RWENZORI MOUNTAINS NATIONAL PARK, UGANDA (N684)

STATE OF CONSERVATION REPORT

Submitted by

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Report of 3rd October 2024

Executive Summary

The Rwenzori Mountains National Park (RMNP) World Heritage site (WHS), number 684, is a natural property located in Uganda, East Africa. The site was inscribed as a World Heritage Site in 1994. However, a number of issues were raised about RMNP in the Extended Session of the 44th World Heritage Committee (WHC) held at Fuzhou, China in 2021 (virtual meeting), and documented under DECISION 44 COM 7B.85 particularly focusing on issues which were raised by the IUCN/ UNESCO reactive mission of 2019. The state party responded to these very issues in the 2022 State of Conservation report. However, this report will also give the response on the progress of interventions by the State party in addressing the issues that were raised.

The issues that were raised include speculation of cable car installation in RMNP, Action plan for monitoring population of elephants, development of small-scale hydropower, reopening of Kilembe Mines, Wildlife Monitoring Plan, Tourism Strategy, Disaster Risk Management and Climate Change adaptation plan and Revision of the General Management Plan. It is important to note that no cable car has been developed on sites, RMNP is contiguous with Virunga National Park in the Democratic Republic of Congo where animals can move freely, hydro power projects are located outside the property and have negligible impact on the property's OUVs, Kilembe mines has not been reopened, UWA with support from WWF-UCO developed an ecological monitoring Protocol (2023-2028) for the property, RMNP tourism business plan runs from 2019-2024 and is due for renewal, Disaster Risk Management and Climate Change adaptation plan is in place and the General management plan will be reviewed next year, 2026. Over the years, Uganda Wildlife Authority together with support from non-governmental organisations and communities neighbouring the Park have been actively involved in conservation of Rwenzori Mountains National Park.

It is important to note that the site is managed in accordance to the General Management Plan which ends in the year 2026 and a number of activities are being implemented on site which include Park Resource access by the neighboring communities, cultural values and conservation, collaboration with other stakeholders, supporting community livelihood projects, implementing revenue sharing projects, mitigating human wildlife conflicts, conducting law enforcement patrols, Transboundary collaboration with Virunga National Park, mitigating climate change impacts, weather data collection, Glacier monitoring, vegetation monitoring, water catchment and hydrological studies, wildlife monitoring and Chimpanzee Census, fire management, infrastructure developments, tourist handling and monitoring hydro power schemes. However, the bottle neck in implementing the above activities has been limited financial resources.

STATE OF CONSERVATION REPORT FOR RWENZORI MOUNATINS NATIONAL PARK (WHS)

October 3, 2024

1. BACKGROUND

1.1 Introduction

Rwenzori Mountains National Park (RMNP) World Heritage Property (number 684) is located in Uganda along the international border between Uganda and the Democratic Republic of Congo (DRC) in Africa. It was inscribed as a World Heritage site in 1994. Rwenzori Mountains National Park (RMNP) covers an area of 995 sq. km, and is located in five Districts namely; Kasese, Bunyangabu, Kabarole, Ntoroko and Bundibugyo, in Western Uganda and is contiguous with Virunga National Park for about 50 km borders in the Democratic Republic of Congo (DRC). It is one of the largest and most important water catchment areas in Western Uganda. The mountain ranges out of which the park was gazetted is much larger running over a hundred kilometres in the north-south direction and fifty kilometres in the east west direction. Rwenzori Mountains National Park which consists of snow-capped mountains was gazetted as a National Park in 1991 (SI No. 26 of 1991), designated as a World Heritage Site (WHS) in 1994 under criteria (VII) and (X) and as a RAMSAR site in 2004 due its numerous water bodies.

It lies between latitudes 00 06' and 00 46' North and longitudes 290 47' and 300 11' East. The snow-capped Mountains also known as the "Mountains of the Moon" sit astride the equator in the middle of the great East African Rift Valley within the Albertine region. RMNP has a wide altitudinal range rising from about 1600 to 5109 metres above sea level. There are numerous ranges in the park, at the centre of which are six main mountains. These are Mt. Stanley (5109m), Mt. Speke (4890m), Mt. Baker (4843m), Mt. Emin (4798m), Mt. Gessi (4715m), Mt. Luigi di Savoia (4627m). The Rwenzori Mountain ecosystem consists of six vegetation belts; Grasslands (1000-2000 m), ii) Afromontane forest (2000-3000 m), iii) Afromontane bamboo (2500-3500 m), iv) Heather/Rapanea zone (3000-4000 m), v) Afro-alpine moorland zones (4000-4500 m) and vi) Rocks (>4500m) both open and covered mosses and lichens at the very highest points.

1.2 Conservation values

A variety of biological, physical and cultural characteristics contributes important and sometimes unique attributes for RMNP. It supports a rich biological diversity of fauna and flora. Fauna with high levels of endemism such as: 54 Albertine Rift endemics of which five species are endangered, 14 are threatened and four have restricted range. The endangered species include the Rwenzori duiker (*Cephalophus rubidus*), Montane squirrel (*Heliosciurus ruwenzorii*), chimpanzee (Pan troglodytes), African elephant (*Loxodonta africana*) and Rwenzori range frog (*Africana ruwenzorica*). The Rwenzori Mountains globally is habitat for unique values that include four species that have restricted range. These are Rwenzori/Kivu climbing mouse (*Dendromus kivu*), the Rwenzori Duiker (*Cephalophus rubidus*), *Bradypodion xenorhium* and the Uganda clawed frog (*Xenopus ruwenzori*).

Flora includes 696 species of trees with 55 Albertine Rift Endemics and five of them threatened. Two tree species are considered to be endemic to the Rwenzori; these are *Hypericum bequaertii* and *Schefflera polysciadia*. Seven other species occur only in Rwenzori and in the other montane forest zones of south-west Uganda. These are *Erica kingaensis*, *Phillippia johnstonii*, *Vernonia sp. Adolfi friderici*, *Ficalhoa laurifolia* and *Ocotea usambarensis*. In terms of restricted range plant species, there are 38 tree and shrub species as restricted to the Rwenzori Mountains National Park. Rwenzori Mountains are one of the largest and most significant water catchment areas in Uganda. The aquatic ecosystems of the Rwenzoris are diverse ranging from high altitude lakes above 3500 m, fast flowing montane streams to slow flowing rivers in the lowland areas. RMNP has a strong cultural/spiritual attachment with the Bakonzo and Bamba people. The cultural significance of the mountains is demonstrated by traditional rituals performed within RMNP, including the construction of hunters" shrines for animal sacrifices, ceremonies involving the exorcism of evil spirits, and human burials.

1.3 Management purpose

The purpose of managing RMNP is to conserve the unique Mountain ranges' ecosystems within the national park for ecological, economic and cultural values and being a National and an International scientific reference point; for sustainable development.

1.4 Conservation threats

RMNP is increasingly threatened by the demands of a growing population and a case of Kasese district, which has a population density of 303 persons per square kilometer and an average household size of 4.7 persons (UBOS, 2024). The increasing population is resulting in the degradation of areas neighboring the park. This may result into exertion of pressure on the park resources in the future. However, programs have been introduced within communicate areas to restore the slopes of the mountains outside the protected areas to mitigate such vegetation loss. Other threats include fire and climate change. Potential threats include poaching and timber cutting. RMNP Management has embarked on enhanced community sensitization, livelihood programs and patrols to avert the potential risks. Clearing of fire lines and removal of bush along the park boundary has ensured the arrest of fires that spread from community land.

1.5 Management programs

There are six management programs including; Resource conservation and management, Research and ecological monitoring, Capacity development, Community conservation, Tourism development & financial sustainability and Governance & corporate affairs.

2. ISSUES OF CONCERN AT THE WHC MEETING HELD AT FUZHOU, CHINA IN 2021 AND RESPONSES TO DECISION 44COM 7B.85 OF THE WH COMMITTEE

Following the Extended Session of the 44th World Heritage Committee (WHC) held at Fuzhou, China in 2021 (virtual meeting), a number of resolutions were reached and

documented under DECISION 44 COM 7B.85 particularly focusing on issues which were raised by the IUCN/ UNESCO reactive mission of 2019. Below are the issues that were highlighted under Decision 44 COM 7B.85 for attention by the State Party of Uganda and responses from the state party of Uganda.

a) ***Issue -*** *The need for the State Party to abandon pursuance of the development of the Cable Car in RMNP.*

Response: To date no cable car project has been developed and there are no plans for this project in the near future. The cable car project mentioned in the current General Management Plan (GMP) that expires next year has not been implemented and yet the GMP will be expiring in 2026. As we commence he formulation of the new GMP, care will be taken to consider the recommendation of the WHC.

b) ***Issue -*** *The need for an action plan for monitoring of the elephant population to create a migratory corridor between RMNP and the other national parks in Uganda.*

Response: RMNP is contiguous with Virunga National Park in the Democratic Republic of Congo. However, there is no connectivity with other parks in Uganda. There are heavily settled community areas and infrastructure developments in the areas that would be connecting RMNP to other parks such as Queen Elizabeth National Park (QENP), Kibale National Park (KNP) and Semuliki National Park (SNP). Implementation of this decision is more detrimental to the property as it would lead to serious conflicts and poor attitudes of the neighboring communities and politicians against the sustainability of the protected area. In addition, the proposed relocation would cost the State Party an entire budget of a whole financial year because of the developments and settlements between RMNP and its counterpart PAs.

The State Party is very confident that the decision is not practical, and prays that this is dropped from the list of issues documented against RMNP. The State Party hereby invites the World Heritage Centre to visit the site for confirmation of this information presented.

c) ***Issue -*** *The development of small-scale hydropower (HEP) projects outside RMNP is seen as a threat to RMNP by the WHC which requested the State Party to conduct a Strategic Environmental Assessment (SEA) for the Rwenzori water catchment, including RMNP.*

Response - The projects are located outside the property and were established after a though conduction of Environmental and Social Impact Studies (ESIA). All the identified threats have either been addressed or are being addressed. The impacts of the HEP stations are very negligible to the property's OUVs because of their sizes that do not attract more than 5 people within a 4 – 5km distance from the property. The proposed mitigation measures are being undertaken with substantial support from the hydropower projects such as quarterly monitoring patrols and construction of the ranger posts close

to the property (Kyondo, Sindila and more recently in 2023 at Kakaka to mitigate illegal activities.

The State Party prays that this issue needs to be dropped as it creates an impression that is not real on the ground.

d) ***Issue*** *- Notify the World Heritage Centre (WHC) of Uganda's plans to reopen Kilembe Mines and that a detailed EIA be conducted and submitted to the WHC before any irreversible decisions are made.*

Response: Kilembe mines has not been reopened and should there be any plans from the Government of Uganda to reopen it, UWA shall notify the WHC accordingly.

e) ***Issue*** *- The need for a wildlife-monitoring plan to ensure that the Key wildlife species are regularly monitored.*

Response: UWA with support from WWF-UCO developed an ecological monitoring Protocol (2023-2028) for the property. The protocol helps in the regular monitoring of wildlife within the property. A copy of the protocol is hereto attached as **Annex 1**. Currently, there is an ongoing chimpanzee and other medium to large mammals' census within the property.

f) ***Issue*** *- Revise the Tourism Strategy to focus on low impact tourism activities.*

Response: The RMNP tourism business plan has strategies which include service quality assurance and tourism regulation, product development and diversification, physical and human capital enhancement among others. All these are geared towards low impact tourism activities.

g) ***Issue*** *- Continued monitoring of climate change impacts on the OUVs of the property and submit a Disaster Risk Management and Climate Change Adaptation plan and have it submitted to the WHC once it is available.*

Response: With support from WWF, UWA continues to carry out annual monitoring of glacier recession on Mt Stanley **(Section 4.3 below)**. The Disaster Risk Management and Climate Change Adaptation Plan is hereto attached as **Annex 2**. The restoration of River Nyamwamba valleys and banks is ongoing.

h) ***Issue*** *- Revise the General Management Plan (GMP) to fully address the OUV of the property, and ensure coordination with other strategies and studies. The GMP for RMNP will be expiring in the year 2026.*

Response: The process for preparation of a new RMNP GMP 2026 to 2036 has already been commenced. The State Party will ensure that all aspects of the OUV are considered.

3.OTHER CONSERVATION ISSUES

3.1 *The General Management Plan (GMP)*

The site is managed in accordance with the general management plan that was developed by the management authorities with the purpose of conserving the site's Outstanding Universal values (OUVs). The current GMP of RMNP runs from 2016 to 2026 and was approved by the UWA's Board of Trustees for implementation. The process of developing this GMP involved consultative meetings with stakeholders from Local Community representatives, Local Governments, NGOs, Central Government Agencies, UWA staff and Urban Authorities.

3.2 Resources access for neighboring communities

RMNP World Heritage Site, is an important source of Non-timber Forest Products (NTFP) for communities living on the slopes of Rwenzori Mountains who are predominantly the "Bakonzo" people. The park authorities allow regulated access to the NTFP **(Plate 1)** to the local communities. The NTFP that are accessed by the communities include smilax, dry bamboo stems, medicinal plants, mushrooms, water, honey, fibre and bamboo shoots among others. Currently we have running Memoranda of Understandings (MoUs) with 34 parishes **(Table 1)** around the site. Empowering local communities to access NTFPs has created a sense of ownership of the site by the communities and this has improved the relations between the community and the site management. These NFTPs are quantified and valued in monetary terms using market prices **(Table 2).**

Plate 1: (Left) Community access to dry bamboo stems and (Right) access to dry logs for fuelwood

	Parish	Details	Subcounty	District
1	Nyakitokooli	Resource Use	Kalangula	Kabarole
2	Kasanzi	Resource Use /Tfp	Ndugutu	Bundibugyo
3	Kisamba II	Resource Use/Boundary Management	Bugoye	Kasese
4	Mutumba	Resource Use	Mutumba	Bunyangabu
5	Bunyandiko	Resource Use/Boundary	Kilembe	Kasese
6	Mabere	Collaborative Resource Use and Boundary Maintenance	Kasithu	Bundibugyo
7	Masule/Ngite	Collaborative Resource Use and Boundary Maintenance	Ngite	Bundibugyo
8	Bumathe	Collaborative Resource Use and Boundary Maintenance	Harugale	Bundibugyo
9	Kakuuka	Collaborative Resource Use and Boundary Maintenance	Sindila	Bundibugyo
10	Kamabale	Collaborative Resource Use and Boundary Maintenance	Karangura	Kabarole
11	Kibwa	Collaborative Resource Use and Boundary Maintenance	Karangura	Kabarole
12	Musandama	Collaborative Resource Use and Boundary Maintenance	Nombe	Ntoroko
13	Nyakatoke	Collaborative Resource Use and Boundary Maintenance	Nombe	Ntoroko
14	Butyoka	Collaborative Resource Use and Boundary Maintenance	Katebwa	Bunyangabu
15	Bukara	Collaborative Resource Use and Boundary Maintenance	Katebwa	Bunyangabu
16	Nsura	Collaborative Resource Use and Boundary Maintenance	Kyamukube	Bunyangabu
17	Ibanda	Collaborative Resource Use and Boundary Maintenance	Ibanda	kasese
18	Bughalitsa	Collaborative Resource Use and Boundary Maintenance	Rukoki	Kasese
19	Kitholhu/KITHOBIRA	Collaborative Resource Use and Boundary Maintenance	Ihandiro	Kasese
20	Bukangama/ Kituti	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bukonzo	Bundibugyo

21	Budweya/Bulambaghira parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bukonzo	Bundibugyo
22	Kihoko and Kasulenge parishes Traditional Footpath users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Harugale	Bundibugyo
23	Kikyo parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Ngamba	Bundibugyo
24	Bunguha parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bukonzo	Bundibugyo
25	Kiraro parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Kitholhu	Kasese
26	Mbata parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bweisumbu	Kasese
27	Buhathiro parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Ihandiro	kasese
28	Butholya	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bukonzo	Bundibugyo

29	Bulemba parish (from busamba Resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bukonzo	Bundibugyo
30	Katoke Parish boundary and resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bugoye	Kasese
31	Kiharara boundary / resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Ibanda Town Council	Kasese
32	Kasangali boundary/ resource user	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Bwisumbu	Kasese
33	Nyabirongo resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Kisinga	Kasese
34	Buhathiro parish resource users	Dry Bamboo firewood, medicinal plants, mushrooms, traditional footpath, cultural sites, bamboo, sheath and smilax	Ihadiro	kasese

Table 1: Parishes with Resource Access MoUs

Resource Use Harvest					
Years	Firewood (bundles)	Bamboo (bundles)	Mushrooms (baskets)	Medicinal plants (baskets)	Smilax (bundles)
2022/2023	541	132	25	15	25
2023/2024	3482	576	81	143	168
Total	4023	708	106	158	193
Monitory Value (UGX)	40,230,000	14,160,000	2,120,000	4,740,000	965,000

Monitory Value (USD.)	10,917	3,843	575	1,286	262

Table 2: Resource use from RMNP as an equal opportunity for economic gain by the community

3.3 Cultural Values and Conservation.

RMNP has a strong cultural/spiritual attachment with the Bakonzo and Bamba people. The local people regard the site as a source of blessings to their socio-economic well-being. The cultural significance of the site is demonstrated by traditional rituals performed including the construction of hunters" shrines for animal sacrifices, ceremonies involving the exorcism of evil spirits, and human burials. There is a belief that if a person dies in the mountains his body is not to be brought home but must be buried where he died. These sites are known by the cultural leaders who have since worked with the park management and other partners to map them out as a basis for their conservation and continued use. Glaciers are at the centre of the traditional belief system of the BaKonzo who have long lived around the Rwenzori Mountains. It is believed that the snow/ice, "Nzururu", is the 'father' of the Bakonzo deities, "Kithasamba" and "Nyabibuya" who are responsible for human life, its continuity and its welfare.

3.4 Collaboration with stakeholders in Park management

The site management has continued to engage and collaborate with various stakeholders to ensure better management of the site with guidance from the GMP and UWA policy. The stakeholders involved include the following; district local governments, security agencies, water management department, cultural institutions, local tourism institutions and other departments of Government.

3.5 Community participation in park programmes

The park promotes community participation in management interventions and benefit sharing schemes. These include increased involvement and participation of communities in General management planning and other plans, fire management, boundary management, collaborative sustainable use for Non-Timber Forest Products, resource use monitoring.

3.6 Support of community livelihood projects.

The park supports community livelihood through provision of benefits that accrue from conservation such as park resources, sharing 20% of gate entry revenues and employment. For example, during this reporting period, a total of 51 rain water harvesting tanks **(Plate 2)** were given out to communities of Kinyampanika, Bunguha and Bulambagira and over 300 energy saving energy stoves **(Plate 3)** with support from World Bank Project. The site management continues to work with Rwenzori Trekking Services and Rwenzori Mountaineering Services as concessionaires that provide employment to hundreds of porters and guides to RMNP.

During this period of reporting, 196 villages around the Park had village conservation teams identified with support from WWF so as to work with the Park management to promote the conservation of the Park. There was also a training of Bughalista and Kihindi resource users group in tree nursery activities and planting plus another training in rabbit rearing and fish

farming for Izahura youth group and Bugombwa reformed poachers group. A total of 163 groups were trained during this reporting period.

Plate 2: Showing support to communities of water tanks to the neighboring communities for rain water harvesting

Plate 3: Support of energy saving stoves to the neighboring communities by the Investing in Forests Protected Area for Climate Smart Development (IFPA-CD) project.

3.7 Revenue sharing projects

The revenue sharing guidelines were reviewed in 2022 and approved by the Board of Trustees of UWA to enhance equitable benefit for the communities in the front-line parishes who bare the highest of conservation costs. In the reviewed guidelines, the distribution of funds is dependent on the area population and length of the park boundary with a particular community or area. The guidelines provide for sharing of 20% of park entry fees to the local community through their respective local governments to implement a number of development/livelihood projects. During this reporting time, a total of UGX **82,143,449**

(Eighty-two million one hundred forty-three thousand four forty-nine shillings only or USD. 22,800 equivalent) was disbursed. Table 3 shows the distribution of the funds to the various districts surrounding RMNP while Plate 4 is a disbursement ceremony showing the cheques as they are being given out to the representatives of the districts.

No	District	Population	District Local Government Perimeter	Population Index (X)	Average Distance (Kms) (Y)	A=(X+Y)/2	AxRS/∑A
1	Kasese	159,676	82.00	0.63905	0.5190	0.5790	47,562,448
2	Bundibugyo	56,693	37.00	0.22689	0.2342	0.2305	18,936,974
3	Bunyagabo	25,924	20.00	0.10375	0.1266	0.1152	9,460,210
4	Ntoroko	5,150	4.00	0.02061	0.0253	0.0230	1,886,322
5	Kabarole	2,423	15.00	0.00970	0.0949	0.0523	4,297,495
	Total	249,866	158.00	1.00000	1.0000	1.0000	82,143,449

Table 3: Showing Revenue Sharing Funds July 2021 To June 2023

Plate: 4 Showing Revenue funds disbursement to beneficiaries

3.8 Human Wildlife Conflicts (HWC)

RMNP management experiences limited HWC incidents. However, crop damage and loss by Vervet monkeys, Red colobus monkeys, Baboons, Chimps and Blue monkeys has been reported in few areas as a result of cultivation of palatable crops along the park boundary. The cultivation by communities of food crops that are palatable to wildlife continues to

attract vermin that destroy crops. UWA is working with the local authorities to influence community attitudes in the type of crops being grown (e.g. garlic) that are high value and yet never raided by wildlife.

3.9 Patrols

During the reporting period, routine patrols were conducted. 507 patrols **(Figure 1 and Tables 4 and 5)** were conducted in the Financial Years 2022/2023 and 2023/2024, which resulted in the arrest of
111 suspects.

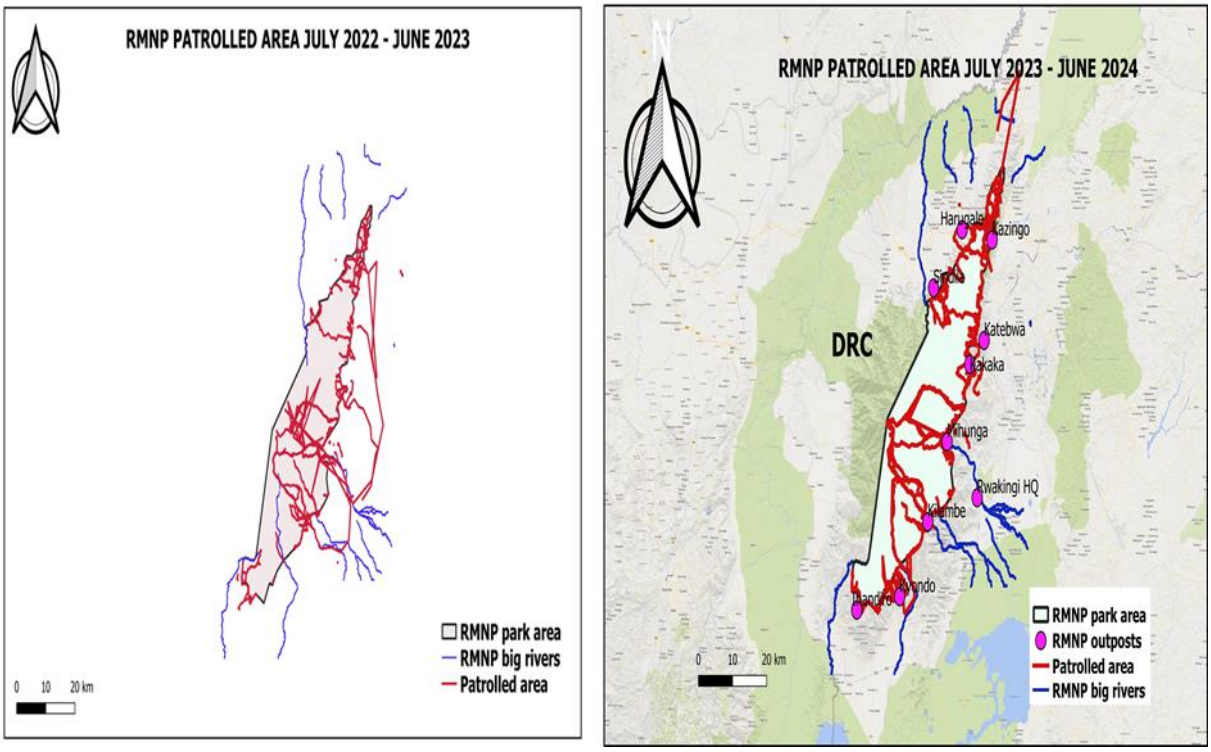


Figure 1: Maps showing patrol coverage

Month	No. Patrols	No. Days	No. Nights	Dist (km)
July	20	35	15	222.38
August	24	40	16	118.99
September	30	49	19	270.51
October	12	22	10	77.56
November	11	15	4	70.54
December	19	29	10	131.87
January	19	34	15	175.5
February	23	40	17	188.9
March	25	50	25	229.7
April	18	25	7	179.71
May	13	23	10	93.67
June	21	35	14	173.37

Total	**235**	**397**	**162**	**1932.7**

Table 4: Showing Patrol effort summary July 2022_June 2023

Month	No. Patrols	No. Days	No. Nights	Distance (km)
July	20	45	25	209.55
August	30	38	8	163.26
September	15	29	14	121.94
October	31	73	42	260.41
November	21	56	35	217.24
December	28	64	36	229.2
January	18	51	33	234.4
February	22	32	10	184.3
March	29	54	25	298.5
April	20	35	15	182.34
May	16	25	9	128.37
June	22	31	9	175.86
Total	**272**	**533**	**261**	**2405.37**

Table 5: Showing Patrol effort summary July 2023 _June 2024

During the period under review, few illegal activities were recorded during the patrols and these activities were mainly non-timber forest product collection (honey, firewood and bamboo). Some patrol teams also observed 9 incidents of poaching using metal traps which were meant for animals like the Rwenzori duiker. Poaching signs were observed throughout the park, but were concentrated mainly in the forest area below 3000 m.a.s.l which is near the park boundary and thus could easily be accessed by the poachers.

3.10 Transboundary collaboration between Democratic Republic of Congo (DRC) and Uganda

RMNP continues to engage our counter parts in Virunga National Park in neighboring DRC in the area of transboundary collaboration. Four (4) cross border meetings with counter parts in the DRC were held to address the threats of cross border insecurity between the DRC and Uganda. Consequently 4 coordinated patrols were conducted along the border between DRC and Uganda. The areas covered included; Kibate, Kafaliso, Kipe and Byoka junction in the southern part of RMNP. The limited number of patrols conducted was due to insecurity in DRC.

4. MONITORING ACTIVITIES

4.1 *Climate Change and Disasters:*

RMNP continues to experience negative impacts of climate change, which include extreme climatic conditions such as droughts and floods. In 2024, global warming caused the melting of Margherita glacier that resulted in the development of deep crevasses along the route to Margherita peak. The management of the site had to suspend the tourism hiking activities to

the Margherita peak for 3 months until a bridge was installed above the crevasses on Mount Margherita glacier. It is important to note that the lost bridges due to floods like Kurt Shefer, Mubuku, Zurangi and Mahoma along the central circuit trail have been repaired. During the reporting period, no significant floods have been registered.

4.2 Weather monitoring (*Data collection) on weather parameters is continuing*

Weather data is continuously collected on quarterly basis from Automatic weather stations installed at different altitudes to monitor impacts of climate change in the park. The stations provide information on rainfall

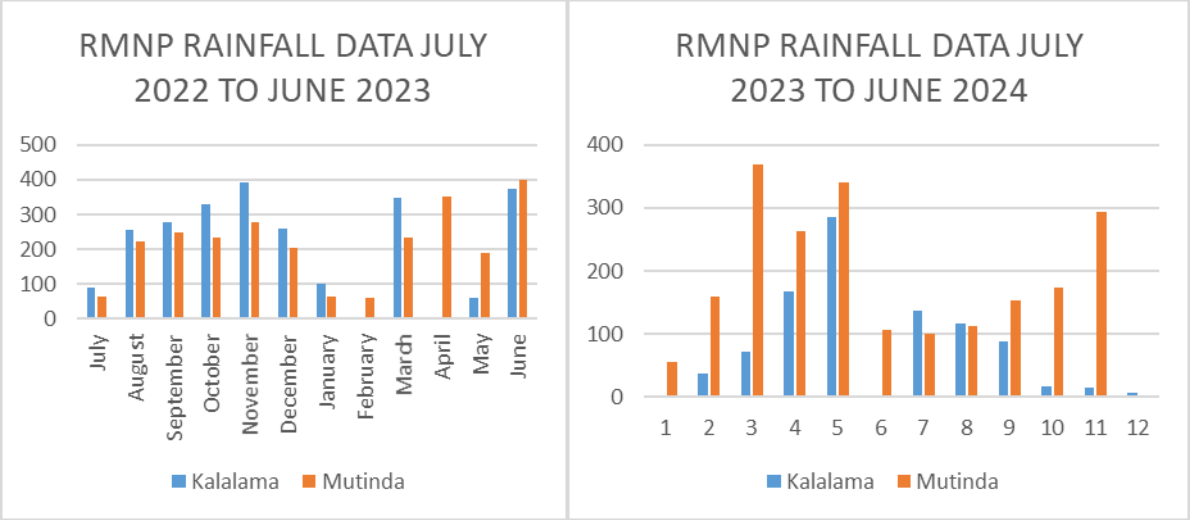


Figure 2 Showing rainfall information

4.3 Glacier monitoring

The glaciers are the Rwenzoris most popular tourism attraction and their loss could greatly negatively impact tourism and tourism revenue. The glacier and snow area continues to reduce significantly from 304.7 acres (2010) to approximately 174.9 acres (2024). Snow Recession monitoring continued from the three permanent sample plots established on Mounts Stanley, Speke and Margarita peak. The melting of glaciers has also resulted into crevasses, which are a barrier to tourism hiking activities. Mitigation of climate change continues through the restoration activities of planting indigenous tree species inside the property. Site management will be glad learning from other sites on how this challenge (climate change mitigation) is being handled. Some ladders have also been constructed in some areas to protect climbers from falling into the crevices.

