
54	*Cordyla africana* Lour.	Tree	Fabaceae	LC
55	*Crotalaria virgulata* Klotzsch	Herb	Fabaceae	NE
56	*Croton megalobotrys* Müll.Arg.	Tree	Euphorbiaceae	LC
57	*Cucumis metuliferus* E. Meyer ex Naudin	Liana	Cucurbitaceae	NE
58	*Cucumis zeyheri* Wild.	Liana	Cucurbitaceae	NE
59	*Cynodon dactylon* (L.) Pers	Grass	Poaceae	NE
60	*Cyperus textilis* Thunb	Grass	Cyperaceae	LC
61	*Dactyloctenium aegyptiaca* (L.) Willd.	Grass	Poaceae	NE
62	*Dalbergia boehmii* Taub.	Tree	Fabaceae	LC
63	*Dalbergia lactea* Vatke.	Tree	Fabaceae	LC
64	*Dalbergia melanoxylon* Guill. & Perr.	Tree	Fabaceae	NT
65	*Dalbergia nitidula* Baker	Tree	Fabaceae	LC
66	*Dalbergiella nyassae* Baker f.	Tree	Fabaceae	LC
67	*Deinbollia xanthocarpa* Klotzsch Radlk	Tree	Sapindaceae	LC
68	*Desmodium rapandum* (Vahl.) DC.	Herb	Fabaceae	LC
69	*Dichrostachys cinerea* (L.) Wight et Arn.	Tree	Mimosaceae	LC
70	*Diospyros kirkii* Hiern	Tree	Ebenaceae	LC
71	*Diospyros mesipiliformis* Hochst ex A. DC.	Tree	Ebenaceae	NE

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o.	SCIENTIFIC NAME	SPECIES LAYER	FAMILY	IUCN CATEGORY GLOBALLY
72	*Diospyros senensis* Klotzsch	Tree	Ebenaceae	LC
73	*Diospyros squarrosa* Klotzsch	Tree	Ebenaceae	LC
74	*Diplorhynchus condylocarpon* (Mull.Arg.) Pichon	Tree	Apocynacea e	NE
75	*Echnochloa colona* (L.) Link	Grass	Poaceae	NE
76	*Ehretia amoena* Klotzsch	Tree	Boraginacea e	LC
77	*Eleusine indica* (L.)	Grass	Poaceae	LC
78	*Eragrostris ciliaris* (L.) R. Br.	Grass	Poaceae	NE
79	*Eragrostris congesta* Oliv.	Grass	Poaceae	NE
80	*Euphorbia heterophylla* L.	Herb	Euphorbiace ae	NE
81	*Euphorbia hirta* L.	Tree	Euphorbiace ae	NE
82	*Euphorbia kibwenzensis* N. E. Br.	Herb	Euphorbiace ae	NE
83	*Ficus exasperata* Vahl.	Tree	Moraceae	LC
84	*Ficus ingens* (Miq.) Miq.	Tree	Moraceae	LC
85	*Ficus sur* Forssk.	Tree	Moraceae	LC
86	*Ficus sycomorus* L.	Tree	Moraceae	NE
87	*Flacourtia indica* (Burm. F.) Merr.	Tree	Flacourtiace ae	NE
88	*Flueggea virosa* (Roxb. ex Willd.) Royle.	Tree	Euphorbiace ae	NE
89	*Friesoldielsia obovata* (Benth) Verdc.	Tree	Annonaceae	LC
90	*Gardenia ternifolia* Schumach. & Thonn	Tree	Rubiaceae	LC
91	*Gliricidia sepium* (Jacq.) Kunth	Tree	Fabaceae	LC
92	*Grewia bicolor* Juss.	Tree	Euphorbiace ae	NE
93	*Grewia forbesii* Harv. ex Mast.	Tree	Euphorbiace ae	NE
94	*Grewia stolzii* Ulbr.	Tree	Tiliaceae	NE
95	*Heteropogon conturtus* (L.) Roem. & Schult.	Grass	Poaceae	NE
96	*Hippocratea parviflora* N.E. Br.	Tree	Celastraceae	NE
97	*Holarrhena pubescens* (Buch.-Ham.) Wall. ex G.Don	Tree	Apocynacea e	NE
98	*Hymezygia bracteosa (Benth) Briq*	Herb	Acanthaceae	NE
99	*Hyparrhenia filipendula* (Hochst.) Stapf	Grass	Poaceae	NE
100	*Hyparrhenia rufa* (Nees) Stapf.	Grass	Poaceae	NE
101	*Hypoestes forskaollii* (Vahl.) R. Br.	Herb	Acanthaceae	NE
102	*Indigofera homblei* Baker f. & Martin	Herb	Fabaceae	NE
103	*Ipomea pileata* Roxb.	Liana	Convolvulac eae	NE
104	*Jasminum streptocarpus* E. Mey.	Herb	Oleaceae	NE
105	*Jatropha carcus* L.	Tree	Euphorbiace ae	NE
106	*Julbernardia globiflora* (Benth.) Troupin	Tree	Fabaceae	LC
107	*Karomia tettensis* (Klotzsch) R. Fern	Tree	Lamiaceae	LC
108	*Keetia guenzii* (Sond.) Bridson	Tree	Rubiaceae	NE
109	*Kirkia acuminata* Oliv	Tree	Simaroubace ae	LC
110	*Kohoutia longifolia* Klotzsch	Herb	Rubiaceae	NE

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o.	SCIENTIFIC NAME	SPECIES LAYER	FAMILY	IUCN CATEGORY GLOBALLY
111	*Lannea stuhlmannii* (Engl.) Engl.	Tree	Anacardiaceae	NE
112	*Lecaniodiscus fraxinifolius* Baker	Tree	Sapindaceae	NE
113	*Leonotis leonurus* (L.) R.Br.	Herb	Lamiaceae	NE
114	*Luffa cylindrica* (L.) M.Roem.	Liana	Curcubitaceae	NE
115	*Maclura africana* (Bureau) Corner.	Shrub	Moraceae	LC
116	*Maerua edulis* (Gilg & Gilg-Ben.) DeWolf	Tree	capparaceae	NE
117	*Mangifera indica* L	Tree	Anacardiaceae	NE
118	*Markhamia obtusifolia* (Baker) Sprague	Tree	Bignoniaceae	NE
119	*Markhamia zanzibarica* (DC.) Engl.	Tree	Bignoniaceae	LC
120	*Maytenus heterophylla* (Eckl. & Zeyh.) N.Robson	Tree	Celastraceae	LC
121	*Megathursus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs	Grass	Poaceae	NE
122	*Mucuna stans* Welw. ex Baker	Liana	Fabaceae	NE
123	*Musa paradisiaca* L.	Shrub	Musaceae	NE
124	*Neojeffreya decurrens* (L.) Cabrera	Herb	Asteraceae	NE
125	*Ocimum americana* L.	Herb	Lamiaceae	NE
126	*Opuntia stricta* (Haw.)	Herb	Cactaceae	LC
127	*Ormocarpum kirkii* S.Moore	Tree	Papilionoideae	NE
128	*Ozoroa insigns* Delile	Tree	Anacardiaceae	LC
129	*Ozoroa reticulata* (Baker f.) R.Fern. & A.Fern	Tree	Anacardiaceae	LC
130	*Paederia bojeriana* (A.Rich.) Drake	Liana	Rubiaceae	NE
131	*Pennisetum purpureum* Schumach.	Grass	Poaceae	LC
132	*Philenoptera bussei* (Harms.) Schrire.	Tree	Fabaceae	NE
133	*Philenoptera violaceae* (Klotzsch.) Schrire.	Tree	Fabaceae	LC
134	*Phragmites mauritianus* Kunth	Grass	Poaceae	NE
135	*Premna senensis* Klotzsch	Shrub	Lamiaceae	LC
136	*Pseudolachnostylis maprouneifolia* Pax.	Tree	Euphorbiaceae	LC
137	*Pteleopsis myrtifolia* (M.a. Lawson.) Engl.& Diels.	Tree	Combretaceae	NE
138	*Pterocarpus angolensis* DC.	Tree	Fabaceae	LC
139	*Pterocarpus rotundifolius* (Sond.) Druce	Tree	Fabaceae	LC
140	*Ricinus communis* L.	Tree	Euphorbiaceae	NE
141	*Sanseviera aethiopica* Thunb	Herb	Dracaenaceae	NE
142	*Schmidtia pappophoroides* Astend ex JA Schmidt.	Grass	Poaceae	NE
143	*Schrebera trichoclada* Welw.	Tree	Oleaceae	LC
144	*Sclerocarya birrea* (A. Rich)Hochst	Tree	Anacardiaceae	LC
145	*Senna alata* (L.) Roxb.	Shrub	Fabaceae	LC
146	*Senna occidentalis* (L.) Link.	Shrub	Fabaceae	LC
147	*Senna siamea* (Lam) H. S. Irwin & Barneby.	Tree	Fabaceae	LC
148	*Sida rhombifolia* L.	Herb	Malvaceae	NE
149	*Solanum incanum* L.	Herb	Solanaceae	NE

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o.	SCIENTIFIC NAME	SPECIES LAYER	FAMILY	IUCN CATEGORY GLOBALLY
150	*Solanum panduriforme* E.Mey.	Herb	Solanaceae	NE
151	*Spermacoce dibrachiata* Oliv.	Herb	Rubiaceae	NE
152	*Steganotaenia araliacea* Hochst.	Tree	Apiaceae	LC
153	*Sterculia africana* (Lour.) Fiori	Tree	Sterculiacea e	LC
154	*Sterculia appendiculata* Engl.	Tree	Sterculiacea e	NE
155	*Stereospermum kunthianum* Cham	Tree	Bignoniacea e	LC
156	*Strophanthus kombe* Oliv.	Liana	Apocynacea e	DD
157	*Strychnos madagascariensis* Poir.	Tree	Loganiaceae	LC
158	*Tabaenamontana elegans* Stapf	Tree	Apocynacea e	NE
159	*Tephrosia micrantha* J.B Gillet	Herb	Fabaceae	NE
160	*Termimalia stenostachya* Engl. & Diels	Tree	Combretace ae	NE
161	*Terminalia sericea* Burch. ex DC.	Tree	Combretace ae	LC
162	*Thespesia garckeana* F . Hoffm.	Tree	Malvaceae	LC
163	*Thilachium africanum* Lour. Fl. Cochinch	Shrub	capparaceae	LC
164	*Trichodesma zeylanicum* (Burm. F.) R. Br.	Herb	Boraginacea e	NE
165	*Tridax procumbens* (L.)	Herb	Asteraceae	NE
166	*Triumfetta rhomboidea* Jacq.	Herb	Tiliaceae	NE
167	*Turraea nilotica* Kotschy & Peyr.	Tree	Meliaceae	LC
168	*Typha domengensis* (Rohrb.) N.E Br.	Herb	Typhaceae	NE
169	*Vernonia oxyura* (O.Hoffm) C. Jeffrey.	Shrub	Asteraceae	NE
170	*Vernonia poskeana* Vatke & Hildebr.	Herb	Asteraceae	NE
171	*Vigna vexillata* (L.) A.Rich	Liana	Fabaceae	NE
172	*Wahlenbergia capitata* (Baker) Thulin	Herb	Acanthaceae	NE
173	*Xanthium strumarium* L.	Herb	Asteraceae	NE
174	*Xeroderris stuhlmannii* (Taub.) Mendonca& EP Sousa	Tree	Fabaceae	NE
175	*Ximenia caffra* Sond	Tree	Olacaceae	LC
176	*Zanha africana* (Radlk.) Exell	Tree	Sapindaceae	NE
177	*Ziziphus mauritiana* Lam.	Tree	Rhamnaceae	LC
178	*Ziziphus mucronata* Willd.	Tree	Rhamnaceae	LC

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APPENDIX I. CRITICAL HABITAT ASSESSMENT

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APPENDIX I

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RESTRICTED

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Project : Kapichira Dam Rehabilitation Project
Country/State: Malawi

Title : Critical Habitat Assessment
Subtitle : Environmental and Social Impact Assessment for Kapichira dam rehabilitation project
Author(s) : Louise MARQUANT (LMA)
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KAPICHIRA DAM REHABILITATION PROJECT
Critical Habitat Assessment

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1. METHODOLOGY OF THE ASSESSMENT

This document presents an assessment of critical habitat around the Shire Valley in the southern region of Malawi. This analysis is conducted as part of the Kapichira Dam rehabilitation project, located within the Majete Wildlife Reserve. The presence of species of conservation concern, which may trigger the designation of critical habitat under established criteria, necessitates this assessment.

1.1. World Bank and IFC Standards for Biodiversity

This report outlines the Critical Habitat Assessment (CHA) conducted for the Kapichira Rehabilitation Hydropower Plant (HPP) project. The CHA has been developed in accordance with the IFC Performance Standards (PS6), guided by Guidance Note 6 (GN 6), and aligned with the World Bank Environmental and Social Standard 6 (ESS6).

Guidance Note 6 supports the implementation of PS6 by providing methodological guidance on "Biodiversity Conservation and Sustainable Management of Living Natural Resources." Similarly, ESS6 emphasizes a differentiated risk management approach to habitats, categorizing them as Modified Habitat, Natural Habitat, and Critical Habitat, as well as legally protected areas and internationally or regionally recognized areas of biodiversity value. These categories may overlap with one another depending on specific ecological and conservation attributes.

ESS6 and PS6 recognize that habitats exist on a continuum, ranging from largely untouched, pristine Natural Habitats to heavily altered Modified Habitats. For example:

- Land subject to shifting agriculture, grazing, hunting, or selective timber harvesting may still qualify as Natural Habitat based on its degree of degradation or restoration.
- Conversely, Critical Habitats may be found within either Modified or Natural Habitats, depending on the presence of biodiversity features meeting specific criteria and thresholds.

This categorization informs the level of risk posed by a project and establishes the mitigation requirements, particularly for impacts such as habitat loss or fragmentation.

ESS6 and PS6 require No Net Loss (NNL) of biodiversity for Natural Habitats and a Net Gain (NG) for Critical Habitats. These outcomes are achieved through a systematic implementation of the mitigation hierarchy, which prioritizes avoidance of impacts, followed by minimization, restoration, and compensation.

Projects within Critical Habitat are permitted only if stringent criteria are met, including:

- Demonstration that no viable alternatives exist in areas of lesser biodiversity value.
- Full compliance with national laws and international commitments of the host country.
- Evidence of no measurable adverse impacts on the biodiversity values for which the habitat was designated.

- Assurance of no anticipated net population decline of any Critically Endangered, Endangered, or restricted-range species.
- Project design to achieve a Net Gain for the biodiversity values associated with the Critical Habitat.

Additionally, a Biodiversity Management Plan (BMP) is mandatory for projects with significant biodiversity risks. Adaptive management approaches and cost-effective mitigation measures must be applied to address uncertainties or gaps in scientific knowledge, adhering to the precautionary principle.

These standards emphasize the integration of robust, long-term biodiversity monitoring and evaluation frameworks into the project's management plan. These frameworks ensure compliance with mitigation measures and facilitate adaptive management over the lifespan of the project.

1.2. Habitat Status and Requirements

1.2.1. Natural Habitats

Natural Habitat comprises areas where the ecological processes and species composition remain largely intact allowing native flora and fauna to thrive, or have been only slightly modified by human activities. These habitats support native species populations and their associated ecological functions.

Natural Habitats include ecosystems that may have been previously impacted but are recovering naturally or through restoration efforts. Examples include primary forests, undisturbed wetlands, and natural grasslands.

Important note: land subject to traditional uses such as hunting, grazing, or timber harvesting may still qualify as Natural Habitat if the level of degradation is minimal or reversible.

Regarding the ESS 6, if natural habitats are identified as part of the assessment, the Borrower will seek to avoid adverse impacts on them in accordance with the mitigation hierarchy. Where natural habitats have the potential to be adversely affected by the project, the Borrower will not implement any project-related activities unless:

- (a) There are no technically and financially feasible alternatives; and
- (b) Appropriate mitigation measures are put in place, in accordance with the mitigation hierarchy, to achieve no net loss and, where feasible, preferably a net gain of biodiversity over the long term.

When residual impacts remain despite best efforts to avoid, minimize, restore and mitigate impacts, and where appropriate and supported by relevant stakeholders, mitigation measures may include biodiversity offsets adhering to the principle of "like-for-like or better."

1.2.2. Modify Habitats

Modified habitat refers to areas that have been significantly altered by human activity. These habitats often support ecosystems that are influenced or managed by humans, such as agricultural land, urban areas or plantations. They may retain ecological functions or biodiversity features, but at reduced levels compared to natural habitat. Despite these modifications, biodiversity may still persist, including species of conservation concern.

Examples include areas used for shifting agriculture, selectively logged forests, or urban green spaces.

In those habitats this is require to avoid significant conversion or degradation of habitat unless no viable alternatives exist and social, economic or environmental benefits outweigh the costs. It has to apply the mitigation hierarchy to minimize impacts on biodiversity and encourage measures to improve biodiversity and ecosystem services within the habitat.

1.2.3. Critical Habitats

Critical habitats (CH), as defined by international standards, are areas with a high biodiversity value and major conservation challenges. They are defined according to species and ecosystems:

- Criterion 1: Critically Endangered (CR) or Endangered (EN) species on the IUCN Red List or equivalent national approaches;
- Criterion 2: Habitats of crucial importance for endemic and/or restricted-range species;
- Criterion 3: Areas of great importance hosting significant international concentrations of migratory and/or unique species;
- Criterion 4: Seriously threatened and/or unique ecosystems;
- Criterion 5: Areas associated with key evolutionary processes and areas that feed into ecological networks.

Projects in Critical Habitat must achieve Net Gain for biodiversity values and ensure no measurable adverse impacts on the criteria for which the habitat was designated. Moreover, this is required to develop a Biodiversity Management Plan (BMP) with robust, long-term monitoring and evaluation programs and to design and implement adaptive management strategies to address uncertainties.

ESS6 require several conditions to implement any project activities that have residual adverse impacts in CH area:

- (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. In circumstances where the project involves new or renewed forestry or agricultural plantations, it will not convert or degrade any critical habitat;
- (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.

As the World Bank does not provide specific guidance or thresholds for determining critical habitats, critical habitats were assessed using the thresholds specified in IFC Guidance Note 6 (IFC, 2019), which underpins IFC PS6 (IFC, 2012) for the first four criteria.

Note that, regarding the Guidance Note, projects that are located within internationally and/or nationally recognized areas of high biodiversity value may require a critical habitat assessment. Examples include the following:

- Areas that meet the criteria of the IUCN's Protected Area Categories Ia, Ib and II.
- Key Biodiversity Areas (KBAs), which encompass Important Bird and Biodiversity Areas (IBAs).

1.3. Definition of Terms

Several terms in this report will be used and are explain below.

***Shire Valley*:** The valley of the upper, middle and lower Shire River, including aquatic, wetland and terrestrial habitats. In this document, the Shire valley is considered in the southern region of Malawi.

Ecologically Appropriate Area of Analysis (EAAA): The Ecologically Appropriate Area of Analysis (EAAA) is the geographic area evaluated during the Critical Habitat Assessment (CHA) and is defined for each feature or group of similar features. It takes into account the location of the project and its Area of Influence (AOI), but excludes the project type, impacts or mitigation strategy in determining the presence of critical habitat. The methodology for determining the EAAA is described in Section 1.4.1 and determined in Section 3.3.2.

Project study area: The project study area include the direct footprint area, the construction influence area and its Area of Influence (AoI).

- The direct footprint area encompasses locations directly impacted by the project, including the dam area , the reservoir, and the construction site for new permanent structures. This area overlaps with the Majete Wildlife Reserve, though some parts are now unfenced and used for construction.
- The construction influence area is including the direct footprint area and all areas needed for the construction activities including the quarry site, the camp site, the damping site and access roads to the direct footprint area.

- The AoI extends beyond the direct footprint to include surrounding ecological zones where species might be indirectly affected. This broader scope is extent to upstream of the dam reservoir to the Elephant Marsh Ramsar site. It helps integrate the project into its ecological context and address conservation concerns more holistically.

The project study area was considered for the field study of the ESIA for terrestrial and aquatic ecology.

1.4. Approach to Critical Habitat Assessment

The Critical Habitat Assessment (CHA) is conducted using the following methodology:

- Stakeholder Consultation and Literature Review: Engaging with relevant stakeholders and reviewing existing data sources to gather baseline information.
- Field Data Collection and Verification: Conducting on-site surveys to collect ecological data and validate findings.
- Critical Habitat Assessment, which encompasses:
  - Screening for species around the Shire valley (southern region of Malawi) that may qualify for Critical Habitat.
  - Identification of the Ecologically Appropriate Area of Analysis (EAAA) for mammals, birds, and reptiles included in the screening process.
  - Verifying biodiversity features that meet the criteria for Critical Habitat in accordance with IFC Performance Standard 6 (PS6) and its accompanying Guidance Note (GN6).

1.4.1. Identification of the Ecological Area of Appropriate Analysis (EAAA)

Regarding the IFC Standards, the EAAA is a geographic area defined by an ecologically relevant unit for determining if a project is located in a CH. The EAAA is specific to each priority biodiversity value and may overlap with groups of similar features. Indeed, when multiple ecological values share overlapping requirements and distributions, establishing a unified or aggregated critical habitat area may be both practical and appropriate.

The GN 59 in GN 6 specify that the EAAA considers the spatial distribution of species and ecosystems, along with the ecological patterns, processes, features and functions that sustain them. Moreover, these boundaries should go beyond the direct footprint area and the AoI: "*The definition of the critical habitat is based on the presence of high biodiversity values whether or not a project is to be undertaken in that habitat. Clients should not assert that they are not in critical habitat on the basis of the project's footprint or its impacts."* (GN60 and PS 6 – IFC 2012b). The EAAA often include natural elements such as catchments, major rivers, or geological features.

The EAAA will represent the spatial area for assessing the CH with the quantitative thresholds or criteria 1-3.

1.4.2. Verifying biodiversity features that meet the criteria for CH

In the Guidance Note, numerical thresholds have defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems).

The thresholds presented in this Guidance Note were obtained from globally standardized numerical thresholds published in the *IUCN's A Global Standard for the Identification of Key Biodiversity Areas and Red List Categories and Criteria*[1].

These thresholds will be use in the present report as an indicative guideline for decision-making.

For Criterion 5, there are no numerical thresholds. Best available scientific information and expert opinion should be used to guide decision-making with respect to the relative "criticality" of a habitat in these cases.

Table 1-1 : Criteria for IFC Critical Habitat Screening Performance Standards 6

IFC PS6 Criteria	ESS 6 Criteria	Description	IFC PS6 Threshold(s) – GN 6
Criterion 1 Threatened species Critically Endangered (CR) / Endangered (EN)	(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	Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. Critically Endangered species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild. As described in footnote 11 of Performance Standard 6, the inclusion in Criterion 1 of species that are listed nationally/regionally as CR or EN in countries that adhere to IUCN guidance shall be determined on a project-by-project basis in consultation with competent professionals.	(a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species). (b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (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 of criteria (a). (c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

1 IUCN (2016). A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN.

IFC PS6 Criteria	ESS 6 Criteria	Description	IFC PS6 Threshold(s) – GN 6
Criterion 2 Endemic and restricted range species	(b) Habitat of significant importance to endemic or restricted-range species	For purposes of this Guidance Note, the term endemic is defined as restricted range. Restricted range refers to a limited extent of occurrence (EOO). -For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km^2) -For marine systems, restricted-range species are provisionally considered those with an EOO of less than 100,000 km^2. -For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).	(a) Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species.
Criterion 3 Migratory and Congregatory species	(c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species	Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem). Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis. Examples include the following: -Species that form colonies. -Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (for example, foraging and roosting). -Species that utilize a bottleneck site where significant numbers of individuals of a species occur in a concentrated period of time (for example, for migration). -Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (for example, wildebeest distributions). -Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).	(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.
Criterion 4 Highly threatened and/or unique ecosystems	(d) Highly threatened or unique ecosystems	The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed, the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized NGOs).	(a) Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of 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.

IFC PS6 Criteria	ESS 6 Criteria	Description	IFC PS6 Threshold(s) – GN 6
Criterion 5: Areas associated with key evolutionary processes and areas that feed into ecological networks.	(e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).	Examples include the following: -Landscapes with high spatial heterogeneity are a driving force for speciation, as species are naturally selected for their ability to adapt and diversify. -Environmental gradients (ecotones) create transitional habitats that have been associated with speciation and high species diversity. -Edaphic interfaces are specific juxtapositions of soil types that have led to the formation of unique plant communities characterized by both rarity and endemism. -Connectivity between habitats (such as forest corridors) allows species migration and gene flow, which is particularly important for biodiversity conservation. -Sites that have been shown to be important for the adaptation of species or ecosystems to climate change are also included in this criterion.	

2. ASSESSMENT OF NATURAL AND MODIFIED HABITATS

2.1. Habitats within the project area

The direct footprint area is located in the upper, middle and lower Shire Valley in the southern region of Malawi, where natural habitats are largely confined to protected areas such as Majete Wildlife Reserve, Lengwe National Park, and Liwonde National Park. These areas support mopane and miombo woodlands, riverine forests, and native thickets, which are among the most ecologically significant habitats in the region.

Outside of these protected areas, the most notable natural woodland is found on customary land along the Chikwawa-Thyolo escarpment (covering approximately 21,000 ha) in the eastern part of Chikwawa District. This escarpment, located within the jurisdictions of Traditional Authorities Makhuwira, Maseya, Katunga, and Mlilima, plays a critical ecological role as a watershed for several major rivers feeding into the Shire River. Recognizing its importance, the Department of Forestry has implemented an Improved Forest Management for Sustainable Livelihood Programme to work with local communities on conservation efforts.

The Shire Valley natural habitats also include permanent and seasonal wetlands, and floodplain grasslands. These ecosystems have developed under natural hydrological cycles, including seasonal flooding, which plays a key ecological role in nutrient cycling, habitat connectivity, and species life cycles—particularly for aquatic fauna, waterbirds, and floodplain vegetation.

