SOUTHERN TANZANIA ELEPHANT PROGRAM STEP

Situation Analysis of the Udzungwa Mountains Landscape

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Executive summary

The report provides an in-depth situation analysis of the Udzungwa Mountains. The report is intended as an input to the development of a holistic, long-term strategy for the Udzungwa Mountains landscape.

The Udzungwa Mountains are important for livelihoods, biodiversity, water, hydro-power and climate. The Udzungwa Mountains are Tanzania's most important biodiversity area containing 46% of Tanzania's endemic vertebrate species, including 20 Udzungwa-endemic species. They provide water for hydropower stations that generate 23% of Tanzania's electricity. The forests provide ecosystem services for surrounding villages that underpin the predominantly agricultural local economy.

Located in Iringa and Morogoro Regions, the Udzungwas are the largest of the Eastern Arc Mountain blocks, extending over 1.9 million hectares and reaching an altitude of 2,676 m. Most natural forest has been cleared, with the remaining forest protected in 31 forest reserves and the Udzungwa Mountains National Park, cumulatively covering 0.4 million ha.

There are at least 20 vertebrate and 37 tree species endemic to the mountains. Many species are considered threatened due to their small and threatened ranges. There are 4 Critically Endangered, 11 Endangered and 30 Vulnerable vertebrate species across the Udzungwas. The exceptional biological importance of the Udzungwa Mountains is demonstrated in a rich body of research on the vertebrate, invertebrate and plant biodiversity. For example, a recent study on spider diversity revealed 631 spider species in just 3.5 hectares, of which 85% were new to science.

Based on their diversity and the presence of threatened and endemic species, the Udzungwa Mountains National Park (UMNP), Uzungwa Scarp Nature Forest Reserve (USNFR) and Kilombero Nature Forest Reserve (KNFR) are the most important forest areas. Together these three protected areas are referred to as the 'core area' in this report. USNFR has the most vertebrate species found only in that forest (5 single-forest endemics) and the most Critically Endangered species among the three forests. Other biologically important forests in the Udzungwas include New Dabaga-Ulangambi, Kigogo and Lulanda Forest Reserves. Since many species have limited elevational ranges, the protection of forests at all altitudes is needed.

For comprehensive protection of Udzungwa biodiversity, the conservation of ancient montane grasslands and Udzungwa endemic species not found in the three core reserves, is needed. A preliminary analysis has identified at least three Udzungwa-endemic vertebrate and five plant species restricted to areas outside the core reserves including Keith's striped frog *Phylictimantis keithae* (EN). Ecological and habitat connectivity, including with neighbouring ecosystems (Ruaha-Rungwa and Nyerere-Selous), is also a priority, particularly in the context of elephant and other large mammal migrations. The Kilombero Elephant Corridor linking UMNP with NNP, facilitated by STEP, is on track for active restoration in 2024.

Conservation outcomes in the core area are affected by socio-economic dynamics in surrounding ares. There are over 250 villages in the Udzungwa 'Zone of Interaction'. It will be important for the strategy to monitor and engage with dynamics and stakeholders in this broader landscape.

Several of the Udzungwa's unique species are threatened with extinction, with one species, the Kihansi spray toad, already extinct in the wild. Populations of several species, including

Udzungwa red colobus, Udzungwa forest partridge and elephant, have experienced localised extinctions and population declines.

Agriculture is the main driver of deforestation in the Udzungwas. It is estimated that 76% of Udzungwa forests have been cleared in the last 2,000 years. Other threats include forest degradation from illegal timber and pole cutting, fire and the wildlife and bushmeat trades. Chytrid fungus is a threat to amphibian species. Forest plantations threaten montane grasslands.

Management effectiveness has improved significantly over the last 30 years, particularly for the Udzungwa Mountains National Park. The management of both KNFR and USNFR have improved since the areas were designated as nature forest reserves. However, both reserves would benefit from more personnel and resources. All three core protected areas recognise the need to strengthen engagement with surrounding villages. Increased cooperation has been achieved through joint patrols, and the two nature forest reserves are considering reviving joint forest management agreements with adjacent communities.

Of the three core protected areas, UMNP receives 76% of the TZS 1.7 billion invested by the Government in their management. This is reflected in more personnel, equipment and effective management for the National Park compared with the two Nature Forest Reserves. In contrast, both Nature Forest Reserves need more staff, equipment (vehicles, motorcycles, IT) and ranger posts. There is also a need for capacity building for reserve staff, including on community engagement, participatory forest management, law enforcement and conflict resolution. Strengthening coordination and cooperation between TFS and TANAPA is needed, as are resources for capacity building for adjacent communities. Given the greater deficit of resources for the Nature Forest Reserves, consideration should be given to prioritising investment in USNFR and KNFR. Additional resources are also needed for forests outside of the core area.