Years	Available Glacier (Acres)	Reduction (Acres)
2010	304.7	304.7
2018	226.7	78
2019	211.6	15.1

2020	198.5	13.1
2021	183.7	14.8
2022	180.6	2.3
2023	177.5	3.1
2024	174.9	2.6

Table 6: Showing RMNP glacier recession trends

Plate 5: Showing Margherita glacier crevasses 2024

4.4 Climate change mitigation and soil conservation interventions

In recognition of the potential for both small and largescale disasters, Uganda Wildlife Authority, with support from UNESCO developed a Climate Change, Disaster Risk Management Plan for Rwenzori Mountains National Park to ensure that appropriate actions are taken prior, in the event of and after the occurrence of disasters. In an effort to operationalize the plan, World Wide Fund for Nature (WWF) funded a project called Climate Adaptation and Protected Area Initiative (CAPA project) seeks to promote nature solutions to strengthening climate resilience and protecting biodiversity in and around RMNP. The project aims at implementing gender responsive, conflict-sensitive Nature based solutions (NbS) interventions and integrate NbS into protected areas and landscape management so as to strengthen the resilience of their ecosystems, biodiversity and communities to the impacts of climate change while giving a voice and agency to all stakeholders. Climate change is a major threat in the site as it manifests through floods, drought, intensive temperatures, unpredictable rainfall and heavy storms with effects on biodiversity within and outside the Protected Areas. Climate Change has compounding effects are a threat to biodiversity, habitats and livelihoods of frontline communities who also struggle to cope with the wrath of crop raiding animals. The prevalence of droughts especially in the protected areas is a contributor to human wildlife conflicts, as wild animals tend to venture out of the RMNP in search of fodder and water during the dry seasons.

Climate change mitigation measures done include planting of indigenous trees by resource user groups under the guidance and supervision of WWF-CAPA, District Forestry Officer (DFO) and UWA along the ridges of Kyambogho, Bughalista, Kihindi and Kisamba in Rwenzori Mountains National Park. Fires, floods and landslides degraded the sites that are being reforested. The aim is to regain ecological integrity and enhance community resilience to the effects of climate change. The activities include sourcing wildlings from different sites of the park, preparation of the planting sites through lining out, line slashing, pitting and planting out have been done. For the season April – November 2024, 437 hectares **(Table 7)** were replanted in Kyambogho Bughalista Kihindi and Kisamba ridges in Rwenzori Mountains National Park as shown in the table below.

No	Name of Ridge	Period of planting	Area planted (Ha)
1	Kyambogho	April- June 2024	11
2	Bughalitsa	October – November 2024	18
3	Kihindi	October – November 2024	16
4	Kisamba	May – June 2024	19
		August, 2024	13
		September, 2024	57
		October, 2024	204
		November, 2024	99
	Total		**437**

Table 8: Showing hectares of area of restoration with indigenous tree species

To support communities to implement soil and water conservation measures on priority hotspots in the sub catchment the following milestones were achieved. A total of 1,062,787 tree seedlings for *Prunus africana*, Mahogany, Eucalyptus and pine **(Plates 6 and 7)** were supplied by WWF- Hempel 2 project to farmers in Kasese, Bunyangabu, Kabarole, Ntoroko and Bundibugyo.

Plate 6: Tree nursery work management. Photo 7: Reforestation by WWF-CAPA initiative.

4.5 Ecological Monitoring

Research and ecological monitoring undertakes activities that enhance generation and provision of scientific timely sound information on wild animals, their health, habitats, monitoring impact of climate change and the ecosystem in general to assist management in decisions making. A detailed ecological monitoring plan for Rwenzori Mountains National Park was developed in 2010 through a consultative and participatory approach with UWA staff and key stakeholders. Monitoring continues with the use of Information Technology (IT) such as drone **(Plate 8)**, SMART, Geographical Information System (GIS) and remote sensing.

Researchers have been encouraged to undertake management oriented research as prioritized in the UWA Monitoring and Research Plan. Consequently, researchers have disseminated findings and recommendations to UWA and other conservation stakeholders. The research findings disseminated suggest that Montane forests can store equal amounts of carbon along elevation and are not per se less productive than the lower-elevation forests, climate gradient influences species assembly along elevation, climate warming increases transformation of soil organic matter and warming decreases the climate mitigation potential of soil organic carbon (Okello, J. 2023). The impacts of climate change on restricted range species is being monitored by use of camera traps in the forest and alpine zones. The restricted range species include Rwenzori/Kivu climbing mouse *(Dendromus kivu)*, the Rwenzori Duiker *(Cephalophus rubidus)*, *Bradypodion xenorhium* and the Uganda clawed frog *(Xenopus ruwenzori)*.

Plate 8: Showing clear and intact RMNP boundary a photo taken by the drone

4.5.1 Impacts of climate change on distribution of large mammals

Monitoring of animal distribution within RMNP continued using the collection of data by the field staff with the help the GPS and Smartphones. For the key species such as elephants chimpanzees, monitoring was done with the use of camera traps in the areas of Mahoma ridge, Nyabitaba and River Mubuku during the reporting period of 2023/24. The results indicate that most of the animals are found in the forest zone more especially the primates - chimps and monkeys. Elephant distribution is still limited to the forest zone and localized to the central zone of the PA, between Lake Mahoma, Nyabitaba and River Mubuku down to the Park boundary in Mihunga. Generally, there is not yet significant impact of climate change noticed on mammals.

5.5.2 Vegetation monitoring

During the reporting period, vegetation monitoring was done in the different vegetation zones. Site Management staff noted that there were gradual shift of vegetation between the vegetation zones with colonization of the bamboo community at elevations of (2664M, 2702M, 2848m and 2944M) which is in the afro-montane forest zone. Afro-montane bamboo zone is common in elevations > 3000M. Site management will continue to monitor the vegetation changes and seek for possible studies. The PA also adapted the use of Global Forest Watcher system to monitor forest cover loss due to landslides or illegal activities, which help to locate any forest cover loss sighted in the PA by use of predetermined coordinates.

4.5.3 Water catchment and water hydrological studies

Rwenzori Mountains National Park is one of the largest and most significant water catchment areas in Uganda that provides water for use at local, national and international level. The aquatic ecosystems of the Rwenzori Mountains National Park are diverse ranging from high altitude glacial lakes above 3500 m, fast flowing montane streams to slow flowing rivers in the lowland areas. These include Lakes Batoda, Bigata, Kachope, Bujuku, and Mahoma. The main rivers on the Ugandan side of the mountain include: Mubuku, Nyamwamba, Nyamughasani, Rwimi, Mpanga and Lamya. The rivers flow down the mountain range and feed the economically important lakes, Edward and George, and constitutes a major source of the White Nile through the waters of river Semliki which flows into L. Albert and continues to the Mediterrean Sea. Agriculture in the areas surrounding Rwenzori greatly benefits from the runoff from the range as well as direct rainfall, which is regulated by the mountains. There are irrigation schemes, hydro power stations and domestic water supplies, both locally and internationally, resulting out of this catchment.

The team from Imperial College and Ugandan Ministry of Water accessed the Rwenzori National Park from 26th July to 2nd August 2024 and installed the river level sensors to monitor the river levels of two small mountain streams [UTM 35 828306, 32050], [UTM 35 826384, 32157]. The rain gauge was also successfully installed at Kiharo Camp [UTM 35N 826109, 32136]. The overall experimental set up includes the 2 river level sensors and 1 rain gauge along the Kiharo Camp valley of the Nyamwamba River. Both sensors and the rain gauge store the data on site and do not transmit data. This means that the data will only become available for research purposes once the research team has manually obtained the

data after a minimum of 1-year of data collection. Hydrological characterization of the highlands required setting up hydrological monitoring equipment in two catchments, one of which was burned in 2012, and the other which was unaffected by the 2012 fire.

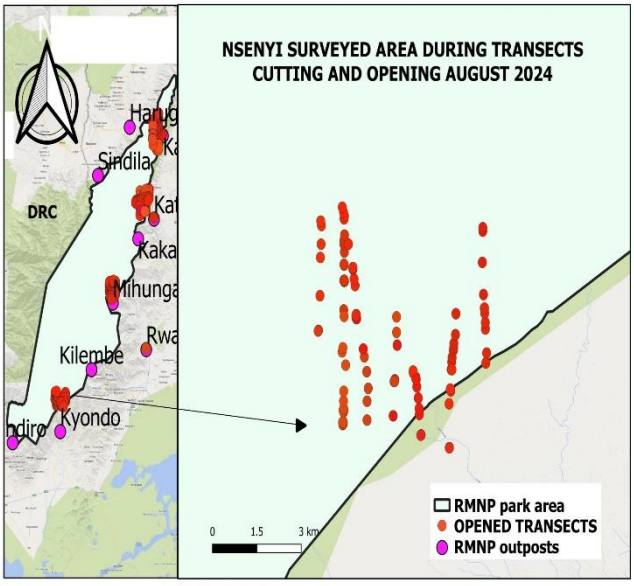
4.5.4 Wildlife Monitoring and 2024-Chimpanzee census exercise

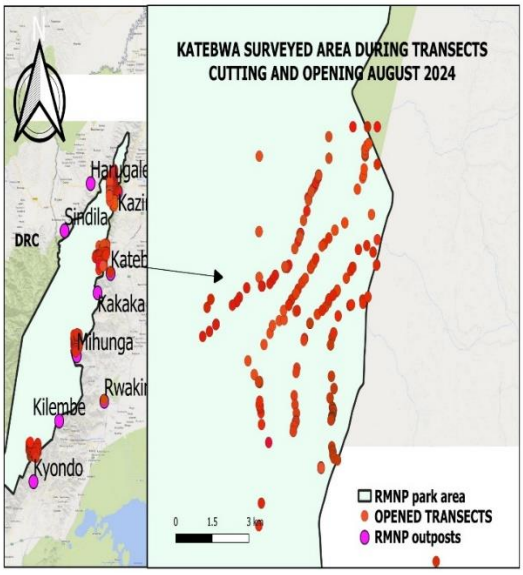
The site management continued to monitor animal distribution within the site using Ranger Based Data (RBD) collection approaches and camera trap method during the period. A Chimpanzee census for RMNP is ongoing with some support from UNESCO WHC small grants and commenced with training of team leaders and UWA staff rangers **(Plate 9)** by the contracted experts. The participants and especially the team leaders were refreshed with knowledge on chimpanzee social behavior, identification of nests, categorization of nests, use of data collection tools and standard line transect method for estimating wildlife populations. The areas that the training sought are key in building technical capacity in data collection and surveys. Guidance was given on the importance of collecting accurate data and ensuring that all objects are properly recorded. Survey areas, transect mapping and opening **(Plate 10)**. Five (5) survey areas were selected in lower than 3000 meters in altitude, which are known to inhabit chimpanzees using the RMNP satellite image map of 2022 and in line with the proposed survey design, inception report, April 2024). Using stratified random sampling, eight (8) transects (of 4 kilometers each) running from North to South were mapped per survey area. At least one (1) transect was mapped in each vegetation type (Montane tropical forest, Mixed montane tropical forest, Bamboo forest, Wetland and Grassland). For each survey area, the (3) experts held detailed sessions with the field team about data collection protocols, map reading, use of data collection tools, professional ethics for data collection and wildlife observation **(Plate 11).** The start points and endpoints of the transects were determined and shown on the map, running from the north to the south.

Plate 9: Showing training of Team leaders in chimpanzee surveys for RMNP

Plate 10: Showing RMNP Chimpanzee census transect cutting 2024

Plate 11: Showing Key animal species by Camera traps





Maps of survey areas for the ongoing Chimpanzee census 2024 produced by use of SMART and GIS tools.

5. FIRE MANAGEMENT

Fire is identified as a potential threat to the park' delicate ecosystems. In the pasts, wild fires were relatively few within RMNP because of the ever-green vegetation. However, due to climate change conditions, fire incidents started increasing; the worst being the 2012 fire that burnt a big patch of the park. Most of the fires are set by the community close to the park boundary while preparing their gardens for planting, or poachers activities and honey collectors. These fires cause damage to ecosystem properties and leave negative impacts on the fragile mountain ecosystem hence calling for urgent and concerted efforts to prevent them. With guidance from the General Management Plan, site management applied various strategies to control and fight fires in and outside the protected area to minimize negative impacts. Strategies implemented included community sensitization and mobilization using media in firefighting techniques, opening and maintaining of external fire lines **(Plate 12)** to stop fire spread from community land to the site, media sensitization and meetings. During the period, the PA implemented fire management activities as follows: Carried out fire fighting for the 07 reported wildfires in the PA in areas of Kisamba, Masule, Nyakaka and Omukorukumi where 68 acres of the park were burnt all fires originating from community gardens. RMNP staff, UPDF and communities participated in putting off the fires. There are fire management strategies such fire line opening and maintenance as prescribed in the fire management plan. Forty (40) kilometers of fire line along the protected area boundary are maintained annually around the PA boundary.

Photo 12: Fire-line maintenance

6.0 INFRASTRUCTURE DEVELOPMENT ON THE SITE (PLATES 13, 14 AND 15)

Inadequate tourism infrastructure and facilities along the trails of Mt. Rwenzori. Inadequate infrastructure and facilities continues to constrain tourism on Mt. Rwenzori as this affects the both the experience of tourist and the rescue and safety interventions. Mt. Rwenzori Tourism Infrastructure Development Project will contribute to increased tourism, which is highlighted as one of the growth opportunities in the Uganda Vision 2040.To improve tourism

infrastructure developments, the Ministry of Tourism, Wildlife and Antiquities is implementing the Rwenzori Mountains Tourism Infrastructure Development Project. The project covers construction of huts and board walks. So far 6 Elena huts have been constructed at 4500 m a.l.s and can accommodate a total of 34 visitors per night together with 36 porters and guides. Construction of 12.89 kilometers of boardwalks in the boggy areas of the RMNP is in progress and all funded by the Ministry of Tourism, Wildlife and Antiquities. Thirty-two meters of the bridge was constructed on the Margherita glacier after development of crevasses along the route to Margherita peak to help visitors access the peak.

Plate 15: Showing a bridge constructed above Marherita crevasses in RMNP

Photo 16: Showing a boardwalk at Kicucu along central circuit trail

Plate 17: Showing constructed visitor accommodation at Elena camp

7.0 TOURISM NUMBERS

Tourism development & financial sustainability aims at increasing park visitations and increased financial revenues for conservation activities. During the reporting period, the number of visitors received in RMNP has surpassed the Pre Covid-19 numbers. In the year 2022/2023, the site received 7557 visitors and 7703 visitors in 2023/2024. For the distantly placed tourism camps, management has improved accommodation (thirty-four (34) visitors per night) at Elena camp, forty visitors per night at Nyabitaba camp and walk boards - twelve (12) kilometers along the swamp areas. These were done to enhance visitor satisfaction and safety. Visitor turn up has increased from 7,557 in 2022/2023 to 7,703 in 2023/2024. Bukurungo trail is being gradually developed for development as the third tourism route to diversify the tourism products, increase visitation, and generate revenues.

8.0 MONITORING OF HYDRO-POWER SCHEMES

Monitoring the implementation of mitigation measures identified in the EIAs for the HEP projects is being done at all the hydropower sites to ensure that the likely negative impacts of hydropower to the property ecosystem are contained. During this reporting period, one ranger post (Kakaka ranger post) was constructed by the developers **(plate 18)** and handed over Uganda Wildlife Authority to enhance deployments and hence monitoring of the area. The developer has continued to provide quarterly funding for patrols in Nyamugahsani and Kakaka water catchment areas inside RMNP.

Plate 18: Showing Kakaka ranger outpost that was constructed 2023 with support from Frontiers Energy

9.0 OTHER CONSERVATION ISSUES THAT MAY IMPACT THE SITE MANAGEMENT

9.1 Financial sustainability

Limited resources may impact negatively the maintenance of the Outstanding Universal values of the site. Currently, the property is being affected by climate change which has resulted in deep crevasses that have developed in the Margherita glacier as a result of melting of the glacier due to global warming. To combat global warming, massive re-afforestation and enrichment planting in and around the property is urgently required and requires revenue to be ploughed back into conservation through operation costs. The organization has been generating revenue. However, revenue is not enough for the operational costs and therefore more resources are needed to support the site in order to implement various conservation activities especially mitigation of negative climate change impacts. It is important to note that the site has been carrying out fundraising drives through proposal writing and sharing them with different partners such as WWF and others.

9.2 Human Population

The property is currently surrounded by five districts which include Kasese, Bunyangabu, Kabarole, Ntoroko and Bundibugyo and there is a growing population in all the five districts. For example, in the last 2024 population census in Uganda, Kasese district was found to have a population density of 303 persons per square kilometer and an average household size of 4.7 persons (UBOS, 2024). The increasing population may in future exert pressure on the park resources despite the patrol efforts. Currently, most of the slopes outside the park boundary have been opened for cultivation leaving limited sources of non-timber products. Potential threats include poaching, timber cutting and boundary encroachment. RMNP Management has embarked on enhanced community sensitization, livelihood programs and patrols to avert the potential risks from the increasing population along the Rwenzori Mountain slopes. The site also has a community conservation unit that preaches the gospel

of conservation to communities around the Park and ensuring good relations between Site Management and the community. Various community projects have been supported and implemented at household level by Site Management, WWF and World Bank in order to improve livelihoods and reduce pressure from the park. The projects supported include Rabbit keeping, Fish farming, Rain Water harvesting tanks, Energy saving stoves among others. However, the Park boundary remains clearly marked to with no possible encroachment of the Park.

10.0 INFORMATION IN COMFORMITY WITH PARAGRAPH 172 OF THE OPERATIONAL GUIDELINES TO THE UNESCO CONVENTION

This section looks at information related to potential major restoration programs, new major constructions within the boundaries or buffer areas where such developments may affect the Outstanding universal values of the Property, its authenticity and integrity. Uganda has no intentions to either alter the boundaries of the property or develop major infrastructure related to site management that may negatively impact the property's Outstanding Universal Values, its authenticity and integrity. The boundaries have been entirely marked and Uganda through the site management will continues to protect of the site as a World Heritage Site and Ramsar site.

11.0 CONCLUSION

Uganda continues to jealously protect, conserve and manage the Outstanding Universal Values (OUVs) of the property. The property constitutes a variety of biological, physical and cultural characteristics. These conservation values are increasingly being threatened by climate change and the demands resources by the growing population. The main tourism activity is peak climbing through glacier and snow that are greatly being threaten by the global warming as a result of climate change. The site management continues to implement the management programs as per the General Management Plan with a number of achievements that aim to protect, enhance and conserve the property. These interventions have enhanced biodiversity monitoring, enhanced patrol efforts, climate change mitigation measures and improvement of the tourism infrastructure along the trails and circuits with negligible impacts on OUVs.

Signed

John Makombo
FOR EXECUTIVE DIRECTOR – UWA

RWENZORI MOUNTAINS NATIONAL PARK

A WORLD HERITAGE SITE

ECOLOGICAL MONITORING PROTOCAL (2023 – 2028)

PREPARED WITH SUPPORT FROM
WWF-UCO (HEMPEL Project:
"A sustainable future for Uganda's Unique World Heritage" - 40001935:)

Cover Page Photographs

Pictures showing Rwenzori Mountains Glaciers at Margarita peak

Availability

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FOREWORD

The conservation Rwenzori Mountains National Park Universal values and their habitats, as well as sensitive natural communities, is integral to maintaining biological diversity. The purpose of this document is to present several available protocols to monitor various parameters identified in the protected area management plans. These protocols are only meant to be a resource and not all protocols may be required, nor are these the only protocols that may be implemented. Monitoring requirements will vary depending on the activity undertaken and the conditions in the area where the activity is to occur. Monitoring and reporting may also be required as part of the mitigation adopted with the Final Environmental Impact Report for the program or any permits obtained to perform specific work activities under this landscape. Individual monitoring protocols will be determined on a case-by-case basis for each project at the discretion of professional staff and/or as required by mitigation.

One of the main functions of Uganda Wildlife Authority (UWA) is to promote use of scientific researched information in wildlife management in the country. UWA aims at providing broad based, scientific information to guide decision making. The framework to achieve this is provided in both the Uganda Wildlife Act (2000) and the Wildlife Research and Ecological Monitoring Policy (1999). These protocols may also help those who prepare and review environmental documents determine when field surveys are needed, how they can be conducted and what information to include in the survey report. These protocols are also meant to help management Identify ppotential impacts to sensitive natural resources in and around the PA. This Research and Ecological Monitoring protocol therefore was developed based on the need for well-planned and well-administered research and ecological monitoring programmes in view of the previous, current and potential threats to Rwenzori Mountains National Park. It identifies monitoring parameters and management-oriented research program based on the identified threats to measure management effectiveness in reducing or mitigating the current and potential identified threats.

TABLE OF CONTENTS

ABREVIATIONS AND ACRONYMS

AOP	Annual Operation Plan
AWF	African Wildlife Foundation
CA	Conservation Area
CAM	Conservation Area Manager
CBDC	Community Based Data Collection
DBH	Diameter At Breast Height
DC	Director Conservation
DTB	Director, Tourism and Business Services
ED	Executive Director
EIA	Environmental Impact Assessment
EMRU	Ecological- Monitoring and Research Unit
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System
HEP	Hydro Electric Power
HQ	Headquarters
IBA	Important Bird and Biodiversity Area
IUCN	International Union for Conservation of Nature
MIKE	Monitoring Illegal Killing of Elephants
MIST	Management Information System
MoU	Memorandum Of Understanding
MTWA	Ministry of Tourism Wildlife and Antiquity
MUBFS	Makerere University Biological Field Station
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NTFP	Non-Timber Forest Products
PA	Protected Area
QECA	Queen Elizabeth Conservation Area
QENP	Queen Elizabeth National Park
QEPA	Queen Elizabeth Protected Area
RBDC	Ranger Based Data Collection
RMNP	Rwenzori Mountains National Park
RMS	Rwenzori Mount nearing Services
RS	Resource Sharing
RTS	Rwenzori Trekking Services
SNP	Semuliki National Park
SRF	Systematic Reconicees Survey
SWIC	Senior Warden In charge
TBS	Tourism and Business Services
TRA	Threat Reduction Assessment
UCO	Uganda Country Office

UPDF	Uganda People Defence Force
UWA	Uganda Wildlife Authority
WCC	Warden Community Conservation
WCS	Wildlife Conservation Society
WEMR	Warden Ecological Monitoring and Research
WLE	Warden Law-enforcement
WR	Wildlife Reserves
WT	Warden Tourism
WWF	World Wildlife Fund for Natura

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On behalf of the Technical Planning Team, we are profoundly grateful to WWF-Uganda for providing the financial resources for Ecological Monitoring Protocol development process. Special thanks go to WWF-UCO and HEMPEL foundation project for their tireless efforts in ensuring that UWA develops Ecological Monitoring Protocol for RMNP. We would like to appreciate the efforts of Mr Daniel Ndizibwe WWF – Kasese field office for following up the day-to-day progress of work and the timely provision of the required logistical support that ensured the successful production of this EMP.

Again, we recognize, in a very special way, the effort and support of all those who made the preparation of this Ecological Monitoring protocol success. Our special thanks go to UWA staff Mr John Justice Tibesigwa (Senior Warden In-Charge RMNP), Nelson Enyagu (Warden Research and Monitoring) Herbert Kitimbo Warden Ecological Monitoring and the UWA rangers provided inputs relating to their experiences in day-to-day monitoring using SMART and Camera traps in ecological monitoring.

CHAPTER ONE

Introduction:

Rwenzori Mountains National Park is a habitat to several endemic, endangered, threatened and rare species of the Albertine Rift and also an Important Bird Area (IBA). The Rwenzoris are renowned for their Outstanding Universal Values including species of conservation concern such as endangered species, threatened species, endemic and restricted range species. In terms of fauna, the park has 54 Albertine Rift endemics which include 18 species of mammals, 21 species of birds, 9 species of reptiles, 3species of plants and 6 species of amphibians. Five species are endangered, 14 are threatened and 4 have restricted range (Howard et al., 1996)

Human population growth in the region and climate change has a direct impact on the Rwenzori keystone species, park resources and its ecosystem at large. The current pressure on park resources by neighboring communities such as poaching of chimpanzee, Rwenzori duikers, Elephants, Blue monkeys, Rock hyrax, and Angolan monkeys for domestic and commercial purpose is on the rise hence affecting the conservation of the species (State of Conservation Report, 2017; SMART Reports 2018, 2019).

Wildlife monitoring Protocol is essential in providing guidelines for assessing the conservation status of wildlife populations and evaluating the effectiveness of management actions (Balmford, Green & Jenkins, 2003). A systematic surveys, monitoring and analysis of population trends and habitats is needed to mitigate the decline of biodiversity and document extinction rates (Balmford, Green & Jenkins, 2003; Ku ̈hl et al., 2008). Survey and monitoring programmes permit evaluation of the sources and impacts of potential threats including: habitat degradation and fragmentation, poaching, and natural catastrophes, such as landslides, fires and disease (Ku ̈hl et al., 2008).

Application of standard monitoring methods using appropriate parameters to Estimating animal numbers, population density and projecting their

conservation direction is often a basic requirement for determining the status of these species. This task is complex since it has no single best approach that exists. Techniques that work well in some situations are useless in others (Caughley & Sinclair, 1994). As such, WWF – UCO with funding from HEMPEL Foundation supported Uganda Wildlife Authority (UWA) to develop Rwenzori Mountains National Park monitoring protocol as a guiding document for ecological monitoring.

1.1. Policy and Legislation

The global importance of mountain ecosystems and the fragility of their resources are both well recognised (Plumptre *et al.* 2007). Rwenzori Mountains ecosystems attract increasing interest from conservationists, politicians, decision makers and many others. The need for a better understanding of the functioning of mountain ecosystems and of the impacts of humans and global climate change on them is widely accepted.

Uganda Wildlife Authority's (UWA) mission sstatement is to "To Cconserve, economically develop and sustainably manage the wildlife and Protected Areas of Uganda in partnership with neighbouring communities and other stakeholders for the benefit of the people of Uganda and the global community".

Under UNESCO WH Convention (1972), Rwenzori mountains National Park is World Heritage Property (number 684) located in western Uganda. It's a Natural property, inscribed on the UNESCO world heritage list as a World Heritage Site in 1994 under criteria (VII) and (X), and RAMSAR site in 2009. As part of state obligations, Uganda is required to submit periodic reports on world heritage site state of conservation that can be generated with detailed information from Ecological Monitoring.

Uganda Wildlife Authority developed a Strategic Plan (2013-2018), outlines Research and Ecological Monitoring as one of the strategic objectives to guide protected area management with scientific information for restoring and maintaining healthy ecosystem in all protected areas. Resource Conservation

and Management and the strategic objectives under this include generating scientific and management-oriented information for wildlife management and to minimize negative impacts of climate change and disasters on wildlife resources and protected areas. These are aimed at supporting the mission of the organisation. The implementation of these strategic programmes and objectives is guided by the 1999 Research and Ecological Monitoring Policy

The 1999 Research and Ecological Monitoring Policy overall goal is "To provide relevant, accurate and timely information that will improve the capacity of UWA to conserve and sustainably manage wildlife resources and biodiversity inside and outside Protected Areas under its jurisdiction for the benefit of the present and future generations of Ugandans and the global community". The policy seeks recognition of the importance of Research and Ecological Monitoring in providing information to the wildlife managers and policy makers. The policy also outlines the importance of data management, benefit and resource/information sharing and collaboration with partners in Research and Ecological Monitoring. The policy thus provides a framework for developing Research and Ecological Monitoring Plans.

1.2. The Need for Research and Ecological Monitoring

There is no doubt about the desperate need for more well-planned and well-administered monitoring programmes. Despite its importance, funding and support for biological and ecological monitoring has been minimal. Monitoring and evaluation of progress are integral parts of protected area management. If there is no effective monitoring of actions taken in conservation then it is very difficult to judge the effectiveness of conservation strategies. Few protected area management authorities in the world have a monitoring system that aims to evaluate progress at all levels of management, although many have monitoring programmes in some of their protected areas. This plan outlines the strategy UWA will use to monitor protected area threats, biodiversity and ecosystem ecological changes and evaluate the progress in reducing the threats in any given period.