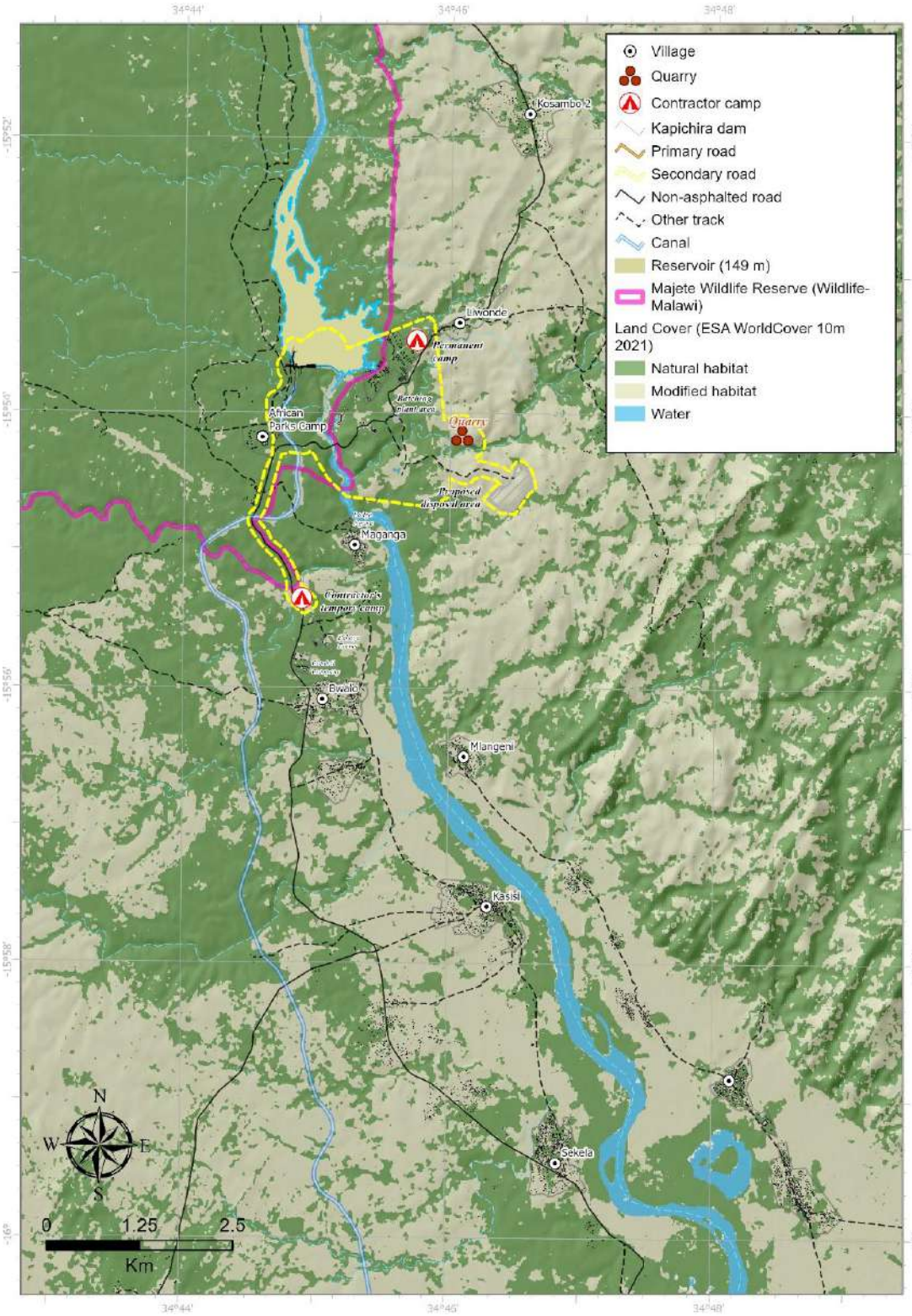
Such habitats are typically resilient to natural disturbances, including seasonal inundation, and support a high level of biodiversity, including migratory birds, endemic plant species, and wetland-dependent mammals such as hippos. Their ecological functioning, however, can be disrupted when natural flooding regimes are altered by human interventions such as dam operations or land conversion.

Indeed, the plant biodiversity assessment conducted in the proposed project area highlighted significant variations in habitat modification levels across different locations. Sampling plots were used to assess the extent of natural and modified habitats (Figure 2-1), which were modify habitats were classified according (following table):

- Habitats modified by cultivation: Land conversion for agriculture has resulted in the clearing of native vegetation, soil tillage, and the application of fertilizers and pesticides, significantly altering soil structure, hydrology, and plant communities.
- Habitats modified by altered flooding regimes: These areas have been shaped by seasonal and extreme flooding events. In some cases, such flooding patterns have been modified by upstream dam operations, resulting in changes in vegetation dynamics, sediment deposition, and hydrological flow.
- Habitats modified by sediment deposition: Changes in sediment transport and deposition, influenced by dam-related flow regulation, have altered the composition and physical structure of certain areas. These modifications can result in increased or reduced sediment loads in specific zones, leading to changes in soil characteristics, drainage, and plant community composition—often favoring generalist or disturbance-adapted species over native specialists.

Table 2-1 : Habitat screening around the Shire valley

Habitat / Vegetation Community	Status	Rationale
Mixed Deciduous Forests	Modified / Natural in protected areas	Once extensive, these forests have been reduced due to logging, firewood collection, and land conversion. Some patches remain intact in protected areas, but fragmentation has affected connectivity for forest-dependent species.
Dry Miombo Woodlands	Modified / Natural in protected areas	While still dominated by *Brachystegia* and *Julbernardia,* frequent fires and charcoal production have significantly degraded these woodlands. Regeneration is slow, leading to lower biodiversity and ecosystem function. Some patches remain intact in protected areas.
Dense Thickets of Dry Savanna Woodlands	Largely Natural	Thickets remain important refuge areas for fauna, particularly within protected zones (Lengwe, Majete). However, some areas have been affected by overgrazing, fire, and selective tree cutting.
Riparian Forests (Shire River, tributaries)	Modified / Natural in protected areas	Hydrological changes from dam construction (Kapichira, Kamuzu Barrage) have altered seasonal flooding patterns, impacting forest structure and species composition. Still provides conservation concern habitat for birds, primates, and amphibians.
Elephant Marsh and Other Wetlands	Modified	Historically a dynamic floodplain wetland, now altered by sedimentation, agriculture, and reduced connectivity to the Shire River. Despite modifications, it remains a key site for migratory birds and fish spawning.
Hillslope Savanna & Woodland Mosaics	Natural Largely intact	though increasing grazing pressure and fire frequency may shift species composition. Key habitat for ungulates and raptors.
Degraded Agricultural Land & Settlements	Highly Modified	Large portions of the valley have been converted for agriculture (maize, sorghum, rice) and settlements, leading to significant habitat loss and soil degradation



Source: ESA World Cover 10m, 2021

Figure 2-1 : Natural and Modified habitats in the project study area

2.2. Protected Areas and Internationally Recognised Areas

A protected area, the Majete Wildlife Reserve (MWR) is located within the direct footprint project area.

An international recognized area, the Elephant Marsh Ramsar Site, is located in the project area of influence less than 20 km from the direct footprint area.

Other protected areas are located between 50 and 130 km from the Kapichira HPP project respectively the Lengwe National Park and the Liwonde National Park.

These areas are described in the table below.

Protected Areas	Description
Lengwe National Park (928 km²)	Lengwe National Park (NP) is designated as national park in 1970 and is under national protection prohibiting hunting and habitat destruction. It is recognized as an Important Bird Area (IBA). Lengwe National Park is notable for its population of Nyala (*Tragelaphus angasii*), which is at the northernmost limit of its range in this park. The park also supports various other species, including African Buffalo (*Syncerus caffer*), Impala (*Aepyceros melampus*), Common Warthog (*Phacochoerus africanus*), Greater Kudu (*Tragelaphus strepsiceros*), Bushbuck (*Tragelaphus scriptus*), and a variety of bird species including tracking data from 2021 indicates that White-backed Vultures utilize habitats within Lengwe, suggesting the presence of this Critically Endangered species.
Liwonde National Park	Liwonde NP is designated as NP in 1975, it is afforded the highest level of protection under Malawian law. It is recognized as both Key Biodiversity Area (KBA) and IBA. Liwonde NP is known for its successful conservation and rehabilitation efforts. Due to its significant reintroduction, it is a key area for biodiversity in the region. The park hosts a variety of species, including African Savanna elephants (*Loxodonta africana*), hippopotamus (*Hippopotamus amphibius*), Nile crocodiles (*Crocodylus niloticus*), and over 380 bird species. Notably, cheetahs (*Acinonyx jubatus*) and lions (*Panthera leo*) have been reintroduced, and the park supports populations of Black rhinoceros (*Diceros bicornis*) and African Wild dogs (*Lycaon pictus*). Following the reintroduction of predators like cheetahs (*Acinonyx jubatus*) and lions (*Panthera leo*), Liwonde has seen the return of several vulture species after a two-decade absence. Notable species include: White-backed Vulture (*Gyps africanus*), Hooded Vulture (*Necrosyrtes monachus*), White-headed Vulture (*Trigonoceps occipitalis*) and Lappet-faced Vulture (*Torgos tracheliotos*). Additionnaly in 2018, the first sighting of a Rüppell's Vulture (*Gyps rueppelli*).

Protected Areas	Description
Majete Wildlife Reserve (700 km²)	MWR is designated as a wildlife reserve 1955 and is protected under national law, with specific regulations to conserve wildlife and their habitats. The reserve is home to the "Big Five" (Lion (*Panthera leo*), Leopard (*Panthera pardus*), African Savanna Elephant (*Loxodonta africana*), Black Rhinoceros (*Diceros bicornis*), and African Buffalo (*Syncerus caffer*)), along with other species such as Sable Antelope (*Hippotragus niger*), Common eland (*Tragelaphus oryx*
Elephant Marsh (1,200 km²)	While not designated as a national park or reserve, Elephant Marsh is designated as a Ramsar Wetland of International Importance in 2017. The area is considered as a KBA since November 2014. The site covers an area of approximately 61,556 hectares and is situated in the lower Shire valley in southern region of Malawi. It is recognized for its ecological importance, and efforts are underway to manage and conserve its resources sustainably. The Ramsar designation underscores the ecological significance of Elephant Marsh, particularly its role in supporting over 20,000 waterbirds, including threatened species such as the Madagascar Pond heron (*Ardeola idae*), Wattled Crane (*Bugeranus carunculatus*), and Grey Crowned Crane (*Balearica regulorum*). The marsh also plays a crucial role in maintaining the valley's hydrological regime through flood control, water storage, and the supply of nutrient-rich sediment. The marsh supports also populations of hippopotamus (*Hippopotamus amphibius*), and Nile crocodiles (*Crocodylus niloticus*).

Other areas of conservation interest are located between 50 and 130 km from the Kapichira HPP. The table below describes the Key Biodiversity Areas (KBAs) within this wide buffer.

Key Biodiversity Areas	Description
Liwonde Hills Forest Reserve	13% of the Liwonde national park is considered as a KBA and an IBA. The Liwonde Highlands comprise a chain of four round hills on a 32 km ridge, rising from the Lake Shore plain and Lake Chilwa. Chikala Hill, the easternmost and highest at 1,626 meters, hosts one of Malawi's finest patches of mid-altitude rainforest, covering 285 hectares between 1,300 and 1,600 meters elevation. The area supports various bird species, including the IUCN vulnerable species Thyolo Alethe (*Chamaetylas choloensis*), which inhabits the ground stratum of mid-altitude forests.
Zomba Mountains	This area is also considered as an IBA. The Zomba Plateau, part of the Zomba Mountains, reaches elevations up to 2,087 meters. The plateau's unique montane forests and grasslands are crucial for biodiversity conservation. The area is home to several bird species, including the IUCN vulnerable species Thyolo Alethe (*Chamaetylas choloensis*).
Ruo River	The Ruo River, a tributary of the Shire River, forms part of the boundary of the South Malawi montane forest–grassland mosaic ecoregion. The riverine habitats support various bird species, though specific threatened species are not well-documented.

Key Biodiversity Areas	Description
Thyolo tea estates	The Thyolo area, known for its tea estates, was once covered by montane forests. Deforestation for tea cultivation has led to habitat loss, threatening species like the Thyolo Alethe (*Chamaetylas choloensis*) which is native to this region.
Soche Mountain Forest Reserve	Soche Mountain, located near Blantyre, is part of the South Malawi montane forest–grassland mosaic ecoregion. The forest reserve protects montane forest habitats. The area supports various bird species, though specific threatened species are not well-documented.
Mountain Mulanje Forest Reserve	This area is also considered as an IBA. Established in 1927, the Mulanje Mountain Forest Reserve covers 56,317 hectares and was designated as a UNESCO Biosphere Reserve in 2000. The reserve protects unique montane ecosystems, including endemic species. The reserve is home to the Mulanje Cedar (*Widdringtonia whytei*), endemic to the area, and bird species like the Thyolo Alethe (*Chamaetylas choloensis*).
Malawi Hill Forest Reserve	The Malawi Hills, including areas like Matandwe Forest Reserve, have faced severe encroachment and deforestation, impacting biodiversity. The vulnerable Thyolo Alethe (*Chamaetylas choloensis*) is found in some forest reserves within this region.

All the areas described above are presented in the following figure.

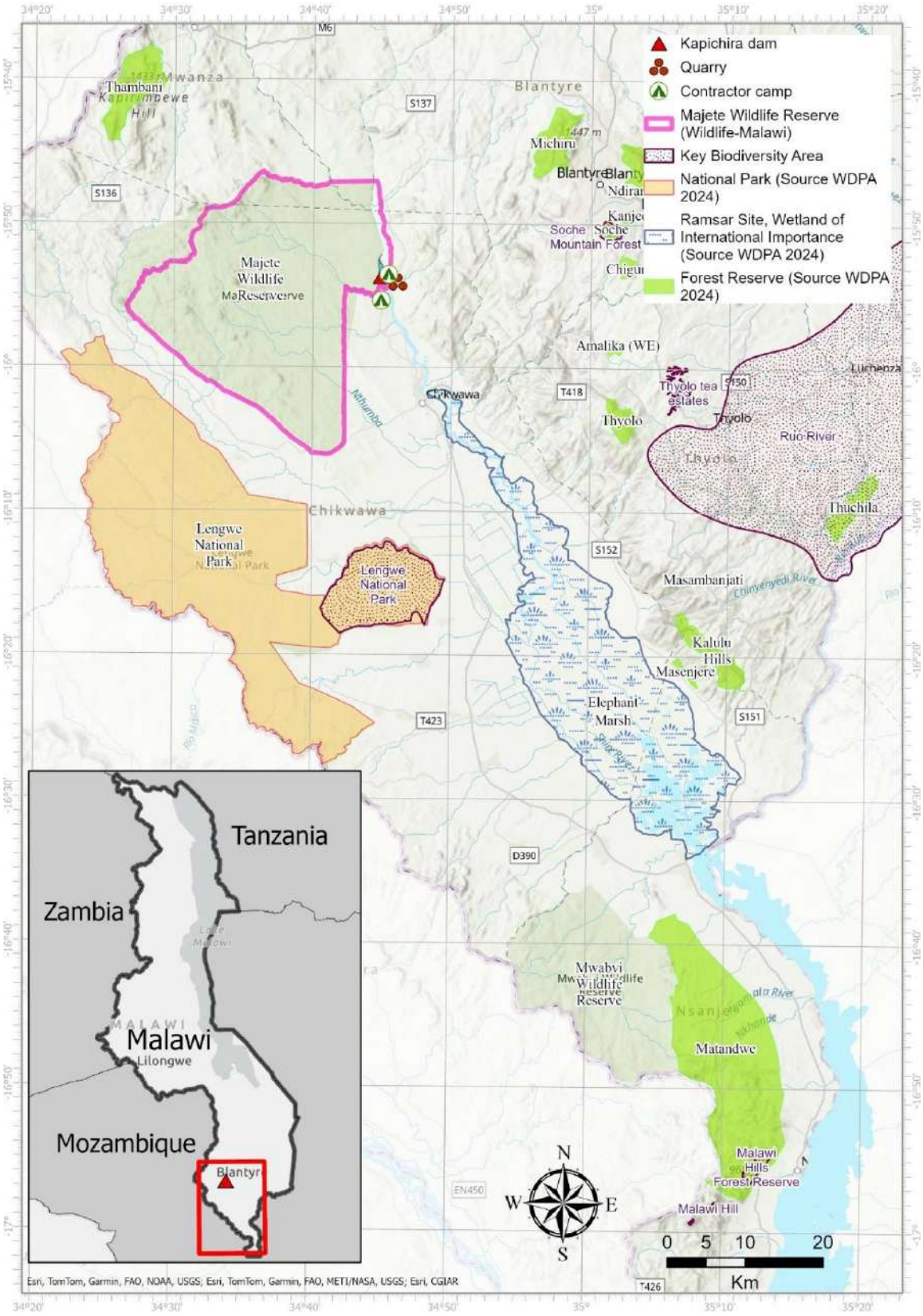


Figure 2-2 : Protected and internationally recognized areas in the southern region of the Shire valley

3. CRITICAL HABITAT DETERMINATION

3.1. Stakeholder consultations and literature review

3.1.1. Stakeholder consultations

Stakeholders consulted has included in August 2024:

- The Elephant Marsh Authorities
- The Majete Wildlife Reserve Authorities

The aim was to identify key conservation concerns and biodiversity values in terms of species and habitats within these two areas of interest.

Majete Wildlife Reserve (MWR)

The meeting on the 9 August 2024 was set with three members of the conservation team of African Parks. Michael Tamala, Craig Thomas from the African Park's conservation team, along with Martin Awazi, the operations manager were interviewed and several concerns related to the dam's presence were highlighted:

- Illumination from infrastructure near the dam causes light pollution, disrupting the life cycles of nocturnal species including bat species and creating ecological traps for many invertebrates, which are essential in the food chain. The operations manager recommended adjusting the lighting orientation towards the ground to mitigate these effects.
- Variations in the water levels of the Shire River and the reservoir have led to certain species being confined to the west bank. For instance, monitoring indicated that elephants were stranded on this side of the reserve for up to 100 days due to elevated water levels preventing crossing.
- The Majete Business Plan for 2025–2027 was shared and discussed with the conservation team regarding issues related to prey dynamics, overgrazing by herbivores, and the monitoring program for species that are well surveyed in the reserve.
    - Due to the hydropeaking of the dam operation upstream of the reserve, the bank of the Shire river in the MWR are highly degraded. No viable populations are fishes needing spawning areas for breeding are present in this section of the river (between the Tedzani dam and the Kapichira dam) as for the Oreochromis species.
    - The overgrazing of vegetation limit the restoration of riparian habitats along the bank in the MWR.

- Four White-headed Vulture nests were recorded on 6 and 7 October 2020 in MWR during the bi-annual aerial wildlife survey. All four nests were located in Baobabs and had at least one adult present when first observed. Due to the remote location of the nests, and minimal aerial support, consistent monitoring was not possible. However, initial observations in October confirmed one chick had hatched and survived until at least 3 months of age. On 13 December 2020 aerial photographs of empty nests were taken, and it was observed that one had a large amount of whitewash, suggesting it was active for a prolonged period. However, no successful fledging of chicks could be confirmed. Recommendations Identifying vulture breeding sites is essential for species monitoring and to inform conservation management of Malawi's recovering vulture populations. Here, two White-backed Vulture and one White-headed Vulture breeding sites were identified. To our knowledge, this is the first published account of White-headed Vultures breeding in Malawi's Southern Region since the 1990s (source from the Lilongwe Wildlife Trust).

Thangadzi River Conservancy:

The meeting was set on the 8 of August 2024 with Mr. Nyirenida wich is a member of Tangadzi River Conservacy (TRC) in the south of the Ramsar site and as part of the Community Conservation of the Marsh. He performs ecotourism activities for bird biodiversity and also trainings with local communities for fishes conservation.

Discussions with members of the Thangadzi River Conservancy, focusing on the conservation of the Elephant Marsh, revealed the following insights:

- Fluctuations in water levels at Elephant Marsh significantly impact flamingo populations, e.g. the Greater Flamingo (*Phoenicopterus roseus*) and Lesser Flamingo (*Phoeniconaias minor*). Between 2020 and 2024, the water receded by approximately 1 km, leading to the complete dryness of certain areas. These changes affect flamingos in several ways:
  - Food availability: As the marsh dries up, aquatic invertebrates and microalgae, which are key food sources for flamingos, become scarce, limiting their ability to feed in the region.
  - Loss of suitable habitat: Flamingos rely on shallow waters for foraging and resting. A severe drop in water levels leads to habitat loss, while a sudden rise can make these areas inaccessible.
  - Disruption of migratory cycles: Since flamingos can only use the site temporarily depending on hydrological conditions, they are forced into frequent migrations. This increases their energy expenditure and exposes them to additional threats, such as predation, lack of resting sites, and stress.
- The presence of invasive weeds, particularly Water Hyacinth (*Eichhornia crassipes*), along with three to four species of reeds and borage, poses a threat to the native ecosystem.
- The increasing human population exerts intense pressure on the natural resources, resulting in increased water abstraction, conversion of natural vegetation, and biodiversity losses.

These hydrological fluctuations, largely influenced by upstream water management and climate variability, have critical implications for the long-term suitability of Elephant Marsh as a key stopover site for flamingos and other waterbirds such as the African Skimmer (*Rynchops flavirostris*). Alterations in water flow and sediment deposition can significantly impact these ecosystems.

It's important to note that initial assessments suggest the water level fluctuations in the Elephant Marsh are primarily influenced by Lake Malawi, indicating that rehabilitation efforts may not directly impact this downstream area.

3.1.2. Literature review

A literature review was conducted to assess the baseline conditions of the Project and provide insights for the Critical Habitat Assessment (CHA). Key sources of project-related information included:

- Key Biodiversity Areas (KBAs) based on the Integrated Biodiversity Assessment Tool (IBAT) extracted from the World Database of Key Biodiversity Areas.
- World Database Protected Areas (WDPA).
- Guidelines for applying management categories to protected areas. Gland, Switzerland: IUCN, Dudley, N. (Editor) (2008).
- IUCN Red Lists from the IUCN database, 2024: https://www.iucnredlist.org/.
- IBAT (Integrated Biodiversity Assessment Tool) database used to identify the theoretical ranges of species in relation to the project right-of-way.
- Malawi Environmental Law – Act No. 19 of 2017 published the 5th of May, 2017.
- Malawi National Plant Red List, 2002.
- Scientific literature on Malawi's biodiversity and threats (see Appendix A for detailed references).
- Malawi – List of fauna and flora species encountered in the Majete Wildlife Reserve in 2023.

Ministry of Agriculture, Irrigation and Water Development. (August 2016). Shire River Basin Management Programme (Phase I). Climate Resilient Livelihoods and Sustainable Natural Resource Management in the Elephant Marsh, Malawi. Sub-Study 4: Biodiversity of the Elephant Marsh.

The Literature review also included other projects around the Kapichira HPP Rehabilitation Project to understand the cumulative impacts, implemented mitigation measures and baseline of the Chikwawa distric. Projects include the Shire Valley Irrigation Project and the Mpatamanga Dam upstream of Kapichira Dam.

- Malawi – Shire Valley Transformation Program: environmental and social impact assessment, environmental and social management plan, and pest management plan – executive summary (English), World Bank Group, Washington, D.C., 2017/08/25.
- Malawi – Shire Valley Transformation Program - Updated environmental and social impact assessment for the Shire Valley Irrigation Project, 2017/08/08.
- Malawi – Mpatamanga Hydropower Project – Environmental & Social Impact Assessment Volume II – Main ESIA Report, 2024/07/31.
- Malawi – Mpatamanga Hydropower Project – Environmental & Social Impact Assessment Volume III – Environmental & Social Management & Monitoring Plan, 2024/07/31.

- Malawi – Mpatamanga Hydropower Project – Key Impacts and Mitigation Measures.
- Malawi – Cumulative Impact Assessment (CIA) of the Mpatamanga HPP on the Shire River Basin.
- Malawi – Majete Wildlife Reserve – Environmental Management Plan for Working in Majete Wildlife Reserve for outside organizations/contractors, 2019/08.

3.2. Field data collection and field verification of existing Information

A campaign of field data collection was also done for Habitat, Mammals, Birds, Herpetofauna and Invertebrate surveys.

The fieldwork lasted two weeks in order to cover the area of direct and indirect impact[2]. The mission was carried out between 2024, 6 and 16 August.

The first week was dedicated to meetings with the stakeholders, namely the Majete reserve and the authorities of the Ramsar site downstream of the project, as well as to carrying out the first inventories in the right-of-way zone of the dam and directly downstream.

The second week's inventories were carried out in the construction zone and in the indirect zone downstream of the project (around the Chikwawa floodplain as identified in the scoping report).

Flora Sampling:

Plant specialists conducted surveys using transects and quadrats (10x10m, spaced 100m apart along gradients perpendicular to slopes). Sampling targeted all habitat types, with 2–3 quadrats per habitat to ensure representativeness. Both structured and semi-random approaches were employed. Data collected included habitat type, GPS coordinates, canopy cover, and other structural details. Unidentified species were photographed and later identified with assistance from the National Herbarium and Botanical Gardens of Malawi.

Terrestrial Invertebrate Sampling:

A review of existing data identified invertebrate species of conservation concern, including IUCN- and CITES-listed species. Field methods included traps (e.g., butterfly traps), hand-picking, scooping, shrub shaking, and photographic documentation. Specimens were preserved for laboratory identification, ensuring comprehensive coverage of habitat types.

Aquatic Invertebrate Sampling:

Dip nets, sedimentation, and stone-rolling techniques were employed to collect invertebrates from various habitats along the Shire River.

[2] Scoping report – Environmental and Social Impact Assessment for the Desing and Construction Supervision of Kapichira Dam Rehabilitation Project. TRACTEBEL, 2024.

Herpetofauna Sampling:

Surveys targeted wetlands, forests, riverine areas, and farmland using opportunistic sampling and active searches (e.g., examining leaf litter, rock crevices, and water bodies). Community interviews provided additional insights into species encountered locally. Data were recorded in the field, with unidentified species photographed for later identification at the Museums of Malawi.

Bird Sampling:

Bird surveys employed transects, listening points, and mist netting in riparian, woodland, and wetland habitats. Observations included visual and auditory identifications, supplemented by interviews with local communities. Key objectives included documenting species of conservation concern and assessing potential sensitivity to project activities.

Mammal Sampling:

Mammals were studied using opportunistic methods (e.g., burrow inspections, tracking footprints, and scat analysis) and systematic live trapping for small and medium-sized species. Local communities were interviewed and provided with field guides to confirm species presence. Data collection included descriptions of habitats and photographic documentation of burrows, tracks, and scat.

Aquatic Sampling:

Fish diversity was assessed using independent (cast netting) and dependent (fisher-based) approaches. Sampling targeted both river and reservoir areas, with minimal stress to captured fish. The dependent approach involved collaboration with local fishers, with data collected at landing sites. Fishing activities were excluded in protected areas like Majete Wildlife Reserve.

3.3. Critical Habitat qualifying species

Species known to inhabit the Middle and Lower Shire valley and potentially present within the Kapichira HPP project area, based on habitat suitability, are identified and detailed in Table 3 1. These species, which may qualify for Critical Habitat, include the following categories (criterion 1 to criterion 3):

- Threatened Species: Listed as Critically Endangered (CR) or Endangered (EN) at the global or national level.

  Species Recognized by the IUCN as Vulnerable (VU) can be considered where their presence is confirmed or highly likely, particularly if they are near the threshold for being classified as Endangered or are of particular concern to stakeholders.
- Restricted-Range Species: Those with a confirmed or likely Extent of Occurrence (EOO) of less than 50,000 km², or aquatic species with a distribution spanning 500 km or less in a linear geographic range.
- Migratory and Congregatory Species: Species known for migratory behavior or those that gather in significant numbers.

A list of these species was preliminary determined and field-investigations, data provided by African Parks and literature review were used to precise the list.

A preliminary table (see Table 3 1) was developed to identify which species could be subject to quantitative thresholds and which ones would automatically trigger the critical habitat designation based on bibliographic data. The screening process considered several factors:

- The suitability of their habitat within the regional context;
- Their known occurrences and population abundances;
- The likelihood of meeting critical habitat criteria based on quantitative thresholds.

For instance, a species with a broad distribution range and no particular regional or national significance would be screened out. This approach ensures that only species meeting the necessary ecological and conservation criteria are considered in the assessment.

Note: Some bird species, present in the Elephant Marsh were screened “in” for the criterion 3 due to the concentration in the Ramsar site. Indeed, under the Ramsar Convention, a wetland is considered internationally important if it regularly supports 1% or more of the biogeographic population of a waterbird species. This same 1% threshold is used in international environmental standards—such as the World Bank’s Environmental and Social Standard 6 (ESS6) and IFC Performance Standard 6 (PS6)—to identify critical habitats under Criterion 3(c). Therefore, sites meeting the Ramsar 1% criterion for migratory or congregatory species may also qualify as critical habitat, particularly when those species occur regularly.