There are 71 villages contiguous with the core protected areas, with a population exceeding 0.25 million. Agriculture and forestry are the main economic activities. ~ 75% of the land in the Udzungwas is classified as village land, managed by the respective Village Councils. There is potential to expand the area under community-based forest management.

Udzungwa tourism generates approximately TZS 332 million per year for the government, mainly (98%) through National Park entrance fees. Of the approximately 8,147 visitors to the Udzungwas annually, most (63%) are East African Community citizens, including 2,817 (35%) children. Although per visit revenue remains low at TZS 40,808 per visit, tourism has generated other benefits. For example, UMNP has successfully promoted environmental education and offers unique attractions to southern-circuit tourism, a priority area in Tanzania's broader economic development plans. Inaccessibility is a major barrier to tourism in both Nature Forest Reserves. Based on current data, it is difficult to see a scenario where tourism revenue would exceed the significant costs of improving access, building tourism infrastructure and managing tourism facilities for the two nature forest reserves. The current approach of niche tourism in KNFR, particularly bird and wilderness tourism, means that despite low visitor numbers (26 / year), KNFR generates the highest return per visit at TZS 103,673 / visit compared with TZS 40,604 / visit in UMNP. Increasing niche tourism, and avoiding excessive costs to TFS, is a potential area for the landscape strategy to explore.

The Udzungwa Mountains are an important source of hydropower for Tanzania. Udzungwa hydropower plants (Kidatu 204 MW, Kihansi 180 MW) comprise 23% of the installed capacity of Tanzania's main electricity generation grid and 67% of Tanzania's hydropower capacity. Once completed, the Julius Nyerere Hydro Power Project (JNHPP), also

dependent on water from the Udzungwa Mountains catchment, is expected to boost national electricity generation capacity by 2,115 MW. Udzungwa forests are particularly important for dry season hydro-power generation. Deforestation can exacerbate the low dry-season river flows that cause seasonal interruptions to hydro-power generation and consequent power-rationing. Climate change models suggest that droughts will increase in the Udzungwa area, amplifying the importance of safeguarding forests' role in dry season river flows. Water from the forests is also vital to commercial and small-holder agriculture in the Great Ruaha and Kilombero valleys.

The most efficient way for water users to pay for the forests' water ecosystem services is via taxation through the national budget. It is more efficient for users to pay taxes to the government, who pass those on to the catchment managers, as is currently implemented. In a context such as the Udzungwas, payments for water ecosystem services involving direct payments from water users to catchment managers are challenging due to difficulties in valuation, attribution, administration, and enforcement. It is recommended that TFS be supported to make a stronger case for the need for more investment in the two nature forest reserves, as TANAPA have done for UMNP. Resolving the management of the heavily degraded Kihansi catchment area should also be prioritised, including securing sufficient budget for its long-term protection.

There is potential to scale-up carbon projects on village land surrounding the core protected areas. These can build on the experience of the two projects already operational in the Udzungwas and REDD+ projects elsewhere in Tanzania. The requirement for additionality in REDD makes it challenging to generate carbon credits from the protected areas directly.

Livelihood interventions will be an important but challenging component of the Udzungwa landscape strategy. Past and present projects have sought to achieve different livelihood-related objectives, including poverty alleviation; threat reduction through substitution of forest-based with non-forest products (e.g. fuelwood substitution); incentivising engagement in forest protection; and improving protected area – community relations, including reducing human – wildlife conflict.

High potential activities for the landscape strategy include micro-finance, tree planting and agro-ecology for income generation. To incentivise forest protection, sustainable forest-product harvesting and community-based forest management in buffer zone woodlands, plus employment in reserve management and forestation projects, are effective strategies. Given the importance of the mountains as water catchment areas, linking integrated water resources management with improved water and sanitation services is also recommended. Strengthening governance, communication and environmental education can improve the protected area - community relations and livelihoods and is increasingly recognised as an effective way to achieve multiple livelihood benefits. Addressing gender inequality and building climate change resilience into livelihood interventions should be prioritised.

A range of governance, economic, political, internal and climate change risks could undermine the impact of the strategy. Broad participation, good communication, capacity building and alignment of the strategy with existing policies, programmes and priorities will strengthen the impact and sustainability of the strategy.