Wildlife population status and distribution has been changing and human populations have increased over the years leading to habitat encroachment in various forms and extensive dependency on wildlife products for both subsistence and economic gains. As a result, the magnitude, extent and nature/type of wildlife threats have varied over time. Consequently, there have been changes in policies, ecological systems and size of habitat leading to changes in management approaches. Considering the above scenario, UWA with support from WWF-UCO embarked on developing this ecological monitoring Protocol. The plan is a product of the field consultative and stakeholder process aimed at supporting and enhancing conservation and management of wildlife in Uganda through strengthened application of Research and Ecological Monitoring.

CHAPTER 02:

2.0. Materials and methods

4.1.Location of Rwenzori Mountains National Park

Rwenzori Mountains National Park was gazetted in 1991 covering an area of Location of the park Rwenzori Mountains National Park (RMNP), a World Heritage Site, lies in Western Uganda. It borders the Democratic Republic of Congo (DRC) in the West. It is located in the four districts of Kasese, Kabarole, Ntoroko and Bundibugyo. The mountains lie between altitudes 0 ° 06' South and 0 ° 46' North and longitudes 29o 47’ West and 30 ° 11' East. The mountain ranges out of which the park has been gazetted are much larger in size running about 80 Kilometres in the North - South direction and 40 Kilometres in the East - West direction. The park is part of the ranges, which rises from about 1670m to 5,109m above sea level (a.s.l), which includes Africa’s third highest peak, Margherita at 5109m asl. The park covers an area of 995km2. Rwenzori Mountains National Park is a constituent protected area in Queen Elizabeth Conservation Area landscape

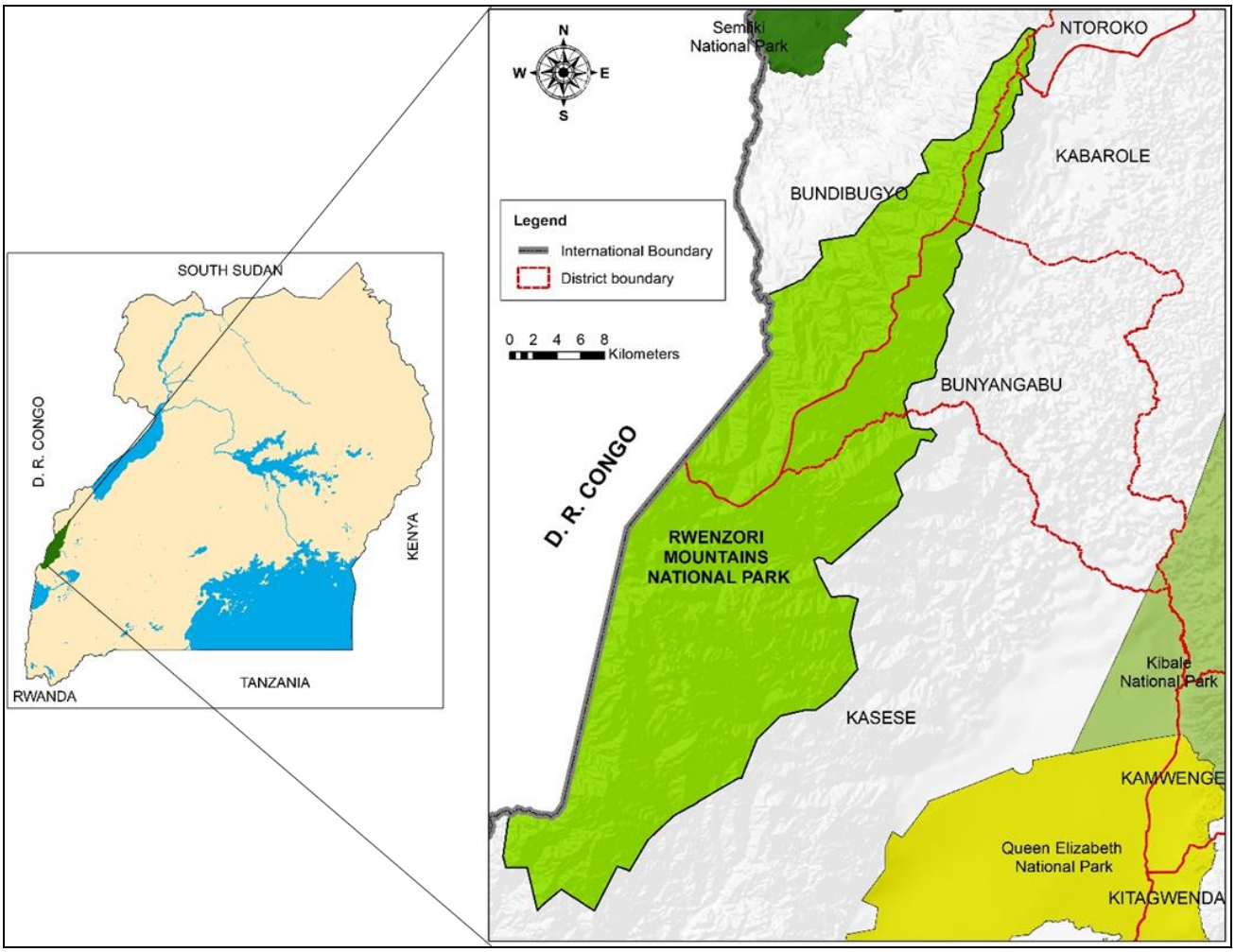

Figure 1: Map of Rwenzori Mountains National Park

4.1. *Purpose of gazettement*

Rwenzori Mountains National Park was gazetted in 1991 to; protect and conserve the park, a world heritage site, with its water catchments value, unique natural and scenic beauty and its fragile mountain ecosystem which supports threatened, endemic, and rare species of fauna and flora for the benefit of the local and international community now and in the future.

4.1. *Conservation Values*

Water catchment The Rwenzori Mountains are one of the largest and most significant water catchment areas in Uganda. It contributes significant waters to the Nile

4.1. *Scenic beauty*

On the ranges are a combination of beautiful peaks, glaciers, Valleys, Rivers, Lakes and various species of flora and fauna making the Rwenzori scenic. The stratified vegetation is one of the main attractions for visitors.

4.1. *Unique biodiversity*

It has Stratified vegetation: grassland, 1000m – 2000m; montane forest, 2,000 – 3,000 m; bamboo/mimulopsis zone, 2500 – 3,000 m; heather/ rapanea zone 3,000 – 4,000 m; Afro – Alpine zone 4,000 – 5,000 m. The most striking plants are found above 3000m. These are the giant tree heathers supporting aerial epiphytic gardens of outstanding botanical and aesthetic interest, some of which are unique to the Rwenzoris. The Afro alpine zone is home to the most graceful of giant lobelia (*lobelia wallastoni*) and groundsels (*Senecio admiralis*). These gigantic species are hallmarks of the Rwenzori.

The mountains are habitat to several endemic, endangered, threatened and rare species of the Albertine Rift and also an Important Bird Area (IBA). The Rwenzoris are renowned for species of conservation concern. The park has 54 Albertine Rift endemics which include 18 species of mammals, 21 species of birds, 9 species of reptiles and 6 species of amphibians. Five species are endangered, 14 are threatened and 4 have restricted range. The endangered species include the Rwenzori duiker (*Cephalophus rubidus*), montane squirrel (*Heliosciurus ruwenzorii*), chimpanzee (*Pan troglodytes*), African elephant (Loxodonta africana) and Rwenzori range frog (*Africana ruwenzorii*). Four species have restricted range. These are Rwenzori/Kivu climbing mouse (*Dendromus kivu*), the Rwenzori Duiker (*Cephalophus rubidus*), *Bradypodion xenorhium* and the Uganda clawed frog (*Xenopus ruwenzori*).

The Rwenzori supports one of the most important bird communities in Uganda, with a total of 217 species having been recorded. Whilst this represents only a moderate level of species richness, the forest harbours many rare, threatened and endemic species. The amphibians show high altitudinal stratification in terms of diversity and richness. Two species of horned chameleons occur in the forest zone. Two species of snakes have been recorded below altitude of 2440 M.

4.1. *Resources for communities*

Rwenzori mountains National Park, a World Heritage Site, is an important source of resources for communities, the Bakonzo, who live on the slopes of the mountain. The resources include smilax and acalph (for basket making), medicinal plants, mushrooms water, honey, fibres from tree bark, bamboo stems and sheath. During the reporting period 4 resource access memorandums of understanding have been signed to enhance sustainable resource access with the local communities along the Park front line Parishes.

4.1. *Cultural values*

The history, culture and beliefs of the Bakonzo are closely woven around the Rwenzori Mountains. These include the Kingdom rituals, management of sacred sites, to mention but a few. The Bakonzo deity Kitasamba with his four wives is believed to have lived in the peaks. During the reporting period, the Katwe-kali sacred site has attracted communities to working more closely with the Park Authority especially in the conservation of the primates / Chimpanzee habitat around the sacred sites. The increasing integration of cultural approaches in the conservation of the primates and its habitats is widely acceptable by communities surrounding the Heritage site and is reducing threats to chimps. But the increasing crop raiding by chimps may relapse the conducive community conservation trend.

2.0. *Glaciers and wetlands*

Rwenzori Mountains National Park is a snow caped mountain with most of its peaks covered with Glaciers. The Glaciers and lakes are an important attraction for visitors with an aril extent of 1 km 2. Numerous rivers flow from the mountain due to high rainfall and melting of snows. Many bogs with associated plant and animal life occur in the mountains

1.1. Management

The General Management Plan (GMP) for RMNP, that forms the basis of this EMP, was developed in 2016 to ensure better conservation and protection of natural resources and to guide the conservation interventions for the park. The six principal themes of the plan are:

1. Resource conservation and management,
2. Monitoring and research,

3. Park operations and maintenance,
4. Community Conservation
5. Tourism development, and
6. Regional cooperation.

In terms of staffing for monitoring and research, the RMNP has Warden in Charge of Research and Ecological Monitoring who is responsible for managing the data from SMART (Spatial Monitoring and Reporting Tool). The warden is under the supervision of the Senior Warden in Charge and the Senior Warden freports to Chief Warden Queen Elizabeth Conservation Area which includes RMNP. Patrol rangers are involved in collecting the monitoring data as part of their regular patrols

1.1. Threats, challenges and concerns

The mountains provide an important catchment for Uganda. The rivers originating from the mountain provide water for hydro power stations and irrigation schemes, and contribute to the domestic water supply for over 1,000,000 people in Uganda. It also supports the fisheries on Lakes George, Edward and Albert (WWF- EARPO, 2006). There is increasing human population around the park leading to high demand for land and resources from the park by the communities bordering the park as well as those beyond the immediate boundary of the park. RMNP carried out assessment and developed a summary of management challenges/threats drawn from UWA documents and consultation with key stakeholders and it is provided below.

Table.1: Threats to the PA

Threats to the PA	**Threat analysis**		
Types of threats	**Likelihood**	**Consequence**	**Level of threat**
Floods	Almost certain (5)	Critical (5)	Severe (10)
Soil erosion	Likely (4)	Major (4)	High (8)
Charcoal burning	Likely (4)	Major (4)	High (8)
Medicinal plant collection	Likely (4)	Major (4)	High (8)
Climate change impacts	Likely (4)	Major (4)	High (8)
Landslide	Almost certain (5)	Critical (5)	Severe (10)
Earthquakes	Rare (1)	Major (4)	Medium (5)
Wild Fires	Almost certain (5)	Major (4)	Severe (9)
Avalanche	Rare (1)	Major (4)	Medium (5)
Drought	Rare (1)	Moderate (3)	Low (4)
Zoonotic diseases	Rare (1)	Major (4)	Medium (5)
Encroachment	Rare (1)	Major (4)	Medium (5)
Illegal NTFP collection	Almost certain (5)	Major (4)	Severe (9)
Pollution	Possible (3)	Minor (2)	Low (5)
Mining	Rare (1)	Insignificant (1)	Low (2)
Timber cutting	Likely (4)	Major (4)	High (8)
Poaching	Likely (4)	Major (4)	High (8)
Human wildlife conflict	Likely (4)	Major (4)	High (8)

CHAPTER THREE

3.1. Monitoring Protocols, Tools and Formats:

Rwenzori Mountains National Park, "A WORLD HERITAGE SITE" is affected by threats like Poaching, encroachment, Fires, climate change impacts and high demand for resources. These have over the time affected the biodiversity of the park. In this section the plan includes methods that can be used by a wide variety of people of different levels of skills and at different time to monitor various parameters of the PA.

The protocols have been developed using guidelines recommended by the World Conservation Monitoring Centre (WCMC) (Tucker *et al*, 2005). The methods will allow different research and monitoring groups to compare their results directly; and pool them to make the data useful in a broader context. The different methods are summarised alongside the monitoring tools. The various data when analysed will ultimately provide insights, trends and thresholds for intervention.

Each protocol has a name; a brief justification statement; specific measurable, achievable and realistic objectives, approaches to be followed and the frequency of data collection. The protocols describe the sampling techniques; equipment, sample preservation as well as data handling. Aspects of data management and analysis as well as samples of field data forms are included. It will be useful if the research team at RMNP took the liberty to update the forms to suit conditions as they try them in the field, if need arises.

Monitoring protocols have been prepared to ensure quality and credibility, so that monitoring is carried out consistently, data are suitable for comparative analysis, and any changes detected are real and not due to differences in sampling, for instance if staff change. The monitoring protocols were reviewed and should be tested to see how applicable it is for management information. The recommended information included in these protocols, includes the following:

a. Monitoring objectives
   - *Reasons for monitoring*
   - *Conservation objectives for the resource*
   - *Monitoring population / area and sub-units*
   - *Establishing the Frequency of occurrence*
b. Monitoring methods
   - *Observation type*
   - *Data type:*
   - *Complete census or sample survey*
   - *Sample area / time period*
c. Monitoring Requirements
   - *Personnel responsible and time required*

- *Experience training necessary*
- *Equipment required*
- *Data storage*
- *Data analysis*

d. Reporting procedures:
e. Indicators

3.1.1. Sample design

The distribution of monitoring activities should ensure that data are representative when this is achievable and desirable. Detailed sampling designs, techniques and tools for gathering data are proposed in this plan. The approaches will promote integration of the various monitoring components in the long term and allow inferences to be made. The parameter(s) to be sampled at each site, sample frequencies, and the protocols are provided. The plan explains how the sampling design will ensure that the data are representative and is appropriate in helping answer various questions. The frequency of sampling for the various parameters is indicated. The designs and tools developed can be used by different stakeholders including local communities and partner institutions. Various parameters are included to help monitor and understand trends of changes in each stratum. Specific features, characteristics and requirements of each stratum are given prominence in this plan

3.1.2. Local Community involvement

Current participation of local communities in ecological monitoring is proposed with a view of enhancing or initiating further involvement. Community involvement is most appropriate in monitoring resource use and access, especially where resource use agreements and MoUs have been signed. Indicators are developed for monitoring some of the key socio-economic features to safeguard their integrity. The components include, for example, resource use, community tourism, impacts of revenue sharing funds, livelihood projects (e.g. harvesting or access to cultural sites/sacred sites), and effectiveness of the collaborative management arrangement and the impacts of increasing population within the frontline community.

3.1.3. Ranger based monitoring (RBM)

The first line of defense for park protection is still rangers, having boots on the ground. Ranger Based Data Collection (RBDC) takes advantage of the presence of rangers, trackers and guides in the park to collect data in a systematic and organized way without increasing the workload. Basic observations that aim at detecting broad trends within habitats, key species, threats and values are made. This information is used for day-to-day management and conservation decision making of RMNP. This is analyzed using Spatial Monitoring and Reporting Tool (SMART) program to generate management information used to assess the effectiveness and impact of management strategies, especially law

enforcement and community conservation and adapt accordingly. The information generated are: -

i) patrol coverage - areas of the park patrolled and those that have not and help determine patrol deployments, hence staff management;

ii) ranger performance - distance covered, number of days and/or nights spent on patrol;

iii) illegal activities – their distribution to help determination of the "hot" zones to focus deployments, and in threat analysis (ranking of illegal activities that threaten the integrity of the park). The information also provides a measure to relate to human use and impact on the park resources;

iv) animal distribution – information can be directly correlated with changes in animal abundance and distribution over time and used in species and tourism management

3.1.4. Data analysis, reporting and interpretation

Spatial Monitoring and Reporting Tool (SMART) have been developed in the PA as database for Ranger Based Data Collection, which includes Data storage, Management, analysis and report processing. This Ecological Monitoring Plan outlines the key steps in entering, editing, storing, and archiving data, in particular from RBDC. Mainly basic analyses of trends are recommended (with some indication of the reliability of results e.g. confidence intervals). In addition, the effort involved and the coverage will be shown to enable comparison with other sites. Basic statistical tools will be used.

3.2. Spatial information

3.2.1. Use of maps, images and GIS in monitoring

RMNP is a spatially heterogeneous (non-uniform) area in biophysical conditions like vegetation and topography and such conditions make planning activities more difficult. Choosing the most appropriate set of management interventions in such an area depends on accurate, detailed area and site description (characterization). Characterization, in turn, is based on *geographic information*. The most basic tool is a geo-referenced (locations of features defined in terms of a coordinate system) map at a suitable scale on which field survey data can be plotted. Geographic Information Systems (GISs), Global Positioning Systems (GPSs) and high-resolution, small-scale satellite imagery (e.g. IKONOS imagery) or aerial photographs are efficient and effective means for obtaining and managing basic geographic planning information. Georeferenced databases such as (SMART) make it substantially easier to monitor impacts of activities in the park; whether the focus is on measuring results or ensuring that mitigation measures are doing their job. GIS integrates spatial and other kinds of information within a single system, offering a consistent framework for analysing geographic data. GIS can help RMNP management devise practical

plans for monitoring, managing and mitigating conservation problems by using it to answer such questions (Johnston 1998) as:

i) What is at?
ii) Where is it?
iii) How large is?
iv) What has changed since?
v) What spatial patterns exist?
vi) What if?

Answering such questions requires a comprehensive GIS database. Major sources of data for GIS include maps, satellite images, aerial photographs and GPS coordinates. Therefore, a survey of existing maps, images, photos and GPS data was made during the development of this ecological monitoring plan. The following sections present a summary of existing information

3.2.2. Geographical Information System (GIS)

RMNP has ArcMap 10.8 and QGIS 3.2 software, downloaded online and It is installed on only one laptop computer in the research and monitoring warden's office but the staff are not trained in how to use. Though the GIS database was developed in 1995, there is little evidence that it has been utilised in park management. The only evidence of its use are maps produced using QGIS or SMART for RMNP Management use such as court, Plans etc. The current use of technology such Drone, Camera traps require staff capacity to be developed in use of GIS to analyze such data for management use.

SMART: this method has been in use since 2015 when it was adapted by UWA from use of Management Information System (MIST) and shall be used to monitor wildlife observation and illegal human activities in the PA during routine patrols. The data can be used to generate information on the species availability, threats and distribution of each specie in the PA. The management shall also use the method to evaluate staff performance in terms of patrol coverage, number and distance covered.

Forest Watcher: application of Forest Watcher is another technology being ventured into by the PA management in monitoring forest loss and fire outbreak in the park. The application helps to inform management on deforestation happening in the PA through alerts that can be used to direct staff to respond and verify the cause of deforestation.

3.2.3. Analog survey maps

Maps covering parts or whole of the RMNP and the surroundings areas are available from the Lands and Mapping Department, Entebbe (Appendix 14). No copy is available at RMNP for reference. All altitudes (contours and spot heights) on these survey maps are in feet (intervals of 500 feet, or about 165 meters). Note that names, or their spelling, may have changed since the maps were made. The maps will be useful for guiding stratification of areas to be monitored according to different characteristics. The maps will also be useful during the actual monitoring exercise and data entry to validate the areas to be monitored. The 1:50,000 maps were the basis for most of the GIS layers of the park.

2.3.3. Aerial photographs

Sets of vertical aerial photos are kept by the Surveys and Mapping Department, Entebbe however RMNP has developed capacity of using unmanned Aerial Vehicle (Drone) used for capturing aerial photos and videos in the PA. This can father be developed and be integrated with other technologies like set light images to monitor the vegetation change and land use in the area. Data on impact of climate change to RMNP ecosystem and values would collect and analyzed using such technology.

Good quality satellite images can provide a historical baseline on cover, but are hard to get for the Rwenzori range, because of frequency of cloud cover. The National Biomass Study project made use of SPOT XS imagery from February 1989 to December 1992, combined with some Landsat TM for their interpretation. It may be worthwhile to trace these images and request digital copies for use and storage by RMNP and supporting partners. It is also advisable to look for imagery available online, as many older ones are now available free-of-charge e.g. Landsat images can be downloaded from the following websites:

- Global Land Cover Facility (UMD) ttp://glcf.umiacs.umd.edu/index.shtml;
- Landsat.org
- Michigan State University; GLOVIS (USGS) http://glovis.usgs.gov/; and
- Earth Explorer (USGS) http://edcsns17.cr.usgs.gov/EarthExplorer/.

3.4. Proposals for RMNP ecological monitoring Protocol

3.4.1. General Overview

Important technical considerations that have been made in designing this monitoring protocol include the following:

i) when to collect field measurements and samples, how often to repeat the fieldwork and for how long;
ii) where to collect field measurements and samples;
iii) what methods to use for collecting the field measurements and samples and for handling and analysing samples brought in from the field;
iv) whether to measure covariates along with other field measurements, e.g surface water temperature and time of the day;
v) how to ensure quality control for monitoring data; and who will do the work?

A short training course on analysis and interpretation of data will be required to show how such data can benefit and inform management. Costs, training, oversight and sustainability should be incorporated in the RMNP operational plans.

3.4.2 Data collection methods

SMART: Rwenzori Mountains National Park uses a conventional law enforcement system of foot patrols that start from ranger camps as well as from park headquarters. The law enforcement rangers have a standardized patrol form used during RBDC and this form should continue to be used for ecological monitoring. The development of SMART program simplified RBDC to use of smart phones to collect data during patrols. The following information is recorded:

- Number of park rangers on patrol
- Duration of the patrol (including rest time)
- GPS location coordinates of routes taken (records every 250m or 15min)
- Observation such as threats and wildlife (direct and indirect) observation, number, age, coordinates
- Additionally, GPS location coordinates of illegal human activity encountered (snares, poachers, poacher camps, camp fires, animal carcasses and cut stumps)
- Wildlife or their signs (nests, dung, hair, footprints) encountered by species and GPS location coordinates

SMART has been in operation in RMNP since mid-2015, therefore there is eight years of ample baseline data on animal and illegal activity encounters and their locations.

3..4.3. Resources required and available

One value of the RBDC approach is that the rangers are required to patrol the park in any case and the monitoring does not add substantial costs to this. The monitoring can actually help make the patrols more effective in terms of coverage and targeting. Compared to the line transect method, data collection based on ranger patrols is cost effective because park rangers work in smaller teams (hence it is relatively cheap),

Monitoring species of conservation concern

Conditions of work and observation are difficult in the tropics (tropical forests), and hence monitoring is relatively expensive. It is impossible to monitor all species or even most of the animal species in RMNP. This plan recommends the monitoring of species of conservation concern which contribute to the uniqueness of RMNP. Such species include those restricted to RMNP, the Albertine Rift endemics and the globally threatened and/or endangered (see Appendix 4- 7). Such species have, in most cases, small population sizes. They are therefore, highly likely to be locally extinct in the face of global climatic change, disease, exotic species invasion and human activity. The monitoring results can help design mitigation and/or adaptation strategies for such species.

The need, for example, to census amphibians has never been more urgent than it is now. Among herpetologists, a growing awareness that amphibians are

declining and becoming extinct in many parts of the world (in many instances in areas of apparently pristine and protected habitats) led to the formation in 1991 of the Declining Amphibian Populations Task Force (DAPTF), set up under the auspices of the IUCN/SSC. Since 1991, it has become apparent that the situation is even worse than expected. One specific threat that has proved devastating to highland amphibians in other regions of the world is the introduction of the amphibian killing fungus

Butrachochytrium dendrobatidis (Woodhams *et al.*, 2006, Daszak *et al.*, 2001, Puschendorf *et al.*, 2006, Kriger and Hero, 2009). This would appear to be a significant, if unevaluated, threat to a number of species of conservation significance in RMNP. The fungus is certainly present in the country already (Goldberg et al., 2007). The development of a careful technical study to assess this threat and the vulnerability of the local amphibian populations is required but will require expertise.

CHAPTER 4

4.0: Monitoring Protocols:

4.1. Protocols for Monitoring Human Impacts

RMNP is faced with a challenge of information gap due to insufficient monitoring and surveys of the key wildlife species that in turn poses management challenges. Standard scientific monitoring protocol designated for wildlife, habitat and threats that could be used by the management to take decision is necessary. It's against these that management developed this monitoring protocols.

Monitoring human activity will focus on signs of illegal activity (e.g. snares, poachers, poacher camps, fires, carcasses and cut stumps). The distribution and intensity of illegal activities will be correlated with wildlife abundance and distribution. In addition, the impacts of tourist activities will be monitored along the tourist routes. Such monitoring will improve cost-effectiveness and performance of law enforcement, as well as other conservation programs. Management decisions will be based on these monitoring indices

3.3.1. Monitoring Forest Fires

Fire is considered one of the major long-term threats to tropical forest biodiversity. Although RMNP is usually too moist to burn, considerable areas can burn during exceptionally dry years. According to the Uganda Wildlife Statute (1996), it is illegal to burn vegetation in the park. Nonetheless, most if not all, fires in RMNP are man-made. Majority of the fires spread to the park after they have gone out of control when local farmers are preparing land for cultivation. There is no record of lightning induced fires because thunderstorms in the tropics are generally associated with rain which reduces the incidence of lightning fires. Forest fires create and increase the likelihood and severity of future fires in previously burnt areas. Opening of the canopy and destruction of large areas of understory promotes invasion by herbaceous and exotic vegetation. If this vegetation becomes established, it will slow forest recovery.

Wild forest fires are monitored to determine a fire hazard period. This is declared basing on long-time monitoring of when and under what weather conditions fires are likely to erupt in the forest. This would assist park management to be prepared during that time and/or conditions to: i) prevent as many fires as possible occurring in the park; ii) extinguish fires that start while they are still small; iii) minimize the size and destructiveness of the fires that become big in spite of the control measures in place, and iv) assess the

effectiveness of the fire control measures. Fires should be recorded whenever they are detected and/or reported.

Indicators to monitor are frequency of fires, area of park burnt, and distribution of the fires per month. Other information to be recorded are cause of fire, time detected, time taken to put it off, source of fire, location, damage and severity and methods used to extinguish the fire. Baseline data on the locations and surface area of burnt sites in RMNP since 2005 exist and the information is stored in SMART and FSC data base. Park rangers will, continue to collect the data on burnt areas using the data sheet designed (Appendix 8).

- The data should be entered on an Excel spreadsheet and preferably entered in GIS database and analysed by Warden Research and Monitoring.
- Data recording should be done immediately after the fire is put off.
- The rangers need to be trained on how to do the assessments and filling the data sheet. The training should preferably be combined with that of fire prevention and control measures.
- Equipment required includes GPS units and tape measures. Each ranger camp can have one unit of each.
- Analysis will include summing up the area burnt, number of locations/fires detected, proportions of fires classified according to damage level and intensity, areas that have been burnt before.
- The analysis should be done annually and can be presented using line graphs and maps. There are no additional costs to monitor burnt areas as this is part of RBM.

3.3.2. Monitoring Tourist Impacts

The basic problem with tourism development is that the tourists and tourism facilities have adverse on the environment. RMNP is a fragile ecosystem and much of what is done within the park will ultimately affect the communities outside the park as the numerous streams and rivers carry much of the waste. According to the RMNP General Management Plan (2016–2026), all tourist camps lacked washrooms. Some of the camps lacked proper rubbish pits (for biodegradable waste). Some of the non-biodegradable materials were also being dumped in the park along trails. This was mainly perpetuated by the porters rather than the visitors. Current locations for latrines at most sites are unsuitable because of their proximity to water sources or location on water logged soils. Along the tourist trails, there are many rest points, but many of them lack proper garbage collection bins and eco-toilets. Sometimes tourists, guides and porters stray off the established trails. Improper disposal of waste and off trail trampling could have adverse impacts on the habitat, wildlife, humans and reduction in aesthetic value.

Monitoring tourism impacts will help park management to assess whether regulations and actions for proper waste management are being adhered to so

that the habitat integrity of the park is maintained. Tourism impacts should be recorded whenever they are encountered and/or reported.

Proposed indicators to monitor tourist impacts in the park include: width of trails at selected points such as fragile habitats like wetlands, volume of non-biodegradable litter collected by rangers, frequency of toilet dirtiness, and number of complaints about litter and/or waste received, off trail trampling impacts like breakage and bruising of plant stems, reduced plant vigour, reduced plant regeneration, loss of ground cover, change in plant species composition and accelerated erosion. GPS coordinate locations of points with adverse tourism impacts also be recorded. Tourism impacts can also be detected from water quality results as explained below. Baseline data does not exist as the tourism impacts are not systematically recorded.

Park rangers and guides can be trained to collect and report this information. Also, tourists can be interviewed for their views on waste management as part of the visitor satisfaction survey.

Data can be entered in an Excel spreadsheet. Since the data is geo-referenced, it can be stored in GIS database. Analysis can be done by Wardens of tourism and/or research and monitoring every three months (quarterly).