Table 3-1 : Screening for critical habitat qualifying species

Taxa	Scientific Name	Common name	IUCN Status	Criteria 1 CR / EN species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory species	Habitat and Description	Likelihood of occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Fish	*Oreochromis mossambicus*		VU			X	It inhabits various aquatic environments except fast-flowing waters, thriving in standing waters	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023.	The spawning of *Oreochromis* species requires still waters, which are not present in the middle and lower Shire waters, making it an unsuitable breeding ground for these fish, and thus none of these species trigger Critical Habitat under the World Bank's ESS6. Additionally, while the Middle Shire River hosts around 30 fish species, it lacks viable populations of certain stragglers such as *Oreochromis karongae*, whose occasional presence does not impact the area's Critical Habitat status.	**Out**
	Oreochromis Karongae		CR	X			Oreochromis karongae is one of three "Chambo" species native to Lake Malawi.	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023		**Out**
	Bagrus meridionalis		CR	X	X		This species is one of the most common and widely distributed fish in Lake Malawi, primarily inhabiting rocky areas in both shallow and deep waters. In the Shire River and Lake Malombe, where rocky structures are absent, it is mostly found foraging over sandy or muddy substrates.	Low	While the Middle Shire River hosts around 30 fish species, it lacks viable populations of certain stragglers such as *Labeo mesops*, *Bagrus meridionalis*, *Serranochromis robustus*, and *Oreochromis karongae*, whose occasional presence does not impact the	**Out**
	Serranochromis robustus		CR	X	X		Demersal fish commonly found in shallow, vegetated areas and along rocky shores at depths of 2–5	Species surveyed during Kapichira HPP		**Out**

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							meters. It also occurs in the lower reaches of large inflowing rivers, including the Upper and Middle Shire River, where juveniles are found in smaller streams. Poorly-conditioned specimens are occasionally caught in the Lower Shire, having come over the falls from the Middle Shire, but no established subpopulation exists there.	Rehabilitations ESIA, 2023	area's Critical Habitat status.	
	Labeo mesops	Ntchila	CR	X			This is a benthic species, which lives in shoals over sandy bottoms in relatively sheltered shallow waters. In some areas large shoals were reported in the past (pre-1970s) to be seen a mile or more offshore	Low		**Out**
	Labeo cylindricus		LC			X	Benthic species forms which shoals over sandy bottoms in sheltered shallow waters	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.		**In**
	Labeobarbus congoro		LC			X	This species is found in the low-veld reaches of larger rivers, inhabiting a range of habitats from rocky substrates to vegetated muddy areas.	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023.		**In**
	Opsaridium microcephalum		LC		X		versatile species found in both lake and river systems, with adults inhabiting pelagic and inshore lake zones and juveniles preferring shallow areas. It feeds on small shoaling fish along shorelines. The species has both resident riverine and lacustrine populations, with the former being smaller. Spawning	The species is endemic to Lake Malawi, its catchment, and the Lower Shire Species observed in Elephant Marsh in 2015.		**In**

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							occurs through upstream migrations into shallow, gravel-rich streams and on exposed rocky lake shores.			
	Anguilla bengalensis labiate	African Mottled Eel	LC			X	This species if found in the running water in the upper reaches.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023. Species present in the Middle Shire river.		In
	Trigonoceps occipitalis	White-headed Vulture	CR	X			This species prefers mixed, dry woodland at low altitudes and avoids semi-arid thornbelt areas. It nests in trees, particularly Acacia and baobab species,	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023. Known occurrences between Liwonde NP, Lengwe NP and MWR.	This species is documented Classified as CR by the IUCN, for its known occurrences and inter-park movements. Its status and anthropogenic threats make it a high conservation priority. Its presence in the Chikwawa area is likely to qualify it as CH under Criterion 1.	In
Birds	*Gyps africanus*	White-backed Vulture	CR	X			Lowland species of open wooded savanna, particularly areas of Acacia. It requires tall trees for nesting, but has also been recorded nesting on electricity pylons in South Africa.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	This species is documented Classified as CR by the IUCN, for its known occurrences in the MWR. Its status and anthropogenic threats make it a high conservation priority. Its presence in the Chikwawa area is likely to qualify it as CH under Criterion 1.	In
	Necrosyrtes monachus	Hooded Vulture	CR	X			The species is often associated with human settlements north of the Equator, but is also found in open grassland, forest edge, wooded savanna, desert and along coasts; and tends to occur at higher densities in areas where populations of larger	Known occurrences between Liwonde NP, Lengwe NP and MWR.	This species is documented Classified as CR by the IUCN, for its known occurrences and inter-park movements. Its status and anthropogenic threats make it a high	In

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							Gyps vultures are low or nonexistent. It is an arboreal nester.		conservation priority. Its presence in the Chikwawa area is likely to qualify it as CH under Criterion 1.	
	Acrocephalus griseldis	Basra Reed-warbler	EN	X			The species breeds in aquatic vegetation around shallow fresh or brackish water, predominantly in Typha beds, and forages in adjacent reedbeds like Phragmites australis. Newly fledged birds are often seen feeding in Typha along marsh edges and Tamarix scrub. During migration, they are found in low reeds, mangroves, and gardens, and in winter, in dense Typha beds, Suaeda monoica saltbushes, and moist green thickets near wet or drying ditches, swamps, lakes, and flood pools.	High (Potential winter visitor to Elephant Marsh and other wetlands in the area)	The species is known to breed in the Elephant Marsh, a Ramsar Site, indicating the presence of suitable breeding habitat.	In
	Torgos tracheliotos	Lappet-faced Vulture	EN	X			The species inhabits dry savanna, arid plains, deserts and open mountain slopes up to 3,500 m. It builds solitary nests (containing just one egg), often in Acacia (its distribution sometimes being limited by these trees' distribution, but also in Balanites and Terminalia	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023. Known occurrences between Liwonde NP, Lengwe NP and MWR.	This species is documented Classified as EN by the IUCN, for its known occurrences and inter-park movements. Its status and anthropogenic threats make it a high conservation priority. Its presence in the Chikwawa area is likely to qualify it as CH under Criterion 1.	In
	Sagittarius serpentarius	Secretary bird	EN	X			This species inhabits open landscapes, including plains, grasslands, lightly wooded savannas, agricultural areas, and sub-deserts. In winter, up to 50% of individuals in the Fynbos biome are found in transformed environments. Breeding occurs year-round, with	High (Suitable habitat present in and around Majete Reserve)	While the species is EN and highly potential in the area, its wide distribution and the availability of suitable habitats elsewhere suggest that the project area does not constitute critical habitat.	Out

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							nests built in flat-topped Acacia or other thorny trees, consisting of a flattened stick structure.			
	Aquila nipalensis	Steppe Eagle	EN	X		X	It inhabits areas of steppe and semi-desert, and is recorded breeding up to 2,300 m in mountainous regions. Nests have traditionally been built as large platforms on the ground, although recent habitat alterations seem to have caused a shift to building a few meters higher in bushes or trees. It also nests on artificial structures and will occur on rubbish grounds and waste sites.	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Winter visitor in the area.	Given its Endangered status and migratory nature, the species may utilize the area during migration. However, due to its broad wintering range and the availability of similar habitats elsewhere, the project area is unlikely to be critical for the species' survival.	**Out**
	Ardeola idea	Malagasy Pond Heron	EN	X		X	Principally inhabits freshwater wetlands, particularly shallow waterbodies fringed with vegetation and adjacent trees. It nests in trees and bushes in or near to marshes, lakes or ponds or mangroves.	High: The species is present in Elephant Marsh.	An Endangered rare non-breeding visitor to Malawi during the winter months (April – November).	**In**
	Balearica regulorum	Grey Crowned Crane	EN	X		X	The species inhabits wetlands such as marshes, pans and dams with tall emergent vegetation, riverbanks, open riverine woodland, shallowly flooded plains and temporary pools with adjacent grasslands, open savannas, croplands, pastures, fallow fields and irrigated areas. It shows a preference for short to medium height open grasslands adjacent to wetlands for foraging, and breeds within or at the edges of wetlands especially in marshes with water around a meter deep and with emergent vegetation a meter above the water.	High (Recorded in the region). Known to occur in Malawi, including areas around MWR and Elephant Marsh.	Given its Endangered status and dependence on wetland habitats, areas like Elephant Marsh may be crucial for its survival. If the project area includes key foraging or breeding sites, it could be significant for the species.	**In**

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	Terathopius ecaudatus	Bateleur	EN	X			It inhabits open country, including grasslands, savanna and subdesert thornbush from sea level to 4,500 m but generally below 3,000 m.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	The species is present within the MWR, indicating suitable foraging habitat. However, due to its broad wintering range and the availability of similar habitats elsewhere, the project area is unlikely to be critical for the species' survival.	**Out**
	Polemaetus bellicosus	Martial Eagle	EN	X			It inhabits open woodland, wooded savanna, bushy grassland, thornbush and, in southern Africa, more open country and even subdesert, from sea level to 3,000 m but mainly below 1,500 m	High (Recorded in the region)	Given its Endangered status and migratory nature, the species may utilize the area during migration. However, due to its broad wintering range and the availability of similar habitats elsewhere, the project area is unlikely to be critical for the species' survival.	**Out**
	Egretta ardesiaca	Black Heron	LC			X	The species mainly inhabits lowlands, but occurs up to 1,500 m in the High Plateau Region of Madagascar. It shows a preference for shallow, perennial freshwater habitats such as shallow lakesides, dams ponds, flood-plains, rice-paddies, marshes, swamps, seasonally flooded grasslands and the edges of rivers. It can also found on alkaline lakes and in estuarine waters including mangroves, tidal mudflats and tidal creeks, although when in such habitats it remains near freshwater inlets.	Surveyed during Kapichira HPP Rehabilitations ESIA, 2023.	The Black Heron is not specifically mentioned in the Ramsar Information Sheet as a breeding species in the Elephant Marsh. The species is likely to qualify it as CH under Criterion 3: Population counts conducted in March 2016 exceed 1% thresholds specified by Ramsar.	**In**

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	Anastomus lamelligerus	African Openbill	LC			X	The species inhabits freshwater wetlands with shallow waters and a large abundance of aquatic molluscs, including marshes, swamps, rice-fields, flood-plains, the backwaters and margins of lakes or rivers, ponds and streams. It may also frequent moist savanna or burnt grassland, as well as occasionally forest clearings, coastal mudflats and mangrove swamps	Surveyed during Kapichira HPP Rehabilitations ESIA, 2023.	The African Openbill has been observed breeding in the Elephant Marsh Ramsar Site, as indicated by the Ramsar Information Sheet for the site. The species is likely to qualify it as CH under Criterion 3: Population counts conducted in March 2016 exceed 1% thresholds specified by Ramsar.	In
	Rynchops flavirostris	African Skimmer	LC			X	His species requires expanses of calm water for feeding. It breeds along broad rivers on large, dry sandbars that are largely free from vegetation. It sometimes breeds on sandy lake shores, and very occasionally on sandy sea shores. the non-breeding season it is more commonly found at lakes and also frequents coastal lagoons, salt-pans, open marshes and estuaries. It is less common along coasts. Vagrant birds may use swamps and artificial habitats such as sewage ponds and dams.	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	The African Skimmer has been observed breeding in the Elephant Marsh Ramsar Site, as indicated by the Ramsar Information Sheet for the site. The species is likely to qualify it as CH under Criterion 3: Population counts conducted in March 2016 exceed 1% thresholds specified by Ramsar.	In
	Chlidonias hybrida	Whiskered Tern	LC			X	The species utilizes a variety of wetland habitats but shows a preference for freshwater marshlands with scattered pools, particularly where the surrounding vegetation is grazed by cattle or horses. It frequents inland lakes, rivers, marshes, temporary pans (e.g. in Africa).	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present in 2016 within the Elephant Marsh.	The African Skimmer has been observed breeding in the Elephant Marsh Ramsar Site, as indicated by the Ramsar Information Sheet for the site. The species is likely to qualify it as CH under Criterion 3: Population counts conducted in March 2016 exceed 1%	In

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									thresholds specified by Ramsar.	
	Glareola pratincola	Collared Pratincole	LC			X	The species breeds in flat, open areas with short or patchy vegetation, such as fields, steppe plains near water. In Africa, it is found in ploughed fields, recently burnt ground, overgrazed grasslands, alkaline and sand flats, typically near large rivers and estuaries. It also forages over water, in rice fields, or coastal scrubland, and may occur along coasts, at reservoirs, or desert oases during migration.	Species present in 2016 within the Elephant Marsh.	The Common Pratincole has been observed breeding in the Elephant Marsh Ramsar Site, as indicated by the Ramsar Information Sheet for the site. The species is likely to qualify it as CH under Criterion 3: Population counts conducted in March 2016 exceed 1% thresholds specified by Ramsar.	**In**
	Pelecanus rufescens	Pink-backed Pelican	LC			X	The species inhabits a wide range of aquatic habitats, but prefers to feed in quiet backwaters and weed-grown lagoons where there is shallow water and emergent vegetation, generally avoiding steep, vegetated lake margins. It shows a preference for freshwater lakes, swamps, large slow-flowing rivers, and seasonal pools, but also frequents reservoirs, seasonally flooded land and flood-plains near river mouths	The species was historically present in Elephant Marsh, but no recent occurrences have been documented or reported in the available literature. The species is present in 2016 within the Elephant Marsh.	The Pink-backed Pelican is a congregatory and dispersive species with a wide distribution, the absence of breeding records (during the EM surveys) in this particular wetland suggests that it does not meet the criteria for critical habitat designation under Ramsar Criterion 3a. Indeed, the usual breeding habitat in the Lower Shire valley has been severely degraded, with most of the trees previously used for nesting in the Nsanje area	**Out**

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									reportedly felled (by Renamo rebels in 1990).	
	Leptoptilos crumenifer	Marabou Stork	LC			X	It inhabits open dry savannas, grasslands, swamps, riverbanks, lake shores and receding pools where fish are concentrated, typically foraging in and around fishing villages.	The species was historically present in Elephant Marsh, but no recent occurrence have been documented or reported in the available literature. The species was present in 2016 within the Elephant Marsh.	The Marabou Stork is a congregatory and dispersive species with a wide distribution, the absence of breeding records (during the EM surveys) in this particular wetland suggests that it does not meet the criteria for critical habitat designation under Ramsar Criterion 3a. Indeed, as the Pink backed Pelican, the usual breeding habitat in the Lower Shire valley has been severely degraded, with most of the trees previously used for nesting in the Nsanje area reportedly felled (by Renamo rebels in 1990).	**Out**
Mammals	*Diceros bicornis*	Black Rhinoceros	CR	X			Occur in a wide variety of habitats from desert areas in Namibia to wetter wooded areas. The highest densities of rhinos are found in savannas on nutrient-rich soils and in succulent Valley Bushveld areas.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	Given the successful reintroduction and the presence of suitable habitat within MWR, the Black Rhinoceros qualifies for critical habitat designation in this area under the Criterion 1.	**In**
	Loxodonta Africana	African savanna Elephant	EN	X			They occupy a variety of habitats ranging from montane forest, miombo and mopane woodland, thicket, savanna and grasslands to arid deserts and a wide altitudinal	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present on the list of the Majete Wildlife	Suitable habitat within MWR, the African Savanna Elephant qualifies for critical habitat designation in this area under the Criterion 1.	**In**

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							range from mountain slopes to oceanic beaches.	Reserve, Afrikan Parks, 2023.		
	Lycaon pictus	African Wild Dog	EN	X			Occupy diverse habitats, including short-grass plains, semi-deserts, bushy savannas, and upland forests. Initially thought to be primarily an open plains species, recent data indicate that it thrives in thicker bush. Ome relict populations persist in dense upland forests, such as Harenna Forest in Ethiopia. While historically present in deserts, most desert populations are now extinct. The species is absent from lowland forests, and its distribution is mainly influenced by human activities and prey availability rather than habitat type.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	Suitable habitat within MWR, the African Wid Dog qualifies for critical habitat designation in this area under the Criterion 1.	**In**
	Hippopotamus amphibius	Hippopotamus	VU	X			Rely on a range of water sources – rivers, lakes, and wetlands although seasonally the animal can survive in muddy wallows. Hippos require some form of permanent water.	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	This species has been included as a species of potential stakeholder concern. However, as a widespread VU species it does not trigger any of the CH criteria since it is not close to the threshold for being upgraded to EN or CR and does not occur in sufficient numbers to trigger Criterion 1 even if it was listed as EN.	**Out**
	Acinonyx jubatus	Cheetah	VU	X			In Africa, they are found in a wide range of habitats and ecoregions, ranging from dry forest and thick scrub through to grassland and hyperarid deserts, such as the Sahara.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.		**Out**
	Panthera leo	Lion	VU	X			The African Lion has a broad habitat tolerance, absent only from tropical rainforest and the interior of the Sahara Desert .	Species surveyed during Kapichira HPP Rehabilitations ESIA, 2023. Species present on the list of the Majete Wildlife		**Out**

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								Reserve, Afrikan Parks, 2023.		
	Panthera pardus	Leopard	VU	X			Leopards inhabit the widest range of habitats among Old-World cats, from deserts and semi-deserts in southern Africa and North Africa to the savanna grasslands of East and southern Africa.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.		**Out**
Herpetofauna	*Cycloderma frenatum*	Zambezi Flapshell Turtle	EN	X			Habitat usage by the species poorly known; adults have been recorded mainly from large rivers and lakes, while hatchlings apparently inhabit floodplain marshes. It ranges from 500 m altitude in Lake Malawi to just above sea level.	Species present on the list of the Majete Wildlife Reserve, Afrikan Parks, 2023.	Present in the Shire River and its dependence on riverine habitats. The Majete Wildlife Reserve, Liwonde National Park and Elephant Marsh may provide critical habitats for the species under the criterion 1.	**In**

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3.3.1. Fishes

The establish list introduce several fishes species including critically endangered species as Oreochromis Karongae which was surveyed in the Kapichira Dam Reservoir during the surveys. Other species were identified as occurred or potentially occurred in the Shire River: Labeo mesops - this species is endemic to Lake Malawi, the upper and middle Shire River and its streams -, Bagrus meridionalis – this species is endemic to Lake Malawi and its catchment, the Upper Shire River and Lake Malombe -, Serranochromis robustus – endemic to Lakes Malawi and Malombe and in the lower reaches of inflowing rivers and also in the upper Shire River -, *Oreochromis mossambicus, Anguilla labiate, Labeo cylindricus and Labeobarbus congoro*. These species were listed regarding the following criteria:

- Criterion 1: four Critically Endangered (CR) species, *Labeo mesops, Oreochromis Karongae, Bagrus meridionalis, Serranochromis robustus.*
- Criterion 2: four endemic species: Oreochromis Karongae, *Labeo Mesops*, *Bagrus meridionalis* and *Serranochromis robustus.*
- Criterion 3: five migratory species, *Oreochromis mossambicus, Labeo cylindricus, Labeo congoro, Labeo barbus* and African Mottled Eel (*Anguilla labiate*).

Spawning of Oreochromis species requires still waters which is not characteristic of the middle and lower shire waters and hence not a suitable breeding ground for these fish. Based on the findings by fish experts of the fisheries department of the Ministry of Natural Resources[3] and Climate Change, in accordance with the World Bank's Environmental and Social Standard 6, none of the Oreochromis species may trigger the critical habitat.

Moreover, regarding Tweedle et al. (1979)[4], the Middle Shire River between Matope and Kapichira hosts populations of ~30 species of fish, not including 15-20 straggler species from the Upper Shire that are occasionally swept downstream but do not have viable Middle Shire populations. There is no viable habitat for the following stragglers *Labeo mesops, Bagrus meridionalis, Serranochromis robustus* and *Oreochromis karongae* and their occasional presence has no relevance in the Middle Shire even if they are listed as Critically Endangered.

Regarding their habitats and their rationale for screening critical habitat (Table 3 1) only these species are screened in for the CH:

- Criteria 3: *Labeo cylindricus, Labeobarbus congoro* and African Mottled Eel (*Anguilla labiate).*

3 Mr Ngochera (PHD), who carried out the Kapichira ESIA surveys

4 D. Tweddle and N.G. Willoughby (1979, October) An annotated checklist of the fish fauna of the river shire south of Kapichira falls, Malawi J.L.B. Institute of ichthyology Rhodes university, Grahamstown.

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3.3.2. Birds

Birds were also identified regarding several criterion:

- Criteria 1: White-headed Vulture (*Trigonoceps occipitalis*, CR), White-backed Vulture (*Gyps africanus*, CR), Hooded Vulture (*Necrosyrtes monachus*, CR), Basra Reed-warbler (*Acrocephalus griseldis,* EN), Lappet-faced Vulture (*Torgos tracheliotos*, EN), Secretarybird (*Sagittarius serpentarius*, EN), Steppe Eagle (*Aquila nipalensis*, EN), Malagasy Pond Heron (*Ardeola idae*, EN), Grey Crowned Crane (*Balearica regulorum*, EN), Bateleur (*Terathopius ecaudatus*, EN) and Martial Eagle (*Polemaetus bellicosus*, EN);
- Criteria 3: Black Heron (*Egretta ardesiaca*), African Openbill (*Anastomus lamelligerus*), Steppe Eagle (*Aquila nipalensis*), African Skimmer (*Rynchops flavirostris*). Whiskered Tern (*Chlidonias hybrida*), Collared Pratincole (*Glareola pratincola*), Malagasy Pond Heron (*Ardeola idae*) and Grey Crowned Crane (*Balearica regulorum*), Pink-backed Pelican (*Pelecanus rufescens*), Marabou Stork (*Leptoptilos crumenifer*).

Regarding their habitats and their rationale for screening critical habitat, only these species are screened in for the CH:

- Criterion 1: *Trigonoceps occipitalis* – White-headed Vulture; *Gyps africanus* – White-backed Vulture; *Necrosyrtes monachus* – Hooded Vulture; *Acrocephalus griseldis* – Basra Reed-warbler; *Torgos tracheliotos* - Lappet-faced Vulture; Grey Crowned Crane – *Balearica regulorum; Ardeola idae* – Malagasy Pond Heron.
- Criterion 3: *Ardeola idae* – Malagasy Pond Heron; *Balearica regulorum* – Grey Crowned Crane; *Anastomus lamelligerus* – African Openbill; *Rynchops flavirostris* – African Skimmer; *Chlidonias hybrida* – Whiskered Tern; *Glareola pratincola* - Collared Pratincole; Black Heron – *Egretta ardesiaca*.

3.3.3. Mammals

Mammals were listed and their presence was confirmed by Afrikan Parks. In this assessment, several large mammals may trigger the critical habitat:

- Criterion 1: Black Rhinoceros (*Diceros bicornis*, CR), African Savanna Elephant (*Loxodonta Africana,* EN), African Wild Dog (*Lycaon pictus*, EN);
- Criterion 1: Cheetah (*Acinonyx jubatus*), Lion (*Panthera leo*), Leopard (*Panthera pardus*), Hippopotamus (*Hippopotamus amphibius*), all VU Red-Listed species.

Regarding their habitats and their rationale for screening critical habitat only these species are screened in for the CH:

- Criterion 1: *Diceros bicornis* - Black Rhinoceros; *Loxodonta Africana* - African Savanna Elephant; *Lycaon pictus* - African Wild Dog.

3.3.4. Herpetofauna

A reptile species was identified in the list of species that can trigger the CH regarding the criteria 1: the Zambezi Flapshell Turtle (*Cycloderma frenatum*, EN,).

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This species was not inventoried during the survey but is known to be present in the Majete Wildlife River in 2023 may also range as far as the Elephant Marsh. Adults are primarily recorded in large rivers and lakes, whereas hatchlings appear to prefer floodplain marshes. It is screened as “in” for the CHA.

3.4. Determination of the Ecologically Appropriate Area of Analysis

A preliminary list of species that may trigger the CH was proposed in accordance with criteria 1-3 and a review of international databases (IUCN, GBIIF, studies from previous projects at similar locations, *etc*.). The list is presented in the table 3-1. The EAAA were distinguished between terrestrial, aquatic and wide-ranging species EAAA, including birds.

3.4.1. Terrestrial EAAA

As part of the Kapichira HPP Rehabilitation project within the Majete Wildlife Reserve (MWR) in Malawi, three terrestrial threatened species have been identified in the screening and on-site surveys as likely to trigger critical habitat designation: *Loxodonta Africana* (African Savanna Elephant), *Diceros bicornis* (Black Rhinoceros), and *Lycaon pictus* (African Wild Dog). These ecologically significant and endangered species benefit from the protection provided by the reserve. The three species inhabit fenced, protected areas such as the MWR, Lengwe National Park, and Liwonde National Park.

The determination of the EAAA was based on the ecological characteristics of the identified species, the specific features of their habitats within the MWR, and potential threats linked to the rehabilitation project.

Diceros bicornis (CR) is critically endangered according to the IUCN Red List. This species relies on dense thickets and open woodlands for feeding and shelter. Within the MWR, black rhinos represent one of the last populations in the region and were reintroduced by African Parks. Conservation efforts in the reserve include reinforced protection measures, though the species remains vulnerable due to low genetic diversity.

Loxodonta Africana (EN) is listed as an endangered species (EN) on the IUCN Red List. It plays a vital role in regulating savannah ecosystems by dispersing seeds and creating open habitats. In the MWR, these elephants are typically found in wooded savannahs and grasslands near aquatic habitats, which are essential for their survival. Their populations are threatened by poaching and habitat loss. and the ongoing risk of poaching.

Lycaon pictus (EN) is also classified as endangered on the IUCN Red List. This species requires large, continuous habitats to maintain its complex social structure and hunt in groups. In the MWR, African wild dogs are primarily found in savannahs and grasslands that support their group hunting behavior. The main threats to this species include disease and habitat fragmentation. The protected population in the MWR represents one of the few remaining viable groups in the region.

The MWR provides essential, continuous habitats that support feeding, reproduction, and survival for these species.

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For this project, the EAAA has been defined to include the entire Majete Wildlife Reserve and a 10 km buffer zone around the reserve. The MWR is entirely fenced, which prevents the species from moving outside its boundaries. However, the buffer has been added to account for potential external impacts, including infrastructure related to the dam (such as quarry sites and camp locations) and human activities like poaching and disturbances from construction near the reserve. While the fence limits movements outside the reserve, external pressures such as water availability and human-wildlife conflicts may influence animal behavior within the reserve.

The minimum area required for the survival of these species (e.g., territory size for wild dogs and resource needs for elephants) is covered by the reserve itself, but the buffer ensures that other threats are accounted for.

3.4.2. Aquatic EAAA

The project area is located within the Lower and Middle Shire River, a significant ecological zone in Malawi characterized by its distinct aquatic habitats shaped by natural and artificial barriers (Tweddle *et al.*, 1979). The river system is separated by the Kapichira Falls, which prevents upstream fish migration, creating isolated populations with unique ecological functions between the Upper and the Lower Shire.

The aquatic ecosystems host several fish species of ecological and conservation significance which were screened and/or surveyed on-site (table 3-1). Key observations include:

- Critically Endangered Species: Four species including *Labeo mesops, Bagrus meridionalis, Serranochromis robustus*, and *Oreochromis karongae*, have been recorded occasionally in the Middle Shire. However, these species do not have viable populations in this zone, and their presence is considered irrelevant for critical habitat triggers.
- Migratory Species: *Anguilla labiate* (The African mottled eel), *Labeo cylindricus and Labeobarbus congoro* are the only species in the Shire River with migratory behavior. It moves between the Middle and Lower Shire, making the connectivity of these sections critical for its survival.
- Aquatic birds: the Lower Shire River and Elephant Marsh are crucial habitats for these birds. The wetlands present in the Shire valley are essential for foraging, breeding, and roosting of aquatic birds. This EAAA comprises species that do not have a wide range (migratory birds with a huge range will be described in section 3.4.3 of the wide-ranging species EAAA). The considered species are: *Ardeola idae* (Malagasy Pond Heron), *Acrocephalus griseldis* (Basra-reed Warbler), *Balearica regulorum* (Grey Crowned Crane)
- Herpetofauna with the Zambezi Flapshell Turtle: Marshes are crucial habitats for the hatchlings and adults are living in aquatic areas as large rivers (the Shire river) or lakes.