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List of Acronyms and Abbreviations

Asl	Above sea level
AWF	African Wildlife Foundation
CBFM	Community-Based Forest Management
CBO	Community-Based Organisation
CCRO	Certified Community Right of Occupancy
CEPF	Critical Ecosystem Partnership Fund
CoCoBa	Community Conservation Bank
CR	Critically Endangered – IUCN Red List Threatened Status
DANIDA	Danish International Development Agency
EAM	Eastern Arc Mountains
EAMCEF	Eastern Arc Mountains Conservation Endowment Fund
EN	Endangered – IUCN Red List Threatened Status
FOLUR	Food systems, Land Use and Restoration in Tanzania's forest landscapes
FR	Forest Reserve
GEF	Global Environment Facility
GN	Government Notice
Ha	Hectare
HIMA	Hifadhi Mazingira Project
IBA	Important Bird Area
IGP	Income Generating Project
IUCN	International Union for the Conservation of Nature
JFM	Joint Forest Management
JKT	Jeshi la Kujenga Taifa – National Service
JNHPP	Julius Nyerere Hydropower Project
KBA	Key Biodiversity Area
KNFR	Kilombero Nature Forest Reserve
KOCD	Kilombero Organisation for Community Development
KPL	Kilombero Plantations Limited
KVTC	Kilombero Valley Teak Company
LA	Local Authority

MEMA	Matumizi Endelevu wa Mazingira Project
MNRT	Ministry of Natural Resources and Tourism
MW	MegaWatt
NCMC	National Carbon Monitoring Centre
NFR	Nature Forest Reserve
NGO	Non-Governmental Organisation
NHMD	Natural History Museum of Denmark
NORAD	Norwegian Agency for Development Cooperation
PA	Protected Area
PAMS	Protected Area Management Solutions Foundation
PES	Payments for Ecosystem Services
PPFP	Participatory Plantation Forestry Programme
PROTECT	Promoting Tanzania's Environment, Conservation, and Tourism Project
REGROW	Resilient Natural Resource Management for Tourism and Growth Project
RESUPPLY	Restoration in supply chains from zero net deforestation to net positive action Project
SCIP	Support to Community Initiated Projects
STEP	Southern Tanzania Elephant Program
SUA	Sokoine University of Agriculture
SUMAJKT	Shirika la Uzalishaji Mali la Jeshi la Kujenga Taifa
TAFORI	Tanzania Forestry Research Institute
TANAPA	Tanzania National Parks Authority
TAWA	Tanzania Wildlife Authority
TAWIRI	Tanzania Wildlife Research Institute
TFCG	Tanzania Forest Conservation Group
TFS	Tanzania Forest Services Agency
TFWG	Tanzania Forest Working Group
UCL	Udzungwa Corridor Limited
UEMC	Udzungwa Ecological Monitoring Centre
UMNP	Udzungwa Mountains National Park
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

US AID	United States Agency for International Development
USFNR	Uzungwa Scarp Forest Nature Reserve
VLFR	Village Land Forest Reserve
VLUP	Village Land Use Plan
VNRC	Village Natural Resources Committee
VSLA	Village Saving and Loan Association
VU	Vulnerable – IUCN Red List Threatened Status
WB	World Bank
WCMC	World Conservation Monitoring Centre
WLT	World Land Trust

1 Introduction

1.1 Background

The Hempel Foundation is supporting a project from January to December 2023 entitled *Developing a long-term protection strategy for the Udzungwa Mountains landscape*, implemented by STEP, UEMC and NHMD in collaboration with other key stakeholders in the landscape. The objective of the project is to develop a holistic, long-term protection strategy for the Udzungwa landscape that has the buy-in of all key stakeholders and will attract the significant, long-term funding required to implement the strategy.

This study aims to provide an in-depth situation analysis of the Udzungwa Mountains as an input to the strategy development process (Annex 1). The focus for the study is the area comprising the Udzungwa Mountains National Park (UMNP), Kilombero Nature Forest Reserve (KNFR) and the Uzungwa Scarp Nature Forest Reserve (USNFR). These three protected areas are referred to as the 'core area'. After an introduction to the landscape in Chapter 1, baseline information on biodiversity, threats and conservation is provided in Chapter 2, followed by a stakeholder analysis in Chapter 3. Chapter 4 provides a brief history of interventions in the Udzungwa Mountain Landscape, followed by an assessment of sustainable financing options, including payments for ecosystem services, in Chapter 5; an analysis of livelihood intervention options in Chapter 6; and a risk analysis in Chapter 7. The study is a desk study drawing on technical reports, policy documents and research publications, as well as consultation with TFS, TANAPA and STEP.