Equipment required includes GPS units, tape measure and containers to carry non-biodegradable waste. There are no additional costs of monitoring as this should be part of RBM. The data can be collected by tourist guides while trekking with the tourists. The major tourist trails and camps should be monitored.

3.3.3. Monitoring Human-Wildlife Conflicts

Crop raiding is a cause of much conflict between local communities and wildlife throughout the world. In Africa the great dependence of a large proportion of the human population for their survival on the land, coupled with the presence of many species of large mammal leads to many sources of conflict between people and wildlife. This in turn creates increasing friction between protected area managers, and local communities living in the areas that are adjacent these protected areas. In certain cases, human-wildlife conflict is undermining what have been, to date, quite successful conservation programs.

Monitoring of wildlife-human conflict will help guide park management identify the spatial-temporal distribution of human-wildlife conflict incidences, assess the damage and identify the animals involved. This information can be used in the development and designing of appropriate strategies and methods for reducing human-wildlife conflict. These will ultimately reduce number of crop/animal/human losses to problem animals, help affected farmers improve agricultural production and improve local people's attitudes towards, and perceptions of, a park and its wildlife.

Human-wildlife conflicts should be recorded whenever they encountered and/or recorded. Proposed indicators to monitor: problem animal raids per village per month, problem animal raids per growing season, problem animal raids per km^2 of human settlement per year. Overall damage can be regarded as a proportion of farms affected in a given area. But this indicator is time consuming to measure. There is no baseline data as incidences of human-wildlife conflict are not systematically recorded.

Park and community rangers' guides can be trained to collect and report this information.
Also, farmers can be interviewed for their views on human-wildlife conflict as part of the socio-economic study.
The data can be analysed by community conservation warden and/or research and monitoring and presented as graphical summaries, which are far more 'user friendly' than the tables and diagrams.
If data is stored in electronic format such as an Excel spreadsheet, this is a rapid, simple process. In area reports, common graphical summaries produced are:

- Monthly distribution of problem animal incidents
- Selection of crops by problem animals
- Type of problem animals
- High, moderate and low levels of damage incidents.

If the same geo- referenced incident data are then transferred onto a GIS, detailed distribution maps can be produced. If these data are cross- referenced to a number of attributes, the possibility for numerical and spatial analyses increases considerably. Equipment required includes GPS units, tape measure, Camera and notebook for recording data.

4.2. Protocol for monitoring Vegetation change

3.7.1. General design

The design of this EMP emphasises the need for precision to make good quality evaluations. Also there are many challenges in interpretation and determining how managers will respond to observed changes.

Vegetation change occurs sometimes as a normal process implying that the aim should not be to prevent any change or to view vegetation change as necessarily undesirable. The longest studies of forest change in the tropics come from Budongo Uganda and show that forest systems are always in state of flux and changing (Eggeling, 1947, Sheil, 1997, Sheil, 1998, Sheil, 1999, Sheil, 2001, Sheil, 2003). The challenge will be to identify undesirable change and what can be done about it.

The UWA should make more efforts to monitor vegetation change using the 10 PSP established across the PA in addition to the assessment of resource harvest

and the impacts of fire and encroachment. More technical measurements of vegetation change are planned in coordination with WCS, ITFC and others (GLORIA plots in the alpine zone, PSPs in forest zone, and remote sensing) – these collaborations need to be facilitated and made as reliable and long-term as possible.

The conservation of special status native plants and their habitats, as well as sensitive natural communities, is integral to maintaining biological diversity. The purpose of these protocols is to facilitate a consistent and systematic approach to botanical field surveys and assessments of special status plants and sensitive natural communities so that reliable information is produced and the potential for locating special status plants and sensitive natural communities is maximized.

Whenever more technical plant species inventories are needed, collection should be supervised and performed as far as possible by well qualified individuals. The data and specimens are deposited at the Herbarium in Makerere University, where also the gene bank is held.

3.1.1. Vegetation Survey Preparation

Before botanical field surveys are conducted, the botanical field surveyors should compile relevant botanical information in the general project area to provide a regional context. Consult available survey reports for known occurrences of special status plants and sensitive natural communities in the project area prior to botanical field surveys. Generally, identify vegetation and habitat types potentially occurring in the protected area based on biological and physical properties (e.g., soils) of the project area and surrounding ecoregion. develop a list of special status plants and sensitive natural communities with the potential to occur within the vegetation and habitat types identified. The list of special status plants with the potential to occur in the project area can be created with the help of the available data.

3.1.2. Vegetation field surveys

Evaluate the need for botanical field surveys prior to the commencement of any activities that may modify vegetation, such as clearing, mowing, or ground-breaking activities. It is appropriate to conduct a botanical field survey when:

- Natural (or naturalized) vegetation occurs in an area that may be directly or indirectly affected by human activities or nature (area), and it is unknown whether or not special status plants or sensitive natural communities occur in the project area;
- Special status plants or sensitive natural communities have historically been identified in a project area; or
- Special status plants or sensitive natural communities occur in areas with similar physical and biological properties as a project area.
- Conduct botanical field surveys in a manner which maximizes the likelihood of locating special status plants and sensitive natural communities that may be present.

- Botanical field surveys should be floristic in nature, meaning that every plant taxon that occurs in the project area is identified to the taxonomic level necessary to determine rarity and listing status.
- Focused on surveys that are limited to habitats known to support special status plants or that are restricted to lists of likely potential special status plants are not considered floristic in nature and are not adequate to identify all plants in a project area to the level necessary to determine if they are special status plants.
- For each botanical field survey conducted, include a list of all plants and natural communities detected in the project area. More than one field visit is usually necessary to adequately capture the floristic diversity of a project area. An indication of the prevalence (estimated total numbers, percent cover, density, etc.) of the special status plants and sensitive natural communities in the project area is also useful to assess the significance of a particular plant population or natural community.

3.1.3. Field Survey Method

Conduct botanical field surveys using systematic field techniques in all habitats of the protected area to ensure thorough coverage. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity, which determines the distance at which plants can be identified. Conduct botanical field surveys by traversing the entire protected area to ensure thorough coverage, documenting all plant taxa observed. Parallel survey techniques such as set light images, drone, transects and plots can be applied as when it is deemed necessary. For expel, transects may be necessary to ensure thorough survey coverage in some habitats. The level of effort should be sufficient to provide comprehensive reporting. Additional time should be allocated for plant identification in the field.

3.1.4. Timing and Number of Visits

Conduct Vegetation field surveys in the field at the times of year when plants will have both evident and identifiable. Usually this is during flowering or fruiting. Space botanical field survey visits throughout the growing season to accurately determine what plants exist in the area. This usually involves multiple visits to the project area (e.g., in early, mid, and late-season) to capture the floristic diversity at a level necessary to determine if special status plants are present. The timing and number of visits necessary to determine if special status plants are present is determined by geographic location, the natural communities present, and the weather patterns of the year(s) in which botanical field surveys are conducted.

3.1.5. Data Collection and Reporting:

Adequate information about special status plants and sensitive natural communities present in agiven area will be collected to enable reviewing agencies and the public to effectively assess potential impacts to special status plants and sensitive natural communities and will guide the development of avoidance, minimization, and mitigation measures. The information necessary to assess impacts to special status plants and sensitive natural communities is

described below. Record the following information for locations of each special status plant and sensitive natural community detected during a botanical field survey of a project area.

- Record specific geographic locations where the special status plants and sensitive natural communities were found. Preferably this will be done by use of global positioning system (GPS) and include the datum in which the spatial data was found for comprehensive, systematic botanical surveys.
- If GPS is not available, a detailed map (1:24,000 or larger) showing locations and boundaries of each special status plant population and sensitive natural community in relation to the project area is acceptable. Mark occurrences and boundaries as accurately as possible.
- The site-specific characteristics of occurrences, such as associated species, habitat and microhabitat, structure of vegetation, topographic features, soil type, texture, and soil parent material. If a special status plant is associated with a wetland, provide a description of the direction of flow and integrity of surface or subsurface hydrology and adjacent off-site hydrological influences as appropriate;
- The number of individuals in each special status plant population as counted (if population is small) or estimated (if population is large);
- If applicable, information about the percentage of each special status plant in each life stage such as seedling, vegetative, flowering, and fruiting;
- The density of special status plants, identifying areas of relatively high, medium and low density of each special status plant in the project area;
- Take digital images of special status plants and sensitive natural communities in the project area, with diagnostic features.

3.1.6. Voucher Collection

When a special status plant or unknown plant specie is located, specimen mast be collected and taken to Herbarium. Voucher specimens provide verifiable documentation of special status plant presence, identification and a scientific record. This information is vital to conservation efforts and valuable for scientific research. Collection of voucher specimens should be conducted in a manner that is consistent with conservation ethics, and in accordance with applicable state and federal permit requirements (e.g., scientific, educational, or management permits pursuant.

Voucher collections of special status plants (or possible special status plants) should only be made when such actions would not jeopardize the continued existence of the population. Voucher specimens should be deposited in herbaria Centre at Makerere University for species identification and species update. Digital imagery can be used to supplement plant identification and document habitat. Record all relevant collector names and permit numbers on specimen labels (if applicable).

3.4. Protocol for Monitoring Water quality and quantity

3.4.1. Introduction

The objective of water quality monitoring is to justify the ecosystem functions and services in terms of water provisioning from the park; to track the extent of pollution of water resources from activities inside and outside the park; keep track of the impacts of gravity flow schemes on the water catchment functions of the park; and to track changes in river flow.

Rwenzori Mountains National Park is an important water catchment providing several ecosystem functions and services to aquatic biota and local communities living on the slopes of the mountains. Over (11) HEP power plants depend on water abstractions from the rivers originating from RMNP such as River Mubuku, River Nyamwamba, River Rubiria, River Nyamughasani, River Rwiimi, River Mpanga, Rive Sindila and Ndugutu. Other development that benefit from RMNP water are the Kilembe mines, Kasese Cobalt Company, Mubuku irrigation scheme. There are 46 gravity flow schemes (GFS) dependent on the park in adjacent areas in the three districts that border the park. These GFS are established with out assessment of the adequacy of ground water to sustain them. The rivers running down the mountain range feed the economically important Lakes Edward and George, and constitute a major source of the White Nile through the waters of river Semuliki, which flow into L. Albert. There are other protected areas, irrigation schemes, hydropower stations and domestic water supplies that depend on this catchment. However, the integrity of these ecological functions is being compromised by the non-regulated use of the freshwater resources such as abstractions and by a threat of climate change. Domestic water supply to over one million surrounding people all benefit from the mountain's water catchment properties (WWF, 1998).

List of Hydro power plants around RMNP

Sno	Facility	Latitude	Longitude	Remarks
1	Bugoye Power Station Tronder	0.3	30.1005	Outside
2	Mubuku I HEP	0.31861	30.1	Outside
3	Mubuku III Power Station KCCL	0.26334	30.12	Outside
4	Nyamwamba 1 HEP	0.23	29.985	Outside
5	Nyamwamba 2 HPS	0.1351	29.5851	Outside
6	Rwimi Power Station	0.39	30.18	Outside
7	Mahoma	0.478611	30.273058	Outside
8	Lubilia	0.083611	29.761944	Outside
9	Ndugutu	0.615556	29.979444	Outside
10	Sindila	0.63	29.978056	Outside
11	Nyamugasani 1	0.137778	29.934722	Outside
12	Nyamugasani 2	0.13	29.9425	Outside
13	Kakaka	0.374458	30.204431	Outside

3.4.2. Monitoring Parameters

The proposed monitoring considers physical, chemical and biological aspects of water quality. It is intended to be simple and quick to apply. The main parameters to be monitored include: river discharge, electrical conductivity, surface water temperature, dissolved oxygen, pH, water transparency, and benthic macro-invertebrates. The justification for monitoring these parameters is to see if there is a change in the catchment such (e.g. pollution) and potential climate change effects that would compromise the quality and quantity of water in streams and rivers.

The proposed parameters are measured in the field apart from the aquatic insects. Rangers and research wardens would require minimal training to use, calibrate and maintain the equipment. The proposed parameters are similar to what is being monitored in Bwindi Impenetrable National Park (BINP) which will facilitate comparisons. The monitoring and research Warden can carry out the analysis of the data with minimal training. ITFC can help with the necessary training of the Warden and rangers.

3.4.3. Frequency

A baseline survey of water quality was set up by measuring the proposed parameters at the sites to be sampled quarterly since 2010. This will form a basis for monitoring future changes in the parameters. It is suggested that monitoring be carried biannually during the wet and dry seasons for all the environmental indicators. Benthic macro-invertebrates should be sampled annually preferably during the dry season. This would give maximum abundance and diversity of aquatic insects as there is minimal disturbance of the assemblage compared to that caused by spates during wet seasons. By monitoring the abundance of aquatic insects, shifts in the range of these organisms will be ascertained and related to climate change.

In order to achieve monitoring objective for water quality, river discharge in m^3s^{-1} at selected stations will be estimated from the buoyant object method. The method is rapid and simple and is applicable for streams and rivers that can be waded. The measurement can be taken by rangers with minimal training. UWA will use the data to assess changes in water volumes in the rivers being monitored and will be able to speculate on the possible causes of the changes e.g. by relating discharge data to rainfall data.

Discharge can be estimated from the product of velocity and cross-sectional area of the river by timing the flow of buoyant sticks over a 5-m stretch and discharge calculated using the formula:

$Q = Wdla/t$

Where; Q- Discharge which units (m^3s^{-1}) W- bank-

full-width of the river (m) d- mean depth (m)

l- distance (m) over which the float travels in time t (seconds)

a- coefficient, which varies with the nature of the sediment (0.8 for rough, and 0.9 for smooth sediments respectively).

Monitoring objective 2 will be achieved through measuring the proposed variables. Long -term monitoring will be conducted to see if there is a change in the catchment such as pollution and potential climate change effects that would compromise the quality and quantity of water in streams and rivers

Electrical conductivity (µS/cm): This is a measure of the ability of water to conduct electricity. It varies with level of human activities in the watershed and the nature of the underlying geology. It also varies with season being lower in the wet season and higher during the dry seasons. It is a recommended that a YSI 30 conductivity meter be used as it has proved to be robust in Bwindi and Kibale National Park studies.

Surface water temperature (°C): Water temperature is extremely important for all freshwater ecosystems. This should be measured onsite using digital equipment such as conductivity and dissolved oxygen meters. With the threat of global climate change, stream water temperature is predicted to rise

Dissolved oxygen (mg/l): Is a crucial requirement of all life in water. It is normally saturated in fast flowing rivers. It is however expected to drop with a reduction in river discharge and an increase in water temperature. Other human impacts such as pollution may alter the concentration of oxygen.

pH: Is a standard measure of the hydrogen ion concentration of the water and is represented using a logarithmic scale. A digital pH meter is recommended for use in monitoring. A robust model such as PHEP 5 TESTR by HANNA instruments is recommended for use

Turbidity / Water transparency /clarity (cm): This will be indexed from a transparency tube fitted with a miniature secchi disc at the bottom

Benthic macro-invertebrates: Benthic macro-invertebrates have been used as bio-indicators of watershed condition and water quality in streams and rivers over the years, e.g. in Bwindi Impenetrable and Kibale National Parks (e.g. Kasangaki et al 2006; Kasangaki et al 2008). This is because various taxa have varying tolerances to different types of disturbances. Various metrics such as number of taxa and their relative abundances can be used as indicators of water quality. The metrics will help management determine status of water resources, evaluate causes of degradation, determine effectiveness of management interventions such as catchment restoration and measure success of management programs.
Aquatic insects should be used because they are easy to sample and identify. Resh (1995) explains why aquatic insects are good indicators of water quality. Benthic macro-invertebrates, in particular, are recognised as valuable organisms for bio-assessments, due largely to their visibility to the naked eye, ease of identification, rapid life cycle often based on the seasons and their largely sedentary habits. Numerous bio-assessment techniques have been

developed over the last three decades, varying in complexity and region of implementation (Dickens & Grahams, 2002).

Research warden and rangers can carry out the analysis with additional practical training in data analysis using the available baseline data. The research warden for Rwenzori and some rangers were trained in these techniques in 2005 and since then have shown that they can apply these methods effectively. A follow up practical session should be organised, to assess how the available data can be further analysed for appropriate management actions.

3.4.4. Monitoring Locations

It is suggested that all rivers and Glacial lakes be considered for water quality and quantity monitoring on either side of the Rwenzori. The suggested rivers for monitoring are Mubuku, Nyamwamba, Rubiriha, Nyamughasani, Rwiimi in Kasese and Lamia, Sindila, Ndugutu in Bundibugyo. River Mubuku is glacier-fed (<2% of the discharge; Taylor et al 2009) while Lamia is dependent on precipitation and ground water.

Three sites should be located on each river; first one in the ericaceous zone; second one at base of mountain (park boundary) and a third one in community land outside the protected area to act as the control.

Monitoring of gravity flow schemes sites should be set above and below point of water withdrawal in order to assess their impacts on stream hydrology and water quality.

Kilembe Mines Ltd has a concession for kaolin extraction within the park. Before mining starts it is suggested that an ecological study be made on the river Nyamwamba to form a baseline on which future changes will be measured. The river already seems negatively impacted from previous mining activities as implied by the apparent impoverishment in aquatic insects just below Kilembe mines and Hospital facilities (Kasangaki, personal observation).

3.5. Protocols for Monitoring climate, gravity flow schemes and glaciers

3.5.1. Introduction

The objective of climate monitoring is to keep track of weather patterns (temperature, rainfall, sunshine, wind strength and direction) and to track changes in glaciers. Various weather parameters should be monitored in order to get an insight into how these influence animals and plant distribution within the Rwenzori ecosystem. In addition, regular monitoring of weather parameters will give an insight into how global climate is changing.

The parameters recommended are the ones below. Justification for their selection is that they are the standard weather parameters measured globally and that data on these parameters is available from other forests such as Kibale and Bwindi National Parks for comparison. In addition, the Tropical Ecology

Assessment and Monitoring (TEAM) Network of monitoring sites by Conservation International in the tropics is monitoring similar parameters.

Weather / climate monitoring protocol

Rain gauges exist at Kalalama and Mitinda along Kilembe trail and in Kasese town. These will provide comparative rainfall data. An automated weather station similar to the ones being used by TEAM is suggested given the difficult terrain of Rwenzori. Three automated weather stations should be established at the highest elevation possible, the second at intermediate elevation, and the third at the base of the mountain. These should be placed along an elevational gradient. An Italian research group has two stations monitoring temperature, rain and radiation in the Rwenzoris.

The five weather stations installed along central circuit trail to establish a profile along a gradient within an altitudinal range of 1700 m to 4,900 were vandalized by un known people. These weather stations measured temperature, precipitation and humidity since 2009 up t0 2017. The focus should be put to acquire more weather equipment for data collection, data storage, validation, analysis and dissemination for management use. In addition, manual weather stations can be placed at all rangers' outposts. The staff at the ranger posts will require training in handling and caring for the equipment and taking readings. The collected data will be submitted to the RMNP in charge of ecological monitoring and research for management use. Department of Metrology should be consulted to collaborate is setting up automatic weather stations in the Rwenzoris to avoid duplication of effort and explore possibilities for collaboration on data collection.

- Air temperature: can be measured simply using mercury- or alcohol- filled thermometer. Alternatively, it could be recorded electronically.
- Relative Humidity
- Precipitation
- Radiation (sunshine)

3.5.2. protocol for monitoring Gravity flow schemes

Gravity flow schemes draw water from rivers inside the national park. There is need for assessing the quantity and quality of the water being drawn in order to justify/prove to the stakeholders the ecosystem functions and services that the Rwenzori watershed provides to communities downstream. Gravity flow schemes to be monitored include the Mugusu and Kamanga stream for the Ruboni community. Assessments should be carried out before and after in collaboration with the communities or communities should be trained to carry out the monitoring of the gravity flow schemes using simple techniques. All the gravity flow schemes and their impacts on the hydrology of the park, the catchments and on major rivers in terms of ecosystem health, quality and quality of water will be monitored. Similar parameters (e,g. discharge, water

levels, temperature) as those suggested for water quality monitoring on major rivers should be measured above and below points of water withdrawals. In addition, riparian vegetation assessments should be carried out to determine potential impacts of water withdrawals on vegetation. Water quality and quantity assessments should be carried out above and below the proposed sites of the GFSs to establish baselines on which to determine likely impacts. Samples of water be taken for Water quality analysis be done in the laboratory at Ministry of water and environment.

3.5.3. Protocol for monitoring Glacial extent and cover

Anthropogenic and climate change is expected to result in the complete loss of glaciers from the high mountains of tropical Africa, with profound impacts on the hydrology and ecology of unique tropical cold-water lakes and rivers located downstream from them (Eggermont & Verschuren, 2006). We suggest that glacial retreat monitoring continues to be undertaken by the PA staff and academic researchers – notably the interpretation of recent data regarding these changes remains disputed[2] (Taylor *et al.*, 2006a, b Molg *et al.*, 2006).

Monitoring of glacial recession is already in progress in collaboration with international experts, this cooperation should be strengthened further as it is logistically challenging for UWA and its field staff. UWA can participate by providing the necessary institutional support to the academic researchers. It remains unclear how managers or others can use and respond to these data in terms of day-to-day, or longer-term, decisions. The current stand of Glacier indicates continuous reduction of Glacier extend and coverage in the mountain. See Table bellow.

Table of Glacier trend (2010 – 2022)

Years	Available Glacier (Acres)	Reduction (Acres)
2010	304.7	304.7
2018	226.7	78
2019	211.6	15.1
2020	198.5	13.1
2021	183.7	14.8
2022	168.4	15.3

3.6. Monitoring in-park resource use

3.6.1. Participatory monitoring

In the context of sustainable in- park resources use, monitoring will focus on observing what goes on in terms of harvesting patterns (e.g. the kind and amount of resources harvested, period of harvesting and who harvests). A Participatory Monitoring (PM) approach is proposed, with periodic cross checking by more qualified researchers. This approach has some potential for facilitating sustainable in-park resource use (Cunningham, 1992; Danielsen *et al.*, 2005; Peters, 1994; Shackleton, 1996). Changes will primarily be observed by relevant resource users in the parishes of Nsuura and Kazingo, where WWF and UWA have initiated some resource use activities (refer to WWF 2007).

Involving relevant resource users in monitoring will increase their motivation for ensuring that the program succeeds. The continued exchange of information (required in PM) will bring the resource users and park management close, which will strengthen their working relationships. It is necessary that WWF, UWA and the resource users reach a common understanding on the way progress will be measured and the findings used to guide harvesting of relevant resources. It is expected that this approach will work in RMNP because there is a clear need for the agreed resources, for example bamboo, which have no clear alternatives outside the park.

The data on resource harvest by communities under the resource use agreement is always recorded and analyzed to show the quantity harvested and economic value in terms of monitory value in comparison with the inventory stock. Resource use monitoring will be conducted as part of the routine UWA monitoring programme where the park rangers are involved (refer to the RMNP collected NTFP economic value report (UWA-2022). (Table.3)

Table 1 Economic value of resources accessed from the park

RESOURCE	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	TOTALS	Unit Cost	Total Cost
Firewood (Bundles)	500	300	434	543	3531	2446	3605	**11,359**	10,000	**113,590,000**
Mushroom (Basket)	26	33	45	63	65	55	55	**342**	20,000	**6,840,000**
Dry Bamboo (Bundles)	2130	1900	1930	533	2527	1760	1379	**12,159**	20,000	**243,180,000**
Bamboo Sheath (Bundles)	157	178	201	17	30	12	88	**683**	5,000	**3,415,000**
Medicinal Plants (Baskets)	176	200	198	65	106	270	177	**1,192**	30,000	**35,760,000**

Fibre (	93	145	173	201	10	8	21	**651**	5,000	**3,255,000**
Smilax	17	10	18	36	306	438	223	**1,048**	5,000	**5,240,000**

3.6.2. Monitoring process

This process will involve keeping records of harvesting activities, and assessing the results and impacts in the field, to form the basis for evaluating the success of the interventions and learning from the experiences. Sustainable in-park resource use will be achieved through three key processes

a) controlled access of the community to the park;
b) community empowerment to manage park and park resources; and
c) a dialogue for park management.

Monitoring will be implemented by the Ridge Committees assisted by park management.

Access and extraction

The rate at which agreed park products are collected and the collection methods will be used to determine whether there is progress towards controlled access to the in-park resources by comparing the data with previous harvest and data from other parks and resource harvesting of similar products. The activities to be monitored include: controlled access to bamboo, firewood, and medicinal plants; and use of the path to Bundibugyo. These will be monitored through the following mechanisms:

Monthly monitoring activities

The Ridge Committees will carry out monthly monitoring of resource use in each of the parishes permitted to access resources through MoU.
Resource use data will be collected and the data will be entered in a village monitoring form indicating person involved, type of resource and quantity harvested. This process will generate information on the quantities collected and harvesting methods. The number of forms filled can later be submitted to the office of Community Conservation for data analysis.
Rangers live within the communities near resource harvesting zones would provide additional checks to the already gathered information. Feedback will be shared at meetings with different resource user groups and RMNP teams

Ranger based monitoring will provide an additional check to monitoring by ridge committees. The rangers will fill the standard forms designed for SMART. This will provide an opportunity for triangulation of data collected by both teams. The linkage is that the rangers will also collect information on harvesting activities. This could be done at intervals of at least once every month. The data can then be synthesised every six months

Monitoring by professional scientists will be carried out in a combination of permanent and temporary geo-referenced plots located close to the trails where resource use is most intense. The plots will be marked discreetly to avoid

suspicion. This will include use of cryptic markers (e.g. metal that can be detected with a device), or use of very accurate GPS, or marked points with listed offset control plots in the remote areas not accessed for exploitation, to guide comparison of the ecological state with and without resource harvesting. Control plots will be selected to match the sample plots near trails. Matching will consider factors such as species diversity, soils, and topography to ensure 'representativeness'. The control plots will be monitored jointly by the RMNP team. The monitoring will be carried out in intervals of at least every month and this should be synthesised after six months.

Perception interviews: A monitoring team composed of representatives of RMNP staff and representatives of community resource user groups will regularly visit individual resource users to discuss park management issues, perhaps on a bi-monthly basis at the beginning and later on a quarterly basis. Issues to be monitored will include resource users' perception of the monitoring process, as well as trends and status of resources. This will provide an opportunity for the resource users to review commitments to the obligations in the resource use agreement they signed highlighting their responsibilities.

Perception interviews will also be used as indicator for community empowerment to participate in managing the park. The monitoring team will regularly (on a quarterly basis) visit individual resource users to discuss their satisfaction with the process including their contribution towards management and whether use of the permitted resources has contributed to their livelihood improvement.

The capacity of the communities to manage the resource will be monitored through the frequency of meetings, nature of issues handled and how handled. It is expected that the communities will meet during the time of synthesising the data at intervals of six months.

Monitoring using the permits will fit into UWA's monitoring plan currently used for various national parks. Triangulation will be made with the data from ranger-based monitoring. This increases the workload but will greatly improve the reliability of the data. Detailed data on type and quantities of resources collected will be entered into a data collection form.

Extraction of medicinal plants is spread throughout the park with some concentration in some areas such as *Kikyo, Kisamba, Akomughabe* and *Kihira* among others. It is proposed that focus on monitoring medicinal plant use be made at these locations, by establishing permanent sample plots (of 10 x 10 m) where various parameters will be monitored. However, the plan will put in consideration any other resource use that may be suspected to have likely negative impacts on some particular resources. This will cater for some resource users that may increase during the period of this monitoring plan. The different questions that will be addressed during the monitoring will vary depending on specific resources and methods that will be used. For each of the resources, the

following aspects will be monitored:

- Productivity
- Levels of harvest, including quantities harvested
- Number of harvesters
- Impacts of harvest on the species harvested
- Impacts on other species
- Recovery/ regeneration rates/ potential.
- Trials of alternative harvest regimes
- Life-cycle dynamics and identification of limiting life stages

In the medium and long term, the monitoring will aim at helping to specifically define safe/sustainable harvest rates (based on most of the above). In the interim period, decisions on quantities of resources to be harvested will be based on the available quantities from studies previously carried out in RMNP.

A periodic survey (for marketed resources) is recommended to monitor the market chain for the different resources. This will also help verify the livelihood contribution of different resources. The market survey will be used to collect data on quantities sold and market prices. The market surveys will be carried out by the joint RMNP staff and resource user group teams.

CHAPTER 05

5.0: ANIMAL MONITORING PROTOCOL

5.1. Introduction:

Mammal: Monitoring Wildlife population status and distribution is very crucial in the management of protected areas. Wildlife population has been changing and human populations have increased over the years leading to habitat encroachment in various protected area forms and extensive dependency on wildlife products for both subsistence and economic gains. As a result, the magnitude, extent and nature/type of wildlife threats have varied over time. Consequently, there have been changes in policies, ecological systems and size of habitat leading to changes in management approaches. Therefore, the monitoring method must fit into the current need for information.