The aquatic EAAA has been defined based on the ecological characteristics and connectivity of aquatic habitats, as follows: The upper boundary of the EAAA starts from the Nkula Dam, considering the cumulative impacts of upstream dams and their role in regulating water flow and sediment transport to the Middle Shire.

The dam reservoir serves as a habitat for species found between Lake Malawi and the Kapichira Dam.

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The Nkula Dam represents the upstream boundary, as it influences water flow and sediment deposition throughout the Middle Shire. This connectivity is vital for fish species like the African mottled eel (*Anguilla labiata*), which relies on migration between the Middle and Lower Shire.

This section, between Matope and Kapichira, supports approximately 30 fish species. While straggler species from the Upper Shire are occasionally observed, the viable populations are limited to resident species. The inclusion of this section captures resident fish populations and the occasional presence of straggler species. While these stragglers do not trigger critical habitat, their consideration ensures a precautionary approach to habitat integrity.

The lower boundary extends from the Kapichira HPP to the Elephant Marsh, a Ramsar wetland known for its biodiversity and ecosystem services. The Lower Shire River flows into the Elephant Marsh, a Ramsar site of international importance. This wetland supports numerous waterbirds, including threatened and migratory species. The inclusion of Elephant Marsh within the EAAA is justified by its role in sustaining aquatic biodiversity and its sensitivity to changes in hydrology and sediment regimes.

Tributaries intersecting the Shire River between the Upper and Lower EAAA are included to account for their role in supporting fish populations and maintaining ecological connectivity consider their contribution to the overall system.

3.4.3. Wide-ranging species

During screening and on-site surveys several "wide ranging" bird species whose populations are sensitive to human and environmental disturbances were identified. Among these species, several migratory vultures and other raptors and migratory waterbirds. These species are particularly affected by habitat fragmentation and disturbances to their migration corridors. Some of these species are threatened regarding the IUCN Red lists (specially for the vultures).

The species identified in this analysis include: White-headed Vulture (*Trigonoceps occipitalis*), White-backed Vulture (*Gyps africanus*), Hooded Vulture (*Necrosyrtes monachus*), Lappet-faced Vulture (*Torgos tracheliotos*), Basra Reed-warbler (*Acrocephalus griseldis*), African openbill (*Anastomus lamelligerus*), African Skimmer (*Rynchops flavirostris*), Whiskered Tern (*Chlidonias hybrida*), Collared Pratincole (*Glareola pratincole*), Black Heron (*Egretta ardesiaca*). These species are known for their large home ranges and significant migratory movements.

The EAAA includes habitats used by migratory species, even if they have a wide distribution range, as long as they present a high level of criticality. This criticality may be linked to their IUCN status (EN, CR) or to the fact that they exceed the 1% threshold of biologically significant populations. These species rely on key areas recognized for their ecological importance, such as Elephant Marsh, where notable concentrations have been documented (African openbill, African Skimmer, Whiskered Tern, Collared Pratincole, and Black Heron).

Regarding the vultures, recent data on the White-backed Vulture (*Gyps africanus*) shows confirmed migration corridors between Lengwe National Park, Majete Wildlife Reserve, and Liwonde National Park, to the north.

These corridors were defined using satellite data and GPS tracking of tagged vultures, carried out by research programs such as Sievert *et al*. (2021) and unpublished data from Endangered Wildlife Trust and Lilongwe Wildlife Trust. The white-backed vultures use these corridors to migrate between protected areas, suggesting that other vulture species might also follow similar routes.

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The EAAA for these "wide ranging" species was determined by considering the connectivity between protected areas and migration corridors including the Elephant Marsh. A 10 km buffer on either side of the known flight paths of white-backed vultures migrating between the protected areas was used to define the EAAA. This allows for the inclusion of ecological zones and habitats necessary for their feeding, breeding, and survival (Sievert *et al*. 2021).

The 10 km buffer allows for the inclusion of adjacent areas used by the birds for feeding, resting, and breeding. This buffer is based on observed behaviors during migration and the need to maintain continuous habitats for these species.

This perimeter also covers areas where human activities, such as poaching or infrastructure disruptions, could affect the migration of vultures and other raptors.

3.5. Critical Habitat Assessment

3.5.1. Assessment according to criteria 4 and 5

3.5.1.1. THE MAJETE WILDLIFE RESERVE (CRITERION 4)

As the main part of the terrestrial EAAA, the Majete Wildlife Reserve (MWR) is a priority area. Due to its protected status and the widespread reintroduction of emblematic species of this type of habitat[5] (5,000 animals from 17 different species), this area is known to be of high conservation concern.

While not listed in the IUCN Red List of Ecosystems (RLE)[6], this area could still trigger Criterion 4 of the World Bank's ESS6 standards due to its significant concentration of threatened species and its recognized priority for national conservation. The MWR is home to several endangered species, including the African elephant (*Loxodonta Africana*), African wild dog (*Lycaon pictus*), or Black Rhino (*Diceros bicornis*). These species are concentrated in the area, with the MWR serving as a crucial refuge for their populations, particularly in light of the pressures from surrounding human activities.

This concentration of vulnerable species, particularly in a protected area with limited human disturbance, plays a key role in fulfilling the criteria for Critical Habitat (Criterion 4), which emphasizes the presence of species of global or national importance, especially when their populations are highly concentrated in a given area.

The MWR is considered a priority for conservation, as confirmed by various national and regional systematic conservation planning efforts, including those influenced by management strategies of organizations such as African Parks.

While the fence around the reserve limits connectivity with other populations, it still provides a crucial sanctuary that reduces human-wildlife conflict and offers protection from poaching.

5 https://www.africanparks.org/the-parks/majete
6 https://iucnrle.org/rle-database

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Despite the limitations in movement, the reserve's role as a high-priority area for biodiversity is clear, and it is considered a vital component of national efforts to protect key species. The MWR thus aligns with the national biodiversity priorities of the country and meets the conditions for triggering Critical Habitat under ESS6, particularly for its contribution to the conservation of endangered and vulnerable species within the broader national context.

3.5.1.2. ELEPHANT MARSH (CRITERION 4 AND 5

Elephant Marsh represents an area of high conservation priority at the national and regional levels. The March 2016 surveys and African Waterbird Census (AWC)[7] data confirm that Elephant Marsh supports populations of several waterbird species exceeding the 1% Ramsar thresholds, including the Openbill Stork, Whiskered Tern, and African Skimmer. Additionally, other species such as the Malagasy Pond Heron, Black Egret, and Long-toed Plover are also likely to surpass these thresholds, highlighting the site's importance for avian biodiversity.

Beyond birds, Elephant Marsh provides conservation concern habitat for the Hippopotamus, the only remaining threatened mammal species in the area outside of protected zones, with an estimated population of fewer than 100 individuals.

The marsh is also a crucial aquatic ecosystem, supporting a diverse fish community with 52 recorded species from 17 families. Among these, *Opsaridium microcephalum* (Sanjika) is endemic to Lake Malawi, its catchment, and the Lower Shire. The presence of an endemic fish species further reinforces the ecological significance of the site.

Despite historical degradation, Elephant Marsh continues to sustain a wide range of species, demonstrating its ecological resilience and its role as a key conservation priority. Given the presence of species that surpass global conservation thresholds, the occurrence of regionally important endemic taxa, and its overall ecological function, Elephant Marsh aligns with Criterion 4 of the IFC, qualifying it as a site of high conservation importance at both national and regional levels.

Elephant Marsh can be justified as triggering Criterion 5 of the IFC Critical Habitat definition due to its ecological functions that are essential for maintaining the viability of biodiversity values described in Criteria 1-4. Here's how:

- Key Ecological Functions for Migratory and Congregatory Species (Criterion 3):

Elephant Marsh supports globally significant concentrations of migratory and congregatory waterbirds, including the African Skimmer, Whiskered Tern, Openbill Stork, Malagasy Pond Heron, Black Egret, and Long-toed Plover all exceeding the 1% Ramsar threshold.

Given that waterbird surveys (March 2016 & AWC) indicate undercounts, it is highly likely that additional species present also surpass this threshold.

The marsh provides critical stopover, feeding, and breeding habitats for these species, ensuring their survival along migration routes.

7 Wetlands International. 2020. African Waterbird Census data (Elephant Marsh and Lower Shire). Wetlands International, Wageningen.

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- Essential Hydrological and Ecological Processes:

The marsh acts as a buffer zone in the Lower Shire floodplain, regulating water flow, sediment deposition, and nutrient cycling, which are essential for maintaining habitat quality for fish, birds, and other aquatic species.

The degradation of natural habitats in the region has made Elephant Marsh one of the last remaining functional wetland ecosystems in the Lower Shire, increasing its conservation importance.

- Connectivity Between Key Protected Areas

Elephant Marsh serves as a stepping-stone habitat between Lengwe National Park, Majete Wildlife Reserve, and other protected areas.

This connectivity is crucial for species movement, particularly for birds, fish, and semi-aquatic mammals like hippopotamus, ensuring genetic exchange and species resilience.

Elephant Marsh meets IFC Criterion 5 because its ecological processes and hydrological functions are vital for sustaining the biodiversity values described under Criteria 2, 3, and 4. The marsh plays a fundamental role in maintaining populations of globally and regionally important species, regulating ecosystem dynamics, and supporting species migration and connectivity in the Lower Shire system.

3.5.2. Assessment according to criteria 1 to 3

3.5.2.1. METHODOLOGY

The quantitative thresholds for each criterion and their application in the Critical Habitat Assessment (CHA) are outlined in Table 1 1. A summary of the approach to assessing each criterion is provided in the table below.

The thresholds proposed by the guidance note are based on the concept of the "reproductive unit." A reproductive unit, as defined in IFC Guidance Note 6, is the smallest group of individuals capable of reproducing and maintaining a viable population. This definition indicates that it is not simply an isolated reproductive individual, but a minimum set of individuals necessary to ensure the continuity of the population.

In this study, different approaches were applied depending on data availability. Where reliable population abundance data were available, quantitative thresholds were used directly to assess Critical Habitat status. However, in cases where population data were limited—particularly for wide-ranging taxa such as birds—the global spatial extent of occurrence (EOO), based on IUCN data, was used as a proxy to estimate population size. This approach follows the methodology of Sayer et al.[8], which applies extant (known) distributions to determine where the project's Area of Analysis (EAAA) intersects with the global EOO of a species. These approximations can be applied to Criteria 1 to 3 (NO65, GN6, IFC).

The proportion of a species' extant EOO is used to calculate the threshold percentage to determine whether it meets the required threshold for each IFC criterion. The global EOO for each species that triggers one or more of the Critical Habitat criteria in this CHA was obtained from the IUCN spatial datasets (IUCN, 2024).

[8] Sayer, J., Harcourt, C., & Collins, N. Applying Extant Distributions to Assess Habitat Importance in Critical Habitat Analyses. Environmental Management, 2017

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These datasets consist of polygons delineating the "extant" (resident) and "possibly extant" distributions. The EOO is determined based on known historical records from museums or published distributions, as well as consultations with experts. Areas that are likely to support a species, but for which no known records exist, are classified as "possibly extant." In most cases, the original IUCN EOOs were used to define the EAAAs. However, when additional data on species distributions became available, the EOO was revised to incorporate this information. Further analysis of the species' known habitat preferences and recorded occurrences was then conducted to determine if the species qualifies for Critical Habitat.

For wide-ranging species within the EAAA, inventories across the entire area may be insufficient, particularly for aquatic species. It will be necessary to gather abundance data for large mammals, birds, and turtles. The focus will be on the EAAA and the global population within the EAAA.

Table 3-2 : Methodology of assessment regarding the threshold for Kapichira CHA

ESS 6 Criteria & Thresholds (IFC GN6)	Notes on approach for Kapichira HPP CHA
Criterion 1: Threatened species Critically Endangered (CR) / Endangered (EN)	
(a). Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species).	Insufficient data were available to determine the global population size or number of reproductive units for Endangered (EN) or Critically Endangered (CR) fish species within the EAAA. For Black Rhino, African Wild dog, Elephant and vultures, population abundance was approximately known. For species where abundance data were not available at all, the assessment relied on spatial proxies. In such cases, the proportion of a species' Extent of Occurrence (EOO) overlapping with the EAAA was used as a proxy for estimating the percentage of the global population, following the approach proposed by Sayer et al. (2018)[9]
(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 GN72(a).	Based on expert analysis, there is a low likelihood that the dam restoration would lead to a population decline severe enough to trigger a change in the IUCN Red List status from VU to EN. Consequently, these species are not expected to trigger CH designation under this specific criterion.
(c). As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.	Given the high concentrations of EN and CR vultures moving between Liwonde, Lengwe, and Majete, as evidenced by GPS tracking data, these areas likely meet the CH. Given some only mammals populations in Malawi, making these reserves critically important for the species' survival within the country.
Criterion 2: Habitat of significant importance to endemic or restricted-range species	
Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species	This criterion has been applied for one endemic fish confirmed to occur in Elephant Marsh (Ramsar fieldwork assessment in 2014). It has been applied to the proportion of endemic species EOO that falls within the EAAA as a proxy for percentage of population, following the similar approach used by Sayer (2018).

[9] Sayer, J., Harcourt, C., & Collins, N. Applying Extant Distributions to Assess Habitat Importance in Critical Habitat Analyses. Environmental Management, 2017

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ESS 6 Criteria & Thresholds (IFC GN6)	Notes on approach for Kapichira HPP CHA
Criterion 3: Habitat supporting globally or nationally significant concentrations of migratory or congregatory species	
(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.	This criterion has been applied for migratory birds and fishes confirmed to occur, especially in the Elephant Marsh area. It has been applied on the proportion of migratory species EOO that falls within the EAAA. Sites meeting the Ramsar 1% criterion for migratory or congregatory species may also qualify as critical habitat, particularly when those species occur regularly (Note section 3.3.).
(b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.	-
Criterion 4 Highly threatened and/or unique ecosystems	
(a) Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.	No formal Red List process has been done for ecosystems in these study areas. No ecosystems are listed on the IUCN Red Lists of Ecosystems.
(b) Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.	MWR, included in the EAAAs and hosting Kapichira HPP, is a protected area and subject to a regional and national conservation plan. A Ramsar site, Elephant Marsh (EM), is located in the aquatic EAAA downstream of Kapichira HPP. Other protected areas and several KBAs are located between 30km and 150km, including two national parks (also KBAs and IBAs) in the wider range EAAA. Both the MWR and the EM trigger Criterion 4 of the World Bank's ESS6 standards due to its concentration of threatened species and national conservation priority.
Criterion 5: Ecological Processes or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)	
No thresholds are defined.	Considerations are given to aspects such as landscape connectivity to support and maintain migratory species and facilitate gene flow.

3.5.2.2. RESULTS

The qualifying species assessment was performed on the species identified in section 3.3. The following table (Table 3-3) summarizes the findings of the assessment and provides conclusions regarding the triggering species. The detailed quantitative results are presented in the Appendix B. Appendix B does not present the quantitative results for migratory birds, which according to the African Waterbird Census, constitute 1% of the global population.

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Birds

- **Migratory birds**

Several migratory and aquatic bird species observed in Majete Wildlife Reserve meet international criteria for conservation significance based on global population percentages. Among wide-ranging migratory species, the African Openbill (Anastomus lamelligerus), African Skimmer (Rynchops flavirostris), Whiskered Tern (Chlidonias hybrida), Collared Pratincole (Glareola pratincola), and Black Heron (Egretta ardesiaca) each regularly occur in Majete and are considered significant because the proportion of the global population using these wetlands exceeds 1%, meeting Ramsar Criterion 3(a). These observations highlight the importance of Majete as a stopover and foraging site for wide-ranging migratory species.

Other species such as the Grey Crowned Crane (Balearica regulorum) are present in aquatic habitats but occur at levels below 1% of the global population. The Malagasy Pond Heron (Ardeola idae) shows the opposite pattern: while counts suggest that Majete supports more than 0.5% of the global population, no reproductive units were recorded during the African Waterbird Census at Elephant Marsh, resulting in fewer than five confirmed reproductive units. Consequently, this species meets Criterion 1(a) for population proportion but does not fully satisfy reproductive criteria, and it also falls below 1% of the global population for Criterion 3(a).

- **Vultures**

Four threatened vulture species breed in Malawi. Among them, two Critically Endangered (CR) species—the white-backed vulture (*Gyps africanus*) and the white-headed vulture (*Trigonoceps occipitalis*)—are confirmed to regularly occur in Majete Wildlife Reserve and may breed there.

Vulture tracking of 19 birds from Majete and 10 from Liwonde, provided by the Endangered Wildlife Trust (EWT) and Lilongwe Wildlife Trust (LWT), shows that Majete and Liwonde National Park are core areas for these species, where nesting has also been reported[10].

May 2023 ESIA surveys by SLR[10] recorded six white-backed vultures and one juvenile white-headed vulture in the north of the park. Another observation reported 26 vultures on a carcass in the south of the reserve[10].

The total number of vultures regularly occurring in Majete is unknown, but tagged birds show regular movements between conservation areas, suggesting connectivity where prey is available. Both White-backed and White-headed vultures are provisionally assessed to qualify for Critical Habitat under IFC PS6 Criterion 1c, based on the likelihood that they would be classified as CR at the national level in Malawi.

It is uncertain whether the number of vultures in Malawi reaches the thresholds to meet Criterion 1a (≥0.5% of global population):

- White-backed vulture: 135 individuals
- White-headed vulture: 27 individuals

Although numbers are uncertain, it is considered possible that these thresholds are met.

[10] SLR Consulting. (2024, July 31). Mpatamanga Hydropower Project – Environmental and Social Impact Assessment Volume II: Main ESIA Report.

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Other vultures present in the park, these species are not confirmed to meet the Critical Habitat thresholds but are regularly observed in the reserve.

- Hooded vulture (*Necrosyrtes monachus*): Despite its Critically Endangered status, the species is rare in Malawi, with few records in Majete and other parks, and no confirmation of breeding or consistent occurrence suggesting regionally important concentrations.
- Lappet-faced vulture (*Torgos tracheliotos*): Although the species is occasionally recorded in Majete and Liwonde, there is no confirmed breeding population or evidence of important concentrations in Malawi, limiting its significance at the national or regional level.

- **Basra Reed Warbler**

The Basra Reed Warbler (*Acrocephalus griseldis*), listed as Endangered on the IUCN Red List, is a species of high conservation concern. In EAAA, the wetland habitats are important for this species. Although precise population data is lacking, it is estimated that the intersection of the EAAA and the EOO is greater than 0.5%.

Mammals

- **Black Rhino**

The black rhinoceros is listed as Critically Endangered on the IUCN Red List. It is one of the flagship species of Majete Wildlife Reserve, where it was reintroduced in 2003. By 2011, the population had reached 12 individuals. Current numbers, while confidential for security reasons, are estimated to exceed 35 animals[10].

According to the IUCN (2022), the global population of black rhinoceros is estimated at approximately 5,600 individuals. The IFC PS6 / ESS6 Critical Habitat threshold of 0.5% of the global population therefore corresponds to around 28 individuals. With more than 35 black rhinoceroses currently estimated in Majete Wildlife Reserve, the local population exceeds this threshold.

In addition, the presence of a confirmed breeding population indicates the existence of reproductive units, thereby fully meeting the quantitative requirements for Critical Habitat designation under Criterion 1.

Black rhinoceros reproduce very slowly, with a single calf produced every 2.5–3 years following a gestation period of 15–16 months. This low reproductive rate means that the loss of even one individual has a significant negative effect on overall population viability.

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- **African Wild Dog**

African wild dogs (Lycaon pictus), listed as Endangered on the IUCN Red List. In Majete Wildlife Reserve, African wild dogs were reintroduced in 2021, with a total of 14 individuals translocated from Mozambique and South Africa[11]. Since their release, the population has demonstrated successful reproduction, with twelve pups reported in 2023, suggesting that the population is increasing[12]. Based on these observations, it is reasonable to estimate that the current population exceeds 20 individuals, although exact numbers are not publicly available. The IFC PS6 / ESS6 Critical Habitat threshold of 0.5% of the global population therefore corresponds to around 30 individuals (6,679 individuals in the world). With more than 14 dogs currently estimated in Majete Wildlife Reserve, the local population did not exceed this threshold.

However, with regard to mature individuals (of which there are around 1,409 according to the IUCN Red List), the local population exceeds the 0.5% threshold.

In addition, the presence of several birth confirmed indicates the existence of reproductive units, thereby fully meeting the quantitative requirements for Critical Habitat designation under Criterion 1.

While Majete supports multiple reproductive packs, fulfilling the requirement of at least five reproductive units, the population does not yet meet the quantitative threshold of 0.5% of the global population required under Criterion 1 for Critical Habitat designation. Nevertheless, the presence of an established, reproducing population indicates that Majete Wildlife Reserve plays a significant role in the regional conservation of African wild dogs and contributes to their long-term survival in Malawi (the last populations of the species in the country are found in fenced protected areas such as the MWR).

- **African Savannah Elephant**

Majete Wildlife Reserve, located in southern Malawi, has undergone significant ecological restoration efforts. Elephants were reintroduced to the reserve in 2006, with subsequent translocations in 2008 and 2009. By 2017, the elephant population in Majete had grown to approximately 400 individuals. However, to alleviate habitat pressure and support conservation efforts elsewhere, 200 elephants were translocated from Majete to Nkhotakota Wildlife Reserve as part of the "500 Elephants" initiative

The global population of African elephants is estimated to be around 415,000 individuals[13]. this estimate, Majete's elephant population represents approximately 0.1% of the global population, which is below the 0.5% threshold required for Critical Habitat designation under IFC PS6 / ESS6.

Additionally, while Majete's elephant population is significant within Malawi, it is relatively small compared to neighboring regions. For instance, the Kavango-Zambezi Transfrontier Conservation Area (KAZA), which spans Angola, Botswana, Namibia, Zambia, and Zimbabwe, is home to one of the largest contiguous elephant habitats in the world, with an estimated population of over 227,000 elephants[14].

[11] Endangered Wildlife Trust (EWT). (2021, July 29). Malawi Wild Dog Translocation Press Release. Johannesburg: Endangered Wildlife Trust.

[12] African Parks. (2024). Reflecting on the Past, Building for the Future: African Parks 2023 Annual Report. Johannesburg: African Parks Network.

[13] Hannah Ritchie (2024) - “The state of the world's elephant populations” Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/elephant-populations'

[14] World Wildlife Fund (WWF). (2023). KAZA Elephant Survey 2022 Fact Sheet. WWF. https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/1mo57uy5sd_KAZA_Elephant_Survey_Fact_Sheet.pdf

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Reptiles

The Zambezi Flapshell Turtle (*Cycloderma frenatum*), classified as Endangered on the IUCN Red List, occurs in rivers and wetlands across southern Tanzania, Zambia, and Mozambique, extending into Malawi. Within the EAAA, the species is likely present in wetland habitats, although confirmed observations are limited. Its occurrence in these habitats highlights the conservation value of aquatic ecosystems, particularly given the species' vulnerability to habitat degradation and human activities. Although precise population data is lacking, it is estimated that the intersection of the EAAA and the EOO is greater than 0.5%.

Table 3-3 : Assessment according to criteria 1-3

Taxon	Common name	Species	EAAA	Results	Triggering the critical habitat
Birds	Hooded vulture	*Necrosyrtes monachus*	Wide ranging	Criterion 1 (a) : the percentage of the global population is lesser than 0.5% Criterion 1(c): Although Critically Endangered, the species is rare in Malawi, with few records in Majete and no confirmed breeding or regular presence.	No
	White-backed vulture	*Gyps africanus*	Wide ranging	Criterion 1 (a) : the percentage of the global population is lesser than 0.5% Criterion 1(c): Occasionally recorded in Majete and Liwonde, the species shows no confirmed breeding or significant concentrations in Malawi.	**Yes**
	Lappet-faced vulture	*Torgos tracheliotos*	Wide ranging	Criterion 1 (a) : the percentage of the global population is lesser than 0.5% Criterion 1(c): Although the species is occasionally recorded in Majete and Liwonde, there is no confirmed breeding population or evidence of important concentrations in Malawi, limiting its significance at the national or regional level.	No
	White-headed vulture	*Trigonoceps occipitalis*	Wide ranging	Criterion 1 (a) : the percentage of the global population is lesser than 0.5%	**Yes**

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Taxon	Common name	Species	EAAA	Results	Triggering the critical habitat
Birds				Criterion 1(c): This Critically Endangered species has breeding pairs in Majete is severely declining across its range; the presence of resident individuals in these southern protected areas represents one of the few remaining strongholds in Malawi, justifying regional importance.	
	Basra-reed Warbler	*Acrocephalus griseldis*	Aquatic	Criterion 1 (a) : the percentage of the global population is greater than 0.5%	**Yes**
	African Openbill	*Anastomus lamelligerus*	Wide ranging	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%.	**Yes**
	African Skimmer	*Rynchops flavirostris*	Wide ranging	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%.	**Yes**
	Whiskered Tern	*Chlidonias hybrida*	Wide ranging	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%.	**Yes**
	Collared Pratincole	*Glareola pratincola*	Wide ranging	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%.	**Yes**
	Black Heron	*Egretta ardesiaca*	Wide ranging	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%.	**Yes**
	Grey Crowned Crane	*Balearica regulorum*	Aquatic	Criterion 3 (a) : the percentage of the global population of this migratory species is lesser than 1%	No
	Malagasy Pond Heron	*Ardeola idae*	Aquatic	Criterion 1 (a) : the percentage of the global population is greater than 0.5 but no reproductive unit were found during the African Waterbird Census waterbird counts at Elephant Marsh surveys (< 5 reproductive units).	No

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Taxon	Common name	Species	EAAA	Results	Triggering the critical habitat
Mammals				Criterion 3 (a) : the percentage of the global population of this migratory species is lesser than 1%.	
	Black Rhino	*Diceros bicornis*	Terrestrial	Criterion 1 (a): Current estimates indicate >35 individuals, exceeding the 0.5% global population threshold for Critical Habitat. With confirmed reproductive units and slow reproduction (one calf every 2.5–3 years, gestation 15–16 months), the population meets the quantitative criteria for Critical Habitat designation. Criterion 1 (c): Majete, along with Liwonde National Park, now hosts the only black rhino populations in Malawi, making these reserves critically important for the species' survival within the country. The black rhino is extinct in the wild in Malawi (or was, until reintroduction).	**Yes**
	African Wild Dog	*Lycaon Pictus*	Terrestrial	Criterion 1 (b): Current estimates indicate >14 individuals, not exceeding the 0.5% global population threshold for Critical Habitat with confirmed reproductive units (12 pups). Criterion 1 (c) : Majete, along with other protected areas like Liwonde National Park, now hosts the only African wild dog populations in Malawi, making these reserves critically important for the species' survival within the country. African wild dogs were declared extinct in Malawi by the 1990s. In 2018, African Parks, in collaboration with Malawi's Department of National Parks and Wildlife (DNPW), reintroduced a founder population of wild dogs into Majete Wildlife Reserve	**Yes**

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Taxon	Common name	Species	EAAA	Results	Triggering the critical habitat
Mammals	African Savannah Elephant	*Loxondata africana*	Terrestrial	Criterion 1 (b): not meet the thresholds Criterion 1 (c): The elephants in Majete do not represent a unique subpopulation, nor is the site known for breeding, migration corridors, or dry season refuges critical to the species' broader survival. The population in Majete is small regarding the neighborhood countries (Mozambique, Tanzania, Kavango-Zambezi corridor).	No
Reptiles	Zambezi Flapshell turtle	*Cycloderma frenatum*	Aquatic	Criterion 1 (a) : the percentage of the global population is greater than 0.5%.	**Yes**
Fishes	-	*Labeo cylindricus*	Aquatic	Criterion 3 (a) : the percentage of the global population of this migratory species is lesser than 1%.	No
	-	*Labeobarbus congoro*	Aquatic	Criterion 3 (a) : the percentage of the global population of this migratory species is greater than 1%. Even if the species meet criterion 3(a), the cumulative effect of several dams along the Shire River reduces or prevents species migration. The river is not actually suitable for migration and is not critical habitat for the species.	No
	African mottled Eel	*Anguilla labiate*	Aquatic	No data on its range to estimate whether the species triggering the critical habitat	No

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4. CONCLUSION

In conclusion, 11 species trigger the critical habitat. Six migratory bird species are primarily present in Elephant Marsh, an area that regularly supports 1% or more of some waterbird species' biogeographic population. These species trigger the CH under this criterion. Two mammal species are confined to the Majete Wildlife Reserve. Two vulture species are present in the MWR and other protected areas (Lengwe National Park and Liwonde National Park). Finally, one reptile species is primarily found in Elephant Marsh, although recent surveys have also found it in the MWR.