1.2 Description of the Udzungwa Mountain landscape

1.2.1 Location

The Udzungwa Mountains (−8.503722 35.9076; −7.678377 36.94129) extend over 1.9 million ha (Mha) (1,2). The mountains are the largest of the 13 mountain blocks that comprise the Eastern Arc Mountains, a series of isolated mountain ranges stretching from the Taita Hills in southern Kenya to the Mahenge Mountains in southern Tanzania. The great age of the Eastern Arc Mountains, combined with a stable climate, have nurtured an exceptional concentration of evolutionarily distinct and threatened biodiversity (3,4). Ranging in altitude from 270 m asl to 2,676 m asl (Luhomero Peak), the mountains comprise eroded Precambrian gneissic and granitic bedrocks uplifted 30 million years ago (5).

1.2.2 Climate and hydrology

The mountains trigger rainfall from easterly clouds sweeping across Tanzania from the Indian Ocean. This results in the mountains receiving double the national annual rainfall, particularly on the east-facing slopes. Precipitation ranges from 500 mm y^{-1} to 2,000 mm y^{-1} on the eastern slopes. Rainfall is bimodal, with peak rainfall between March and May and a smaller peak between November and January. Mean annual temperatures vary with altitude from 23°C, 20°C and 17°C in the lowland, submontane and montane forests respectively (2).

The Udzungwa Mountains are part of the Rufiji River basin, Tanzania's largest river basin. They straddle the watershed between the Kilombero and Great Ruaha Rivers, two of the Rufiji's three main tributaries. To the north-west, water from the Udzungwas flows into the Little Ruaha and Lukosi rivers. These flow eastwards into the Great Ruaha, which also collects water flowing directly from the north-east and eastern Udzungwas. To the south, water from the Udzungwas flows into the Kilombero River, contributing 62% of the Rufiji River's annual runoff (6). High precipitation on the mountains, and the two thousand metres altitudinal drop, underpin the mountains' role as a powerhouse for hydro-electricity. A list of rivers from the core area reserves is provided in Annex 7.

1.2.3 Vegetation

The Udzungwa Mountains comprise a mosaic of vegetation types. With altitude, dry lowland forest gives way to wetter submontane forest at around 800 m asl, with montane forest above 1,400 m asl. At higher altitudes, there are patches of montane grassland with unique species assemblages. Riverine forest provides habitat connectivity. There are also areas of wetland, miombo woodland and thicket. The total area of natural forest is 195,321 ha, distributed across 65 natural forest fragments (≥ 10 ha), with a median fragment area of 126 ha (7).

1.2.4 Administration, population and economy

Administratively, the mountains are located in two regions (Iringa and Morogoro) and three Districts (Kilombero (both Mlimba and Ifakara Municipalities), Kilolo and Mufindi). Approximately 0.7 million people live in the mountains[1]. Agriculture and forestry are the main economic activities, including small-scale farms and woodlots, and commercial plantations (mainly pine, eucalyptus and tea). The mountains are important for hydropower and, increasingly, for tourism.

1.2.5 Protected Areas

There are 32 protected areas with natural forests in the Udzungwa Mountains, covering 436,576 ha (Annex 3). TANAPA manages the Udzungwa Mountains National Park, the largest protected area (199,000 ha). The Tanzania Forest Services Agency manage two Nature Forest Reserves (167,274 ha) and eleven National Forest Reserves (1 productive, 10 protective) (60,911 ha). Under the authority of the District Councils, Kilombero DC manages Ihanga FR (3,467 ha), while Mufindi DC manage five Udzungwa Local Authority Forest Reserves (808 ha). There are at least 12 Village Land Forest Reserves (5,116 ha). There are also patches of natural forest on private estates, including the tea estates, and over 60,000 ha of degraded woodland on village land in Kilolo District (8).