5.2. Camera Trap Installation and Servicing Protocol

5.2.1. Field Preparation

1. Research the target species for your camera, including its habitat preferences, tracks and signs, and previous sightings in the area you are going.
2. Research your site, consider your access and field conditions. Where will you park? Do you need a permit to park in this location? What is your hiking route? Call the local ranger district office closest to your site for information on current field conditions, especially when snow is possible to still be present
3. Know your site: familiarize yourself with your location, the purpose of your monitoring, target species, and site-specific instructions (i.e., scent application, additional protocols).
4. Review this protocol and the species-specific protocol for your camera trap installation, to understand processes and priorities for the overall program this year
5. Coordinate with your team leader before conducting your camera check to make sure you receive any important updates

6. Gather the supplies needed for your check and schedule the pick-up either from the
nearest route.

7. Resources such as batteries, memory cards for cameras, data sheets and GPS should be made available for field work during installation.

8. Before going into the field, make sure you/your team members have a copy of this document as well as everything else needed on the equipment checklist.

Negative Surveys

Adverse conditions from yearly weather patterns may prevent botanical field surveyors from determining the presence of, or accurately identifying, some special status plants in the project area. Disease, drought, predation, fire, herbivory, or other disturbance may also preclude the presence or identification of special status plants in any given year. Discuss all adverse conditions in the botanical survey report.

The failure to locate a known special status plant occurrence during one field season does not constitute evidence that the plant occurrence no longer exists at a location, particularly if adverse conditions are present. For example, botanical field surveys over a number of years may be necessary if the special status plant is an annual or short-lived plant having a persistent, long-lived seed bank and populations of the plant are known to not germinate every year. Visiting the project area in more than one year increases the likelihood of detecting special status plants, particularly if conditions change. To further substantiate negative findings for a known occurrence, a visit to a nearby reference site may help ensure that the timing of botanical field surveys was appropriate.

3.8. Data handling protocol

3.8.1. The importance of data management

The raw data collected through the various protocols must be carefully checked, then entered in databases, checked, corrected and double checked, before analysis and evaluation concerning management questions. The challenges posed by data management in any organization should not be underestimated; too often in designing a monitoring approach, the management aspects of data are overlooked.

RMNP management (ideally UWA) must clearly define data- management systems and allocate responsibilities for each step in managing data from each monitoring protocol (a table like the one below may provide an overview). Oversight by a staff member (Warden R&M first comes to mind, but an assistant might be added) who is well trained and experienced in database management and GIS is needed to ensure quality control of the data sets. Without due attention to quality control

and basic "housekeeping tasks", the value of collecting large long-term data sets would be wasted. With good controls and effective management, it should be relatively simple to utilise data in a wide variety of informative ways.

'Data' only becomes useful 'information' if the right questions were asked in the first place and appropriate analyses carried out to address them. Not all questions need to involve sophisticated statistical manipulations. Already MIST provides useful information on the location of illegal activities for example, as output is visual and easy to present.

Data collected	By whom?	Who enters data?	Who checks and corrects?	Who analyses data & presents results?	Analyses required
Water quality	Rangers	Ranger, assigned to database management	Warden R&M	Warden R&M	Refer to section 3.4
Resource use	Rangers, Warden R&M	Ranger, assigned to database management	Warden R&M	Warden R&M	Quantities harvested over a defined period
Illegal human activities	Rangers	Rangers	Wardens LE and R&M	Wardens LE and R&M	Catch per unit effort; Change in distribution
Wildlife	Rangers	Rangers	Wardens LE and R&M	Wardens LE and R&M	Catch per unit effort; Change in distribution
Ranger performance	Rangers	Rangers	Wardens LE and R&M	Wardens LE and R&M	Effective patrol man-days per unit distance; Effective patrol days/staff/month; Patrol coverage

3.8.2. Format for storing monitoring data

Currently, the PA has software called SMART that is used to store RBDC information collected on wildlife sightings, threats, and problem animal incidences but this does not include other data collected from the PA monitoring activities such as Glacier, water quality etc. The discussion of databases should not be focused on software, but rather consider the needs and ease of use. Systems such as MS Access are flexible enough, and available on stand alone computers to provide a reasonable basis

for data handling. It would seem most effective if any system was in general use throughout UWA. In terms of data -flow and controls there are a number of online systems that might be used in terms of controlled flow, access and archiving.

In most cases, monitoring data include location of the observations, such as GPS coordinates. Such spatial data allows for linking the dataset to a GIS layer, and therefore visualization of data sets. For many users and decision makers, this will aid understanding. Both Excel and Access files (most spreadsheet formats in fact) can be incorporated into commonly used GIS systems like QGIS and ArcGIS Pro. The GIS environment can play the connector-role between otherwise separately created data files; because all information from monitoring are geographically defined, the point data (spot observations of species, like from RBM, water quality measurement locations or vegetation plot locations), line data (e.g. transects) or polygons (extend of vegetation type) can be displayed and by clicking on them, the data files are accessed. This function is available as a standard in a GIS database, and links between datasets may be created as long as they have some parameter in common (like location).

The value of RBM data collected over many years and stored in SMART should not be underestimated. These data form an integral part of the monitoring data archive already existing for RMNP and an effort should be made to use them in whatever system is selected for the future. RMNP/WWF isupgrading SMART to smart connect that will use server to store data collected from the field. This will easy real time sharing of information with decision makers and park managers.

In order to build on an archive of data relevant for Uganda's Protected Areas, UWA should develop clear guidelines for researchers to leave behind their data and reports. The relevant data collection forms that are provided for various taxa should be used and data submitted to the warden in charge of research and monitoring for analysis in time.

3.8.4. Archiving

UWA may consider attracting a consultant for technical advice on internet-based archiving of its data. Given that RMNP is a World Heritage site, advice and funding to develop this may possibly be sought from UNESCO. BINP and other Ugandan NPs have a similar need.

2.0.Reporting Protocol

Monitoring and Surveys reports provide an important record of information on field survey results and protected area conditions. Botanical survey reports containing the following information should be prepared whenever vegetation field surveys take place, and should also be submitted with environmental stators documents:

- The report should contain the Names and qualifications of botanical field surveyor(s),
- Dates of surveys (indicating the botanical field surveyor(s) that surveyed each area on each survey date), and total person-hours spent;

- A discussion of the survey preparation methodology; and a list of special status plants and sensitive natural communities with potential to occur in the region;
- Description(s) of reference site(s), if visited, and the phenological development of special status plant(s) at those reference sites;
- A description and map of the area surveyed relative to the protected area;
- A list of all plant taxa occurring in the project area, with all taxa identified to the taxonomic level necessary to determine whether or not they are a special status plant;
- A discussion of how climatic conditions and human induced activities may have affected the botanical field survey results;

4.0. Conclusions

In order to implement this Ecological Monitoring Protocol for RMNP, it is important for UWA and other stakeholders to decide on 'what data are needed, and for what purpose'. This EMP provides detailed methods that can be used to address monitoring needs for various purposes: from the management oriented to the academic. During preparation of this monitoring plan, the need to have various baselines was emphasised by various stakeholders. It would be ideal and desirable to include such baselines, but this has not been achieved in this plan because of two reasons: i) many of the data that exist, for example in the SMART database require verification and preliminary analyses to extract the baselines; and ii) various data are held by stakeholders such WCS, MUIENR and the Herbarium as well as the Museum in Makerere University. Obtaining such data requires that proper mechanisms for the sharing of the data are put in place. An overview of existing spatial data for RMNP, with UWA and the WWF project has, for example, been carried out and should inform subsequent monitoring efforts. Safe, well organised archives and meta-data (sources, with dates of last corrections and updates) require more attention. Partners must, therefore, be invited to contribute to the monitoring programme. Moreover, there is a need to ascertain what data are available and what plans there are for utilising such data. The UWA should therefore take a lead in ensuring that this EMP is implemented.

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ANNEX.1: : Table of Red List of Mammals in RMNP

SPECIES NAME	COMMON NAME	IUCN RED LIST STATUS	UGANDA RED KIST STATUS	Observed During survey	Not Observed during survey
Cephalophus rubidus (Cephalophus nigrifrons)	Rwenzori Duiker	EN	EN	XX	
Loxodonta africana	African Elephant	VU	CR	XX	
Dasymys montanus	Montane Marsh Rat,	EN	EN		**
Hylochoerus meinertzhageni	Giant Forest Hog	LC	EN	XX	
Myosorex blarina	Ruwenzori Mouse-shrew,	EN	EN		**
Pan troglodytes	Common Chimpanzee	EN	EN	XX	
Cephalophus nigrifrons	Black-fronted Duiker	LC	VU	XX	
Chaerephon aloysiisabaudiae	Duke of Abruzzi's Wrinkle-lipped bat, Free-tailed Bat	LC	VU		**
Colobus angolensis	Angolan Colobus	LC	VU	XX	
Crocidura niobe	Ruwenzori Musk Shrew, Niobe's Shrew	LC	VU		**
Dendromus kivu	Rwenzori Climbing Mouse, Kivu African Climbing Mouse	LC	VU		**
Grammomys dryas	Montane Thicket Rat,Forest Thicket Rat	NT	VU		**
Heliosciurus ruwenzorii	Montane Sun Squirrel, Rwenzori Sun Squirrel	LC	VU	XX	
Hybomys lunaris	Ruwenzori Striped Mouse	VU	VU		**
Micropotamogale ruwenzorii	Ruwenzori Otter Shrew	LC	VU		**
Otomys typus	Northern Groove-toothed Rat	LC	VU		**
Paracrocidura maxima	East African Montane Shrew, Greater Large-headed Shrew	NT	VU		**
Ruwenzorisorex suncoides	Osgood's Montane Shrew, Rwenzori Shrew	VU	VU		**
Sylvisorex lunaris	Long-tailed Forest Shrew, Moon Forest Shrew	VU	VU		**
Sylvisorex vulcanorum	Dwarf Forest Shrew, Vulcano Shrew	NT	VU		**
Dendrohyrax dorsalis	Western Tree Hyrax	LC	DD	XX	
Rhinolophus ruwenzorii	Rwenzori Horseshoe Bat	VU	DD		**
Saccolaimus peli	Pel's Pouched Bat	LC	DD		**
Thamnomys venustus	Montane Forest Rat, Charming Thicket Rat	VU	DD		**
Panthera pardus	Leopard	VU	VU		**
Genetta victoriae	Giant Forest Genet	LC	DD	XX	

CR- ; DD- Data Deficient ; EN- Endangered ; LC- Low Concern; NT- Nearly

ANNEX.1: Priority Reptile and Amphibian species for monitoring

	Family	**Species**	**Common name**	**Albertine Rift endemic**	**Status**
Reptile	Lacertidae	*Adolfus vauereselli*		+	-
Reptile	Viperidae	*Atheris nitschei*		+	-
Reptile	Chamaeleonidae	*Bradypodion carpenteri*		+	-
Reptile	Chamaeleonidae	*Bradypodion xenorhinum*		+	-
Reptile	Chamaeleonidae	*Chamaeleo johnstoni*	Three-horned chameleon	+	-
Reptile	Chamaeleonidae	*Chamaeleo rudis*		+	-
Reptile	Scincidae	*Leptosiaphos graueri*		+	-
Reptile	Scincidae	*Leptosiaphos meleagris*		+	-
Reptile	Colubridae	*Philothamnus ruandae*		+	-
Amphibian	Pipidae	*Xenopus ruwenzoriensis*	Uganda Clawed Frog	+	-
Amphibian	Arthroleptidae	*Africana ruwenzorica*	Rwenzori Range Frog	+	EN
Amphibian	Arthroleptidae	*Phrynobatrachus versicolor*	Rwanda River Frog	+	NT
Amphibian	Arthroleptidae	*Hyperolius discodactylus*	Disc-fingered Reed Frog	+	-
Amphibian	Arthroleptidae	*Leptopelis kivuensis*	Kisenyi Forest Treefrog	+	-
Amphibian	Arthroleptidae	*Phrynobatrachus petropedetoides*	Rwenzori River Frog	+	-

A7.4. Data Collection Form: Amphibians and Reptiles

DATE:_____ OBS:_____ LOCATION:_____ pg___of___

Start temp (C):_____ End temp (C):_____ %clouds:_____ Rain:_____ Wind speed:_____
Start time:_____ End time:_____

Area	Time	Species	Type	Sub.	Mark	Total length				SVL				Age	Sex	Status	Other type

Data entered by:____ checked by:____
Wind speed codes: 0=no movement; 1= calm, smoke drifts; 2=light, feel on face, leaves rustle; 3=gentle, leaves in constant motion, flags extend; 4=moderate, dust and paper rises; 5=fast, small trees sway, crested wavelets on water.

Det. Type=Detection type; v=visual; c=capture; a=auditory; s=sign. Sub.=Substrate type: R=rock; L=log; W=water; V=vegetation; X=litter. Age: A=adult; M=metamorph; L=tadpole; E=egg mass. Sex: M/F/U, Status: G=gravid; S=swollen testes; otherwise, leave this column blank

ANNEX.1: **RESOURCE USE DATA SHEET**

Protected Area……RWENZORI MOUNTAINS…NATIONAL PARK…

Parish……..Village……

Name of Recorder…….....

Date	Name of the User and Permit number	Resource harvested.	Qty	Amount	Time Taken (HRs)	Observations

ANNEX.2: Standard survey data sheets

GROUND SURVEY DATA SHEET – RWENZORI MOUNTAINS NATIONAL PARK

Survey Area: _____

Observer (Team Leader): ……	Date: ……	Other observers 1……
Transect No.: ……	Transect length: ……	2……
Start time: ……	End Time: ……	3……

Way Point No	N	E	Time	Altitude	Animal species	Perp. Dist. (m)	Group Size	Species			Remarks
								M	F	Young	

REMARKS: *G=Grassland; M=Montane Forest, B=Bamboo;; P=Poaching, H=Heather Forest CT=Cultivation,*
ANIMAL SPECIES: **BF**=Buffalo, **BN**=Baboon, **EL**=Elephant, **BP**=Bush pig, **LPD**=Leopard, **CN**=Chimp nest, **ED**=Elephant dung, **RDK**=Rwenzori Duiker, **CZ**= Chimpanzee, **BWC**=Black and white colobus, **BM**=Blue monkey, **RTM**=Red-tailed monkey, **RH**=Rock hyrax, **LHM**=L'hoest monkey

RWENZORI MOUNTAINS NATIONAL PARK
CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN
2022/23 -2031/32

JULY 2022

Cover Page Photograph

River Mubuku after the May 2020 floods near Mihunga gate inside Rwenzori Mountains National Park

Availability

This publication is available in hard copy from UWA library and a soft copy from the UWA website http://www.ugandawildlife.org

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PREAMBLE

Rwenzori Mountains National Park has over the years been hit by flash floods, landslides, earthquakes, drought and wild fires. The progressive loss of biodiversity, community livelihoods and infrastructure as a result of the disasters and risks has become a major concern. Continued occurrences of these disasters and risks have negative consequences on development of infrastructure, facilities and conservation of the Outstanding Universal Values. The disaster risks in the Rwenzori landscape are caused by the following hazards as identified and analysed in this plan;

1. Floods
2. Temperature increase
3. Rain
4. Landslides
5. Deforestation
6. Reducing glaciers and snow
7. Strong winds
8. Avalanche
9. Earthquake
10. Land cracks/fault lines
11. Land sinks
12. Fire
13. Pollution
14. Land shears
15. Mining

The Rwenzori Mountains National Park climate change and disaster risk management plan forms a unique opportunity to address the challenges that Rwenzori Mountains landscapes face from impacts of Natural disasters. The main objective of Rwenzori Mountains National Park Climate and disaster risk management plan is to provide guidance and strengthen Rwenzori Mountains National Park capacity for Climate Change Disaster risk management and to provide a framework for stakeholders' involvement and participation in Disaster risk management.

The Rwenzori Mountain National Park Climate change disaster risk management plan has adapted a multi-stakeholder approach aimed at creating more coherent and inclusive disaster risk management practices by mobilising local Governments, key stakeholders, communities, civil society organizations in a strategic manner across key sectors.

Actions to reduce risks associated with disasters due to hazards have been developed. These actions have been derived from an analysis of root causes such as poverty levels, generation of greenhouse gases, inadequate social services, urbanization trend, limited livelihoods alternatives, negative community attitudes towards conservation, inadequate awareness and insecurity across the landscape.

Mechanisms for financing, implementation and monitoring of this plan has been identified and described.

ACKNOWLEDGEMENT

Uganda Wildlife Authority (UWA) appreciates the support from UNESCO in the development of this plan. Also, special thanks go to the District Local Government of Kasese, Bunyangabu, Kabarole, Ntoroko and Bundibugyo; Central Government Agencies and relevant Ministries and other conservation stakeholders such as World Wide Fund for Nature (WWF), Save the Children, and Cultural Institutions for their participation in one way or another to ensure that the Climate Change and Disaster Risk management plan is of high quality and well aligned and contributes to the country's disaster and risk management plan agenda. Uganda Wildlife Authority shall continue to rely on your support during implementation of this plan.

ACRONYMS

ASL	Above Sea Level
CAO	Chief Administrative Officer
CBO	Community Based Organization
CC	Community Conservation
CCR	Community Conservation Ranger
DEO	District Environment Officer
DLG	District Local Government
DRC	Democratic Republic of Congo
DWD	Directorate of Water Development
EARS	East African Rift Valley Systems
EM	Ecological Monitoring
EMS	Emergency medical services
GMP	General Management Plan
IUCN	International Union for Conservation of Nature
KCCL	Kasese Cobalt Company Limited
LCV	Local Council five
LSSP	Land Sector strategic Plan
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MIST	Management Information System
MLHUD	Ministry of Lands, Housing and Urban Development
MMU	Mountains of the Moon University
MUK	Makerere University Kampala
MWE	Ministry of Water and Environment
MUST	Mbarara University of Science and Technology
NEAP	National Environment Action Plan
NEMA	National Environment Authority
NFA	National Forest Authority
NFP	National Forestry Plan
NGO	Non-governmental Organisation
NWSC	National Water and Sewerage Corporation
OPM	Office of Prime Minister
OUVs	Outstanding Universal Values
PNV	Parc National des Virunga
REMODA	Rwenzori Mountains Development Association
RMNP	Rwenzori Mountains National Park
RMS	Rwenzori Mountaineering Services
RNS	Rwenzori Nature Adventures
RRGEA	Rwenzori Ranges Guides and Escorts Association
RRHA	Rwenzori Ranges Hikers Association
RTS	Rwenzori Trekking Services
RWATs	Rwenzori Action for Tourism Services
RWEMCCA	Rwenzori Community Conservation Association

SADS	Systems Administrator and Database Specialist
SEA	Sustainable Environment Awake
SIDA	Swedish International Development Agency
SWIC	Senior Warden In Charge
UNATCOM	Uganda National Commission for UNESCO
UNCCD	United Nations Convention to Combat desertification
UNESCO	United Nations Education, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNRA	Uganda National Roads Authority
UNWSC	Uganda National Water and Sewerage Corporation
UPDF	Uganda People's Defense Force
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
WCS	Wildlife Conservation Society
WESIP	Water and Environment Sector Investment Plan
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

The disaster risks in the Rwenzori landscape are caused by the following hazards as identified and analysed in this plan;

1. Floods
2. Temperature increase
3. Rain
4. Landslides
5. Deforestation
6. Reducing glaciers and snow
7. Strong winds
8. Avalanche
9. Earthquake
10. Land cracks/fault lines
11. Land sinks
12. Fire
13. Pollution
14. Land shears
15. Mining

Due to climate change impacts accelerating the above hazards, development and conservation of the Rwenzori Mountain National Park ecosystem and the surrounding Rwenzori landscape has been hindered. The objective of this plan is therefore to provide guidance and strengthen Rwenzori Mountains National Park management capacity to deal with Climate Change Disaster risk in close collaboration with stakeholders in the landscape.

In order to reduce the risks of disasters, enhance the park's management capacity and stakeholders and innovate and implement robust infrastructure designs in the Rwenzori Landscape among others, the planning team identified root causes of the issues in the landscape. Identification and analysis of the problem root causes enabled the multi-stakeholder planning team to propose mitigation actions including those for prevention and recovery for the next ten years. Key among the proposed actions for the ten years include;

1. Build capacity of community response teams to manage emergencies
2. Coordinate with civil society organizations and private sector in responding to risks and disasters
3. Designate selected river valleys for natural regeneration
4. Desilt and stabilize river banks for selected rivers (Kirumya, Nyamwamba, Mpanga, Yerya and Wasa)
5. Develop and implement wet land management plan for selected wetlands (Semuliki delta, Kinyanjojo, Mugunu, Karusandara and Kiyombya)
6. Develop basic rescue and safety skills amongst communities
7. Develop the capacity to manage early warning system
8. Enforce implementation of environmental laws
9. Equip the park with modern rescue and safety equipment
10. Establish an inclusive system for dissemination of early warning information
11. Identify evacuation centres in suitable areas
12. Integrate Indigenous Traditional Knowledge (ITK)in the disaster and risk management

13. Mobilise and support tree planting initiatives
14. Popularize disaster risk management information in the prone areas
15. Procure and install 01 earthquake detection equipment in Kisomoro Bunyangabu
16. Procure and Install early warning system in Rwenzori Mountains National Park
17. Protect and restore water catchment areas (Humya, Wasa, Mpanga, Yerya and Nyamwamba)
18. Support climate smart agriculture practices
19. Support existing community efforts in conservation of critical natural resources
20. Train communities in innovative entrepreneurial skills

The proposed activities will be implemented by all stakeholders in and beyond the landscape who have differentiated mandates. Technical and financial support will be needed for successful implementation of the plan which is estimated to cost Uganda shillings 66,912,000,000/- over the ten-year period translated into Uganda shillings 6,691,200,000/- annual average expenditure.

BACKGROUND

1.1 Introduction

Rwenzori Mountain National Park (RMNP), which is about 995 sq.km is located in the five districts of Kasese, Bunyangabu, Kabarole, Ntoroko and Bundibugyo which are found in western Uganda and borders Democratic Republic of Congo (DRC). RMNP is one of the largest and most important water catchment areas in western Uganda. The mountain ecosystem is of global importance as a world heritage site and is habitat to several endemic, endangered; threatened and rare species of the Albertine rift some of them with restricted rangers.

The Mountain lies between Latitude 00 06' and 00 46' North and longitudes' 290 47' and 300 11' East. Over 75% of the Mountain range is found in Uganda with rest falling in DRC. In the DRC the mountain is part of Parc Nationale de Virunga (PNV) and are contiguous with Rwenzori for about fifty kilometres. It was gazetted in 1991 and it is the largest most significant water catchment area in East African region, contributing large volumes of water to the River Nile. The snow-capped block Mountains of the moon, strides the equator rising up to 5109m ASL. Due to its unique biodiversity, scenery, beauty, and rich cultural attachments, it was designated as a World Heritage site in 1994 and RAMSAR site 2009.

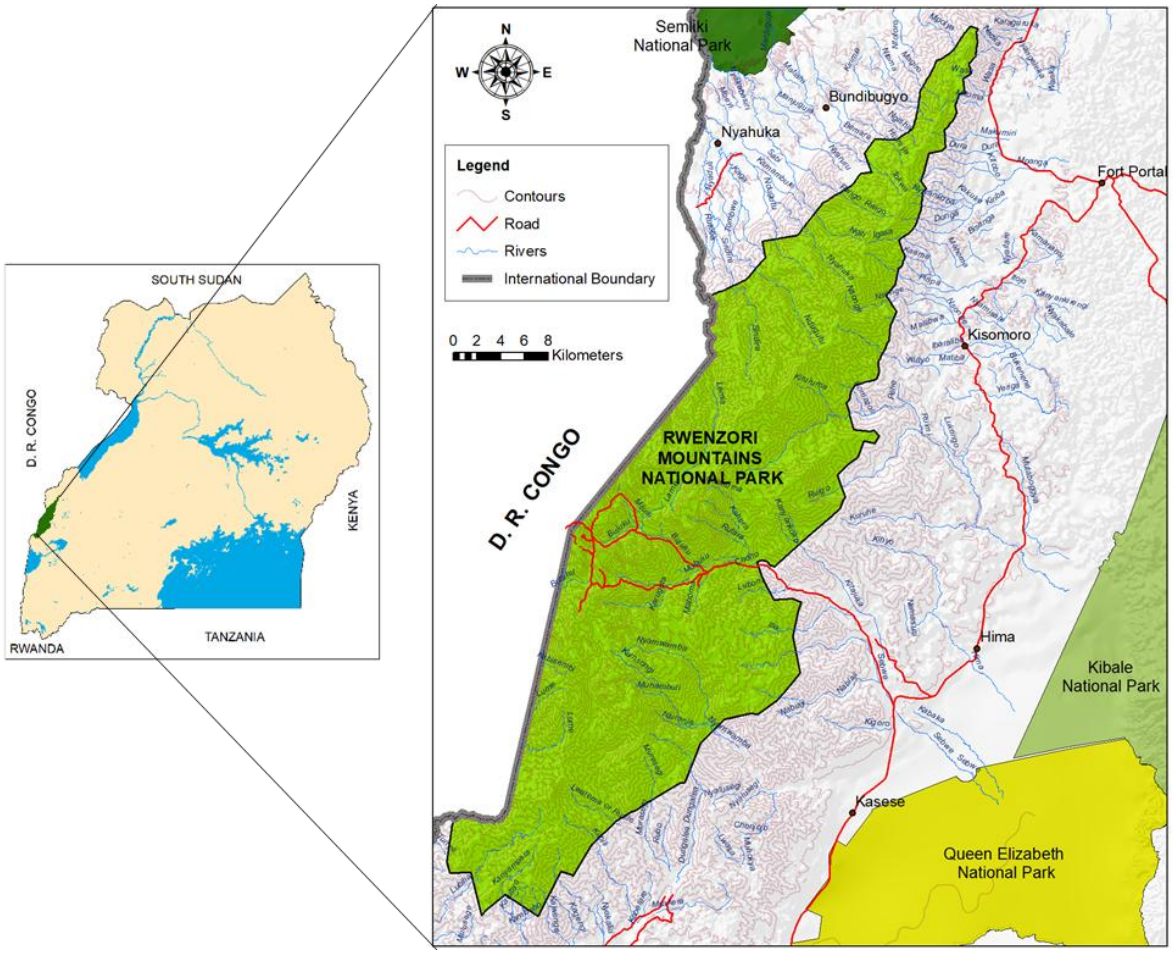


Figure 1: RMNP Location Map

As a result of climate change, RMNP has suffered frequent flash floods, landslides, wild fires, drought, Temperature increase, Rain, Deforestation, reducing glaciers and snow, Strong winds, Avalanche, Land cracks/fault lines, Land sinks, Pollution, Land shears, Mining, Floods and Earthquakes among others that have hindered the development of the Rwenzori Mountain National Park ecosystem and the surrounding Rwenzori landscape.

The above scenario has made Rwenzori Mountains National Park management (RMNP) to develop a climate change and disaster risks management Plan to prevent, prepare, respond and recover with a view of conserving the Outstanding Universal Values (OUVs) and ensuring that the Heritage Property contributes to its full potential and sustainable development.

The plan was therefore developed by constituting a planning team from neighboring districts and key stakeholders who were identified through a stakeholder analysis process. During the planning process the risk values of the identified hazards within the landscape were assessed hence the hazards were ranked according to the risk values as explained in the subsequent sections.

1.2 Fauna

Rwenzori has many unique species of global conservation concern. The park has 54 Albertine Rift endemics species; 18 species of mammals, 21 species of birds, 9 species of reptiles and 6 species of Amphibians. 14 species are threatened, 5 species are endangered and 4 species have restricted range. They include; Rwenzori duiker, African elephant, Rwenzori/Kivu climbing mouse, Uganda clawed frog, Chimpanzee, Rwenzori three horned chameleon, Rwenzori turaco, and Dwarf otter-shrew (RMNP GMP 2016).

1.3 Flora

The Rwenzori Mountains has unique vegetation largely determined by its geographical history, bio-geophysical context and altitudinal range, rising from 1600 metres to 5,109 metres above sea level. The high altitude vegetation forms distinct zones; grassland (1000-2000m), montane forest (2000-3000m), bamboo zone (2500-3500m), heather zone (3000-4000m), Afro-alpine moorland zone (4000-4500m) and Rocks and snow (4500-5109m). Some of the important plants include *Hypericum bequaertii*, *Schefflera polysciadia* and *Erica kingaensis*. The park contains globally important flora such as Giant lobelias and *Dendreosenecios*.

1.4 Outstanding Universal Values

Rwenzori Mountains National Park was designated as a World Heritage Site in 1994 with the following Outstanding Universal Values;

Criterion (vii):

The Rwenzoris are the legendary "Mountains of the moon", a reflection of the mist-shrouded mountains of this rugged massif that tower almost 4,000 m above the Albertine Rift Valley, making them visible from great distances. These mountains offer a unique and pristine landscape of alpine vegetation studded with charismatic giant lobelias, groundsels, and heathers which have been called "Africa's botanical big game". The combination of spectacular snow-capped peaks, glaciers, V-shaped valleys, fast flowing rivers with magnificent waterfalls, clear blue lakes and unique flora contributes to the area's exceptional natural beauty.

Criterion (x):

Because of their altitudinal range, and the nearly constant temperatures, humidity and high isolation, the mountains support the richest montane flora in Africa. There is an outstanding range of species, many of which are endemic to the Albertine Rift and bizarre in appearance. The natural vegetation has been classified as belonging to five distinct zones, determined largely by altitude and aspect. The higher altitude zones, covered by heath and Afro-alpine moorland, extend from around 3,500m to the snow

line and represent the rarest vegetation types on the African continent. Significant species include the giant heathers, groundsels, lobelias and other endemics. In terms of fauna, the Rwenzori have been recognized as an Important Bird Area with 217 bird species recorded to date, a number expected to increase as the park becomes better surveyed. The montane forests are also a home to threatened species such as the African forest elephant, eastern chimpanzee and l'Hoest's monkey. The endangered Rwenzori black-fronted or red duiker, believed to be a much localized subspecies or possibly a separate species, appears to be restricted to the Park.