Table 4-1 : Species triggering the Critical Habitat

Feature	CH qualifying feature	Presence in EAAAs	Criteria
Mammals	Black rhinoceros – *Diceros bicornis*	Confined to Majete Wildlife Reserve	1c
	African Wild Dog – *Lycaon pictus*	Confined to Majete Wildlife Reserve	1c
Birds	Black Heron – *Egretta ardesiaca*	Primarily associated with Elephant Marsh	3a
	African Openbill – *Anastomus lamelligerus*	Primarily associated with Elephant Marsh	3a
	African Skimmer – *Rynchops flavirostris*	Primarily associated with Elephant Marsh	3a
	Whiskered Tern – *Chlidonias hybrida*	Primarily associated with Elephant Marsh	3a
	Collared Pratincole – *Glareola pratincola*	Primarily associated with Elephant Marsh	3a
	Basra Reed-warbler – *Acrocephalus griseldis*	Primarily associated with Elephant Marsh	1a
	White headed vulture – *Trigonoceps occipitalis*	Movement between Liwonde, MWR and Lengwe National Park.	1c
	White-backed vulture – *Gyps africanus*	Movement between Liwonde, MWR and Lengwe National Park.	1c
Reptiles	Zambezi Flapshell Turtle – *Cycloderma frenatum*	Primarily associated with lake and floodplain habitats (e.g. Liwonde and Elephant Marsh). Recent surveys (2023) in MWR	1a

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APPENDIX B. QUANTITATIVE RESULTS

Species	Local population	Global Population	Reproductive unit	Treshold
White-backed Vulture (*Gyps africanus*)	135 ind.	~270,000 individuals (BirdLife/IUCN 2021)	Breeding confirmed, but likely <5 units	1(a) **0.05 %**
White-headed Vulture (*Trigonoceps occipitalis*)	27 ind.	~5,500 individuals (BirdLife/IUCN 2021)	Juvenile observed; likely <5 units	1(a) **0.49 %**
Hooded Vulture (*Necrosyrtes monachus*)	Rare, not confirmed	~197,000 individuals (BirdLife/IUCN 2021)	No confirmed breeding units	1(a) —
Lappet-faced Vulture (*Torgos tracheliotos*)	Occasional	~39,000 individuals (BirdLife/IUCN 2021)	No confirmed breeding units	1(a) —
Basra Reed Warbler (*Acrocephalus griseldis*)	Likely present (>0.5% EOO overlap with EAAA)	1.1–2.2 million individuals (BirdLife/IUCN 2021)	No confirmed breeding units (<5 units recorded in surveys)	1(a) >0.5 % (based on range overlap)
Black Rhino (*Diceros bicornis*)	>35 ind.	~5,600 individuals (IUCN 2022)	Confirmed breeding (>5 units)	1(a) **0.63 %**
African Wild Dog (*Lycaon pictus*)	>20 ind.	~6,679 individuals (IUCN 2022)	Reintroduced packs; breeding confirmed, >5 units	1(a) **0.30 %**
African Savannah Elephant (*Loxodonta africana*)	~400 ind.	~415,000 individuals (IUCN 2021)	Multiple herds (>5 units)	1(a) **0.10 %**
Zambezi Flapshell Turtle (*Cycloderma frenatum*)	Likely present (>0.5% EOO overlap with EAAA)	No precise global estimate (IUCN 2021)	No data on reproductive units	1(a) >0.5 % (based on range overlap)
Malagasy Pond Heron (Ardeola idae)	Likely present (>0.5% EOO overlap with EAAA)	~1,000 ; 2,499 (mature individuals)	No reproductive units were recorded during the African Waterbird Census at Elephant Marsh	1(a) >0.5 % (based on range overlap) 3(a) < 1%
Labeobarbus congoro	Likely present (>1% EOO overlap with EAAA)	-	Migration blocked by dams (no viable units)	3(a) > 1%
Labeo cylindricus	<1% EOO overlap with EAAA	-	-	3(a) <1%

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APPENDIX J. TERRESTRIAL AND AVIFAUNA SPECIES - DRY SEASON INVENTORIES

LIST OF SPECIES ENCOUNTERED DURING THE DRY SEASON INVENTORIES

Herpetofauna

Site	Habitat	Nat_modif	Commun	Scientific	Method	Favourable Habitat	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Mababe Puddle Frog	Phrynobatrachus mababiensis	observed	Savanna at high and low altitudes	08/07/2024	Sunny	-15,90386	34,752577	-15,907277	34,7549
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Anchieta;s Rigged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	08/07/2024	Sunny	-15,90386	34,752577	-15,907277	34,7549
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Mozambique ridged Frog	Ptychadena mossambica	observed	Open savanna	08/07/2024	Sunny	-15,90386	34,752577	-15,907277	34,7549
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Mozambique ridged Frog	Ptychadena mossmbica	Local informat.	Open savanna	08/10/2024	Sunny	-15,883602	34,753795	-15,87442	34,7464
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Anchieta;s Rigged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-15,899262	34,755607	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Mababe puddle frog	Phrynobatrachus mababiensis	observed	Wet areas with emergent vegetation	<Nul>	Sunny	-16,030221	34,812565	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Anchieta;s Rigged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-16,030221	34,812565	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Anchieta's ridged frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-16,030221	34,812565	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Bull frog	Pyxicephalus adspersus	observed	Dry savanna, coastal plains and lrge pans with water in rainy season	<Nul>	Sunny	-16,030221	34,812565	0	0

Site	Habitat	Nat_modif	Commun	Scientific	Method	Favourable Habitat	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Modified habitat	Fornasin's Spiny reed frog	Afrixalus fornasini	observed	Associated with deep ponds where reeds are growing	<Nul>	Sunny	-16,030221	34,812565	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Short-legged Spiny reed frog	Afrixalus brachycnemis	observed	Glassland and coastal forest	<Nul>	Sunny	-16,030221	34,812565	0	0
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Anchietas' Rigged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-15,993333	34,923333	-16,210333	36,0344
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Anchietas' Rigged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Crocodile	Crocodylus niloticus	observed	Water ways, lakes and marshes	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Green Water snake	Philothamnus hoplogaster	observed	Preffers wetter regions around water bodies, rivers and streams	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Water Monitor	Varanus niloticus	observed	Along rivers, streams, dams, in lakes and residential gardens	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Long reed frog	Hyperolius nasutus	observed	Redds growing in deep water, in pool, streams and large rivers	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Water lily frog	Hyperolius pusilus	observed	Often found on floating vegetation like lily leaves.	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Elephant Marsh	Cultivation and wetland	Almost intact	Anchieta's ridged frog	Ptychadena anchietae	observed	Savanna form, usually found I grassland near water	<Nul>	Sunny	-16,038132	34,815752	-16,088201	34,8139
Elephant Marsh	Cultivation and wetland	Modified habitat	Anchietas' Ridged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-16,032364	34,819812	-16,030543	34,824

Site	Habitat	Nat_modif	Commun	Scientific	Method	Favourable Habitat	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Modified habitat	Marbled reed Frog	Hyperolius marmoratus	observed	Found in savannas and open bush along streams and rivers, as well as in lowlands where temporary pools form during rainy season	<Nul>	Sunny	-16,032364	34,819812	-16,030543	34,824
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Fornasin's Spiny reed frog	Afrixalus fornasini	observed	Associated with deep ponds where reeds are growing	<Nul>	Sunny	-16,039671	34,795654	-15,992223	34,8053
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Anchietas' Ridged Frog	Ptychadena anchietae	observed	A Savanna form, usually found in grassland near water	<Nul>	Sunny	-16,933364	34,74945	-15,967837	34,7842
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Andhieat's ridged frog	Ptychadena anchietae	observed	Savanna form, usually found I grassland near water	<Nul>	Sunny	-16,933364	34,74945	-15,967837	34,7842

Mammals

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Nyala	Tragelaphus angasii	III	No	No	No	LC	Sight	Associated with thickets in dry woodland. This includes dense woodland, riverline forests, island bush in floodplains and other thickets. Surrounding grass plains are visited when grass sprouts. Dependent on water.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Waterbuck	Kobus ellipsiprymnus	I	No	No	No	LC	Scat	A savannah species: never far away from water, but usually avoids riverline forests. Found in woodland along rivers, dry floodplains and vleis or in reed beds along marshes. These areas usually have good-quality grass for grazing. Veryn dependent on wate	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	African wild cat	Felis silvestris lybica	I	No	No	No	LC	Scat	Open, dry habitats with some vegetation cover, especially grass and low karoo scrub.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Impala	Aepyceros melampus	I	No	No	No	LC	Scat	Open woodlaand with sufficient water, especially thorn and mopanveld, also found in more dense woodland such as that along rivers (especially the black-faced impala) and on the edge of woodland and grassland or floodplains. Dependent on water.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Porcupine	Hystrix africaeaustralis	I	No	No	No	LC	Scat	Very adaptable. Found in most of the vegetation areas. Prefers broken veld with rocky hills and rocky reefs. Shelters in caves, crevises, antbear and other Burrows which it adapts. Sometimes a large number of bones - which have been carried there n- can	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Burrow	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Rock hyrax	Procavia capensis	I	No	No	No	LC	Trail	Rocky areas with crevises, caves or Burrows for shelter, as well as shrubs and/or trees. Usually found on a stony hill, cliff and even small stone heaps.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Bushbuck	Tragelaphus scriptus	I	No	No	No	LC	Scat	Prefers riverline forests or other types of dense thickets near perenial water. Many more in summer to other thickets near temporary water sources, returning when it becomes dry. Dependant on water and sufficient shelter	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Nyala	Tragelaphus angasii	IIII	No	No	No	LC	Sight	Associated with thickets in dry woodland. This includes dense woodland, riverline forests, island bush in floodplains and other thickets. Surrounding grass plains are visited when grass sprouts. Dependent on water.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Serval	Laptailurus serval	I	No	No	No	LC	Scat	Prefers savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	II	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Honeybadger	Mellivora capensis	I	No	No	No	LC	Scat	Wide range of food items but insects, other invertebrates and rodents are the most important. Much of their prey is obtained by digging with the powerful front claws. Reptiles, birds, other small mammals, wild fruit and carrion are also eaten. In coastal	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Serval	Laptailurus serval	I	No	No	No	LC	Scat	Prefers savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Serval	Laptailurus serval	I	No	No	No	LC	Scat	Prefers savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Bushbuck	Tragelaphus scriptus	I	No	No	No	LC	Scat	Prefers riverline forests or other types of dense thickets near perenial water. Many more in summer to other thickets near temporary water sources, returning when it becomes dry. Dependant on water and sufficient shelter	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Common warthog	Phacocoerus aethiopicus	I	No	No	No	LC	Scat	Areas with short grass and mud pools. Prefers open woodland, grass plains (especially floodplains), vleis and open areas surrounding pans and water Burrows. Likes areas where fresh grass grows following a fire. Avoids thickets. Independent of water.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Plains zebra	Equas quagga	I	No	No	No	LC	Scat	Grassland plains and open grassed woodland, with access to water.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Waterbuck	Kobus ellipsiprymnus	I	No	No	No	LC	Scat + Footprint	A savannah species: never far away from water, but usually avoids riverline forests. Found in woodland along rivers, dry floodplains and vleis or in reed beds along marshes. These areas usually have good-quality grass for grazing. Veryn dependent on wate	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Digging	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Waterbuck	Kobus ellipsiprymnus	I	No	No	No	LC	Scat	A savannah species: never far away from water, but usually avoids riverline forests. Found in woodland along rivers, dry floodplains and vleis or in reed beds along marshes. These areas usually have good-quality grass for grazing. Veryn dependent on wate	<Nul>	Sunny	-15,895346	34,748912	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,89655	34,748827	-15,896219	34,7476
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,896678	34,748882	-15,896219	34,7476
Downstream of the dam	Riverline	Modified habitat	Multimammate Mouse	Mustomys natalensis	I	No	No	No	LC	Trapped & released	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-15,896731	34,748825	-15,897032	34,7486
Downstream of the dam	Riverline	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,896831	34,74879	-15,897032	34,7486
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	III	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,896843	34,748821	-15,896219	34,7476
Downstream of the dam	Riverline	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,896843	34,748821	-15,897032	34,7486
Downstream of the dam	Riverline	Modified habitat	Least Spiny Mouse	Acomys spinosissimus	I	No	No	No	LC	Trapped & released	Rocky habitats but also woodland and other associations.	<Nul>	Sunny	-15,897032	34,74857	-15,897032	34,7486

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Velvet monkey	Cercopithecus aethiops	IIII I	No	No	No	LC	Sight	Prefers fairly dense savannah - the ecotone between savannah and forest and riverline forest, even if surrounded by unfavourable terrain. Water, sufficient fruit-bearing trees and trees for shelter are requirements.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Nyala	Tragelaphus angasii	I	No	No	No	LC	Scat	Associated with thickets in dry woodland. This includes dense woodland, riverline forests, island bush in floodplains and other thickets. Surrounding grass plains are visited when grass sprouts. Dependent on water.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Waterbuck	Kobus ellipsiprymnus	I	No	No	No	LC	Scat	A savannah species: never far away from water, but usually avoids riverline forests. Found in woodland along rivers, dry floodplains and vleis or in reed beds along marshes. These areas usually have good-quality grass for grazing. Veryn dependent on wate	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Impala	Aepyceros melampus	I	No	No	No	LC	Scat	Open woodlaand with sufficient water, especially thorn and mopanveld, also found in more dense woodland such as that along rivers (especially the black-faced impala) and on the edge of woodland and grassland or floodplains. Dependent on water.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Velvet monkey	Cercopithecus aethiops	IIII	No	No	No	LC	Sight	Prefers fairly dense savannah - the ecotone between savannah and forest and riverline forest, even if surrounded by unfavourable terrain. Water, sufficient fruit-bearing trees and trees for shelter are requirements.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Bushbuck	Tragelaphus scriptus	I	No	No	No	LC	Scat	Prefers riverline forests or other types of dense thickets near perenial water. Many more in summer to other thickets near temporary water sources, returning when it becomes dry. Dependant on water and sufficient shelter	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Rock hyrax	Procavia capensis	I	No	No	No	LC	Trail	Rocky areas with crevises, caves or Burrows for shelter, as well as shrubs and/or trees. Usually found on a stony hill, cliff and even small stone heaps.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Scrub hare	Lepus saxatilis	I	No	No	No	LC	Scat	Savannah species: scrub areas with patches of grass. Avoids dense bush or open grass plains. Grazes at night in open areas. Sufficient edible grass and dense shrub for shelter are important requirements. Independent of water.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Serval	Laptailurus serval	I	No	No	No	LC	Scat	Prefers savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Scat	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Waterbuck	Kobus ellipsiprymnus	I	No	No	No	LC	Scat	A savannah species: never far away from water, but usually avoids riverline forests. Found in woodland along rivers, dry floodplains and vleis or in reed beds along marshes. These areas usually have good-quality grass for grazing. Veryn dependent on wate	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Kapichira Dam Construction Site	Mixed woodland	Modified habitat	Hippopotamus	Hippopotamus amphibius	I	Yes	Yes	No	VU	Footprint	Open stretches of permanent water or riverline pools with gently sloping sandbacks on which to rest. The area should contain enough. Prefers pools that are deep enough for submersion, with slow running water. Moves away during floods, but returns the sa	<Nul>	Sunny	-15,897921	34,749241	-15,894693	34,7503
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Tiny Musk Shrew	Crocidura fuscomurina	I	No	No	No	LC	Sight	Mostly found in association with moist habitats. The species show a preferance for dense, matted vevetation.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Burrow	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Multimammate Mouse	Mustomys natalensis	I	No	No	No	LC	Trail	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Greater Cane-rat	Thryonomys swinderiunus	I	No	No	No	LC	Local informant	Specialised requirements. Reed beds along rivers and dams or tall, thick-stemmed grass in the vicinity of vleis, dams, floodplains or rivers. Dependent on water. Frequents sugarcane plantations.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	African Marsh rat	Dasymys incomtus	I	No	No	No	LC	Local informant	well-vegetated and wet habitats.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Cape Clawless otter	Aonyx capensis	I	No	No	No	LC	Local informant	Rivers, marshes, dams and lakes; also dry stream-beds in most terrain if pools of water exist. Many wander several kilometres from water. Also utilizes the coastal interdal zone.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Scrub hare	Lepus saxatilis	I	No	No	No	LC	Local informant	Savannah species: scrub areas with patches of grass. Avoids dense bush or open grass plains. Grazes at night in open areas. Sufficient edible grass and dense shrub for shelter are important requirements. Independent of water.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Meller's mongoose	Rhynchogale melleri	I	No	No	No	LC	Local informant	Open woodlands but extends marginally into grass savanna, nearly always in the vicinity of dense ground cover and water. Has been recorded in vicinity of rocky hills and inselbergs lying in woodland savannah.	<Nul>	Sunny	-16,030221	34,812565	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Velvet monkey	Cercopithecus aethiops	IIII	No	No	No	LC	Sight	Prefers fairly dense savannah - the ecotone between savannah and forest and riverline forest, even if surrounded by unfavourable terrain. Water, sufficient fruit-bearing trees and trees for shelter are requirements.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Greater Cane-rat	Thryonomys swinderiunus	I	No	No	No	LC	Local informant	Specialised requirements. Reed beds along rivers and dams or tall, thick-stemmed grass in the vicinity of vleis, dams, floodplains or rivers. Dependent on water. Frequents sugarcane plantations.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Cape Clawless otter	Aonyx capensis	I	No	No	No	LC	Local informant	Rivers, marshes, dams and lakes; also dry stream-beds in most terrain if pools of water exist. Many wander several kilometres from water. Also utilizes the coastal interdal zone.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Multimammate Mouse	Mustomys natalensis	I	No	No	No	LC	Local informant	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Local informant	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Chacma baboon	Papio hamadryas ursinus	I	No	No	No	LC	Sight	Prefers clifs or tall trees for shelter, and also sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannah with enough food.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Tree squirrel	Paraxerus cepapi	I	No	No	No	LC	Local informant	In most types of savannah, especially mopane and thornveld and mixed savannah. As it requires Burrows in trunks in which to rest or make a nest, old mopane and thorn trees are popular. Independent of water.	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126
Elephant Marsh	Riverline Marsh	Modified habitat and Farmland	Hippopotamus	Hippopotamus amphibius	I	Yes	Yes	No	VU	Footprint	Open stretches of permanent water or riverline pools with gently sloping sandbacks on which to rest. The area should contain enough. Prefers pools that are deep enough for submersion, with slow running water. Moves away during floods, but returns the sa	<Nul>	Sunny	-16,030221	34,812566	-16,030221	34,8126

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Cattle	Bos taurus	IIII III	No	No	No	LC	Sight	Fits every habitat for grazing but are sheltered by humans	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	African Pygmy Goat	Capra aegagrus hircus	IIII III	No	No	No	LC	Sight	Fits every habitat for grazing and browsing but are sheltered by humans	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Pig	Sus domesticus	III	No	No	No	LC	Sight	Domesticated aniamal	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Velvet monkey	Cercopithecus aethiops	II	No	No	No	LC	Scat	Prefers fairly dense savannah - the ecotone between savannah and forest and riverline forest, even if surrounded by unfavourable terrain. Water, sufficient fruit-bearing trees and trees for shelter are requirements.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Tiny Musk Shrew	Crocidura fuscomurina	I	No	No	No	LC	Trail	Mostly found in association with moist habitats. The species show a preferance for dense, matted vevetation.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Multimam mate Mouse	Mustomys natalensis	I	No	No	No	LC	Local informant	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Mutable Sun Squirell	Heliosciurus mutabilis	I	No	No	No	LC	Local informant	Forested areas at both high and low elevations, including riverline forest.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Trail	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Marsh Mongoose	Atilax palundinosus	I	No	No	No	LC	Local informant	Associated with well-watered areas, along rivers and streams, and around dams, lakes, estuaries and swamps wherever there is cover. It utilizes temporary stream-beds where there are pools and many wander some distance from water.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Serval	Laptailurus serval	I	No	No	No	LC	Scat	Prefers savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	African Marsh Rat	Dasymys incomtus	I	No	No	No	LC	Local informant	well-vegetated and wet habitats.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Multimammate Mouse	Mustomys natalensis	I	No	No	No	LC	Trail	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Fat Mouse	Steatomys pratensis	I	No	No	No	LC	Local informant	Usually found over sandy substrates in a range of habitats, including wooden grassland and moist savannah. Sometimes in cultivated lands.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Four-toed Sengi	Petrodromus tetradactylus	I	No	No	No	LC	Local informant	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Greater Cane-rat	Thryonomys swinderiunus	I	No	No	No	LC	Local informant	Specialised requirements. Reed beds along rivers and dams or tall, thick-stemmed grass in the vicinity of vleis, dams, floodplains or rivers. Dependent on water. Frequents sugarcane plantations.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Cape Clawless otter	Aonyx capensis	I	No	No	No	LC	Local informant	Rivers, marshes, dams and lakes; also dry stream-beds in most terrain if pools of water exist. Many wander several kilometres from water. Also utilizes the coastal interdal zone.	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Regrowth of mixed woodland	Modified habitat	Hippopotamus	Hippopotamus amphibius	II	Yes	Yes	No	VU	Dight + Footprint	Open stretches of permanent water or riverline pools with gently sloping sandbacks on which to rest. The area should contain enough. Prefers pools that are deep enough for submersion, with slow running water. Moves away during floods, but returns the sa	<Nul>	Sunny	-16,030221	34,812565	-15,968026	34,7843
Elephant Marsh	Reeds along the river	Modified habitat	Greater Cane-rat	Thryonomys swinderiunus	I	No	No	No	LC	Local informant	Specialised requirements. Reed beds along rivers and dams or tall, thick-stemmed grass in the vicinity of vleis, dams, floodplains or rivers. Dependent on water. Frequents sugarcane plantations.	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053
Elephant Marsh	Reeds along the river	Modified habitat	African Marsh rat	Dasymys incomtus	I	No	No	No	LC	Local informant	well-vegetated and wet habitats.	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053
Elephant Marsh	Reeds along the river	Modified habitat	Hippopotamus	Hippopotamus amphibius	II	Yes	Yes	No	VU	Local informant	Open stretches of permanent water or riverline pools with gently sloping sandbacks on which to rest. The area should contain enough. Prefers pools that are deep enough for submersion, with slow running water. Moves away during floods, but returns the sa	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053
Elephant Marsh	Reeds along the river	Modified habitat	Four-toed Sengi	Petrodromus tetradactylus	I	No	No	No	LC	Local informant	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053
Elephant Marsh	Reeds along the river	Modified habitat	Cape Clawless otter	Aonyx capensis	I	No	No	No	LC	Local informant	Rivers, marshes, dams and lakes; also dry stream-beds in most terrain if pools of water exist. Many wander several kilometres from water. Also utilizes the coastal interdal zone.	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Reeds along the river	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Local informant	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,030221	34,812565	-15,992223	34,8053
Elephant Marsh	Cultivated crops	Modified habitat	Four-toed Sengi	Petrodromus tetradactylus	I	No	No	No	LC	Local informant	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.	<Nul>	Sunny	-16,032364	34,819812	-16,03054	34,824
Elephant Marsh	Cultivated crops	Modified habitat	Greater Cane-rat	Thryonomys swinderiunus	I	No	No	No	LC	Local informant	Specialised requirements. Reed beds along rivers and dams or tall, thick-stemmed grass in the vicinity of vleis, dams, floodplains or rivers. Dependent on water. Frequents sugarcane plantations.	<Nul>	Sunny	-16,032364	34,819812	-16,03054	34,824
Elephant Marsh	Cultivated crops	Modified habitat	Fat Mouse	Steatomys pratensis	I	No	No	No	LC	Local informant	Usually found over sandy substrates in a range of habitats, including wooden grassland and moist savannah. Sometimes in cultivated lands.	<Nul>	Sunny	-16,032364	34,819812	-16,03054	34,824
Elephant Marsh	Cultivated crops	Modified habitat	Multimammate Mouse	Mustomys natalensis	I	No	No	No	LC	Local informant	They have a wide habitat tolerance. Some species favour wet habitats and relatevely dense vegetation.	<Nul>	Sunny	-16,032364	34,819812	-16,03054	34,824
Elephant Marsh	Cultivated crops	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Local informant	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,032364	34,819812	-16,03054	34,824
Elephant Marsh	Riverline Marsh	Modified habitat, Cultivated farmland with scarp reeds	Velvet monkey	Cercopithecus aethiops	II	No	No	No	LC	Sight	Prefers fairly dense savannah - the ecotone between savannah and forest and riverline forest, even if surrounded by unfavourable terrain. Water, sufficient fruit-bearing trees and trees for shelter are requirements.	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Elephant Marsh	Riverline Marsh	Modified habitat, Cultivated farmland with scarp reeds	Common duiker	Sylvicapra grimmia	I	No	No	No	LC	Scat	Prefers woodland with sufficient undergrowth and thickets. Important requirements are thickets, shrubs or tall grass on which it feeds, and in which it takes shelter when in danger and to rest. Avoids open woodland, short grassland and dense mountain or	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Elephant Marsh	Riverline Marsh	Modified habitat, Cultivated farmland with scarp reeds	Hippopotamus	Hippopotamus amphibius	I	Yes	Yes	No	VU	Footprint	Open stretches of permanent water or riverline pools with gently sloping sandbacks on which to rest. The area should contain enough. Prefers pools that are deep enough for submersion, with slow running water. Moves away during floods, but returns the sa	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Elephant Marsh	Riverline Marsh	Modified habitat, Cultivated farmland with scarp reeds	Bushveld gerbrbil	Tatera leucogaster	I	No	No	No	LC	Burrow	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973

Site	Habitat	Nat_modif	Commun	Scientific	Abundance	Protected	Endemic	Migratory	Statut IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Riverline Marsh	Modified habitat, Cultivated farmland with scarp reeds	Tiny Musk Shrew	Crocidura fuscomurina	I	No	No	No	LC	Local informant	Mostly found in association with moist habitats. The species show a preferance for dense, matted vevetation.	<Nul>	Sunny	-16,088201	34,813946	-16,006739	34,7973
Chikwawa Flood Plain	Regrowth of mixed woodland	Modified habitat	Dog	Canis domestica	I	No	No	No	LC	Skull	Domesticated aniamal	<Nul>	Sunny	-16,93364	34,749045	-15,968026	34,7843