1.5 Climate

The climate of RMNP is tropical, affected by seasonal movements of the inter-tropical convergence zone and by altitude and topography (Howard PC, 1991). There are two rainy seasons each year from March – May and from August – December though these seasons are altered due to climate change impacts.

The annual humidity and atmospheric pressure in Rwenzori is declining. The highest average atmospheric pressure was recorded in 2010 and 2009and the lowest (692.6mb) was recorded in 2012. The trend showed a steady decline in average annual atmospheric pressure.

The mean annual rainfall declined from 1071mm to 798mm in the period of one year 2011-2012. Mean annual temperature increased to 9.960c between 2009 and 2010 then declined by 6.7oc between 2010 and 2012. The overall temperature increased by 2.250c.

Air temperature decreases with increasing altitude as follows; From Mihunga which is 1800m above sea level is 18.0oc, Nyabitaba which is 2,500m above sea level is 10.9oc and Stanley Plateau is 4,900m above sea level is -2oc.

Table 1 showing temperature and rainfall

Year	Average air temperature	Average humidity (%)	Average atmospheric pressure (MB)	Average rainfall (mm)
2009	4.2	95.0	724.8	861
2010	13.2	89.8	766.7	1041
2011	9.6	87.2	715.7	1071
2012	6.5	56.6	692.6	798

Source: RMNP weather data

1.6 Hydrology

One of Rwenzori Mountain's most important ecological and economic functions is the impact the range has on the area's hydrological cycle. The range's permanent streams

and rivers contribute to the Nile by way of river Semliki which flows into L. Albert, Rivers Mpanga, Nyamwamba, Mubuku which flows into Lake George and many other permanent rivers. Agricultural lands surrounding the park are fed partly by the mountain run off and partly from direct rainfall regulated by the Rwenzori forest. The fisheries of Lakes George and Edward, hydropower and irrigation schemes and domestic water supply to over 500,000 surrounding people all benefit from the mountain's water catchment properties

1.7 Geology and Geomorphology

Rwenzori Mountains were formed about three million years ago by the uplifting of rocks due to forces within the earth's crust. The rocks include igniess, amphibolite, granite and quartzite (Taylor & Howard, 1998). The soils derived from these rocks are generally of low fertility. Lower slopes mainly have moderately acidic soils while soils on the upper slopes, are generally more acidic, and heavily leached. Moreover, glaciation in the last 300,000 years has left moraines such as the Nyabitaba ridge and Lake Mahoma. There are glaciers on the Rwenzori range specifically on Mt Stanley, Mt. Speke and Baker. However, tremendous reduction in the glacial coverage is reported (Pomeroy & Tushabe 2004;). The presence of snow fields and glaciers on the steeply rugged peaks, rising up to 5,109m a.s.l. present a scenically spectacular view (Leggat & Beaton 1971).

Rwenzori ranges are composed of Precambrian rocks which contrast strongly with the much younger deposits of the neighbouring Rift Valley. Most of the rocks are similar to and locally continuous with the basement complex of very old (200 my) granite gneisses and quartzite's which lie on the eastern side of the Rift Valley. The Mountain was formed about three million years ago by uplifting of rocks due to forces within the earth's crust. The oldest is the massive granitic, Speke Gneiss which also composes Emin and Gessi, Luigi, the lesser peaks in the upper Nyamugasani and Nyamwamba, and the bulk of the long northern ridge are also formed of gneiss. Quartzites correlated with the Toro Quartzites lie along the SE foothills. The rocks include igniess, amphibolites, granite and quartzite. There are glaciers on the Rwenzori range specifically on Mt. Stanley, Mt. Speke and Mt. Baker.

The block glacier / snow-capped mountains of the moon were formed during the formation of the east African Rift Valley. It consists of six distinct massif separated by deep gorges.

1.8 Soils

The soils derived from these rocks are generally of low fertility. Lower slopes mainly have moderate acidic soils while soils on the upper slopes are generally more acidic and heavily leached. The Characteristic feature of the physical geography of the Rwenzori region, the river systems show the area is underlain by huge river particles

and boulders and when the soil is saturated with intensive rainfall the structures are stressed and therefore boulders break loose causing intense destruction along its way. The areas in the catchment with shallow and rocky surface are associated with low infiltration rate. When the rainfall occurs such areas witness rapid surface runoff and accumulation of potential downstream floods. Also steep slopes and thin soils promote the rapid concentration of storm runoff to confined streams and narrow river valleys resulting into flash flooding. When the weak soil structure come in contact with the heavy river flow and cannot withstand the heavy boulders capacity to tear and wear the river beds.

1.9 Glaciers and Snow

Rwenzori is one of the snow-capped mountains with rather permanent glacier and snow just along the equator. Unfortunately, scientific studies and physical observation indicate that glaciers receded from an area of 1,600 acres (650 hectares) in 1906 to 870 acres (352 hectares) in 1955 to a mere 366 acres (148 hectares) in 2008. The recent topography of the Rwenzori Mountains block has been shaped by several glaciations which can be compared to equivalent stages of Mt. Elgon. Rwenzori Mountains is among the three mountains in the south-eastern basins that was affected by glaciations during Cosmo genic apparent age and covered ice up to 40% during Lake Mahoma stage.

Over twenty glacier lakes exists in the alpine zone, and over 50 rivers originate from the mountain to feed important life supporting activities in the plains occupied by millions of people and is believed to be contributing to the White Nile through the Semuliki river.

1.10 Park Management history

Part of the Rwenzori Mountains above 2200 m covering about 995 sq. km were gazetted as forest reserve in 1941. The first forest management plan written in 1948 prescribes strict protective management in view of the mountains role as Uganda's largest and most valuable water catchment. The second management plan in 1961continued to emphasize the importance of water catchment protection, however the extraction of traditional forest products such as firewood, bamboo, and specified types of timber were permitted.

Since the sixties, the mountain increasing was threatened by the demands of a growing population. Poachers removed most of the large animals from th main valleys while cultivation of steeper land below the protected area boundary cause serious soil erosion.

Uganda was isolated during the seventh and some of the eighties by internal unrest. The return of stability in the late eighties, and renewed foreign visitation to the

country, came at time of massive international concern for environmental protection. National and international organizations and individuals noted and spotlighted the problems faced by the Rwenzori. This led for the proposal for the establishment of a national park in the Rwenzori Mountains, Uganda . Submitted to the government of Uganda by the World wide fund/ New York Zoological Society (UWA, 1999)

Later Government appointed a team that held extensive consultations regarding the elevation of Rwenzori of Rwenzori Mountain forest reserve to National Park status. Among the key stakeholders consulted were the communities, the majority of whom supported the proposal. The team produced a report "Rwenzori Mountains National Park: results of Public enquiry and recommendations for the establishment ". In 1991, the Rwenzori Mountains were gazetted as a national park affording a total protection of all flora and fauna. The Management was transferred from Forest department to Uganda National park, now Uganda Wildlife authority (UWA) thereby accorded high conservation status which excludes any form of exploitative use of resources. UWA established the Park headquarters at Nyakalengijo village close to the tourism trail head. Outposts (ranger stations) were established at Kilembe Bundibugyo and Kazingo near Bukuku.

In 1994, in further recognition of its value to the international community, Rwenzori Mountains National Park was designated a world Heritage Site and RAMSAR site in 2009. Between 1997 and 2001 the park was closed to tourism due to insurgency as the allied Democratic Forces used the Park as their based as they fought with Government troops. The park was reopened in July 2001 after they were defeated.

Originally at Nyakalengijo, which used to the Park headquarters there was insufficient infrastructure for staff. In 2005, World Wide Fund(WWF) donated building to UWA at Rwakingi and the Park Headquarters shifted to this location this was also to enable staff access social services in Kasese Town. Other than the Park headquarters, the parks is administered under eleven outposts along the entire boundary and is constituent protected area within Queen Elizabeth Conservation Area landscape and thereby supervised by the chief warden of Queen Elizabeth Conservation area.

1.11 Surrounding Human population

Before the establishment of the colonial boundaries between Congo and Uganda in 1910, the local communities inhabiting the Rwenzori Mountains areas comprised of a three major ethnic groups: The Bakonjo and Bamba on the Uganda side, the Banandi people in the current DRC (Yeoman, 1992). Before the forest policy of the 1929 which initiated the gazettment of natural forests into central forest reserves, human settlements stretched into the current boundaries of RMNP. Currently, human settlements are confined to the lower slopes outside the park boundaries.

The history, culture and beliefs of the Bakonzo and Bamba are closely woven around the Rwenzori Mountains. These include the Kingdom rituals, management of sacred sites, to mention but a few. The Bakonjo deity Kitasamba with his four wives is believed to have lived in the peaks. During the reporting period, the two tribes (Bakonjo and Bamba) split to form two kingdoms with the Bamba kingdom on the northern lowlands of the mountains and the Bakonjo kingdom remaining on the slopes and the rest of Kasese district and parts of the Democratic Republic of Congo occupied by the Konjo language

The region surrounding the RMNP is one the most densely populated rural areas in Africa, with 150 – 450 people per sq km (Tumusiime, 2006). In 1992 at least 300,000 Bakonjo lived in the area but by 2002, the population around the mountain in Uganda had grown up to 1,000,000 people (WWF 2004).

Rwenzori has a strong cultural / spiritual attachment with the Bakonzo and the Bamba people. The Bakonzo people say that since memorial they have regarded the Rwenzoris as repository of many blessings to their social economic wellbeing. As such, the mountains constituted a form of reserve even before the colonial period (Yeoman 1990). The cultural significance of the mountains is demonstrated by traditional rituals performed within RMNP, including the construction of hunters' shrine for animal sacrifices, ceremonies involving the exorcism of evil spirits and human burials. There is a belief if a person dies in the mountains his body is not to be brought home but must be buried where he died from. Glaciers are at the centre of traditional belief system of the Bakonzo who have long lived around the Rwenzori Mountains. It's believed that the snow / ice "Nzururu" is the father of the Bakonzo deities, "Kitasamba" and "Nyabibuya" who are responsible for human life, its continuity and its welfare.

1.12 Increasing Human Population

The property is surrounded by a buffer area with increasing human population that may put pressure on the park resources. Management has already clearly marked the park boundaries to eliminate possible encroachment of the park. Patrol efforts have been stepped up with patrol posts well distributed along the property boundary to ensure that continuous monitoring of the site is achieved on a daily basis. Site management has also engaged the community in various awareness and restoration activities including soil conservation, tree planting and river banks management. We also have a fully-fledged community conservation unit that interfaces with the communities in ensuring good relations between Site Management and the community. We have further commenced livelihood enhancement projects that are anticipated to divert community pressure from the park. A number of projects are now being funded by UWA at household/ community level for this purpose and more funds have been committed within the 2019/2020 financial year to continue with

these efforts. Site management has engaged the community through negotiating multiple resources access agreements that regulate resource access as a means of avoiding over exploitation of the non-timber resources. Woodlots are also being encouraged and some of the community members have started implementing this intervention. Meanwhile, family planning strategies are being enforced by the Ministry of Health to ensure birth control.

1.13 Culture

The Bakonjo people since time immemorial have regarded the Rwenzoris as a repository of many blessings to their socio-economic well-being. As such, the mountains constituted a form of reserve even before the colonial period (Yeoman et al., 1990). The cultural significance of the mountains is demonstrated by traditional rituals performed within RMNP, including the construction of hunters‟ shrines for animal sacrifices, ceremonies involving the exorcism of evil spirits, and human burials. There is a belief that if a person dies in the mountains his body is not to be brought home but must be buried where he died. These sites are known by the cultural leaders but the Park authorities have very little knowledge about them. Access to these sites has been a controversial issue between park authorities and local communities in some places.

ENABLING POLICY AND LEGISLATION

2.1 National policies

It is essential for PA managers to understand some of the relevant laws that empower them to do their work and the legal notices by which the park was established. With this knowledge, they can effectively conduct law-enforcement work, ensure appropriate stakeholder participation in the management of the PA and address any challenges to its integrity. Some of the laws and policies pertaining to wildlife and biodiversity conservation in Uganda are summarized below.

2.1.1 Constitution of the Republic of Uganda

The over-all legal framework for biodiversity management in Uganda is the Constitution of the Republic of Uganda (amended 2005). The National Constitution provides the following provisions for biodiversity management.

a) *Protection of natural resources:* Objective No. XXVII provides that natural resources shall be managed in such a way as to meet the development and environmental needs of the present and future generations of Uganda, particularly by taking all measures to prevent or minimize damage and destruction to land, air and water resources resulting from pollution or any other kind of natural resource degradation.

b) *Management of natural resources:* Article 237 (2)(b) gives powers to Government or Local Government as determined by Parliament by law to hold in trust for the people and protect natural lakes, rivers, wetlands, forests, game and forest reserves, national parks and any land to be reserved for ecological and to touristic purposes for the common good of all citizens.

c) Article 245 empowers Parliament to provide, through law for measures to manage the environment and promote sustainable development as well as environmental awareness.

d) Article 286 of the Constitution gives effect to international treaties, which Uganda was a party to before the promulgation of the Constitution in 1995.

2.1.2 National Environment Policy (1995)

The National Environment Management Policy (1995) provides for the institutional structure as well as policy measures for biodiversity management in Uganda. The over-all goal of the policy is sustainable social and economic development which maintains or enhances environmental quality and resources productivity on a longer term basis that meets the needs of the present generations without compromising the ability of future generations to meet their own needs.

The specific objectives of the policy are:

a) Enhance health and quality of life of all Ugandans and promote long-term sustainable economic development through sound environmental and natural resources management and use.
b) Integrate environmental concerns in all development-oriented policies, planning and activities at national, district and local levels, with participation of the people.
c) Conserve, preserve and restore ecosystems and maintain ecological processes and life support systems, including conservation of national biodiversity.
d) Optimize resource use and achieve sustainable level of resource consumption.
e) Raise public awareness to understand and appreciate linkages between environment and development.
f) Ensure individual and community participation in environmental improvement activities.

This Policy is deemed sufficient in terms of general requirements for biodiversity management. However, by treating biodiversity as a cross-cutting issue, certain aspects of biodiversity management e.g., management of invasive species is not adequately addressed.

2.1.3 The Uganda Wildlife Policy, 2014

The Wildlife Policy vision for the wildlife sector is "Sustainably managed and developed wildlife resources and healthy ecosystems in a developed Uganda. The Policy goal is to conserve wildlife resources of Uganda in a manner that contributes to the sustainable development of the nation and the well-being of its people.

The Policy objectives are as follows;

i. To promote sustainable management of Uganda's wildlife Protected areas.
ii. To sustainably manage wildlife populations in and outside Protected areas.
iii. To promote sustainable and equitable utilization of wildlife resources as a viable form of land use for national economic development.
iv. To effectively mitigate human wildlife conflicts.
v. To promote wildlife research and training.
vi. To promote conservation education and awareness across the nation.
vii. To ensure net positive impacts of exploration and development of extractive industries and other forms of development in wildlife conservation areas.
viii. To effectively combat wildlife related crime.
ix. To promote and support local, regional and global partnerships for conservation of wildlife.

2.1.4 The Tourism Policy of Uganda, 2003

The Tourism Policy recognizes that in the 1960's Uganda was a main tourism destination in Eastern Africa and therefore tourism was one of the major economic sectors for the country. Unfortunately, the turmoil of the 1970's and 1980's drastically reduced wildlife numbers and destroyed infrastructure resulting into reduced numbers of tourists.

This policy is aimed at ensuring that tourism becomes a vehicle for poverty eradication in the future to the extent possible within the resource base and market limitations. It further recognizes UWA's role and contribution towards the achievement of this objective. This is mainly in the area of managing and developing the extensive resource base as well as developing and marketing various products. The policy further emphasizes the need to facilitate the flow of tourists within the region and promotion of East Africa as a single tourist destination.

2.2 National Acts and regulations

2.2.1 The National Environment Act (cap 153)

The Act provides for the over-all management, coordination and monitoring of environment management and conservation in Uganda. It provides for the protection and conservation of natural resources in Uganda as well as promotion of international cooperation in the field of the environment. The Act provides for issuance of regulations and guidelines for the management of various environmental aspects.

2.2.2 Wildlife Act, 2019

The Act provides for;

- Conservation of wildlife throughout Uganda, so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use, in order to support sustainable utilization of wildlife for the benefit of the people of Uganda.
- Sustainable management of wildlife conservation areas.
- Conservation of selected examples of wildlife communities in Uganda.
- Protection of the rare, endangered and endemic species of wild plants and animals.
- Ecologically acceptable control of problem animals.
- Enhancement of economic and social benefits from wildlife management by establishing wildlife use rights and the promoting of tourism.
- Control of import, export and re-export of wildlife species and specimens.
- Implementation of relevant international treaties, conventions, agreements or other arrangements to which Uganda is a party.
- Public participation in wildlife management.

2.2.3 The National Forestry and Tree Planting Act, 2003

The Act provides for among other things, the conservation, sustainable management and development of forests, and the promotion of tree planting for the benefit of people of Uganda and the international community. It classifies forests in Uganda as central forest reserves, local forest reserves, community forests and forests forming part of a wildlife conservation area declared under the Uganda Wildlife Statute, 1996. The Act recognizes various stakeholders in the management of forest reserves, which should be guided by the Management Plan prepared by the responsible body. In addition, the Act aims at ensuring that forests and trees are conserved and managed in a manner that meets the needs of the present generation without comprising the rights of future generations by safeguarding forest biological diversity and the environmental benefits that accrue from forest and trees.

2.3 Sector development plans

2.3.1 National Biodiversity Strategy and Action Plan (NBSAP, 2010/2025)

The National Biodiversity Strategy and Action Plan (2015) provides over-all strategies and actions for management of Uganda's biodiversity as well as measures for enhancing institutional collaboration in the management of biodiversity in Uganda.

2.3.2 Uganda Wildlife Authority Strategic Plan (UWA 2020/2025)

The Mission of UWA as stated in the strategic plan is to conserve, economically develop and sustainably manage the wildlife and protected areas of Uganda in partnership with the neighboring communities and other stakeholders for the benefit of the people of Uganda and the global community. The goal is to have sustainably managed wildlife areas that are providing enjoyment, supporting community livelihoods and contributing to National development.

In order to achieve the above targets, the strategic plan identifies key conservation challenges mentioned below;

- Restoring and maintaining health ecosystems
- Management of Human-Wildlife conflicts
- Achieving financial self-sustainability
- Improvement of infrastructure and equipment

2.3.3 The National Forestry Plan (NFP, 2002)

The Vision of the National Forest Plan (2002) is "A sufficiently forested, ecologically stable and economically prosperous Uganda". This Vision is intended to be realized through the following objectives:
a) Enhance the capacity of forestry institutions to enable them effectively perform their mandates.
b) Increasing forest resource base by increasing forest cover to the 1990 levels.
c) Increase economic productivity of forests and employment in the forestry sector.

d) Raise incomes for households through forest-based initiatives.
e) Restore and improve ecosystem services derived from sustainably managed forests.

2.3.4 Land Sector Strategic Plan (LSSP, 2001)

The Land Sector Strategic Plan (2001) emphasizes sustainable land management. It recognizes the provisions for ownership and management of reserved land (forest reserves, national parks, wildlife reserves, lakes, rivers and wetlands) under the trusteeship of Central and Local Governments, management of common property resources, individual land use and planning and development of urban areas.

2.3.5 Wetlands Sector Strategic Plan (WSSP, 2010)

The over-all goal of the Wetlands Sector Strategic Plan (2010) is Uganda's Wetlands managed and used wisely in ways conducive to conserving the environment and its biodiversity, as well as optimizing sustainable benefits to the people neighbouring wetlands. This goal is to be achieved through the following strategic Objectives:
a) Knowledge and understanding of ecological processes and socio-economic values of wetlands enhanced.
b) Public and stakeholder awareness of wetlands and their beneficial products and services increased.
c) Institutional framework for wetlands management further developed and maintained.
d) Appropriate wetlands policy and legislation in place and enforced.
e) Planning and management of wetlands systems improved.
f) Vital wetlands protected and their characteristics and functions conserved.
g) Community-based regulation and administration of wetlands resource use established and strengthened through central Government and district administrations.

2.3.6 Water and Environment Sector Investment Plan (WESIP, 2007)

The Water and Environment Sector Investment Plan (2007) aspires to achieve a sustainable, productive resource base and healthy environment for improved livelihoods, poverty eradication and economic growth. Its objectives are to:
a) Secure land tenure and ownership.
b) Sustainably harness natural resources.
c) Ensure clean, healthy and productive environment.
d) Ensure productive natural resource base.
e) Ensure harmonious Strategic planning and management.

2.3.7 National Environment Action Plan (NEAP, 1994)

The over-all Policy Goal of National Environment Action Plan (1994) is to achieve sustainable social and economic development which maintains or enhances

environmental quality and resource productivity on a long-term basis that meets the needs of both present and future generations.

The Specific Objectives are to:
a) Enhance the health and quality of life for all Ugandans through sound environment management.
b) Integrate environmental and natural resources concerns into policies, plans and programme at national and district levels with popular participation.
c) Conserve, preserve, and restore ecosystems, including national biodiversity.
d) Optimize resource use and sustainable resource consumption.
e) Raise public awareness and understanding of linkages between environment and development.
f) Ensure participation in environment and natural resources activities.

Overall, these measures reflect broad intentions for mainstreaming biodiversity management in the respective sectors.

2.4 INTERNATIONAL FRAMEWORKS FOR BIODIVERSITY MANAGEMENT IN UGANDA

2.4.1 International frameworks

Uganda is a signatory to a number of international Conventions, Protocols and Agreements relating to biodiversity management. They include;
1. Convention on Biological Diversity (CBD),
2. Cartagena Protocol on Bio-safety,
3. Convention relating to the Preservation of Flora and Fauna in their Natural State,
4. African Convention on the Conservation of Nature and Natural Resources,
5. Convention on Wetlands of International Importance Especially as Water Fowl Habitat (The Ramsar Convention),
6. Convention on the Protection of the World Cultural and Natural Heritage,
7. Agreement on Cooperative Enforcement Operations directed at Illegal Trade in Wild Fauna and Flora,
8. United Nations Convention to Combat Desertification (UNCCD),
9. United Nations Framework Convention on Climate Change (UNFCCC),
10. Convention on the Protection of the World Cultural and Natural Heritage and,
11. World Trade Organization (Sanitary and Phyto-sanitary Rules).

Each Convention is implemented through a national Focal Point in a designated ministry or lead agency (Section 5.6).

2.4.2 Regional frameworks

Uganda is signatory to the following regional protocols and agreements:
1. EAC Treaty,

2. EAC Protocol on Environment and Natural Resources Management,
3. Protocol for Sustainable Development of Lake Victoria Basin,
4. Convention for the establishment of the Lake Victoria Fisheries Organization (LVFO),
5. EAC Protocol on Wildlife Conservation and Law Enforcement,
6. Tripartite Management Agreements for Trans-boundary Wildlife Protected Area, and,
7. Cooperative Framework Agreement on the Nile.

Each framework is implemented through a national Focal Point in a ministry or lead agency.

SITUATION ANALYSIS

3.1 Hazards that have caused disasters within the landscape

3.1.1 Floods

Over the past 50 years, at least eight major flash floods have affected catchments of the Rwenzori Mountains. The most recent ones occurred on May 10th 2020, in the Nyamwamba, Nyamughasani, Lubiriha and Lamia Catchments. The occurrence of floods has increased recently due to the changing climatic conditions in the landscape. The repeated floods in the Rwenzori Mountains National Park have caused significant loss of land and biodiversity, human life, crops, animals and social and physical infrastructure.

3.1.2 WildFires

In February 2012, wild fires started in the Heather and spread to the Afro-alpine moorland zone. Rwenzori Mountains National Park management responded to the threats by ensuring the development of fire management plan. The fire burnt an area of 4800 ha, which amounts to approximately 5% of the property. This fire exposed some of the operational challenges of the park to fight such high altitude fires, including the inadequacy of firefighting equipment, a poor communication network, and the absence of fire-prevention measures.

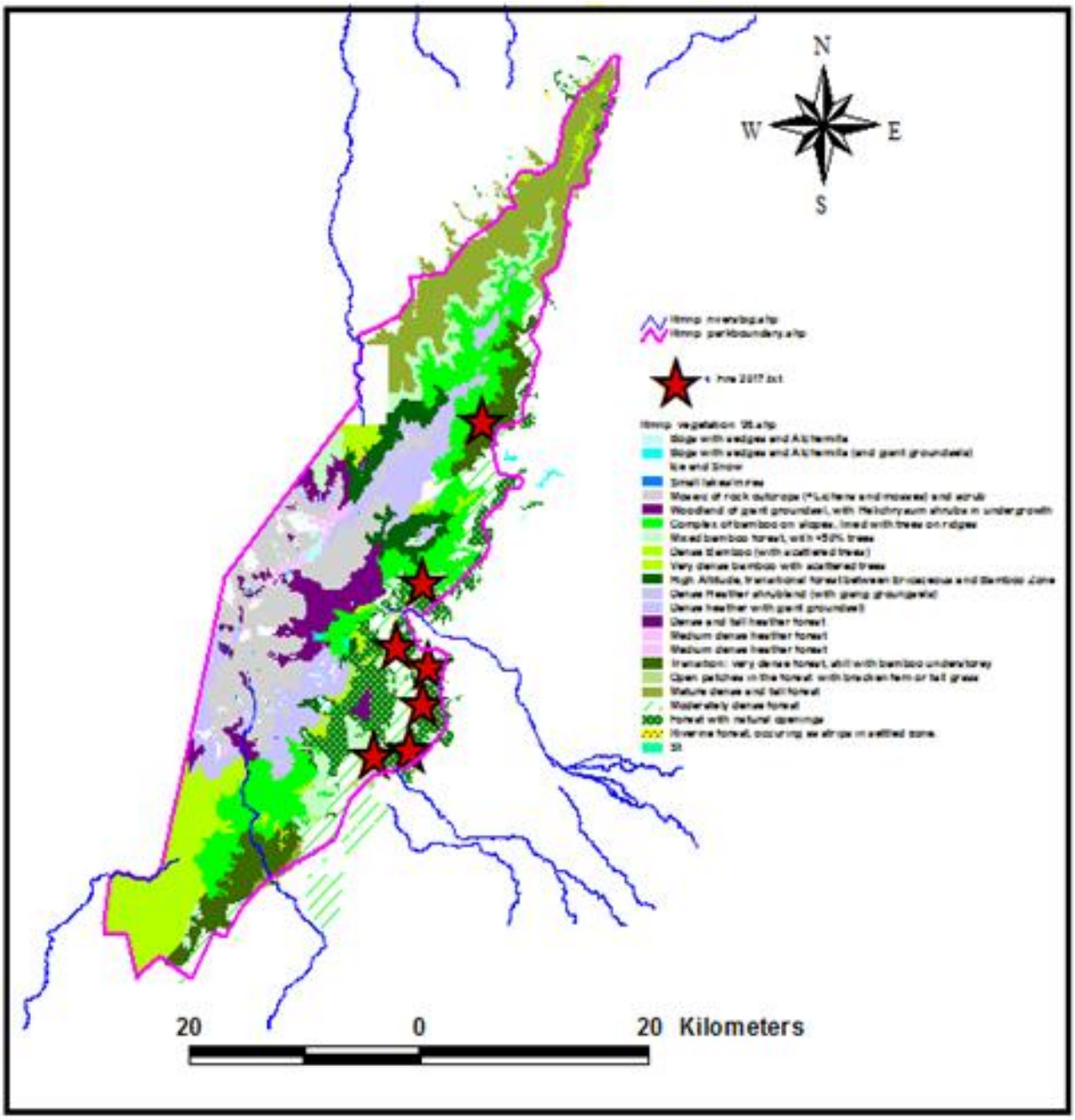


Figure 2: Map showing burnt areas in 2017

Plate 1: Photograph showing wildfires in the Rwenzori Mountains

3.1.3 Pollution

RMNP is surrounded by an agricultural community and the rise in population and poor agricultural practices has made pollution one of the major hazards in the area. This is compounded by flooding that occurs after heavy rain in the area. Most of the rivers burst their banks and carry heavily pollutant laden run off water to lower plains where flooding becomes eminent. Tourism wastes from the mountains are sometimes washed down to the lower plains. This adds up onto waste management burden.

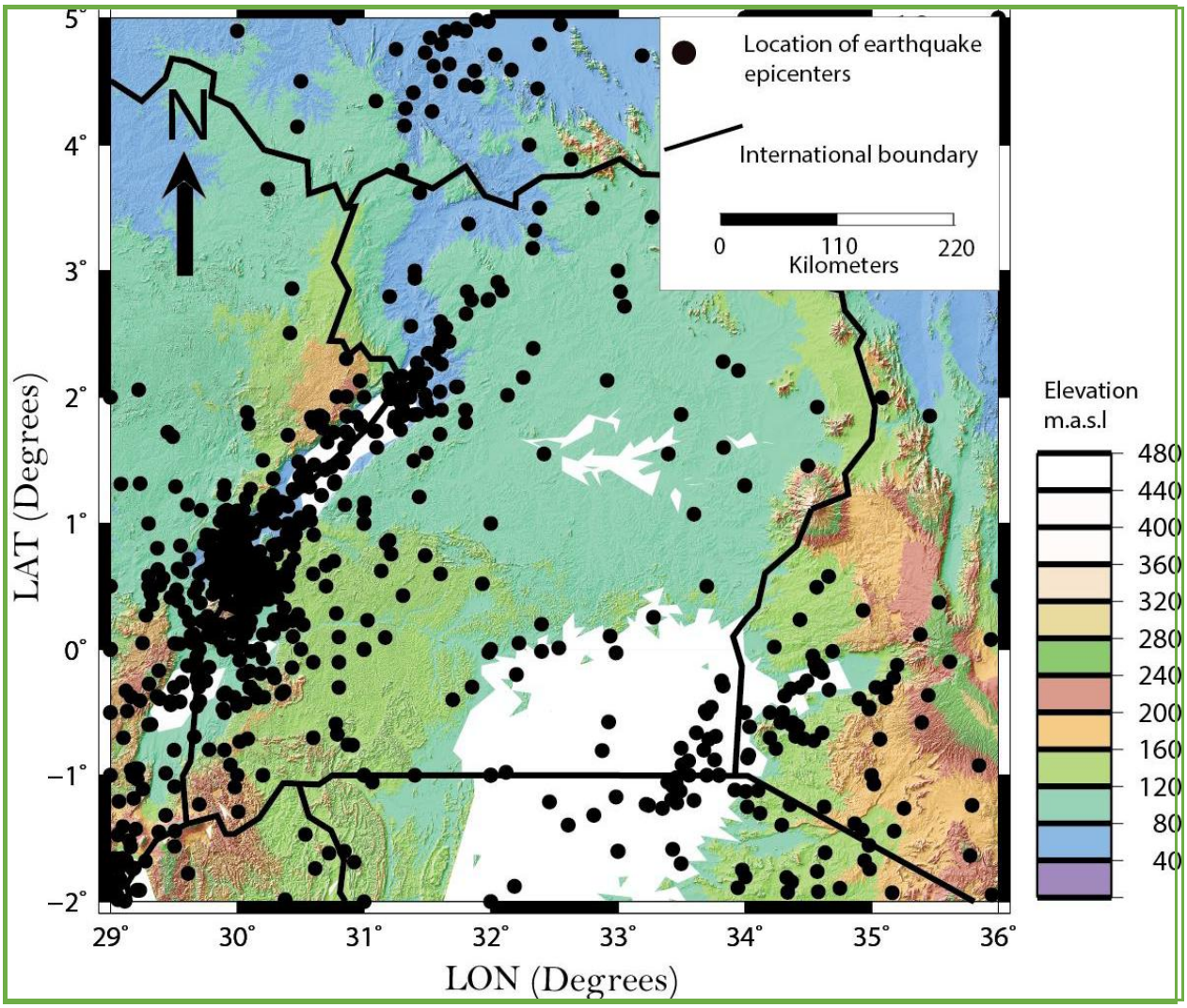
3.1.4 Mining

There are a number of mining industries in the region and key among them are sand mining and brick making that have created dams and pools near the rivers which when the river flood, all the waste therein are washed down stream.

3.1.5 Earthquakes

Earthquake incidences in Uganda are related with the East African Rift System (EARS). Uganda lies between the two arms of the EARS. Its west border with D.R.Congo lies almost entirely in the western branch of the EARS, while the eastern border is about a few hundred kilometers from the Eastern Branch of the EARS.

The Rwenzori chain and tectonic movements cause stress accumulation that is released along the border and boundary faults to the mountains. It is believed that the fault lines lie along Nyamwamba, Kicwamba, Bwamba, Kitimbi-Semuliki, and Ruimi-Wasa areas.



Source Jacobs et al 2014b

Figure 3: Seismic map of Uganda

3.1.6 Landslides

The Rwenzoris is among the areas with the highest population density in Uganda and is susceptible to various sizes of landslides due to the variable topography and Geology. Prolonged high intensity rainfall is the primary trigger of landslides in the landscape. Deforestation and cultivation of the slopes is recognized as a destabilizing factor resulting into high landslide susceptibility. Rwenzori Mountains with its exceptionally steep topography, wet climate, and active faulting is prone to landslides occurrences and its impact is significant. This is very rampant in the landscape and the photograph below shows the severity of the landslides in the landscape.

Plate 2:Photograph showing a Landslide that destroyed part of the tourism trail

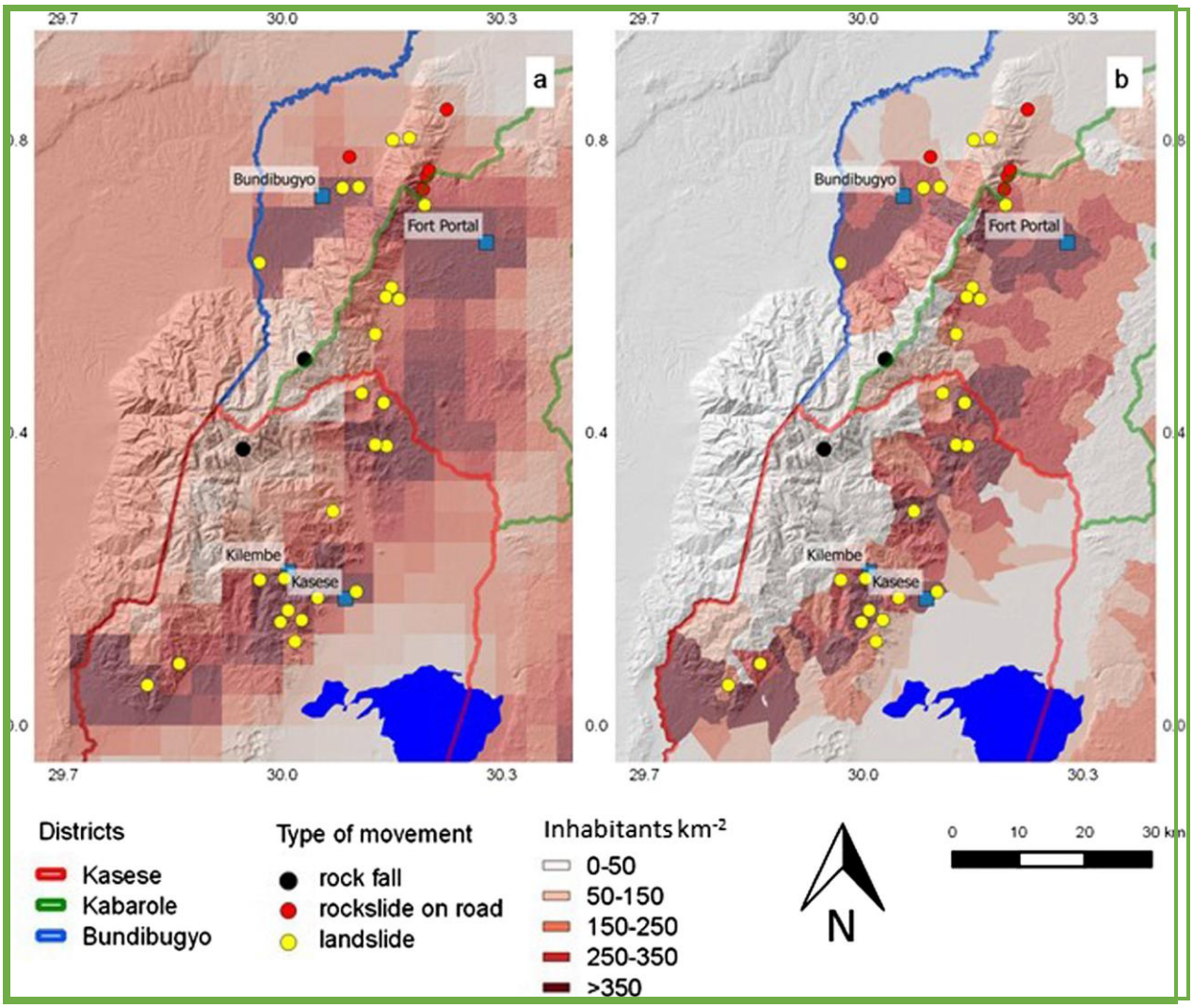


Figure 4: Maps showing the location of sites for rock and landslides in parts of Rwenzori region

3.1.7 Temperature increase

Rwenzori Mountains National Park has two dry and rainy seasons each year. Air temperature decreases with increasing altitude i.e. from 18.0°C at Mihunga (1800m.), followed by 10.9°C at Nyabitaba station (2500m) to the lowest at Stanley (4900m), (UWA 2016). Temperature as one of elements of weather has not been spared by climate change phenomenon. Over years, the known temperature patterns of Rwenzori have been changing and causing the melting of glaciers from the peaks.

3.1.8 Reducing glaciers and snow

Recent field mapping and analysis of Landsat imagery confirm a rapid decline in the area extent of glaciers on the Central Rwenzori Massif that is consistent with an

overall recessionary trend over the 20th century. Glacial cover on the three remaining glaciered summits (Mounts Stanley, Speke and Baker) has decreased from 2.01 ± 0.56 km^2 in 1987 to 0.96 ± 0.34 km^2 in 2003 and is expected to disappear within the next two decades. Increased air temperature suggested by the spatially uniform nature of recent loss of glacial cover at lower elevations is supported by station data in western Uganda and gridded climate data sets. The observed rise in air temperatures over the last four decades is also consistent with warming trends predicted in the tropical troposphere from climate model simulations that incorporate historical increases in greenhouse gases (*Santer et al.*, 2005).

3.1.9 Avalanches

Avalanches are masses of snow, ice, and rocks that fall rapidly down a mountain side. This is a common occurrence at high altitude especially on the Stanley glacier as witnessed last year 2020. It destroyed the trails and ladders hampering the hike to Margherita peak, a common tourist attraction on the mountain.

Plate3: Picture showing an avalanche from the receding snow at Stanley peak

PLAN OBJECTIVES

4.1 Overall objective

To provide guidance and strengthen Rwenzori Mountains National Park management capacity to deal with Climate Change Disaster risk in close collaboration with stakeholders in the landscape.

4.1.1 Specific objectives

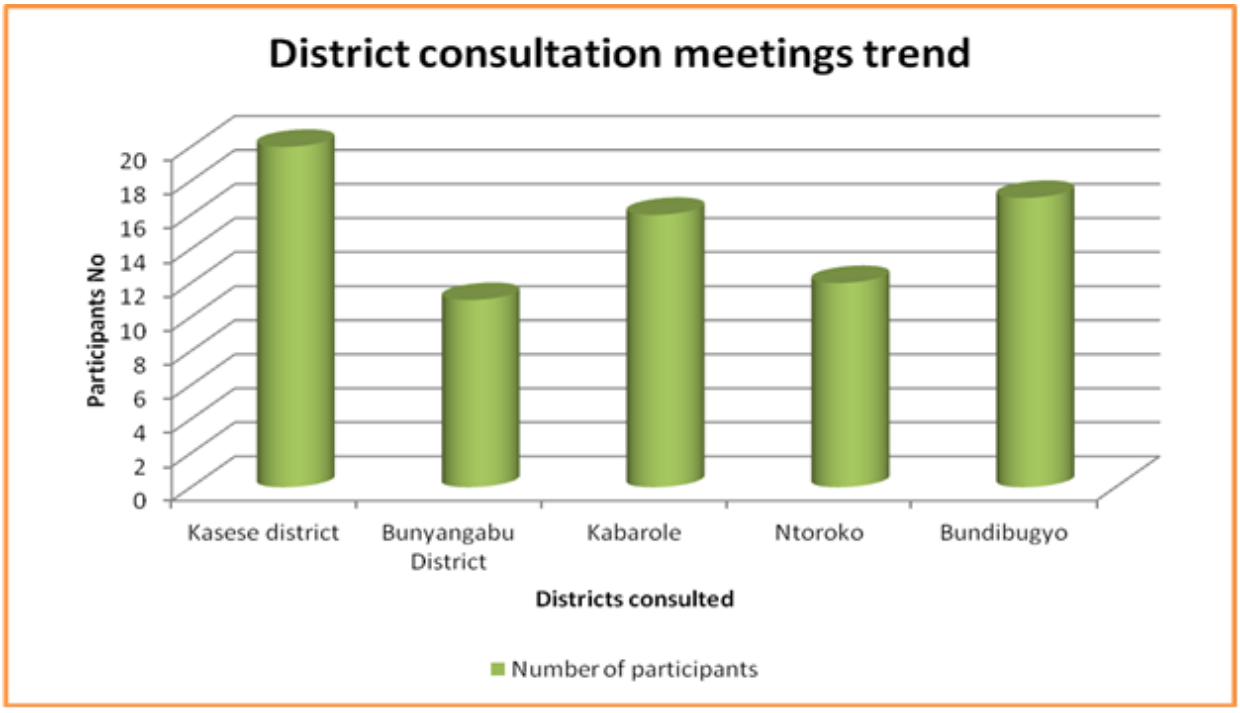
1. To reduce the risks of disasters in the Rwenzori Landscape.
2. To enhance the park's management capacity and stakeholders around the park for systematic responses to the eminent disasters.
3. To innovate and implement robust infrastructure designs that can withstand disaster forces.
4. To enhance the adaptive capacity of vulnerable groups around the Rwenzori Landscape.

4.2 The Planning Process and implementing agencies

4.2.1 Data and Information collection and management

The development of this climate change and disaster risk management plan was as a result of an interactive process that involved various stakeholders within RMNP Landscape. A planning team was composed of representatives from UWA, District Local Government, Non-governmental Organizations (NGO's) operating around RMNP and the communities around RMNP. The composition of the planning team (annex 1) was arrived at through a stakeholder analysis (annex 2).

The stakeholder analysis also guided the consultations with stakeholders. The stakeholders consulted included Local and Central Government Agencies, NGO's, members of community groups, opinion leaders, representatives from tourism groups and farmers. The graphs below show the category of stakeholders consulted and the numbers that attended the meetings.



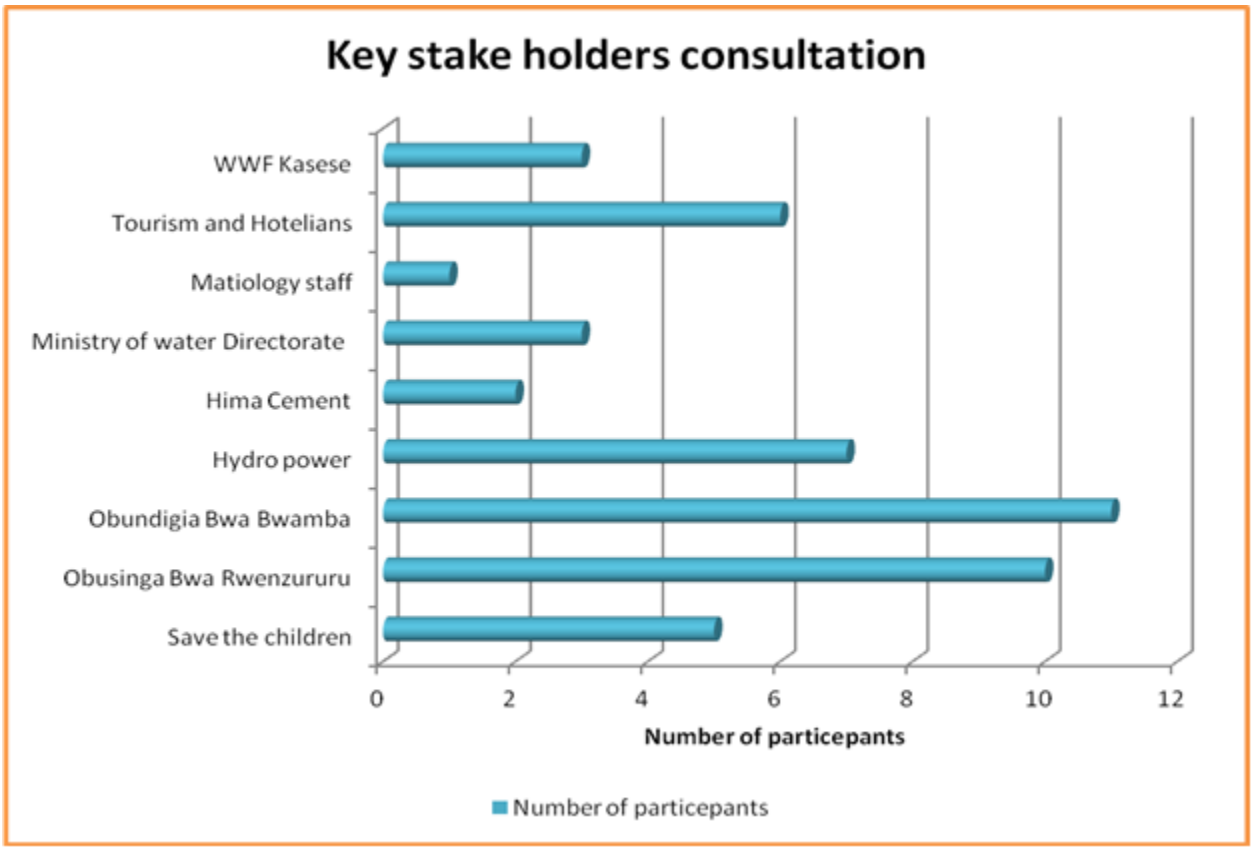


Figure 5: Graphs showing stakeholders consulted

4.2.2 The Plan Implementing Agencies

In order to realize the success of this plan at implementation of the proposed actions in the subsequent sections, a number of agencies need to coordinate the available resources both human and financial capacities. The envisaged agencies in relation to this property (RMNP) include but not limited to the following;

a) Uganda wildlife authority

b) Surrounding District Local Governments (Kasese, Bunyangabo, Kabarole, Ntoroko and Bundibugyo)

c) Civil society organizations such as WWF-Uganda, Save the Children, and Medicines sans frontiers (MSF)

d) Central Government Ministries, Departments and Agencies such as Ministry of Tourism Wildlife and Antiquities (MTWA), Ministry of Water and Environment (MWE), Ministry of Disaster Preparedness and Refugees (MDPR), Ministry of Defense (MoD), Ministry of Works and Transport (MoWT) and Ministry of Health (MoH), Ministry of Energy and Mineral Development, etc..

e) The Private Sector such as Lar-farge group of companies (Hima Cement), Nyamwamba hydropower Company Limited, Nyamughasani hydropower Company limited, Lubirhia hydropower company limited, Sindila hydropower Company Limited, and Kilembe mines.

f) International agencies such as UNESCO-World Heritage Centre, Red Cross Society and UNICEF.

g) Regional transboundary agencies such as Greater Virunga transboundary agency, and Semuliki Transboundary Watershed Management Committee.

4.2.3 Data analysis

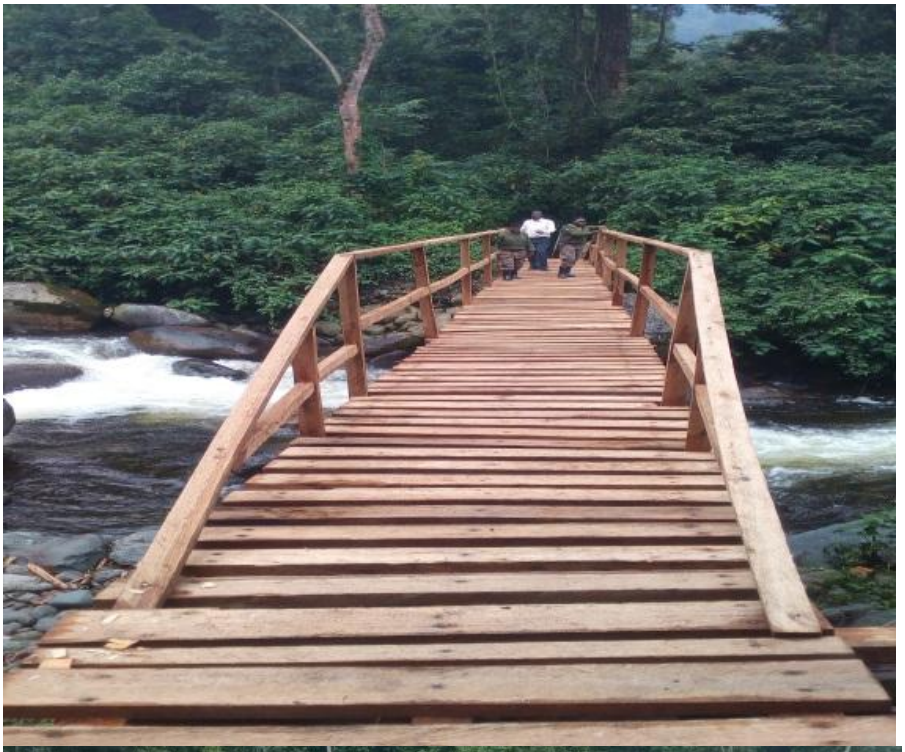
The collected data through consultations and desk work was analyzed by the planning team in a proposal generation workshop. This was done through Hazard identification and description approach (Annex 3), Hazard risk assessment procedures (annex 4) and problem tree analysis-root causes (Annex 5). As a result of the risk assessment, risk values for the identified hazards were determined which assisted in the hazard priority ranking given below.

Table 2 showing hazard risk priority rank

Hazard	Risk value
Floods	76
Temperature increase	62

Rain	60
Landslides	56
Deforestation	52
Reducing glaciers and snow	46
Strong winds	44
Avalanche	36
Earthquake	35
Land cracks/fault lines	32
Land sinks	31
Fire	30
Pollution	30
Land shears	29
Mining	26

THE RISK PLAN



4.1 Proposed Prevention, Mitigation and Recovery actions

In order to reduce the risks of disasters, enhance the park's management capacity and stakeholders and innovate and implement robust infrastructure designs in the Rwenzori Landscape among others, the planning team identified root causes of the issues in the landscape. Identification and analysis of the problem root causes enabled the multi-stakeholder planning team (annex 1) to propose mitigation actions including those for prevention and recovery for the next ten years as shown in the table 3 below.

Table 3 Showing Proposed Prevention, Response and Recovery Actions

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
	Poverty	Prevention actions	1. Develop proposals and lobby for financial support to finance basic needs of vulnerable communities	10 proposals developed	Number of successful proposals
		Response actions	1 Train communities in innovative survival, rescue and entrepreneurial skills	50 community groups trained	Number of groups trained
		Recovery actions	1. Support disaster affected communities with income generating activities	100 groups supported	Number of groups supported
	Green House Gases/Climate Change	Prevention actions	1. Mobilise and support tree planting initiatives	200 farmers mobilised and supported per year with tree planting initiatives	Number of farmers supported
			2. Promote use of clean energy technologies	Solar, energy saving stoves, biogas, hydroelectric power	Number of technologies promoted, Number of individuals benefiting from clean energy
			3. Designate selected river valleys for natural regeneration .	5 river valleys designated	Number of river valleys designated
			4. Protect and restore water catchment areas (Humya, Wasa, Mpanga, Yerya and Nyamwamba)	5 water catchments protected and restored	Number of water catchments restored

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
			5. Support existing community efforts in conservation of critical natural resources	50 community existing groups supported	Number of groups supported
			6. Monitor compliancy to ESIA (environmental and social impact assessment) for all development projects	13 hydro power, 36 gravity flow schemes, 1 mining and infrastructure projects monitored	Number of projects monitored
			7. Enforce existing pollution regulations	Coffee processing companies, commercial farmers, industries, tourism activities, mining and urban centers	Number of projects monitored
			8. Strengthen the capacity of stakeholders in disaster risk management.	100 stakeholders trained in disaster risk management	Number of stakeholders trained
		Recovery actions	1. Restore (Kinyanjojo, Kahokya, Kiyanja, Kanyabakende and Mugunu) degraded wetlands.	5 degraded wetlands restored	Number of wetlands restored
	Social Services	Prevention actions	1. Develop and implement the cable car project	01 Cable car project developed	Cable car in place and functional
			2. Procure and install 01 earthquake detection equipment in Kisomoro Bunyangabu	01 earthquake detection equipment	Earthquake equipment installed

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
				procured and installed	
			3. Procure and Install early warning system in Rwenzori Mountains National Park	01 Early warning systems procured and installed	Number of early warning system installed
			4. Develop and implement wet land management plan for selected wetlands (Semuliki delta, Kinyanjojo, Mugunu, Karusandara and Kiyombya).	5 wetland plans developed and implemented	Number of wetland plans developed
			5. Document previous occurrences and continuously update disaster risk map	Previous occurrences and risk map update	Updated risk map in place
			6. Lobby MDAs and other stakeholders to fund the implementation of Rwenzori landscape disaster and risk management plan	10 meetings with MDAs and other stakeholders	Number of meetings held
		Response actions	1. Identify evacuation centres in suitable areas	5 evacuation centers identified	Number of centers identified and in place
			2. Support and equip health facilities to respond to environmental disaster related emergencies	10 health facilities supported to respond to disasters emergencies	Number of health facilities supported

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
			3. Coordinate with civil society organizations and private sector in responding to risks and disasters	50 coordination meetings held	Number of meetings held
		Recovery actions	1. Desilt and stabilize river banks for selected rivers (Kirumya, Nyamwamba, Mpanga, Yerya and Wasa)	5 rivers desilted and stabilized	Number of rivers desilted and stabilized
			2. Create alternative routes to avalanche affected areas	1 alternative route created	route in place
			3. Provide psychosocial support to the affected communities	10 affected communities groups provided psychosocial support	Number of communities supported
			4. Provide clean and safe water to the affected communities	30 affected communities provided with clean water	Number of communities provided with clean water
	Urbanization	Prevention actions	1. Enforce implementation of physical planning laws in and outside the park	Infrastructure development monitored in and outside the park	Number of infrastructure developed
			2. Design and implement climate resilient infrastructure	resilient Infrastructure designed and implemented	Number of resilient infrastructure designed and developed

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
			3. Support the development of physical development plans	4 physical development plans supported	Number of physical development plans supported
			4. Support initiatives aimed at promoting proper waste disposal.	50 initiative waste disposal projects supported	Number of projects supported
	Livelihood	Prevention actions	1. Support climate smart agriculture practices	1000 households supported to practice smart agriculture	Number of households practicing smart agriculture
			2. Support establishment of demonstration tree nurseries at district level	5 demonstration tree nurseries per district	Number of tree nursery beds
		Recovery actions	1. Identify and support disaster vulnerable communities with alternative income generating activities within the Rwenzori landscape	50 vulnerable communities identified supported with income generating activities	Number of vulnerable communities supported
	Community Attitude	Prevention actions	1. Review and implement the fire management plan	01 RMNP fire management plan reviewed	Reviewed Management plan.
			2.Enforce implementation of environmental laws	Enforce environmental laws on river banks, wet lands, hilly and mountainous areas	Number of river banks, wetlands, hilly and mountainous areas and other infrastructure

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
				inside the park and other infrastructure developments	
		Response	1. Build capacity of community response teams to manage emergencies.	Capacity of 10 community response team developed	Number of response community team developed
	Awareness	Prevention actions	1. Establish an inclusive system for dissemination of early warning information	01 inclusive early warning system established	Inclusive early warning system in place
			2. Develop the capacity to manage early warning system	10 staff trained in early warning system management	Number of staff trained in early warning system
			3. Popularize disaster risk management information in the prone areas	30 popularization meetings held per year	Number of meetings conducted
			4. Participate in the commemoration of International days relating to environmental conservation e.g. 21st March, 22nd March, 5thJune, 3rd March etc.	5 environmental commemoration days celebrated per year in 5 districts	Number of participations
			5. Popularize and Celebrate Rwenzori Mountains National Park day *(March)*	1 celebration event organized to celebrate RMNP	celebration functions held

S/N	Root Causes	Type of Actions	Activities	Targets	Indicators
			6. Support the functioning of established environmental committees at all levels	67 environmental committees supported	Number of environmental committees supported
		Response actions	1. Integrate Indigenous Traditional Knowledge (ITK)in the disaster and risk management	Indigenous knowledge integrated in risk management	Number of indigenous practices applied in risk management
	Insecurity	Prevention actions	1. Equip the park with modern rescue and safety equipment	assorted modern rescue equipment acquired	Number of equipment in place
			2. Develop basic rescue and safety skills amongst communities	30 trainings to develop basic rescue safety skills amongst communities	Number of trainings
		Response actions	1. Temporarily relocate people from land and mudslide prone areas to safer places.	affected people relocated to evacuation centers temporarily	Number of people relocated temporarily

4.2 The ten-year work plan and budget

In implementing the proposed actions above, the implementing team will be guided by the work plan in table 4 and the estimated budget in table 5 below;