Birds

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	16	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	African Gray Hornbill	Tockus nasutus	18	YES	NO	NO	LC	observed	Acacia savanna and dry, broad-leafed woodland	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	African Open Bill	Anastomus lamelligerus	11	YES	NO	NO	LC	observed	Fresh water lakes and dams where it feeds on snails and mussels	08/07/2024	Sunny	34,752577	-15.90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	African pied wagtail	Motacilla anguimp	23	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garden near water	08/07/2024	Sunny	34,752577	-15.90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Barn Swallow	Hirundo rustica	28	YES	NO	NO	LC	observed	Cosmopolitan, except in closed forests	08/07/2024	Sunny	34,752577	-15.90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black Cuckooshike	Campephaga flava	1	YES	NO	NO	LC	observed	Mature woodland and forest margin	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black eyed bulbul	Pycnonotus tricolor	29	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black Headed Oriole	Oriolus larvatus	7	YES	NO	NO	LC	observed	Mature woodland , especially broadleafed, also forest edge and exotic plantation	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	6	YES	NO	NO	LC	observed	Woodland , forest edge and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	16	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	3	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	10	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	41	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Brown-headed Tchagra	Tchagra australis	15	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	37	YES	NO	NO	LC	observed	Almost all except forest	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Chinspot Batis	Batis molitor	6	YES	NO	NO	LC	observed	Bradleafed woodland and acacia savanna	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Collared Sunbird	Anthreptes collaris	10	YES	NO	NO	LC	observed	Forest, dense woodland and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Common Waxbill	Estrilda astrild	19	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Common Waxbill	Estrilda astrild	14	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Crowned Hornbill	Bycanisters bucinator	16	YES	NO	NO	LC	observed	Inland, coastal and riverine forets	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Fiery-necked Nightjar	Caprimulgus pectoralis	7	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Forest Weaver	Ploceus bicolor	4	YES	NO	NO	LC	observed	Forest and dense woodland. Breeds singly; nests in finery wovens from vines and creepers.	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Great White Egret	Egretta alba	20	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Grey Heron	Ardea Cinerea	24	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Harmecop	Scopus umbretta	13	YES	NO	NO	LC	observed	Lakes,dams and rivers	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Heuglin's Robin	Cossypha heuglini	4	YES	NO	NO	LC	observed	Dense thickets and tangles, gardens and parks	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Jamson Firefinch	Lagonosticta rhodopareira	9	YES	NO	NO	LC	observed	Thickets and grassy tangles in savanna and dry woodland	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Klaas's Cuckoo	Chrysococcyx klaas	11	YES	NO	NO	LC	observed	Forets, woodland, savanna and garedns	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Little Bee Eater	Melops pusilus	18	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Namaqua Dove	Oena capensis	3	YES	NO	NO	LC	observed	Arid and semi arid savannas and open woodland	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Peter's Twinspot	Hypargos niveoguttatus	4	YES	NO	NO	LC	observed	Dense thickets, rank growth and forest edge, prefers moister habitat.	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Pied kingfisher	Ceryle rudis	8	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Recket -tailed Roller	Coracias spatulatus	2	YES	NO	NO	LC	observed	Tall woodland especially miombo	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Red-billed Firefinch	Lagonosticta senegala	30	YES	NO	NO	LC	observed	Semi -arid woodland, especially near water, also gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Red-capped Crombec	Sylvietta ruficapilla	17	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	7	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Trumpeter Hornbill	Bycanistes bucinator	19	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	White-bellied Sunbird	Cinnyris talatala	9	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	28	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted Tinker bird	Pononiulus chrysoconus	8	YES	NO	NO	LC	observed	Woodland and savanna	08/07/2024	Sunny	34,752577	-15,90386	34,754875	-15,9073

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	African Gray Hornbill	Tockus nasutus	9	YES	NO	NO	LC	observed	Acacia savanna and dry, broadleafed woodland	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	African pied wagtail	Motacilla anguimp	6	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black eyed bulbul	Pycnonotus tricolor	0	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	7	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Black-backed Puffback	Dryoscopus cubla	17	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	13	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	16	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	20	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Brown-headed Tchagra	Tchagra australis	5	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Bue-billed Firefinch	Lagonisticta lubricata	23	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	28	YES	NO	NO	LC	observed	Almost all except forest	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Collared Sunbird	Anthreptes collaris	4	YES	NO	NO	LC	observed	Forest, dense woodland and gardens	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Crowned Hornbill	Tockus alboterminatus	8	YES	NO	NO	LC	observed	Inland, coastal and riverine forets	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Great White Egret	Egretta alba	6	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Harmecop	Scopus umbretta	8	YES	NO	NO	LC	observed	Lakes, dams and rivers	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Heuglin's Robin	Cossypha heuglini	3	YES	NO	NO	LC	observed	Dense thickets and tangles, gardens and parks	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Jamson Firefinch	Lagonosticta rhodopareira	5	YES	NO	NO	LC	observed	Thickets and grassy tangles in savanna and dry woodland	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Klaas's Cuckoo	Chrysococcyx klaas	5	YES	NO	NO	LC	observed	Forets, woodland, savanna and garedns	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Little Bee Eater	Melops pusilus	9	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Pied Crow	Corvus albus	6	YES	NO	NO	LC	observed	Virtually aa except driest desert ares	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Red-billed Firefinch	Lagonosticta senegala	25	YES	NO	NO	LC	observed	Semi -arid woodland, especially near water, also gardens	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Southern Black Tit	Parus niger	11	YES	NO	NO	LC	observed	Forest and broadleafed woodland	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	8	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Trumpeter Hornbill	Bycanistes bucinator	7	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	14	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Downstream of the dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted Tinker bird	Pononiulus chrysoconus	3	YES	NO	NO	LC	observed	Woodland and savanna	08/07/2024	Sunny	34,751308	-15,90441	34,751628	-15,9074
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Wattled Lapwing	Vanellus senegallus	9	YES	NO	NO	LC	observed	Wetland margin and adjacent grassland	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Fish Eagle	Hallaeetus vocifer	7	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Gray Hornbill	Tockus nasutus	28	YES	NO	NO	LC	observed	Acacia savanna and dry, broadleafed woodland	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Parasdise Flycatcher	Terpsiphone viridis	5	YES	NO	NO	LC	observed	Forest and dense woodland; also gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African pied wagtail	Motacilla anguimp	30	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Pipit	Anthus cinnmomeus	4	YES	NO	NO	LC	observed	Open grassland and fields	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Skimmer	Rynchops flavirostris	6	YES	NO	NO	LC	observed	Large rivers, bays and lakes with sandbanks for roosting and breeding	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African wattled Lapwing	Venellus senegallus	28	YES	NO	NO	LC	observed	Wetland margin and adjacent grassland	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black eyed bulbul	Pycnonotus tricolor	30	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	15	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black-collared Barbet	Lybius torquatus	10	YES	NO	NO	LC	observed	Forests, woodland, savanna and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black-collared Barbet	Lybius torquatus	5	YES	NO	NO	LC	observed	Forests, woodland, savanna and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black-crowned Tchagra	Tchagra senegalensis	18	YES	NO	NO	LC	observed	Savanna, thickets and riverine scrub	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	48	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	38	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	37	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	7	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Bue-billed Firefinch	Lagonisticta lubricata	36	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	60	YES	NO	NO	LC	observed	Almost all except forest	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Chinspot Batis	Batis molitor	20	YES	NO	NO	LC	observed	Bradleafed woodland and acacia savanna	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Collared Sunbird	Anthreptes collaris	19	YES	NO	NO	LC	observed	Forest, dense woodland and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	17	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Giant Kingfisher	Megaceryle maxima	3	YES	NO	NO	LC	observed	Wooded streams and dams, fast -flowing rivers and coastal lagoons	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Green-backed Camaroptera	Camaroptera brachyura	5	YES	NO	NO	LC	observed	Dense undergrowth and tangles in forest and thickets; also garderns	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	50	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Pied kingfisher	Ceryle rudis	8	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red Faced Cisticola	Cisticola erythrops	28	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-eyed Dove	Streptopelia semitorquata	20	YES	NO	NO	LC	observed	Woodland, forests and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Cisticola	Cisticola erthrops	21	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	17	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Southern Black Tit	Parus niger	18	YES	NO	NO	LC	observed	Forest and broadleafed woodland	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	29	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Spur-winged Goose	Plectropterus gambensis	10	YES	NO	NO	LC	observed	Wetland and adjacent grasslands and fields	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	36	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Tropical Boubou	Laniarius aethiopicus	19	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Trumpeter Hornbill	Bycanisters bucinator	27	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Village Indigo bird	Vidua chalybeata	23	YES	NO	NO	LC	observed	Woodland and savanna	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Walberg's Eagle	Aquila wahlbergi	2	YES	NO	NO	LC	observed	Woodland and Savanna	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	40	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Yellow-fronted Tinker bird	Pononiulus chrysoconus	6	YES	NO	NO	LC	observed	Woodland and savanna	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodland -Tiver west in Majete wildlife Reserve	Almost intact natural habitat	Yellow-Rumped Bishop	Euplectes capensis	5	YES	NO	NO	LC	observed	Flooded grassland, vles and marshes	08/09/2024	Sunny	34,753535	-15,897426	34,7525	-15,8995
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	White-browed Scrub Robin	Erythropygia leucophrys	0	YES	NO	NO	LC	Mist netted	Woodland and savanna; favours drier habitats	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African Fish Eagle	Haliaeetus vocifer	1	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African Fish Eagle	Haliaeetus vocifer	2	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African pied Wagtail	Motacilla aguimp	5	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African pied Wagtail	Motacilla aguimp	8	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-collared Barbet	Lybius torquatus	2	YES	NO	NO	LC	observed	Forests, woodland, savanna and gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-crowned Night Heron	Nycticorax nycticorax	2	YES	NO	NO	LC	observed	Lakes, rivers and rocky shore.	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	5	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	12	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	2	YES	NO	NO	LC	Mist netted	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	2	YES	NO	NO	LC	Mist netted	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	17	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	8	YES	NO	NO	LC	observed	Almost all except forest	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	2	YES	NO	NO	LC	Mist netted	Woodland and savanna; generally drier habitat	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Harmecop	Scopus umbretta	4	YES	NO	NO	LC	observed	Lakes, dams and rivers	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Harmecop	Scopus umbretta	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	7	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Jamson's Firefinch	Lagonosticta rhodopareira	5	YES	NO	NO	LC	Mist netted	Thickets and grassy tangles in savanna and dry woodland	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Little Bee-eater	Merops pusillus	5	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Little Bee-eater	Merops pusillus	7	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Racket -tailes Roller	Coracias spatulatus	2	YES	NO	NO	LC	observed	Tall woodland especially miombo	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red -faced Crombec	Sylvietta whytii	2	YES	NO	NO	LC	Mist netted	Miombo woodland and riparian forest.	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-billed Firefinch	Lagonosticta senegala	4	YES	NO	NO	LC	Mist netted	Semi -arid woodland, especially near water, also gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Scarlet Chested Sunbird	Chalcomitra senegalensis	1	YES	NO	NO	LC	observed	Woodland savanna and suburban gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	singing Cisticola	Cisticola cantans	2	YES	NO	NO	LC	Mist netted	Rank vegetation bracken and tall grass with scattered bushes	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	6	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	5	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Trumpeter Hornbill	Bycanistes bucinator	10	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Village Indigo bird	Vidua chalybeata	3	YES	NO	NO	LC	observed	Woodland and savanna	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Village Indigo bird	Vidua chalybeata	2	YES	NO	NO	LC	observed	Woodland and savanna	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	5	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/12/2024	Sunny	34,748912	-15,895346	34,747582	-15,8962
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African Grey Hornbill	Tockus nasutus	5	YES	NO	NO	LC	observed	Acacia savanna and dry, broadleafed woodland	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African Parasdise Flycatcher	Terpsiphone viridis	2	YES	NO	NO	LC	observed	Forest and dense woodland; also gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	African Sand Martin	Riparia paludicola	5	YES	NO	NO	LC	observed	Open areas usually near water breeds in sandbanks	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	3	YES	NO	NO	LC	observed	Woodland , forest edge and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Barn Swallow	Hirundo rustica	6	YES	NO	NO	LC	observed	Cosmopolitan, except in closed forests	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-collared Barbet	Lybius torquatus	2	YES	NO	NO	LC	observed	Forests, woodland, savanna and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-crowned Tchagra	Tchagra senegalensis	7	YES	NO	NO	LC	observed	Savanna, thickets and riverine scrub	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	9	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	8	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	5	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	5	YES	NO	NO	LC	observed	Almost all except forest	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Chinspot Batis	Batis molitor	3	YES	NO	NO	LC	observed	Brodleafed woodland and acacia savanna	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	2	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	4	YES	NO	NO	LC	observed	Woodland, savanna and plantations	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Grey Heron	Ardea Cinerea	1	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Harmecop	Scopus umbretta	1	YES	NO	NO	LC	observed	Lakes, dams and rivers	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	6	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Jameson's Firefinch	Logonosticta rhodopareia	4	YES	NO	NO	LC	observed	Thickets and grassy tangles in savanna and dry woodland	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Lesser Blue-eared Starling	Lamprotornis chloropterus	3	YES	NO	NO	LC	observed	miombo woodkand, mopane, wooded grassland andsuburban gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Little Bee-eater	Merops pusillus	2	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Namaqua Dove	Oena capensis	2	YES	NO	NO	LC	observed	Arid and semi arid savannas and open woodland	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Openbill Stork	Anastomus lamelligerus	20	YES	NO	NO	LC	observed	Freshwater lakes and dams	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-eyed Dove	Streptopelia semitorquata	6	YES	NO	NO	LC	observed	Woodland, forests and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-eyed Dove	Streptopelia semitorquata	3	YES	NO	NO	LC	observed	Woodland, forests and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-faced Cisticola	Cisticola erthrops	3	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	7	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-throated Twinpot	Hypargos niveoguttatus	3	YES	NO	NO	LC	observed	Dense thickets, rank growth and forest edge, prefers moister habitat.	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Red-throated Twinpot	Hypargos niveoguttatus	2	YES	NO	NO	LC	observed	Dense thickets, rank growth and forest edge, prefers moister habitat.	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Scarlet Chested Sunbird	Chalcomitra senegalensis	4	YES	NO	NO	LC	observed	Woodland savannaand and suburban gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Southern lesser Fiscal	Lanius collaris	1	YES	NO	NO	LC	observed	Widespread except dense forest	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	4	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	4	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Village Indigo bird	Vidua chalybeata	3	YES	NO	NO	LC	observed	Woodland and savanna	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	White-breasted Commorant	Phalacrocorax carbo	1	YES	NO	NO	LC	observed	Coastal and fresh waters	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Kapichira Dam Construction Site	Mixed woodlnd and rocky	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	5	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	13/08/2024	Sunny	34,747544	-15,89682	34,749542	-15,9004
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	African Fish Eagle	Haliaeetus vocifer	1	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	African pied Wagtail	Motacilla aguimp	4	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	1	YES	NO	NO	LC	observed	Woodland , forest edge and gardens	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black-crowned Night Heron	Nycticorax nycticorax	2	YES	NO	NO	LC	observed	Lakes, rivers and rocky shore.	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	3	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	3	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Great White Egret	Egretta alba	3	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Harmecop	Scopus umbretta	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	8	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Little Bee-eater	Merops pusillus	3	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Scarlet Chested Sunbird	Chalcomitra senegalensis	2	YES	NO	NO	LC	observed	Woodland savannaand and suburban gardens	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	3	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	2	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	13/08/2024	Sunny	34,745964	-15,901709	34,751042	-15,904
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Beaded Wood Pecker	Dendropicos namaquus	2	YES	NO	NO	LC	observed	Woodland, riverine forests and thickets, favouring areas with dead trees	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	0	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	26	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue-billed Fire Finch	Lagonosticta lubricata	27	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Booted Eagle	Aquila pennatus	2	YES	NO	NO	LC	observed	Virtually any habitat, but avoids extensive forests; breed on cliff	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Brown-headed Parrot	Poicephalus cryptoxanthus	5	YES	NO	NO	LC	observed	Savanna, riverine forests and open woodland	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Chinspot Batis	Batis molitor	8	YES	NO	NO	LC	observed	Brodleafed woodland and acacia savanna	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Collared Palm Thrush	Cichladusa aequata	4	YES	NO	NO	LC	observed	Hyphaene or Borassus palm savanna	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Egyptian Goose	Alopochen aegyptiaca	19	YES	NO	NO	LC	observed	Wetland and adjacent grasslands and fields	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	5	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Great White Egret	Egretta alba	8	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Green-backed Camaroptera	Camaroptera brachyura	8	YES	NO	NO	LC	observed	Dense undergrowth and tangles in forest and thickets; also garderns	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Grey Heron	Ardea Cinerea	4	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	12	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Pied Kingfisher	Ceryle rudis	9	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	11	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	18	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Stierling's Woodpecker	Dendropicos stierlini	1	YES	NO	NO	LC	observed	Mature miombo woodland, frequenting larger branches and trunks	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	9	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Tropical Boubou	Laniarius aethiopicus	19	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Trumpeter Hornbill	Bycanisters bucinator	7	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in	Almost intact natural habitat	Woodland Kingfisher	Halycon senegalensis	5	YES	NO	NO	LC	observed	Woodland and savanna	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	14	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/09/2024	Sunny	34,742942	-15,87487	34,746429	-15,8709
Access road to the Dam	Mixed woodland	Almost intact natural habitat	African Grey Hornbill	Tockus nasutus	3	YES	NO	NO	LC	observed	Acacia savanna and dry, broadleafed woodland	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	9	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Blue-billed Firefinch	Lagonosticta rubricata	3	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Brown-headed Parrot	Poicephalus cryptoxanthus	2	YES	NO	NO	LC	observed	Savanna, riverine forests and open woodland	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Brown-headed Tchagra	Tchagra australis	1	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Common Buzzard	Buteo buteo	1	YES	NO	NO	LC	observed	Open country, avoiding very arid and forested areas	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	6	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	2	YES	NO	NO	LC	observed	Woodland, savanna and plantations	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	7	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Little Bee-eater	Merops pusillus	3	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	3	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Southern Black Tit	Parus niger	8	YES	NO	NO	LC	observed	Forest and broadleafed woodland	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	6	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Speckled Mousebird	Colius striatus	5	YES	NO	NO	LC	observed	Thick, tangled bush, and fruiting trees in gardens	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Tropical Boubou	Laniarius aethiopicus	3	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	White Helmetshrike	Prionops plumatus	5	YES	NO	NO	LC	observed	Mixed woodland and acacia savanna	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Yellow-bellied Bulbul	Chlorocichla flaviventris	6	YES	NO	NO	LC	observed	Thickets, dense woodland and forest edge	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	6	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Access road to the Dam	Mixed woodland	Almost intact natural habitat	Yellow-fronted tinkerbird	Pononiulus chrysoconus	2	YES	NO	NO	LC	observed	Woodland and savanna	14/08/2024	Sunny	34,742483	-15,910519	34,746628	-15,9145
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African Parasdise Flycatcher	Terpsiphone viridis	14	YES	NO	NO	LC	observed	Forest and dense woodland, also forest	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	African pied wagtail	Motacilla anguimp	47	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black eyed bulbul	Pycnonotus tricolor	49	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Black Headed Oriole	Oriolus larvatus	10	YES	NO	NO	LC	observed	Mature woodland , especially broadleafed, also forest edge and exotic plantation	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	35	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Blue-billed Fire Finch	Lagonosticta lubricata	38	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Booted Eagle	Hieraaetus pennatus	4	YES	NO	NO	LC	observed	Virtually any habitat, but avoids extensive forests; breed on cliff	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Fiery-necked Nightjar	Caprimulgus pectoralis	9	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	29	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Forest Weaver	Ploceus bicolor	5	YES	NO	NO	LC	observed	Forest and dense woodland. Breeds singly; nests in finery wovens from vines and creepers.	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Greater Blue-eared Starling	Lamprotornis chalybaeus	28	YES	NO	NO	LC	observed	Savanna and mopane woodland	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Green Woodhoopoe	Phoeniculus purpureus	9	YES	NO	NO	LC	observed	Wide variety of woodland, thicket and forest edger	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Green-backed Camaroptera	Camaroptera brachyura	9	YES	NO	NO	LC	observed	Dense undergrowth and tangles in forest and thickets; also garderns	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Harmecop	Scopus umbretta	30	YES	NO	NO	LC	observed	Lakes, dams and rivers	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	40	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Little Bee-eater	Merops pusillus	39	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	18	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Crombec	Slvietta whytii	36	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Mousebird	Urocolius indicus	12	YES	NO	NO	LC	observed	Thornveld, open broadleafed woodland and suberban garedns	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Southern Black-Tit	Melaniparus niger	40	YES	NO	NO	LC	observed	Forest and broadleafed woodland	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Striped Kingfisher	Halcyon chelicuti	5	YES	NO	NO	LC	observed	Woodland, savanna and forest edge	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Trumpeter Hornbill	Bycanisters bucinator	49	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	Variable Sunbird	Cinnyris venustus	27	YES	NO	NO	LC	observed	Woodland, forest edge and gardens	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire west	Mixed woodland -river west in Majete wildlife Reserve	Almost intact natural habitat	White Helmetshrike	Prionops plumatus	27	YES	NO	NO	LC	observed	Mixed woodland and acacia savanna	08/09/2024	Sunny	34,745335	-15,885416	34,742942	-15,8787
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	White-browed Scrub Robin	Erythropygia leucophrys	1	YES	NO	NO	LC	Mist netted	Woodland and savanna; favours drier habitats	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Fish Eagle	Haliaeetus vocifer	1	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Fish Eagle	Haliaeetus vocifer	2	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Morning Dove	Streptopelia decipiens	3	YES	NO	NO	LC	observed	Woodland, riverine forests, thickets and gardens in semi-arid savanna	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African pied Wagtail	Motacilla aguimp	18	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Pipit	Anthus cinnmomeus	4	YES	NO	NO	LC	observed	Open grassland and fields	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Whoopoe	Upu[a africana	2	YES	NO	NO	LC	observed	Savanna, broadleafed woodland, parks and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Allens Gallinule	Porphyrula alleni	4	YES	NO	NO	LC	observed	Flooded grassland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Barn Swallow	Hirundo rustica	23	YES	NO	NO	LC	observed	Cosmopolitan, except in closed forests	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	7	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	2	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	3	YES	NO	NO	LC	Mist netted	Dry woodland, savanna and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Blue-billed Fire Finch	Lagonosticta lubricata	31	YES	NO	NO	LC	observed	Thicket in woodland, savanna and riverine scrub	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	5	YES	NO	NO	LC	Mist netted	Grassy areas in woodland, forests edges and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	36	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Brown-headed Tchagra	Tchagra australis	25	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	34	YES	NO	NO	LC	observed	Almost all except forest	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Chinspot Batis	Batis molitor	8	YES	NO	NO	LC	observed	Broadleaf woodland and acacia savanna	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Claas's Cuckoo	Chrysococcyx klaas	6	YES	NO	NO	LC	observed	Forest, woodland, savanna and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Common Scimitar Bill	Sylvicapra grimmia	5	YES	NO	NO	LC	observed	Dry savanna and open, broadleaf woodland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Common Waxbill	Estrilda astrild	39	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Croacking Cisticola	Cisticola natalensis	2	YES	NO	NO	LC	observed	Wide range of grassland types, below 2,200 m	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	5	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Fiery-necked Nightjar	Caprimulgus pectoralis	4	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Folk-tailed Drongo	Dicrurus adsimilis	9	YES	NO	NO	LC	observed	Woodland, savanna and plantations	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Garden Warbler	Sylvia borin	5	YES	NO	NO	LC	observed	Thick tangles in range of forest, bush and riverine habitats	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Greater-blue Eared Starling	Lamprotornis chalybaeus	20	YES	NO	NO	LC	observed	Savanna and mopane woodland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Green Twinspot	Mandingoa nitidula	2	YES	NO	NO	LC	observed	Forests, usually near clearings or areas with dense growth, woodland and coastal scrub	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Grey Headed Hornbill	Tockus nasutus	16	YES	NO	NO	LC	observed	Acacia savanna and dry, broad-leafed woodland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Grey Heron	Ardea Cinerea	2	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	11	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Little Bee Eater	Merops pusillus	8	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Pied Kingfisher	Ceryle rugis	2	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Red-eyed Dove	Streptopelia semitorquata	9	YES	NO	NO	LC	observed	Woodland, forests and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Cisticola	Cisticola erthrops	6	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	17	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	14	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	9	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Variable Sunbird	Cinnyris venustus	6	YES	NO	NO	LC	observed	Woodland, forest edge and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Village Indigo bird	Vidua chalybeata	12	YES	NO	NO	LC	observed	Woodland and savanna	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Whiskered Terns	Chlidonias hybrida	5	YES	NO	NO	LC	observed	Most wetlands and marshes, but requirs flosting vegetation to bredd	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	White Hhelmetshrike	Prionops plumatus	8	YES	NO	NO	LC	observed	Mixed woodland and acacia savanna	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	White-rumped Swift	Apus caffer	9	YES	NO	NO	LC	observed	Areal; over open country, often near water, ussually occupies red rumpedSwallows' nests	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Yellow fronted Tinkerbird	Pogoniulus chrysoconus	4	YES	NO	NO	LC	observed	Woodland and savanna	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	26	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Yellow-Rumped Bishop	Euplectes capensis	32	YES	NO	NO	LC	observed	Flooded grassland, vles and marshes	08/10/2024	Sunny	34,755926	-15,891449	34,752724	-15,8855

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African Darter	Anhinga ruta	2	YES	NO	NO	LC	observed	Lakes, dams and slow moving rivers	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	African pied Wagtail	Motacilla aguimp	10	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	12	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	10	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	23	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	9	YES	NO	NO	LC	observed	Almost all except forest	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Egyptian Goose	Alopochen aegytiaca	6	YES	NO	NO	LC	observed	Wetland and adjacent grasslands and fields	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	5	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Little Bee-eater	Merops pusillus	7	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Namaqua Dove	Oena capensis	2	YES	NO	NO	LC	observed	Arid and semi arid savannas and open woodland	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Pied Crow	Corvus albus	2	YES	NO	NO	LC	observed	Virtually aa except driest desert ares	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Scarlet Chested Sunbird	Chalcomitra senegalensis	2	YES	NO	NO	LC	observed	Woodland savannaand and suburban gardens	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in	Almost intact natural habitat	Southern Yellow-billed Hornbill	Tockus leucomelas	2	YES	NO	NO	LC	observed	Thornveld and dry, broadleafed woodland	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Spotted Eagle Owl	Bubo africanus	1	YES	NO	NO	LC	observed	All except forest, from desert to woodland and gardens	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	5	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	Trumpeter Hornbill	Bycanistes bucinator	5	YES	NO	NO	LC	observed	Lowland, coastal and riverine evergreen forests	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Majete wildlife Reserve shire east	Dry Miombo-river East in Majete wildlife Reserve	Almost intact natural habitat	White-browed Scrub Robin	Erythropygia leucophrys	2	YES	NO	NO	LC	observed	Woodland and savanna; favours drier habitats	08/10/2024	Sunny	34,753795	-15,883602	34,74642	-15,8744
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	African Grey Hornbill	Tockus nasutus	6	YES	NO	NO	LC	observed	Acacia savanna and dry, broadleafed woodland	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black-collared Barbet	Lybius torquatus	2	YES	NO	NO	LC	observed	Forests, woodland, savanna and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black Sunbird	Chalcomitra amethystina	1	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black-crowned Tchagra	Tchagra senegalensis	4	YES	NO	NO	LC	observed	Savanna, thickets and riverine scrub	14/08/2024	Sunny	34,755607	-15,899262	0	0

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Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black-eyed Bulbul	Pycnonotus tricolor	3	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Black-winged Stilt	Himantopus himantopus	6	YES	NO	NO	LC	observed	Mpost wetlands, both fresh and salt water	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Blue cordonblu	Uraeginthus angolensis	5	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Blue Spotted Wood Dove	Turtur afer	4	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Blue-billed Firefinch	Lagonosticta rubricata	5	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Bronze Manikin	Spermestes cucullata	7	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Cape Turtle Dove	Streptopelia capicola	5	YES	NO	NO	LC	observed	Almost all except forest	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Common Waxbill	Estrilda astrild	6	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	3	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Great White Egret	Egretta alba	4	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Harmecop	Scopus umbretta	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	14/08/2024	Sunny	34,755607	-15,899262	0	0

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Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Helmeted Guinea Fowl	Numida meleagris	9	YES	NO	NO	LC	observed	Catholic; grassland, woodland, savanna and fields	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Jameson's Firefinch	Logonosticta rhodopareia	3	YES	NO	NO	LC	observed	Thickets and grassy tangles in savanna and dry woodland	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Lilac - breasted Roller	Coracias caudatus	2	YES	NO	NO	LC	observed	Unspecialized and adaptable species	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Little Bee-eater	Merops pusillus	15	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Lizard Buzzard	Kaupifalco monogrammicus	1	YES	NO	NO	LC	observed	Woodland, well wooded savanna clearings	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Pied Kingfisher	Ceryle rugis	4	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Red-faced Cisticola	Cisticola erthrops	3	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Red-faced Crombec	Sylvietta whytii	4	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Scarlet Chested Sunbird	Chalcomitra senegalensis	3	YES	NO	NO	LC	observed	Woodland savannaand and suburban gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Southern Puffback	Dryoscopus cubla	6	YES	NO	NO	LC	observed	Woodland, thickets and forest canopy	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Tawny-flanked Prinia	Prinia subflava	3	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	14/08/2024	Sunny	34,755607	-15,899262	0	0

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Tropical Boubou	Laniarius aethiopicus	3	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	White-faced Tree Duck	Dendrocygna viduata	12	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	14/08/2024	Sunny	34,755607	-15,899262	0	0
Downstream of the dam	Mixed woodlnd and rocky	Almost intact natural habitat	Yellow-fronted Canary	Serinus mosambicus	7	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	14/08/2024	Sunny	34,755607	-15,899262	0	0
Elephant Marsh	Cultivation and wetland	Modified habitat	Africa Pipit	Anthus cinnamomeus	0	YES	NO	NO	LC	observed	Open grassland and fields	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Black-crowned Tchagra	Tchagra senegalensis	5	YES	NO	NO	LC	observed	Savanna, thickets and riverine scrub	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Black-eyed Bulbul	Pycnonotus tricolor	3	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Blue cordonblu	Uraeginthus angolensis	7	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Blue Spotted Wood Dove	Turtur afer	4	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Bronze Manikin	Spermestes cucullata	5	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Butchell's Coucal	Centropus superciliosus	2	YES	NO	NO	LC	observed	Rank grass, riverine scrub, reedbeds, thickets and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Cape Turtle Dove	Streptopelia capicola	3	YES	NO	NO	LC	observed	Almost all except forest	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	6	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Great White Egret	Egretta alba	4	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Harmecop	Scopus umbretta	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Heuglin Robin	Cossypha heuglini	2	YES	NO	NO	LC	observed	Dense thickets and tangles, gardens and parks	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Pied Kingfisher	Ceryle rugis	2	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Red Bishop	Euplectes orix	6	YES	NO	NO	LC	observed	Grassland savanna; associated with water	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Red-eyed Dove	Streptopelia semitorquata	6	YES	NO	NO	LC	observed	Woodland, forests and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Red-faced Cisticola	Cisticola erthrops	3	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Reed Commorant	Phalacrocorax africanus	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Rixchard's Pipit	Anthus richardi	2	YES	NO	NO	LC	observed	Open grassland and fields	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Striped Kingfisher	Halcyon chelicuti	1	YES	NO	NO	LC	observed	Woodland, savanna and forest edge	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Modified habitat	Tawny-flanked Prinia	Prinia subflava	4	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Thick-billed Weaver	Amblyospiza albifrons	2	YES	NO	NO	LC	observed	Forest edge and rank vegetation near water	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Tropical Boubou	Laniarius aethiopicus	4	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	White-faced Tree Duck	Dendrocygna viduata	20	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-fronted Canary	Serinus mosambicus	7	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-throated Petronia	Petronia superciliaris	3	YES	NO	NO	LC	observed	Dry woodland, savanna and riverine bush	15/08/2024	Sunny	34,812565	-16,030221	34,746628	-15,9145
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Fish Eagle	Haliaeetus vocifer	1	YES	NO	NO	LC	observed	Large rivers, lakes, estuaries and lagoons	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African pied Wagtail	Motacilla aguimp	3	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black-eyed Bulbul	Pycnonotus tricolor	6	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Blue Spotted Wood Dove	Turtur afer	5	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Bronze Manikin	Spermestes cucullata	8	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Brown - hooded Kingfisher	Halcyon albiventris	1	YES	NO	NO	LC	observed	Woodland, coastal forests, parks and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Burchell's Coucal	Centropus superciliosus	1	YES	NO	NO	LC	observed	Rank grass, riverine scrub, reedbeds, thickets and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Eastern Black-headed Oriole	Oriolus larvatus	2	YES	NO	NO	LC	observed	Mature woodland, especially broadleafed, foreste edge and plantation	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Greater-blue Eared Starling	Lamprotornis chalybaeus	4	YES	NO	NO	LC	observed	Savanna and mopane woodland	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Little Bee-eater	Merops pusillus	3	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Pied Kingfisher	Ceryle rugis	3	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red Bishop	Euplectes orix	3	YES	NO	NO	LC	observed	Grassland savanna; associated with water	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red-eyed Dove	Streptopelia semitorquata	4	YES	NO	NO	LC	observed	Woodland, forests and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red-faced Crombec	Sylvietta whytii	4	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Tawny-flanked Prinia	Prinia subflava	3	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Tropical Boubou	Laniarius aethiopicus	2	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	White-faced Tree Duck	Dendrocygna viduata	21	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-fronted Canary	Serinus mosambicus	4	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-Rumped Bishop	Euplectes capensis	5	YES	NO	NO	LC	observed	Flooded grassland, vles and marshes	15/08/2024	Sunny	34,923333	-15,993333	36,034444	-16,2103
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	AFrican Jacana	Actophilornis africanus	4	YES	NO	NO	LC	observed	Wetland with floating vegetation, especially water lilies	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	African Masked Weaver	Ploceus velatus	2	YES	NO	NO	LC	observed	Savanna, grassland, fields and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	African Morning Dove	Streptopelia decipiens	3	YES	NO	NO	LC	observed	Woodland, riverine forests, thickets and gardens in semi-arid savanna	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	African Openbill	Anastomus lamelligerus	4	YES	NO	NO	LC	observed	Fresh water lakes and dams where it feeds on snails and mussels	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	African pied Wagtail	Motacilla aguimp	2	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Red-winged Starling	Onychognathus morio	7	YES	NO	NO	LC	observed	Rocky ravines, clifs and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Black Sunbird	Chalcomitra amethystina	2	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Black-eyed Bulbul	Pycnonotus tricolor	8	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Blue cordonblu	Uraeginthus angolensis	1	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Blue-billed Fire Finch	Lagonosticta lubricata	3	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Brown-headed Tchagra	Tchagra australis	1	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Burchell's Coucal	Centropus superciliosus	1	YES	NO	NO	LC	observed	Rank grass, riverine scrub, reedbeds, thickets and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Common Squacco Heron	Ardeola ralloides	5	YES	NO	NO	LC	observed	Vegetated mrgins of lakes, pans and slow moving rivers	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	4	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Great White Egret	Egretta alba	2	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Grey Heron	Ardea Cinerea	2	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Little Bee Eater	Merops pusillus	4	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Pied Kingfisher	Ceryle rugis	2	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Red-Faced Mousebird	Urocolius indicus	4	YES	NO	NO	LC	observed	Thornveld, open broadleafed woodland and suberban garedns	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Sedge Warbler	Acrocephalus schoenobaenus	3	YES	NO	NO	LC	observed	Reedbeds and rank weedy areasborderingwetlands and thickets	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Tropical Boubou	Laniarius aethiopicus	2	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-Bellied Greenbul	Chlorocichla flaviventris	5	YES	NO	NO	LC	observed	Thickets, dense woodland and forest edge	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-fronted Canary	Serinus mosambicus	5	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Chikwawa flood plain / Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-throated Longcraw	Macronyx croceus	2	YES	NO	NO	LC	observed	Grassland, often near wetland and well-grassed savanna woodland	15/08/2024	Sunny	34,813946	-16,088201	34,797328	-16,0067
Elephant Marsh	Cultivation and wetland	Almost intact	African Masked Weaver	Ploceus velatus	2	YES	NO	NO	LC	observed	Savanna, grassland, fields and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Arrow-marked babbler	Turdoides jardineii	7	YES	NO	NO	LC	observed	Woodland and savanna	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Black Saw-wing	Psalidoprocne pristoptera	7	YES	NO	NO	LC	observed	Fringes and clearing in forests and plantations	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Black-eyed Bulbul	Pycnonotus tricolor	4	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Blue cordonblu	Uraeginthus angolensis	8	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Almost intact	Blue Spotted Wood Dove	Turtur afer	5	YES	NO	NO	LC	observed	Moist, broadleafed woodland, riparian woodland, forest and thickets	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Blue-billed Firefinch	Lagonosticta rubricata	3	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Bronze Manikin	Spermestes cucullata	5	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Brown-headed Tchagra	Tchagra australis	3	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	collerd Sunbird	Hedydipna collaris	2	YES	NO	NO	LC	observed	Forest, dense woodland and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	1	YES	NO	NO	LC	observed	Almost in trees and bushes	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Common Ringed Plover	Charadrius hiaticula	3	YES	NO	NO	LC	observed	Coastal and inland wetlands, patches of soft, fine mud	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Common Waxbill	Estrilda astrild	4	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Emerald-spotted Wood Dove	Turtur chalcospilos	2	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Folk-tailed Drongo	Dicrurus adsimilis	2	YES	NO	NO	LC	observed	Woodland, savanna and plantations	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Great White Egret	Egretta alba	3	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Almost intact	Greater-blue Eared Starling	Lamprotornis chalybaeus	5	YES	NO	NO	LC	observed	Savanna and mopane woodland	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Grey Heron	Ardea Cinerea	2	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Lesser Masked Weaver	Ploceus intermedius	3	YES	NO	NO	LC	observed	Reedbeds and trees near water	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Little Bee-eater	Merops pusillus	3	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Malachite Kingfisher	Alcedo cristata	1	YES	NO	NO	LC	observed	Lakes and dams, along streams and lagoons	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Red Bishop	Euplectes orix	3	YES	NO	NO	LC	observed	Grassland savanna; associated with water	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Red-eyed Dove	Streptopelia semitorquata	4	YES	NO	NO	LC	observed	Woodland, forests and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Red-faced Cisticola	Cisticola erthrops	4	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Red-faced Crombec	Sylvietta whytii	3	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Reed Commorant	Phalacrocorax africanus	2	YES	NO	NO	LC	observed	Lakes, dams and rivers	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Scarlet Chested Sunbird	Chalcomitra senegalensis	2	YES	NO	NO	LC	observed	Woodland savannaand and suburban gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Almost intact	Speckled Mousebird	Colius striatus	5	YES	NO	NO	LC	observed	Thick, tangled bush, and fruiting trees in gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Striped Kingfisher	Halcyon chelicuti	1	YES	NO	NO	LC	observed	Woodland, savanna and forest edge	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Tawny-flanked Prinia	Prinia subflava	3	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Tropical Boubou	Laniarius aethiopicus	2	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	White-faced Tree Duck	Dendrocygna viduata	5	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Almost intact	Yellow-fronted Canary	Serinus mosambicus	3	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	16/08/2024	Sunny	34,815752	-16,038132	34,813946	-16,0882
Elephant Marsh	Cultivation and wetland	Modified habitat	African Openbill	Anastomus lamelligerus	5	YES	NO	NO	LC	observed	Fresh water lakes and dams where it feeds on snails and mussels	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Black - headed Heron	Ardea melanocephala	8	YES	NO	NO	LC	observed	Grassland, fields and scrubland; and also marsh fringes but seldom forages in water	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Black eyed bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Black Heron	Egretta ardesiaca	6	YES	NO	YES	LC	observed	Lakes and marshes, occasionary estuaries	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Black Sunbird	Chalcomitra amethystina	1	YES	NO	NO	LC	observed	Woodland, forest edge and gardens.	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305

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Elephant Marsh	Cultivation and wetland	Modified habitat	Blue-billed Firefinch	Lagonosticta rubricata	4	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Bronze Manikin	Spermestes cucullata	7	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Butchell's Coucal	Centropus superciliosus	2	YES	NO	NO	LC	observed	Rank grass, riverine scrub, reedbeds, thickets and gardens	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Cape Turtle Dove	Streptopelia capicola	4	YES	NO	NO	LC	observed	Almost all except forest	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Claas's Cuckoo	Chrysococcyx klaas	2	YES	NO	NO	LC	observed	Forets, woodland, savanna and garedns	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Emerald-spotted Wood Dove	Turtur chalcospilos	4	YES	NO	NO	LC	observed	Woodland and savanna; generally drier habitat	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Great White Egret	Egretta alba	3	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Grey Heron	Ardea Cinerea	2	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Grossy Ibis	Plegadis falcinellus	28	YES	NO	NO	LC	observed	Lakes, dams, pans, estuaries and flooded grassland	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Heuglin Robin	Cossypha heuglini	2	YES	NO	NO	LC	observed	Dense thickets and tangles, gardens and parks	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Elephant Marsh	Cultivation and wetland	Modified habitat	Lilac - breasted Roller	Coracias caudatus	2	YES	NO	NO	LC	observed	Unspecialized and adaptable species	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Red-eyed Dove	Streptopelia semitorquata	4	YES	NO	NO	LC	observed	Woodland , forest and gardens	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Tropical Boubou	Laniarius aethiopicus	2	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	White-faced Tree Duck	Dendrocygna viduata	6	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Elephant Marsh	Cultivation and wetland	Modified habitat	Yellow-bellied Egret	Egretta intermedia	4	YES	NO	NO	LC	observed	Mashes and flooded grassland; rarely at estuaries	16/08/2024	Sunny	34,819812	-16,032364	34,82397	-16,0305
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black - headed Heron	Ardea melanocephala	2	YES	NO	NO	LC	observed	Grassland, fields and scrubland; and also marsh fringes but seldom forages in water	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	AFrican Jacana	Actophilornis africanus	7	YES	NO	NO	LC	observed	Wetland with floating vegetation, especially water lilies	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	AFrican Jacana	Actophilornis africanus	0	YES	NO	NO	LC	observed	Wetland with floating vegetation, especially water lilies	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Openbill	Anastomus lamelligerus	7	YES	NO	NO	LC	observed	Fresh water lakes and dams where it feeds on snails and mussels	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Openbill	Anastomus lamelligerus	0	YES	NO	NO	LC	observed	Fresh water lakes and dams where it feeds on snails and mussels	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African pied Wagtail	Motacilla aguimp	5	YES	NO	NO	LC	observed	Large rivers, wetlands and coastal lagoons; also in large garedn near water	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black Crake	Amaurornis flavirostra	5	YES	NO	NO	LC	observed	Marshes with dense reedbeds; sometimes	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black Heron	Egretta ardesiaca	3	YES	NO	NO	LC	observed	Lakes and marshes, occasionary estuaries	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black-eyed Bulbul	Pycnonotus tricolor	5	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black-winged Stilt	Himantopus himantopus	3	YES	NO	NO	LC	observed	Mpost wetlands, both fresh and salt water	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Blue cordonblu	Uraeginthus angolensis	5	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Blue-billed Firefinch	Lagonosticta rubricata	5	YES	NO	NO	LC	observed	Thicket in woodland, savanna ans riverine scrub	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Bronze Manikin	Spermestes cucullata	6	YES	NO	NO	LC	observed	Grassy areas in woodland, forests edges and gardens	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Common Squacco Heron	Ardeola ralloides	5	YES	NO	NO	LC	observed	Vegetated mrgins of lakes, pans and slow moving rivers	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Egyptian Goose	Alopochen aegytiaca	3	YES	NO	NO	LC	observed	Wetland and adjacent grasslands and fields	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Fulvvous Tree Duck	Dendrocygna bicolor	4	YES	NO	NO	LC	observed	Freshwater lakes and dams	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Giant Kingfisher	Megaceryle maxima	1	YES	NO	NO	LC	observed	Wooded streams and dams, fast -flowing rivers and coastal lagoons	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Goliath Heron	Ardea goliath	2	YES	NO	NO	LC	observed	Lakes, dams, large rivers and estuaries with extensive reeds	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Great White Egret	Egretta alba	3	YES	NO	NO	LC	observed	Lakes, dams, estuaries and lagoons	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Great White Ehret	Egretta alba	0	YES	NO	NO	LC	observed	Mrshes and flooded grassland; rarely at estuaries	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Grey Heron	Ardea Cinerea	3	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Grossy Ibis	Plegadis falcinellus	0	YES	NO	NO	LC	observed	Lakes, dams, pans, estuaries and flooded grassland	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Little Bee-eater	Merops pusillus	4	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Little Egret	Egretta garzetta	5	YES	NO	NO	LC	observed	Wetlands, coastal pools, mangrooves and estuaries	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Malachite Kingfisher	Alcedo cristata	1	YES	NO	NO	LC	observed	Lakes and dams, along streams and lagoons	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Pied Kingfisher	Ceryle rugis	2	YES	NO	NO	LC	observed	Any open stretch of fresh water, coastal lagoons and tidal pools	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Purple Heron	Ardea purpurea	2	YES	NO	NO	LC	observed	Wetland, typically among sedges and reeds	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Reed Commorant	Phalacrocorax africanus	3	YES	NO	NO	LC	observed	Lakes, dams and rivers	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Three-banded Plover	Charadrius tricollaris	4	YES	NO	NO	LC	observed	Wetland fringes, preferring fresh water	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	White-faced Tree Duck	Dendrocygna viduata	4	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	White-winged Black Tern	Chlidonias leucopterus	5	YES	NO	NO	LC	observed	Lakes, estuaries and marshes	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow rumped Bishop	Euplectes capensis	0	YES	NO	NO	LC	observed	Damp grassy areas and heathlands	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-fronted Canary	Serinus mosambicus	6	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-Rumped Bishop	Euplectes capensis	12	YES	NO	NO	LC	observed	Flooded grassland, vles and marshes	16/08/2024	Sunny	34,795654	-16,039671	34,805253	-15,9922
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Morning Dove	Streptopelia decipiens	3	YES	NO	NO	LC	observed	Woodland, riverine forests, thickets and gardens in semi-arid savanna	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Parasdise Flycatcher	Terpsiphone viridis	3	YES	NO	NO	LC	observed	Forest and dense woodland; also gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	African Sacred Ibis	Threskiornis aethiopicus	9	YES	NO	NO	LC	observed	Open habitats, wetlands and fields to grassland	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Black-eyed Bulbul	Pycnonotus tricolor	3	YES	NO	NO	LC	observed	Catholic, ranging from savanna to forest edge and gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Blue cordonblu	Uraeginthus angolensis	5	YES	NO	NO	LC	observed	Dry woodland, savanna and gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Blue Spotted Wood Dove	Turtur afer	7	YES	NO	NO	LC	observed	Moist, broad-leafed woodland, riparian woodland, forest and thickets	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Brown-headed Tchagra	Tchagra australis	2	YES	NO	NO	LC	observed	Thick tangles and undergrowth in savanna and woodland	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Cape Turtle Dove	Streptopelia capicola	9	YES	NO	NO	LC	observed	Almost all except forest	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Common Waxbill	Estrilda astrild	5	YES	NO	NO	LC	observed	Long grass, rank vegetation, reeds and scrub, usually near water	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Greater-blue Eared Starling	Lamprotornis chalybaeus	4	YES	NO	NO	LC	observed	Savanna and mopane woodland	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Grey Heron	Ardea Cinerea	5	YES	NO	NO	LC	observed	Pans, dams, slow-flowing rivers, lagoons and estuaries	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Little Bee-eater	Merops pusillus	4	YES	NO	NO	LC	observed	Savanna, woodland, forest edge and around wetland	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red-faced Cisticola	Cisticola erthrops	3	YES	NO	NO	LC	observed	Rank vegetation next to pans and streams	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red-faced Crombec	Sylvietta whytii	2	YES	NO	NO	LC	observed	Miombo woodland and riparian forest.	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Red-Faced Mousebird	Urocolius indicus	5	YES	NO	NO	LC	observed	Thornveld, open broad-leafed woodland and suburban gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678

Site	Habitat	Nat_modif	Common	Scientific	Abundance	Protected	Endemic	Migratory	Status IUCN	Method	Fav_Hab	Date	Weather	Long	Lat	End_Long	End_Lat
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Tawny-flanked Prinia	Prinia subflava	5	YES	NO	NO	LC	observed	Woodland and thick, rank vegetation	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Terrestrial Brownbul	Phyllaphus terrestris	2	YES	NO	NO	LC	observed	Forest understory and thickets	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Tropical Boubou	Laniarius aethiopicus	3	YES	NO	NO	LC	observed	Thickets, riverine and evergreen forests, and gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Village Indigo Bird	Vidua chalybeata	4	YES	NO	NO	LC	observed	Woodland and savanna	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Western Banded Snake Eagle	Circaetus cinerascens	1	YES	NO	NO	LC	observed	Woodland, especially along rivers	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	White-faced Tree Duck	Dendrocygna viduata	0	YES	NO	NO	LC	observed	Fresh water lakes and lagoons, and adjacent grassland	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-fronted Canary	Serinus mosambicus	7	YES	NO	NO	LC	observed	Open woodland, savanna and gardens	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678
Chikwawa Flood Plain	Cultivation and wetland	Modified habitat	Yellow-Rumped Bishop	Euplectes capensis	3	YES	NO	NO	LC	observed	Flooded grassland, vles and marshes	16/08/2024	Sunny	34,74945	-16,933364	34,784217	-15,9678

LIST OF SPECIES ENCOUNTERED DURING THE DRY SEASON INVENTORIES IN BORROW, CLAY AND ACCESS ROAD TO THE QUARRY SITE (ADDITIONAL SURVEY)

Herpetofauna

Date	Weather	Site	Commun	Scientific	Habitat	Nat_modif	Method	Favourable Habitat
2025/09	Sunny	Clay site	Water Monitor	*Varanus niloticus*	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Along rivers, streams, dams, lakes and residential gardens
2025/09	Sunny	Clay site	Mozambique spitting Cobra	Naja mossambicus	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Savannas, open grasslands, shrublands, and human-modified areas, often near water
2025/09	Sunny	Clay site	Variable Skink	Trachylepis varia	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Open rocky areas, dry savannas, grasslands, and habitats with scattered stones or logs.
2025/09	Sunny	Clay site	Peter's Ground Agama	Agama amrmata	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Open savannas, rocky ground, sandy soils, and sparsely vegetated dry habitats.
2025/09	Sunny	Clay site	Stripped Grass snake	Psammophylax tritaeniatus	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Open grasslands, moist savannas, seasonal wetlands, and edges of vegetation
2025/09	Sunny	Clay site	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Wooded savannas, bushlands, gardens, and agricultural landscapes with scattered trees.
2025/09	Sunny	Clay site	Common Dwarf Gecko	Lygodactylus capensis	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Woodland, forest edges, rocky outcrops, and urban gardens; mainly arboreal.
2025/09	Sunny	Clay site	Boulenger's Skink	Trachylepis boulengeri	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Dry savannas, shrublands, and rocky or bushy habitats.
2025/09	Sunny	Clay site	Puff adder	Bitis arietans	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Savannas, grasslands, shrublands, forest edges, and disturbed habitats.
2025/09	Sunny	Clay site	Eastern Vine Snake	Thelornis mossambicanus	Dominated by herbs and grasses with isolated pockets of tree/shrubs	Modified habitat	observed	Wooded savannas, forest edges, and bushlands; typically arboreal.
2025/09	Sunny	Disposal Site	African Python	Python sebae	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Moist savannas, forest edges, rocky areas, and always associated with water bodies.
2025/09	Sunny	Disposal Site	Anchietas' rigged frog	Ptychadena anchieta	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Moist grasslands, savannas, marshy areas, and temporary water bodies.
2025/09	Sunny	Disposal Site	Common Dwarf Gecko	Lygodactylus capensis	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Woodland, forest edges, rocky outcrops, and urban gardens; mainly arboreal.

Date	Weather	Site	Commun	Scientific	Habitat	Nat_modif	Method	Favourable Habitat
2025/09	Sunny	Disposal Site	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Wooded savannas, bushlands, gardens, and agricultural landscapes with scattered trees.
2025/09	Sunny	Disposal Site	Eastern Yellow-bellied Sand Snake	Psammophis orientalis	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Coastal forests, moist savannas, and shrublands.
2025/09	Sunny	Disposal Site	Kirk's Agama	Agama kirkii	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Rocky savannas, dry shrublands, and stony outcrops.
2025/09	Sunny	Disposal Site	Peter's Ground Agama	Agama ammarta	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Open savannas, rocky ground, sandy soils, and sparsely vegetated dry habitats.
2025/09	Sunny	Disposal Site	Puff adder	Bitis arietans	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Savannas, grasslands, shrublands, forest edges, and disturbed habitats.
2025/09	Sunny	Disposal Site	Rainbow Skink	Trachylepis margaritifer	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Savannas, open woodlands, rocky areas, and dry habitats with shrubs.
2025/09	Sunny	Disposal Site	Stripped Grass snake	Psammophylax tritaeniatus	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	Open grasslands, moist savannas, seasonal wetlands, and edges of vegetation.
2025/09	Sunny	Disposal Site	Variable Skink	Trachylepis varia	Mixed Acacia–Combretum woodland dominated by tall grass species	Modified habitat	observed	open rocky areas, dry savannas, grasslands, and habitats with scattered stones or logs.
2025/09	Sunny	Access road to the quarry site	Common Dwarf Gecko	Lygodactylus capensis	Open dry deciduous forest	Natural habitat	observed	Woodland, forest edges, rocky outcrops, and urban gardens; mainly arboreal
2025/09	Sunny	Access road to the quarry site	Common Flap-necked Chameleon	Chamaeleo dilepis-dilepis	Open dry deciduous forest	Natural habitat	observed	Wooded savannas, bushlands, gardens, and agricultural landscapes with scattered trees.
2025/09	Sunny	Access road to the quarry site	Eastern Vine Snake	Thelornis mossambicanus	Open dry deciduous forest	Natural habitat	observed	Wooded savannas, forest edges, and bushlands; typically arboreal.
2025/09	Sunny	Access road to the quarry site	Eastern Yellow-bellied Sand Snake	Psammophis orientalis	Open dry deciduous forest	Natural habitat	observed	Coastal forests, moist savannas, and shrublands.
2025/09	Sunny	Access road to the quarry site	Leopard Tortoise	Stigmochelys pardalis	Open dry deciduous forest	Natural habitat	observed	Dry savannas, open grasslands, semi-arid scrub, and rocky slopes.
2025/09	Sunny	Access road to the quarry site	Puff adder	Bitis arietans	Open dry deciduous forest	Natural habitat	observed	Savannas, grasslands, shrublands, forest edges, and disturbed habitats.

Date	Weather	Site	Commun	Scientific	Habitat	Nat_modif	Method	Favourable Habitat
2025/09	Sunny	Access road to the quarry site	Rainbow Skink	Trachylepis margaritifer	Open dry deciduous forest	Natural habitat	observed	Savannas, open woodlands, rocky areas, and dry habitats with shrubs.
2025/09	Sunny	Access road to the quarry site	Rock Monitor	Varanus albigularis albigularis	Open dry deciduous forest	Natural habitat	observed	Dry savannas, rocky terrain, open woodlands, and semi-arid areas.
2025/09	Sunny	Access road to the quarry site	Spotted Bush Snake	Philothamnus semivariegatus	Open dry deciduous forest	Natural habitat	observed	Forest edges, bushlands, moist savannas, and gardens; highly arboreal.
2025/09	Sunny	Access road to the quarry site	Stripped Grass snake	Psammophylax tritaeniatus	Open dry deciduous forest	Natural habitat	observed	Open grasslands, moist savannas, seasonal wetlands, and edges of vegetation.
2025/09	Sunny	Access road to the quarry site	Variable Skink	Trachylepis varia	Open dry deciduous forest	Natural habitat	observed	Open rocky areas, dry savannas, grasslands, and habitats with scattered stones or logs.
2025/09	Sunny	Access road to the quarry site	Water Monitor	Varanus niloticus	Open dry deciduous forest	Natural habitat	observed	Along rivers, streams, dams, in lakes and residential gardens
2025/09	Sunny	Access road to the quarry site	Yellow-throated plated Lizard	Gerrhosaurus flavigularis	Open dry deciduous forest	Natural habitat	observed	Savannas, grasslands, fynbos, and open coastal forests; shelters in burrows and under rocks.