Table 4 showing the ten-year work plan

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
Poverty	Prevention actions	1. Develop proposals and lobby for financial support to finance basic needs of vulnerable communities											UWA	DLG, WWF, MWE, Save the Children
	Response actions	1 Train communities in innovative survival, rescue and entrepreneurial skills											UWA	DLG, WWF
	Recovery actions	1. Support disaster affected communities with income generating activities											OPM	UWA, DLG, WWF, Save the children, Red Cross
Green House Gases/Climate Change	Prevention actions	1. Mobilise and support tree planting initiatives											DLG	UWA, WWF, MWE, NFA
		2. Promote use of clean energy technologies											WWF	UWA, MWE, MEMPD
		3. Designate selected river valleys for natural regeneration .											DLG	UWA, MWE, MW&T, NEMA
		4. Protect and restore water catchment areas (Humya, Wasa,Mpanga,Yerya and											MWE	DLGS, UWA, WWF

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
		Nyamwamba)												
		5. Support existing community efforts in conservation of critical natural resources											UWA	WWF, SAVE THE CHILDREN, DLG
		6. Monitor compliancy to ESIA (environmental and social impact assessment) for all development projects											NEMA	UWA, DLGS
	Response actions	1. Enforce existing pollution regulations											NEMA	UWA, DLGS
		2. Strengthen the capacity of stakeholders in disaster risk management.											OPM	UWA, MWE, REDCROSS, SAVE THE CHILDREN, WORLD VISION
	Recovery actions	1. Restore (Kinyanjojo, Kahokya, Kiyanja, Kanyabakende and Mugunu) degraded wetlands.											NEMA	WETLANDS, MWE, DLGS
Social Services	Prevention actions	1. Develop and implement the cable car project											MTWA	UWA
		2. Procure and install 01 earthquake detection equipment in Kisomoro Bunyangabu											UNMA	UWA
		3. Procure and Install early warning system in Rwenzori Mountains National Park											UNMA	UWA

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
		4. Develop and implement wet land management plan for selected wetlands (Semuliki delta, Kinyanjojo, Mugunu, Karusandara and Kiyombya).											WETLANDS MGT	UWA, MWE
		5. Document previous occurrences and continuously update disaster risk map											UWA	DLGS, OPM
		6. Lobby MDAs and other stakeholders to fund the implementation of Rwenzori landscape disaster and risk management plan											UWA	DLGS, OPM, WWF
	Response actions	1. Identify evacuation centres in suitable areas											DLGS	OPM
		2. Support and equip health facilities to respond to environmental disaster related emergencies											DLGS	OPM, REDCROSS, MSF, SAVE THE CHILDREN - UGANDA
		3. Coordinate with civil society organizations and private sector in responding to risks and disasters											OPM	UWA, DLGS
	Recovery actions	1. Desilt and stabilize river banks for selected rivers (Kirumya, Nyamwamba, Mpanga,											DLGS	OPM, MWE

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
		Yerya and Wasa)												
		2. Create alternative routes to avalanche affected areas											UWA	RMS, RTS
		3. Provide psychosocial support to the affected communities											DLGS	REDCROSS, SAVE THE CHILDREN, WORLD VISION, MSF
		4. Provide clean and safe water to the affected communities											MWE	DLGS, SAVE THE CHILDREN, WORLD VISION
Urbanization	Prevention actions	1. Enforce implementation of physical planning laws in and outside the park											DLGS	UWA, MIN OF WORKS AND URBAN PLANNING
		2. Design and implement climate resilient infrastructure											DLGS	MIN. OF WORKS AND TRANSPORT, MINISTRY OF HOUSING AND URBAN DEV'T
		3. Support the development of physical development plans											DLGS	MIN. OF WORKS AND TRANSPORT, MINISTRY OF HOUSING AND URBAN DEV'T, UWA
		4. Support initiatives aimed at promoting proper waste disposal.											DLGS	UWA, NEMA
Livelihood	Prevention actions	1. Support climate smart agriculture practices											DLGS	MAAIF, UWA, MWE
		2. Support establishment of demonstration tree nurseries at district											DLGS	UWA, NFA, WWF

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
		level												
	Recovery actions	1. Identify and support disaster vulnerable communities with alternative income generating activities within the Rwenzori landscape											DLGS	OPM, OWC
Community Attitude	Prevention actions	1. Review and implement the fire management plan											UWA	WWF
		2. Enforce implementation of environmental laws											NEMA	UWA, MWE,DLGS
	Response	1. Build capacity of community response teams to manage emergencies.											DLGS	OPM, UWA, SAVE THE CHILDREN AND WORLD VISION
Awareness	Prevention actions	1. Establish an inclusive system for dissemination of early warning information											MWE	OPM, UMA, UWA
		2. Develop the capacity to manage early warning system											MWE	UWA, MWE,DLGS, OPM, UMA
		3. Popularize disaster risk management information in the prone areas											DLGS	UWA, OPM, SAVE THE CHILDREN, WORLD VISION
		4. Participate in the commemoration of International days relating to											UWA	DLGS, MTWA, MDA, NEMA, WWF

Root Causes	Type of Actions	ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Responsibility	Others
		environmental conservation e.g. 21st March, 22nd March, 5thJune, 3rd March etc.												
		5. Popularize and Celebrate Rwenzori Mountains National Park day (March)											UWA	DLGS, MTWA, MDA, NEMA, WWF
		6. Support the functioning of established environmental committees at all levels											DLGS	UWA, MDAS, NEMA
	Response actions	1. Integrate Indigenous Traditional Knowledge (ITK)in the disaster and risk management											CULTURAL INSTITUTIONS	UWA, DLGS, MINISTRY OF GENDER, LABOUR AND SOCIAL DEVELOPMENT, WWF
Insecurity	Prevention actions	1. Equip the park with modern rescue and safety equipment											UWA	MTWA, WWF
		2. Develop basic rescue and safety skills amongst communities											DLGS	OPM,UWA, SAVE THE CHILDREN, WORLD VISION, MSF
	Response actions	1. Temporarily relocate people from land and mudslide prone areas to safer places.											DLGS	OPM

Table 5 showing budget estimates

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
1. Develop proposals and lobby for financial support to finance basic needs of vulnerable communities	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	55,000,000
2. Train communities in innovative survival, rescue and entrepreneurial skills	50,000,000	50,000,000			50,000,000	50,000,000			50,000,000	50,000,000	350,000,000
3. Support disaster affected communities with income generating activities	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000
4. Mobilise and support tree planting initiatives	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	440,000,000
5. Promote use of clean energy technologies	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000
6. Designate selected river valleys for natural regeneration .	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	110,000,000
7. Protect and restore water catchment areas (Humya, Wasa,Mpanga,Yerya and Nyamwamba)	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	1,100,000,000
8. Support existing community efforts in conservation of critical	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
natural resources											
9. Monitor compliancy to ESIA (environmental and social impact assessment) for all development projects	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	1,100,000,000
10. Enforce existing pollution regulations	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	385,000,000
11. Strengthen the capacity of stakeholders in disaster risk management.	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	990,000,000
12. Restore (Kinyanjojo, Kahokya, Kiyanja, Kanyabakende and Mugunu) degraded wetlands.	325,000,000	325,000,000									975,000,000
13. Develop and implement the cable car project			3,000,000,000								3,000,000,000
14. Procure and install 01 earthquake detection equipment in Kisomoro Bunyangabu				1,000,000,000							1,000,000,000
15. Procure and Install early warning system in Rwenzori Mountains National Park			700,000,000	700,000,000							1,400,000,000
16. Develop and implement wet land management plan for selected wetlands (Semuliki	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000						900,000,000

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
delta, Kinyanjojo, Mugunu, Karusandara and Kiyombya).											
17. Document previous occurrences and continuously update disaster risk map	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	275,000,000
18. Lobby MDAs and other stakeholders to fund the implementation of Rwenzori landscape disaster and risk management plan	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	90,000,000	990,000,000
19. Identify evacuation centres in suitable areas	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	275,000,000
20. Support and equip health facilities to respond to environmental disaster related emergencies	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000
21. Coordinate with civil society organizations and private sector in responding to risks and disasters	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000
22. Desilt and stabilize river banks for selected rivers (Kirumya, Nyamwamba, Mpanga, Yerya and Wasa)	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	700,000,000	7,700,000,000
23. Create alternative routes to avalanche	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
affected areas											
24. Provide psychosocial support to the affected communities	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	110,000,000
25. Provide clean and safe water to the affected communities	900,000,000	900,000,000	900,000,000	900,000,000	900,000,000	900,000,000	900,000,000	900,000,000	900,000,000	900000000	9,900,000,000
26. Enforce implementation of physical planning laws in and outside the park	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	330,000,000
27. Design and implement climate resilient infrastructure	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	11,000,000,000
28. Support the development of physical development plans	50,000,000	50,000,000	50,000,000	50,000,000							250,000,000
29. Support initiatives aimed at promoting proper waste disposal.	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	4,400,000,000
30. Support climate smart agriculture practices	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000	2,200,000,000
31. Support establishment of demonstration tree nurseries at district level	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000
32. Identify and support disaster vulnerable communities with alternative income	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	550,000,000

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
generating activities within the Rwenzori landscape											
											-
33. Review and implement the fire management plan	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000	4,400,000,000
34. Enforce implementation of environmental laws	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	385,000,000
35. Build capacity of community response teams to manage emergencies.	25,000,000	25,000,000			25,000,000	25,000,000			25,000,000	25,000,000	175,000,000
36. Establish an inclusive system for dissemination of early warning information	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	825,000,000
37. Develop the capacity to manage early warning system	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000	385,000,000
38. Popularize disaster risk management information in the prone areas	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	330,000,000
39. Participate in the commemoration of International days relating to environmental conservation e.g. 21st March, 22nd March,	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50,000,000	50000000	50000000	550,000,000

ACTIVITIES	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Total Amount
5th June, 3rd March etc.											
40. Popularize and Celebrate Rwenzori Mountains National Park day (March)	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	110,000,000
41. Support the functioning of established environmental committees at all levels	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	67,000,000	737,000,000
42. Integrate Indigenous Traditional Knowledge (ITK)in the disaster and risk management	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	55,000,000
43. Equip the park with modern rescue and safety equipment	300,000,000				300,000,000		0	0	0	300,000,000	900,000,000
44. Develop basic rescue and safety skills amongst communities	225,000,000	225,000,000	-	-	-	225,000,000	225,000,000	0	0	0	1,125,000,000
45. Temporarily relocate people from land and mudslide prone areas to safer places.	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000	3,300,000,000

5. Plan implementation, monitoring and evaluation

5.1 Implementation

This plan shall be implemented through annual operations plans extracted from the ten-year work plan and budget. Funds to implement the annual work plan will be sought from stakeholders listed in the previous sections in addition to the locally available funds from UWA to implement especially preventive and recovery actions proposed in this plan. However, in case of a disaster happening other stakeholders such as District Disaster management committees, Civil Societies, and Central Government will be mobilized for emergency response guided by this plan.

There will be deliberate actions to train and build capacity on the management of risks and disasters for example the use of emergency equipment, regular emergency simulation drills, and awareness-raising activities. Involving stakeholders in implementation of the plan requires linking them to regular planned activity review programs and simulation exercises.

5.2 Monitoring

Monitoring of the Plan will be the main engine for tracking and assessing progress in implementation. The monitoring process will entail regular and systematic collection and processing of data from all activities. The process will involve UWA staff who are managing the property at field level and other stakeholders as means of consolidating stakeholder coordination and firsthand information sharing. The monitoring approaches will involve both conventional monitoring approaches and participatory approaches such as joint stakeholder field monitoring visits. The data collected will be analyzed and presented in a manner that enables management to make decisions on a regular basis.

5.3 Evaluation

Evaluation of the plan will be very crucial in determining the extent to which the objectives have been achieved. Evaluation will also assess the effectiveness of the approaches, methods and interventions in achieving the objectives. Efficient use of resources such as funds, equipment, human resources and time will also be evaluated.

To ensure that UWA management and stakeholders are able to take informed decisions regarding corrective actions required to enhance the implementation process before end of the plan; a mid-term evaluation will be conducted at the end of the fifth year. The evaluation team will comprise representatives from UWA, MWE, DLGs, OPM and MLHUD. The results of the mid-term evaluation will be used to make the necessary improvements in implementation of the plan in order to fully realize its

purpose by the end of the 10-year period. A final evaluation will be conducted during the 10th year of implementation of this plan. The results of the final evaluation will inform the development of the subsequent 10-year Climate Change and Disaster risk management plan.

ANNEXES

Annex 1: Climate Change Disaster Risk Management Planning team

No.	Names	Designation	Sex	Contact
1	Kapere Richard	Manager Planning UWA	M	0772658875
2	Muthahinga Moses	Chairman Rwenzori Mountaineering Services	M	0773115842
3	Kamuhanda Herbert	Environment Officer	M	0782319316
4	Oyite Jasper	Assistant Warden Law Enforcement	M	0774240306
5	Muganzi Edgar	Senior Environment Officer	M	0772395749
6	Zironda John Francis	Program Officer FWFW	M	0772916765
7	Ndizihiwe Daniel	Wildlife Manager WWF	M	0783202057
8	Kakuru Bright	Weather Observer Kasese Met. station	M	0775298250
9	Kabugo Cyril	Ranger M&R	M	0701103878
10	Kabasinguzi Kurusum	Environment officer-Bundibugyo	F	0772966096
11	Okware James	SWIC	M	0774318289
12	Kabagenyi Joy	Admin	F	0772608966
13	Enyagu Nelson	Assistant Warden EM	M	0782363284
14	Kaikubulha S. Peter	CCR	M	0773326213
15	Natukunda Alice	Warden CC	F	0772511087
16	Kisembo Micheal	Ass. CAO	M	0779779543
17	Kiteme Rita	Sociologist- MWE	F	0783000233
18	Kagaba Johnson	DEO- Kabarole	M	0784012311
19	Muhindo Tadeo	DDMC	M	072926991
20	Opolot Joseph	Warden Accounts	M	0772924959
21	Asiimwe Cranmier	Environmental Officer. Butama	M	0777123054
22	Maurine Aagende	EMS	M	0700819356
23	Kibalama Brian	Tourism Officer Rwenzori; Trekking Services	M	0704131875
24	Kooli Augustine	Senior Environment Officer-	M	0782544911

		Kasese		
25	Maate Jockus	District Environment Officer Bundibugyo	M	0774281622

Annex 2: Stakeholder analysis

NB: Y=YES; N=No; K=Key

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
	Tourism stakeholders						
1		Rwenzori Mountaineering services (RMS)	Provide tourism services (guiding, porter, accommodation, Rescue, catering, Marketing), Community outreach (Establishment of trees nurseries, Education bursaries, health related work)	Y	Y	N	K
2		Rwenzori Trekking services (RTS)	Provide tourism services (guiding, porter, accommodation, Rescue, catering, trail development, maintenance and marketing)	Y	Y	Y	K
3		Rwenzori Ranges and Hikers Association (RRHA)	Rwenzori tourism marketing and guiding	Y	Y	N	K

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
4		Community Tourism Associations (Ruboni, Turaco, Bunyangabo, Abanyarwenzori, North Rwenzori, Kitholhu, Kilembe central tourism route, Kinyampanika Chimpanzee conservation Association, etc…)	Tourist camping and accommodation, crafts, village walks, Dance & Drama, cultural tourism	N	N	N	N
5		Tour operators (Kabarole tours, Rwenzori Nature Adventures-RNA, Matooke tours, Acacia, Kitandara, Volcano, Great Lakes, Geo-Lodges, etc..	Rwenzori tourism marketing, Accommodation, Transportation, Guiding, Interpretation, etc…	Y	Y	N	K
	Industrial partners						
1		Hima cement Factory	Park resource users (Water) Employment to communities Tree planting outside the park Pollutant (Air and Water)	Y	Y	Y	K
2		Kilembe mines	Park resource users (Water) Employment to communities	Y	Y	Y	K

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
			Tree planting outside the park				
			Pollutant (Water)				
			Soil erosion				
			Exerting pressure for mineral extraction from the park				
3	**Hydropower plants**	(KCCL, TRONDA, RMS, Hima Tibet, Kakaka, on Nyamugasani river, on Sindila & Ndugutu rivers, Kagando Hospital, etc…)	Use of Rwenzori Water for power generation	Y	Y	Y	K
			Employment				
			Provide renewable energy to the community and the Park				
			Tree planting outside the park				
	Government Institutions						
1		National Forestry Authority (NFA)	Management of central forest reserves	Y	Y	Y	K
			Regulation of forest resource utilization				
2		District and Sub-county Local Governments (Kasese, Bunyangabu, Bundibugyo, Ntoroko & Kabarole)	Extension services (agriculture, forestry, roads, vermin control, health, etc…)	y	y	y	K
			Collaboration and coordination (e.g. Security, developments, etc…)				
3		National Environment Management Authority (NEMA)	· Approval of the Environmental Impact Studies	Y	Y	Y	K

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
4		Uganda National Roads Authority (UNRA)	Road maintenance (e.g. Nkenda-Mihunga)	Y	Y	Y	K
5		Uganda Electricity Generation Company Ltd	Development of Hydropower sources	Y	Y	Y	K
6		National Water and Sewerage Corporation (NWSC)	Abstraction and supply of water from Rwenzori Mountain Ranges	Y	Y	Y	K
7		Directorate of Water Development (DWD)	Abstraction and supply of water from Rwenzori Mountain Ranges for production	Y	Y	Y	K
8		Wetlands Management Department	Support in Conservation of the RAMSAR site-RMNP	Y	Y	Y	K
9		Uganda Meteorological Authority	Monitoring weather parameters Regulation of use of weather data	Y	Y	Y	K
10		Uganda National Commission for UNESCO (UNATCOM)	Support management of world heritage site	Y	Y	Y	K
11		IUCN – International Union for Conservation of Nature	Support biodiversity conservation	Y	Y	Y	K
12		Mubuku Irrigation Scheme	Rwenzori water extraction for Agriculture-Irrigation Food production for the Region	Y	Y	N	K

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
13	Security agencies	(Uganda Peoples Defense Forces, Uganda Police Force, Uganda Prisons Service, Internal Security Organization)	Coordination of security issues Law enforcement	Y	Y	N	K
	Non-Governmental Organizations (NGOs)						
1		World Wide Fund for Nature (WWF)	Support to conservation programs in and outside the park	Y	Y	Y	K
2		Wildlife Conservation Society (WCS)	Monitoring Vegetation changes	Y	Y	Y	Y
3			Support to conservation programs in and outside the park	Y	Y	N	K
4		Agri Evolve	Support soil and conservation, add value on coffee, reforestation and bee keeping	Y	Y	Y	K
5		Eco-Trust	· Support to conservation programs in and outside the park	Y	Y	N	K
6		NatureUganda	· Promote Mountain Climbing	Y	Y	Y	K
7		ENABEL	Capacity building and infrastructure	Y	Y	Y	K
8		Mountain Clubs of Uganda	Support to conservation programs in and outside the park	Y	Y	Y	K

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
9		MacArthur Foundation	Support of conservation education programs in and outside the park	Y	Y	Y	K
10		World Vision	Livelihood support to local communities around the park	Y	Y	Y	K
11		Save the Children	Disaster management and supporting vulnerable children	Y	Y	Y	K
12		Rotary clubs	Tree planting, health programs and Livelihood support to local communities	Y	Y	N	K
	Political leaders		Community mobilisation and policy making	Y	Y	N	K
		Districts;					
		Kabarole:					
		C/person LCV					
		Bundibugyo:					
		C/person LCV					
		Ntoroko,					
		Chairperson LCV					
		Bunyangabu;					
		C/Person LCV					
		C/Person LCV					
		Kasese;					
	Community Based Organization (CBO)						

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
1		Cultural Institutions (Obusinga Bwa-Rwenzururu, Obukama bwa Tooro, Obudingya bwa Bwamba)	Integrate culture into conservation	Y	Y	N	K
			Promote culture and conservation				
2		Bundibugyo Extension workers Association	Environmental conservation	Y	Y	N	K
3		Rwenzori Action for Tourism Services (RWATs)	Provide tourism services (guiding, porter, accommodation, catering, Marketing), Community outreach (Establishment of trees nurseries	Y	Y	N	K
4		Rwenzori Mountains Community Conservation Association (RweMCCA)	· Use totems to promote conservation	Y	Y	N	K
5		Rwenzori Mountains Development Association (REMODA)	· Obtain park resources	Y	Y	N	K
6		Resource users (Nsura, Nyakitokoli, Bunaiga, Kamabare, etc…)	· Tree planting and maintenance of the boundaries	N	N	N	N

No.	Stakeholders Category	Names of Stakeholders	Roles	Network	Legitimacy	Resources	Key
7		Boundary Management Committees (Bukara-Kinyampanika mountains conservation association)	Piloting buffer crops (Kei-apple, etc..)	N	N	N	N
8		Vermin control committees (Mbunga, Bunyandiko, etc…)	Conservation Awareness and sustainable livelihoods support	N	N	N	N
9		Sustainable Environmental Awake (SEA)	Support patrol operations	N	N	N	N
		Ex-poacher groups (e.g. Bikone, Bunyandiko, Bukara, Kalonge, etc….)	Engaged in income generating activities				
	Researchers						
1		Everest Mountain-Kilimanjaro (Ev-K2-CNR)	Monitoring weather parameters	Y	Y	Y	K
			Conduct Various researches				
2		Universities (MUK, MMU, MUST)	Monitoring weather parameters	Y	Y	N	K
3		L'Umana Dimora (Italian Environmental Association)	Monitoring the movement of the mountain	Y	Y	Y	K
4		Department of Earth, Planet and Space Science (UCLA)	Assessment of the current ecological changes of snow	Y	Y	Y	K
5		National Institute of Polar Research	Researchers	Y	Y	Y	Y
	EMBASSIES	Italian Embassy	Supports conservation	Y	Y	Y	K

Annex 3: Hazard identification and description

No	Hazard	Risk description
1.	Floods	- Damage to the infrastructure on the mountain - effect to vegetation and animals - Loss to human lives and properties - Soil Erosion - Siltation to water bodies Disease outbreaks such as malaria, cholera
2.	Fire	- Destruction of fauna and flora leading to extinction - Damage to Infrastructure - Accelerates soil erosion - Air pollution - Affects soil structure - Modification of vegetation
3.	Pollution	-Domestic waste leading to the damage of environmental and aesthetic value
4.	Mining	-Open cast mining resulting to a trap for animal - Sand mining, quarrying and murram extraction leading to water pools which are breeding areas to mosquitoes and also dangers to humans and animals - Environmental pollution - Change of landscape
5.	Rain	-It causes soil erosion leading to floods and landslides among others
6.	Deforestation	- Lack of food for wildlife - Wildlife habitats fragmentation - Floods, landslides, mudslides, soil erosion etc - Extinction of species
7.	Reducing glaciers	-Creation of crevasses that lead to rock falls and accidents for

No	Hazard	Risk description
	and snow	mountain hikers - Loss of Rwenzori aesthetic views - Loss of habitats to restricted range species e.g. snow leopards - Loss of cultural values associated with the snow - Reduction in underground Water reservoirs in the region
8.	Temperature increase	- Melting of the glacier resulting into extra release of water into the surroundings which accumulate over time and during the rainy season, the water exceeds the holding capacity of the reservoirs. - Drying of combustible bio-mas leading to susceptibility to fires - Causing depression which creates rainfall - Leads to extinction of some animals - Habitat animal modification leading to shifting in animal range - Causes drought - Disease outbreaks such as malaria
9.	Earthquake	- Leads to landslides that destroys vegetation - Destruction of infrastructures - Creates localised migration of animals
10.	Landslides	- Destruction of infrastructure - Destruction of fauna and flora - Loss of human life and properties - Causes floods and soil erosion
11.	Avalanche	- Mass wasting of ice, rock and snow leading to loss of animals and vegetation - Destroying infrastructure and leading to accidents - Creates rivers

Annex 4: Hazard Risk assessment

1. HAZARD ASSESSMENT

	Frequency			Intensity			Overall Rank			Add	Divide by 3
Hazards	**What do you think is the chance that this hazard will continue to occur in the next 5 years**			**Usually how strong or severe is this hazard in a single event**			**What do you think is the overall impact of this hazard**				
	Certain	**May occur**	**Not likely**	**Very**	**Moderate**	**Not very**	**High**	**Moderate**	**Low**		
Floods	3	2	1	3	2	1	3	2	1	9	3
Fire	3	2	1	3	2	1	3	2	1	7	2
Pollution	3	2	1	3	2	1	3	2	1	7	2
Mining	3	2	1	3	2	1	3	2	1	6	2
Rain	3	2	1	3	2	1	3	2	1	8	3
Deforestation	3	2	1	3	2	1	3	2	1	7	2
Reducing glaciers and snow	3	2	1	3	2	1	3	2	1	8	3
Temperature increase	3	2	1	3	2	1	3	2	1	8	3
Earthquake	3	2	1	3	2	1	3	2	1	7	2
Landslides	3	2	1	3	2	1	3	2	1	9	3
Avalanche	3	2	1	3	2	1	3	2	1	7	2

2. **Vulnerability Assessment**

	Impact on:															**Add**	**Divi by 5**
Hazards	Human population			Buildings			Infrastructure such as roads, water supplies, electricity, etc…			Resources such as forests, farm lands, mines, watersheds, OUVs, etc..			Economy e.g. revenue lost, lost employment, etc..				
	High	**Medium**	**Low**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**		
Floods	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	15	3
Fire	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	10	2
Pollution	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	9	2
Mining	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	10	2
Rain	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	12	2
Deforestation	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	11	2
Reducing glaciers and snow	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	11	2
Temperature increase	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	11	2
Earthquake	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	12	2
Landslides	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	13	3
Avalanche	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	9	2

3. **Manageability Assessment**

Hazards	What is the overall awareness of the public?			How good is the legislation that governs this hazard?			**How good is the warning or prediction that an event will occur?**			How well does the Government respond to an event?			How well does the Government anticipate and prepare for an event?			How good are prevention and mitigation measures regarding this event?			What is the level of public participation in management?			What is your overall rating for NGOs involvement and capacity?			What is your overall rating for the Government's management capacity			**Add**	**Divide by 9**
	Good	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**		
Floods	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	14	2
Fire	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	13	2
Pollution	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	10	1
Mining	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	14	2
Rain	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	17	2
Deforestation	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	17	2
Reducing glaciers and snow	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	11	1
Temperatur	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	13	1

Hazards	What is the overall awareness of the public?			How good is the legislation that governs this hazard?			**How good is the warning or prediction that an event will occur?**			How well does the Government respond to an event?			How well does the Government anticipate and prepare for an event?			How good are prevention and mitigation measures regarding this event?			What is the level of public participation in management?			What is your overall rating for NGOs involvement and capacity?			What is your overall rating for the Government's management capacity			**Add**	**Divide by 9**
	Good	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**	**Good**	**Modest**	**Poor**		
e increase																													
Earthquake	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	11	1
Landslides	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	12	1
Avalanche	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	9	1

4. **RISK VALUE**

Risk value ranking				
Hazard	**Hazard Assessment (B)**	**Vulnerability Assessment (C)**	**Manageability Assessment (D)**	**R=BxC/D**
Floods	40	40	21	76
Fire	25	24	20	30
Pollution	27	22	20	30
Mining	23	24	21	26
Rain	40	36	24	60
Deforestation	39	33	25	52
Reducing glaciers and snow	37	25	20	46
Temperature increase	37	32	19	62
Earthquake	29	24	20	35
Landslides	38	37	25	56
Avalanche	25	20	14	36
Land shears	21	22	16	29
Land sinks	21	25	17	31
Land cracks/fault lines	25	22	17	32
Strong winds	32	25	18	44

Annex 5: Root cause analysis

HAZARDS	TYPE ONE CAUSES	TYPE TWO CAUSES	TYPE THREE CAUSES	TYPE FOUR CAUSES	ROOT CAUSES
FLOODS ***1. TEMPERATURE INCREASE*** ***2. RAIN*** ***3. LANDSLIDES*** ***4. DEFORASTATION*** ***5. REDUCING GLACIER AND SNOW*** ***6. STRONG WINDS*** ***7. AVALANCHE*** ***8. EARTHQUAKE*** ***9. LAND CRACKS/FUALT LINES*** ***10. LAND SINKS*** ***11. FIRE*** ***12. POLLUTION*** ***13. LAND SHEARS*** ***14. MINING***	• Heavy rains • Prolonged rains • River siltation • Poor land practices • Natural occurrence • Snow melting • Global warning • Urbanisation • Demand for fuel wood • Poor methods of farming • Timber cutting • Natural Cause • Natural Cause and human induced. • Humans • Agro chemicals • Physical waste	• Climate change • Global warming • Melting of glaciers • Nature of landscape • Forest cover • Too much accumulation of water vapour in the atmosphere • Seasonal movement of sun • Floods • Encroachment on river banks • Mudslides • Cultivation of steep slopes • Land shears • Landslides • Illegal irrigation activities • Mining • Better services • Wars and conflicts • Safety and security • Poverty	• Greenhouse gases • High temperatures • High temperatures • Nature • Population increase • Poverty • Land shortage • Non-compliance of laws and regulations • Corruption • Political interference • Poor land use planning • Inadequate law enforcement • Heavy rains • Urbanisation • Political differences • Tribal conflicts • Cultural drives • Un employment • Safety from hazards and risks	• Greenhouse gases, • High fertility rates • Lack of awareness • Refugee influx • Inadequate family planning methods • Cultural beliefs and stereotypes • Corruption • Political influence • Poverty • Cultural esteem • Insecurity •	Poverty Inadequate awareness Insecurity Poor Community attitude Inadequate Livelihood support Urbanization Poor Social services Green House gases

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