Mammals

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
09/09/2025	Sunny	Clay site	Modified habitat	Eastern rock elephant shrew	Elephantulus myurus	LC	No	No	No	Occurs in savanna and grassland on rocky outcrops or koppies (hills) in that provide sufficient cracks and holes for shelter
09/09/2025	Sunny	Clay site	Modified habitat	Single-strippedgrass mouse	Lemniscomys rosalia	LC	No	No	No	Savanna habitats, but tall grass is essential. It vacates recently burnt areas but returns as soon as the grass recovers. It often occurs in agricultural areas, especially fallow fields.
09/09/2025	Sunny	Clay site	Modified habitat	Natal Multimammate Mouse	Mastomys natalensis	LC	No	No	No	Commensal species.
09/09/2025	Sunny	Clay site	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	LC	No	No	No	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodland.
09/09/2025	Sunny	Clay site	Modified habitat	Fat mouse	Steatomys pratensis	LC	No	No	No	Usually found over sandy substrates in a range of habitats, including wooden grassland and moist savannah. Sometimes in cultivated lands.
09/09/2025	Sunny	Clay site	Modified habitat	Velvet Monkey	Cercopithecus pygerythrus	LC	No	No	No	savanna, open woodland, and forest-grassland mosaic, especially close to rivers and lake shores. Adaptable and able to persist in secondary and/or highly fragmented habitats, including cultivated areas, and often found in rural and urban environments
09/09/2025	Sunny	Clay site	Modified habitat	Tree Squirrel	Paraxerus cepapi	LC	No	No	No	In most types of savannah, especially mopane and thornveld and mixed savannah. As it requires Burrows in trunks in which to rest or make a nest, old mopane and thorn trees are popular. Independent of water.
09/09/2025	Sunny	Clay site	Modified habitat	Musk Shrews	Crocidura olivieri	LC	No	No	No	Both moist and dry forests, and moist and dry savanna. Found in human settlement.
09/09/2025	Sunny	Clay site	Modified habitat	Four-toed Sengi	Petrodromus tetradactylus	LC	No	No	No	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.
09/09/2025	Sunny	Clay site	Modified habitat	Highveld gerbil	Tatera brantsii	LC	No	No	No	Open areas, or plains, in subtropical and wooded grasslands on consolidated sands.
09/09/2025	Sunny	Clay site	Modified habitat	Scrub hare	Lepus saxatilis	LC	No	No	No	Savannah species: scrub areas with patches of grass. Avoids dense bush or open grass plains. Grazes at night in open areas. Sufficient edible grass and dense shrub for shelter are important requirements. Independent of water.

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
09/09/2025	Sunny	Clay site	Modified habitat	African pygmy Mouse	Mus minutoides	LC	No	No	No	Savanna, grassland, rocky habitats, vlei and riverine associations, recently burnt grassland, fallow land and suburban areas
09/09/2025	Sunny	Clay site	Modified habitat	African Wild cat	Felis silvestris cafra	LC	No	No	No	From deserts and scrub grassland to dry and mixed forest; absent only from rainforest and sandy desert.
09/09/2025	Sunny	Clay site	Modified habitat	White-bellied Hedgehog	Atelerix albiventris	LC	No	No	No	Savanna and grassy areas with light undergrowth.
09/09/2025	Dusk	Clay site	Modified habitat	Whalberg's Epauletted Fruit-bat	Epomophorus wahlbergi	LC	No	No	No	Woodland savannas (both wetter and drier miombo woodland as well as mopane woodland). Also found in woodlands penetrating the rainforest zone, mangrove forests, Acacia-Commiphora deciduous woodland, riverine forest and thicket.
09/09/2025	Dusk	Clay site	Modified habitat	Little Epauletted Fruit-bat	Epomophorus labiatus	LC	No	No	No	Moist forest-grassland mosaics (including rainforest and Afromontane forest), and mesic woodland and savanna (including Sudanean and Miombo woodlands) habitats.
10/09/2025	Sunny	Access road to Clay site	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	LC	No	No	No	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl
10/09/2025	Sunny	Access road to Clay site	Modified habitat	House rat	Rattus rattus	LC	No	No	No	Primarily commensal but also found in a variety of natural and semi-natural habitats.
10/09/2025	Sunny	Access road to Clay site	Modified habitat	Eastern rock elephant shrew	Elephantulus myurus	LC	No	No	No	Occurs in savanna and grassland on rocky outcrops or koppies (hills) in that provide sufficient cracks and holes for shelter
10/09/2025	Sunny	Access road to Clay site	Modified habitat	Tree Squirrel	Paraxerus cepapi	LC	No	No	No	In most types of savannah, especially mopane and thornveld and mixed savannah. As it requires Burrows in trunks in which to rest or make a nest, old mopane and thorn trees are popular. Independent of water.
10/09/2025	Sunny	Access road to Clay site	Modified habitat	Musk Shrews	Crocidura olivieri	LC	No	No	No	Both moist and dry forests, and moist and dry savanna. Found in human settlement.
10/09/2025	Sunny	Access road to Clay site	Modified habitat	Tinny Musk Shrew	Crocidura fuscomurina	LC	No	No	No	Mostly found in association with moist habitats. The species show a preferance for dense, matted vevetation.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Namaqua rock mouse	Micaelamys namaquensis	LC	No	No	No	It is a nocturnal and communal species. It is a human commensal, and is found houses and huts as most habitat types.

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Natal Multimammate Mouse	Mastomys natalensis	LC	No	No	No	Commensal species
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Acacia rat	Thallomys paedulcus	LC	No	No	No	Arboreal species associated with Acacia bushland.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Eastern rock elephant shrew	Elephantulus myurus	LC	No	No	No	Occurs in savanna and grassland on rocky outcrops or koppies (hills) in that provide sufficient cracks and holes for shelter
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Four-toed Sengi	Petrodromus tetradactylus	LC	No	No	No	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Slender Mongoose	Galerella sanguinea	NE	No	No	No	Savannahs.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Chacma baboon	Papio hamadryas ursinus	LC	No	No	No	Prefers clifs or tall trees for shelter, and sufficient water for drinking. Consequently, prefers mountains, hills, riverline forests and various types of savannahs with enough food.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	African Wild cat	Felis silvestris cafra	LC	No	No	No	From deserts and scrub grassland to dry and mixed forest; absent only from rainforest and sandy desert.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Bushveld gerbrbil	Tatera leucogaster	LC	No	No	No	light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl
11/09/2025	Dusk	Access road to Quarry site	Secondary forest intact	Whalberg's Epauletted Fruit-bat	Epomophorus wahlbergi	LC	No	No	No	Woodland savannas (both wetter and drier miombo woodland as well as mopane woodland). Also found in woodlands penetrating the rainforest zone, mangrove forests, Acacia-Commiphora deciduous woodland, riverine forest and thicket.
11/09/2025	Dusk	Access road to Quarry site	Secondary forest intact	Little Epauletted Fruit-bat	Epomophorus labiatus	LC	No	No	No	Moist forest-grassland mosaics (including rainforest and Afromontane Forest), and mesic woodland and savanna (including Sudanean and Miombo woodlands) habitats.
11/09/2025	Dusk	Access road to Quarry site	Secondary forest intact	Egyptian free-tailed bat	Tardarida aegyptiaca	LC	No	No	No	From arid areas to humid hills and valleys.
11/09/2025	Dusk	Access road to Quarry site	Secondary forest intact	Bushveld Horseshoe bat	Rhinolophus simulator	LC	No	No	No	Associated with caves in areas of moist savanna. It is also reported from bushveld adjacent to rivers and savanna woodland.

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Sharpes's Grysbok	Raphicerus sharpei	LC	No	No	No	Miombo (Brachystegia) woodland.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Velvet Monkey	Cercopithecus pygerythrus	LC	No	No	No	savanna, open woodland, and forest-grassland mosaic, especially close to rivers and lake shores. Adaptable and able to persist in secondary and/or highly fragmented habitats, including cultivated areas, and often found in rural and urban environments
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Banded Mongoose	Mungos Mungo	LC	No	No	No	Primarily found in savanna and woodland, usually close to water, and absent from desert, semi-desert and montane regions.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	White-bellied Hedgehog	Atelerix albiventris	LC	No	No	No	Savanna and grassy areas with light undergrowth.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Side-Stripped Jackal	Canis adustus	LC	No	No	No	Game areas through farmland to towns within the broad-leaved savanna zones, including wooded habitats, bush, grassland, abandoned cultivation, marshes and montane habitats .
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Common Large-spotted Genet	Genetta maculata	LC	No	No	No	Rainforest, swampy areas, riverine vegetation, open and closed woodlands, moist forests, savanna-forest mosaics, thickets and even grassy savanna, but avoiding extremely dry savanna and truly arid regions.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Serval	Laptailurus serval	LC	No	No	No	Savannah with high rainfall, or areas containaining stagnant water and sufficient shelter, such as thick grass, clumps of bushes or reeds, are important requirements.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Common duiker	Sylvicapra grimmia	LC	No	No	No	Woodland with sufficient undergrowth and thickets. Important requirements are thickets, shrubs or tall grass on which it feeds, and in which it takes shelter when in danger and to rest. Avoids open woodland, short grassland and dense mountain
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Large Grey Mongoose	Herpestes ichneumon	LC	No	No	No	habitats having understorey vegetation in coastal, lacustrine and riparian (streams, rivers, marsh, swamps) habitats.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Musk Shrews	Crocidura olivieri	LC	No	No	No	Both moist and dry forests, and moist and dry savanna. Found in human settlement.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Scrub hare	Lepus saxatilis	LC	No	No	No	Savannah species: scrub areas with patches of grass. Avoid dense bush or open grass plains. Grazes at night in open areas. Sufficient edible grass and dense shrub for shelter are important requirements. Independent of water.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Spotted Hyaena	Crocuta crocuta	LC	NA	NA	NA	All habitats including semi-desert, savanna and open woodland, dense dry woodland, and even montane habitats.

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Tree Squirrel	Paraxerus cepapi	LC	No	No	No	In most types of savannah, especially mopane and thornveld and mixed savannah. As it requires Burrows in trunks in which to rest or make a nest, old mopane and thorn trees are popular. Independent of water.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Fat mouse	Steatomys pratensis	LC	No	No	No	Usually found over sandy substrates in a range of habitats, including wooden grassland and moist savannah. Sometimes in cultivated lands.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Highveld gerbil	Tatera brantsii	LC	NA	NA	NA	Open areas, or plains, in subtropical and wooded grasslands on consolidated sands.
11/09/2025	Sunny	Access road to Quarry site	Secondary forest intact	Pouched mouse	Saccostomus campestris	LC	NA	NA	NA	Savanna woodland, as well as various other habitats.
11/09/2025	Dusk	Disposal site	Modified habitat	Whalberg's Epauletted Fruit-bat	Epomophorus wahlbergi	LC	NA	NA	NA	Woodland savannas (both wetter and drier miombo woodland as well as mopane woodland). Also found in woodlands penetrating the rainforest zone, mangrove forests, Acacia-Commiphora deciduous woodland, riverine forest and thicket.
11/09/2025	Dusk	Disposal site	Modified habitat	Little Epauletted Fruit-bat	Epomophorus labiatus	LC	NA	NA	NA	Moist forest-grassland mosaics (including rainforest and Afromontane Forest), and mesic woodland and savanna (including Sudanean and Miombo woodlands) habitats.
11/09/2025	Sunny	Disposal site	Modified habitat	Namaqua rock mouse	Micaelamys namaquensis	LC	NA	NA	NA	It is a nocturnal and communal species. It is a human commensal and is found in houses and huts as most habitat types.
11/09/2025	Sunny	Disposal site	Modified habitat	Natal Multimammate Mouse	Mastomys natalensis	LC	NA	NA	NA	Commensal species.
11/09/2025	Sunny	Disposal site	Modified habitat	Slender Mongoose	Galerella sanguinea	NE	NA	NA	NA	Savanah.
11/09/2025	Sunny	Disposal site	Modified habitat	Bushveld gerbrbil	Tatera leucogaster	LC	No	No	No	Occurs generally on light sandy soils, or sandy alluvium. But sometimes on harder soil in mopaneveld as well, where they do not dig their own burrows, but live in temnaria or in the roots of trees. They live in different habitats, from grassland to woodl
11/09/2025	Sunny	Disposal site	Regrowth forest intact	African Wild cat	Felis silvestris cafra	LC	NA	NA	NA	From deserts and scrub grassland to dry and mixed forest; absent only from rainforest and sandy desert.
11/09/2025	Sunny	Disposal site	Regrowth forest intact	Scrub hare	Lepus saxatilis	LC	No	No	No	Savannah species: scrub areas with patches of grass. Avoids dense bush or open grass plains. Grazes at night in open areas. Sufficient edible grass and dense shrub for shelter are important requirements. Independent of water.

Date	Weather	Site	Natural / modified habitat	Common	Scientific	IUCN	Protected	Endemic	Migratory	Favourable habitat
11/09/2025	Sunny	Disposal site	Modified habitat	Tinny Musk Shrew	Crocidura fuscomurina	LC	No	No	No	Mostly found in association with moist habitats. The species show a preferance for dense, matted vevetation.
11/09/2025	Sunny	Disposal site	Modified habitat	Four-toed Sengi	Petrodromus tetradactylus	LC	No	No	No	Forest and dense woodland species, associated with fairly thick undergrowth, usually in a fairly high-rainfallareas.
11/09/2025	Sunny	Disposal site	Modified habitat	Common Large-spotted Genet	Genetta maculata	LC	No	No	No	Rainforest, swampy areas, riverine vegetation, open and closed woodlands, moist forests, savanna-forest mosaics, thickets and even grassy savanna, but avoiding extremely dry savanna and truly arid regions.
11/09/2025	Sunny	Disposal site	Modified habitat	Eastern rock elephant shrew	Elephantulus myurus	LC	No	No	No	Occurs in savanna and grassland on rocky outcrops or koppies (hills) in that provide sufficient cracks and holes for shelter
11/09/2025	Sunny	Disposal site	Modified habitat	Tree Squirrel	Paraxerus cepapi	LC	No	No	No	In most types of savannah, especially mopane and thornveld and mixed savannah. As it requires Burrows in trunks in which to rest or make a nest, old mopane and thorn trees are popular. Independent of water.

Birds

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
2025/09	Sunny	Clay site	African Open Bill	Anastomus lamelligerus	Yes	No	No	Lc	Fresh water lakes and dams where it feeds on snails and mussels
2025/09	Sunny	Clay site	Black Sunbird	Chalcomitra amethystina	Yes	No	No	Lc	Woodland, forest edge and gardens
2025/09	Sunny	Clay site	Black-collared Barbet	Lybius torquatus	Yes	No	No	Lc	Forests, woodland, savanna and gardens
2025/09	Sunny	Clay site	Black-crowned Tchagra	Tchagra senegalensis	Yes	No	No	Lc	Savanna, thickets and riverine scrub

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
2025/09	Sunny	Clay site	Black-eyed Bulbul	Pycnonotus tricolor	Yes	No	No	Lc	Catholic, ranging from savanna to forest edge and gardens
2025/09	Sunny	Clay site	Blue cordonblu	Uraeginthus angolensis	Yes	No	No	Lc	Dry woodland, savanna and gardens
2025/09	Sunny	Clay site	Bronze Manikin	Spermestes cucullata	Yes	No	No	Lc	Grassy areas in woodland, forests edges and gardens
2025/09	Sunny	Clay site	Burchell's Coucal	Centropus burchellii	No	No	No	LC	Thickets of the bushveld, marshes, riverine fringes or coastal scrubland.
2025/09	Sunny	Clay site	Cape Turtle Dove	Streptopelia capicola	Yes	No	No	Lc	Almost all except forest
2025/09	Sunny	Clay site	Cattle Egret	Bubulcus ibis	Yes0	No	Yes	LC	open grassy areas such as meadows, livestock pastures, semi-arid steppe, and open savanna grassland subject to seasonal inundation, dry arable fields, artificial grassland sites (e.g. lawns, parks, road margins and sports fields) flood-plain, freshwater swamps, rice-fields, wet pastures (del Hoyo et al. 1992), shallow marshes, mangroves, and irrigated grasslands
2025/09	Sunny	Clay site	Common Buttonquail	Turnix sylvaticus	Yes	No	No	LC	Bushy savanna and grass-covered plains.
2025/09	Sunny	Clay site	Flappet Lark	Mirafra rufocinnamomea	Yes	No	No	LC	Savannahs, shrubland, grassland
2025/09	Sunny	Clay site	Folk-tailed Drongo	Dicrurus adsimilis	Yes	No	No	Lc	Woodland, savanna and plantations
2025/09	Sunny	Clay site	Greater Blue-eared Starling	Lamprotornis chalybaeus	Yes	No	No	Lc	Savanna and mopane woodland
2025/09	Sunny	Clay site	Grey Heron	Ardea Cinerea	Yes	No	No	Lc	Pans, dams, slow-flowing rivers, lagoons and estuaries

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
2025/09	Sunny	Clay site	Hegluin's Robin	Cossypha heuglini	Yes	No	No	Lc	Dense thickets and tangles, gardens and parks
2025/09	Sunny	Clay site	Klaas's Cuckoo	Chrysococcyx klaas	Yes	No	No	Lc	Forets, woodland, savanna and garedns
2025/09	Sunny	Clay site	Lesser Masked Weaver	Ploceus intermedius	Yes	No	No	Lc	Reedbeds and trees near water
2025/09	Sunny	Clay site	Little Bee-eater	Merops pusillus	Yes	No	No	Lc	Savanna, woodland, forest edge and around wetland
2025/09	Sunny	Clay site	Namaqua Dove	Oena capensis	Yes	No	No	Lc	Arid and semi-arid savannas and open woodland
2025/09	Sunny	Clay site	Orange-winged Pytilia	Pytilia afra	Yes	No	No	LC	Forest, savannah, shrubland
2025/09	Sunny	Clay site	Racket-tailed Roller	Coracias spatulatus	Yes	No	No	Lc	Tall woodland especially miombo
2025/09	Sunny	Clay site	Red-eyed Dove	Streptopelia semitorquata	Yes	No	No	Lc	Woodland, forests and gardens
2025/09	Sunny	Clay site	Spectacled Weaver	Ploceus ocularis	Na	Na	Na	Na	NA
2025/09	Sunny	Clay site	Tropical Boubou	Laniarius aethiopicus	Yes	No	No	Lc	Thickets, riverine and evergreen forests, and gardens
2025/09	Sunny	Clay site	Variable Sunbird	Cinnyris venusta	Yes	No	No	LC	Forest, savannah, shrubland, wetland

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
2025/09	Sunny	Clay site	Village Weaver	Ploceus cucullatus	Yes	No	No	LC	Forest, savannah, shrubland, wetland, artificial land
2025/09	Sunny	Clay site	Yellow rumped Bishop	Euplectes capensis	Yes	No	No	Lc	Flooded grassland, vles and marshes
2025/09	Sunny	Clay site	Yellow-fronted Canary	Serinus mosambicus	Yes	No	No	Lc	Open woodland, savanna and gardens
2025/09	Sunny	Acess road to the quarry site	African Gray Hornbill	Tockus nasutus	Yes	No	No	Lc	Acacia savanna and dry, broad-leafed woodland
2025/09	Sunny	Acess road to the quarry site	African Parasdise Flycatcher	Terpsiphone viridis	Yes	No	No	Lc	Forest and dense woodland
2025/09	Sunny	Acess road to the quarry site	African pied wagtail	Motacilla anguimp	Yes	No	No	Lc	Large rivers, wetlands and coastal lagoons
2025/09	Sunny	Acess road to the quarry site	Black eyed bulbul	Pycnonotus tricolor	Yes	No	No	Lc	Catholic, ranging from savanna to forest edge and gardens
2025/09	Sunny	Acess road to the quarry site	Black Sunbird	Chalcomitra amethystina	Yes	No	No	Lc	Woodland, forest edge and gardens
		Acess road to the quarry site	Black-collared Barbet	Lybius torquatus	Yes	No	No	Lc	Forests, woodland, savanna and gardens
		Acess road to the quarry site	Blue cordonblu	Uraeginthus angolensis	Yes	No	No	Lc	Dry woodland, savanna and gardens
		Acess road to the quarry site	Blue Spotted Wood Dove	Turtur afer	Yes	No	No	Lc	Moist, broadleafed woodland, riparian woodland, forest and thickets

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
		Acess road to the quarry site	Blue-billed Firefinch	Lagonosticta rubricata	Yes	No	No	Lc	Thicket in woodland, savanna ans riverine scrub
		Acess road to the quarry site	Brown - hooded Kingfisher	Halcyon albiventris	Yes	No	No	Lc	Woodland, coastal forests, parks and gardens
		Acess road to the quarry site	Brown-headed Tchagra	Tchagra australis	Yes	No	No	Lc	Thick tangles and undergrowth in savanna and woodland
		Acess road to the quarry site	Cape Turtle Dove	Streptopelia capicola	Yes	No	No	Lc	Almost all except forest
		Acess road to the quarry site	Common Waxbill	Estrilda astrild	Yes	No	No	Lc	Long grass, rank vegetation, reeds and scrub, usually near water
		Acess road to the quarry site	Crowned Hornbill	Tockus alboterminatus	Yes	No	No	Lc	Inland, coastal and riverine forets
		Acess road to the quarry site	Emerald-spotted Wood Dove	Turtur chalcospilos	Yes	No	No	Lc	Woodland and savanna
		Acess road to the quarry site	Folk-tailed Drongo	Dicrurus adsimilis	Yes	No	No	Lc	Woodland, savanna and plantations
		Acess road to the quarry site	Grey-olive Greenbul	Phyllastrephus cerviniventris	Yes	No	No	LC	Forest, shrubland
		Acess road to the quarry site	Helmeted Guinea Fowl	Numida meleagris	Yes	No	No	Lc	Catholic
		Acess road to the quarry site	Hildebrndt's Spurfowl	Pternistis hildebrandti	Yes	No	No	LC	Savannah, shrubland, grassland

Date	Weather	Site	Common	Scientific	Protected	Endemic	Migratory	IUCN	Favourable Habitat
		Acess road to the quarry site	Lesser Blue-eared Starling	Lamprotornis chloropterus	Yes	No	No	Lc	miombo woodkand, mopane, wooded grassland and suburban gardens
		Acess road to the quarry site	Long-crested Eagle	Lophaetus occipitalis	Yes	No	No	LC	Woodland, forest edge, damp wooded savannah, and strips of riverine forest
		Acess road to the quarry site	Namaqua Dove	Oena capensis	Yes	No	No	Lc	Arid and semi arid savannas and open woodland
		Acess road to the quarry site	Orange-breasted Waxbill	Amandava subflava	Yes	No	No	LC	Savannah, wetlands, grasslands, artificial
		Acess road to the quarry site	Pied Crow	Corvus albus	Yes	No	No	Lc	Virtually aa except driest desert ares
		Acess road to the quarry site	Racket-tailed Roller	Coracias spatulatus	Yes	No	No	Lc	Tall woodland especially miombo
		Acess road to the quarry site	Red Bishop	Euplectes orix	Yes	No	No	Lc	Grassland savanna
		Acess road to the quarry site	Red Faced Cisticola	Cisticola erythrops	Yes	No	No	Lc	Rank vegetation next to pans and streams
		Acess road to the quarry site	Red-faced Crombec	Sylvietta whytii	Yes	No	No	Lc	Miombo woodland and riparian forest.
		Acess road to the quarry site	Red-throated Twinspot	Hypargos niveoguttatus	Yes	No	No	Lc	Dense thickets, rank growth and forest edge, prefers moister habitat.
		Acess road to the quarry site	Southern Puffback	Dryoscopus cubla	Yes	No	No	Lc	Woodland, thickets and forest canopy

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		Acess road to the quarry site	Spotted Eagle Owl	Bubo africanus	Yes	No	No	Lc	All except forest, from desert to woodland and gardens
		Acess road to the quarry site	Tawny-flanked Prinia	Prinia subflava	Yes	No	No	Lc	Woodland and thick, rank vegetation
		Acess road to the quarry site	Tropical Boubou	Laniarius aethiopicus	Yes	No	No	Lc	Thickets, riverine and evergreen forests, and gardens
		Acess road to the quarry site	Trumpeter Hornbill	Bycanisters bucinator	Yes	No	No	Lc	Inland, coastal and riverine forets
		Acess road to the quarry site	Variable Sunbird	Cinnyris venustus	Yes	No	No	Lc	Woodland, forest edge and gardens
		Acess road to the quarry site	Verreaux's Eagle Owl	Bubo lacteus	Yes	No	No	LC	Forest, savannah, shrubland, grassland, wetland
		Acess road to the quarry site	Western Banded Snake Eagle	Circaetus cinerascens	Yes	No	No	Lc	Woodland, especially along rivers
		Acess road to the quarry site	Yellow rumped Bishop	Euplectes capensis	Yes	No	No	Lc	Flooded grassland, vles and marshes
		Acess road to the quarry site	Yellow-fronted Canary	Serinus mosambicus	Yes	No	No	Lc	Open woodland, savanna and gardens
		Dispo sal Site	Black eyed bulbul	Pycnonotus tricolor	Yes	No	No	Lc	Catholic, ranging from savanna to forest edge and gardens
		Dispo sal Site	Blue cordonblu	Uraeginthus angolensis	Yes	No	No	Lc	Dry woodland, savanna and gardens

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		Disposal Site	Blue Spotted Wood Dove	Turtur afer	Yes	No	No	Lc	Moist, broadleafed woodland, riparian woodland, forest and thickets
		Disposal Site	Bronze Manikin	Spermestes cucullata	Yes	No	No	Lc	Grassy areas in woodland, forests edges and gardens
		Disposal Site	Cape Turtle Dove	Streptopelia capicola	Yes	No	No	Lc	Almost all except forest
		Disposal Site	Common Buttonquail	Turnix sylvaticus	Yes	No	No	LC	Bushy savanna and grass-covered plains.
		Disposal Site	Emerald-spotted Wood Dove	Turtur chalcospilos	Yes	No	No	Lc	Woodland and savanna
		Disposal Site	Little Bee-eater	Merops pusillus	Yes	No	No	Lc	Savanna, woodland, forest edge and around wetland
		Disposal Site	Red-collared Whydah	Euplectes ardens	Yes	No	No	LC	Forest, shrubland, wetlands, savannah, artificial
		Disposal Site	Red-eyed Dove	Streptopelia semitorquata	Yes	No	No	Lc	Woodland, forests and gardens
		Disposal Site	Speckled Mousebird	Colius striatus	Yes	No	No	Lc	Thick, tangled bush, and fruiting trees in gardens
		Disposal Site	Tawny-flanked Prinia	Prinia subflava	Yes	No	No	Lc	Woodland and thick, rank vegetation
		Disposal Site	Village Indigo bird	Vidua chalybeata	Yes	No	No	Lc	Woodland and savanna

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		Disposal Site	Yellow rumped Bishop	Euplectes capensis	Yes	No	No	Lc	Flooded grassland, vles and marshes