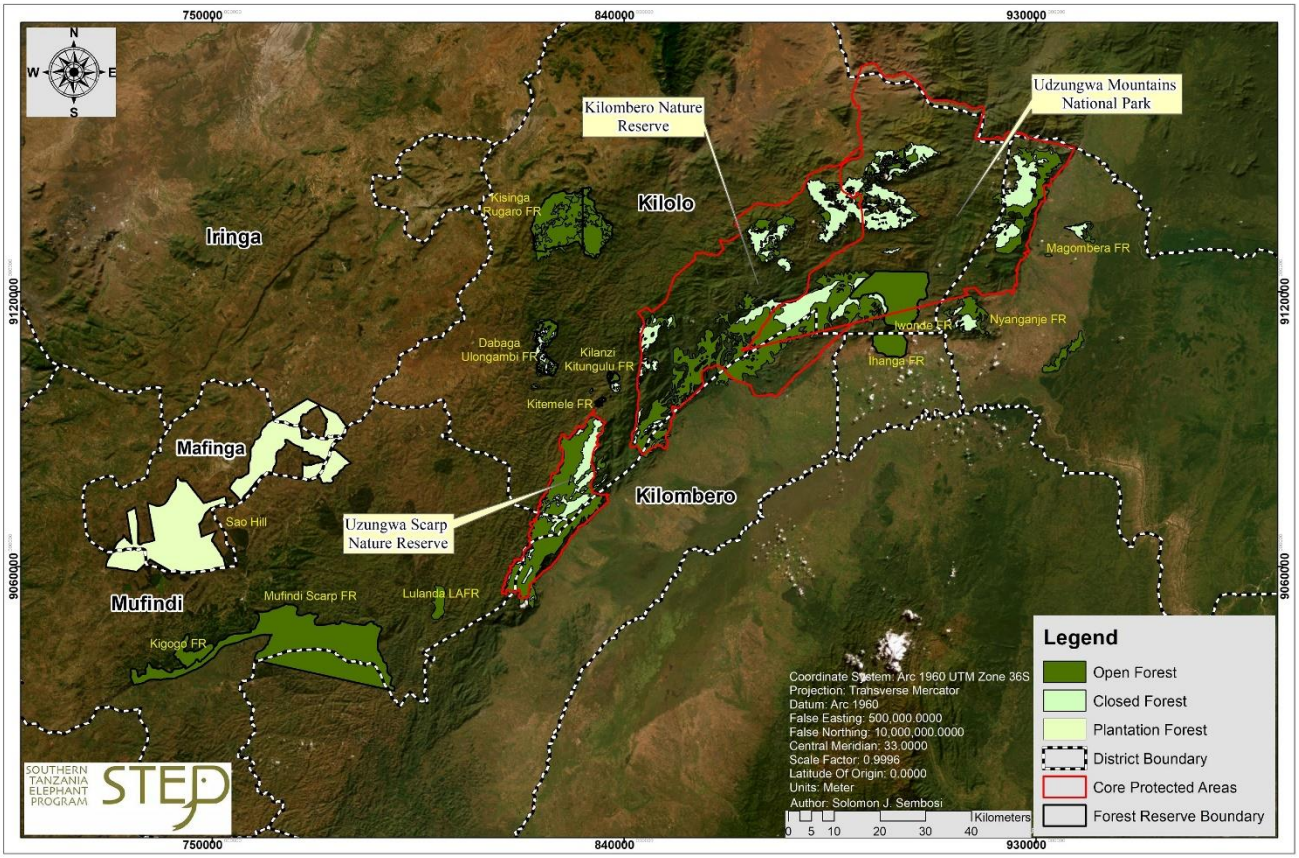
National Parks and Nature Forest Reserves have biodiversity conservation as their primary objective. Nature Forest Reserves are legally defined as '*land covered by forest used principally to protect nature and scenic areas of national or international significance and to maintain and enhance biodiversity and genetic resources in an undisturbed, dynamic and evolutionary state known as a nature forest reserve*,' (the Forest Act 2002 22 (2c)), while National Parks are designated '*to preserve the country's heritage encompassing natural and cultural resources…including fauna and flora, wildlife habitat, natural processes, wilderness*…' (National Policies for National Parks in Tanzania, 1994. Mandate).

1.2.6 Global conservation designations

Due to their biodiversity importance, the Udzungwa Mountains are recognised as global conservation priorities according to multiple conservation prioritisation analyses. The mountains are classified as Important Bird Areas (IBA TZ 011 and TZ 066), a Key Biodiversity Area (Udzungwa Mountain Range) and comprise part of the Eastern Afromontane Biodiversity Hotspot and Eastern Arc Forests Ecoregion (9).

[1] https://www.easternarc.or.tz/mountain/udzungwa/

Figure 1. Map of the Udzungwa Mountain landscape



2 Baseline

2.1 Biodiversity status and trends

2.1.1 Species endemism, richness and threatened status

Overall, the biodiversity importance of the Udzungwa Mountains is well-established in the scientific literature. Research supports the prioritisation of KNFR, USNFR and UMNP, with USNFR having the most strictly endemic and critically endangered species of the three core reserves. However, some Udzungwa-endemic species are not found in the core area, and some Udzungwa montane grasslands are not yet protected. Other important forests include New Dabaga-Ulangambi, Kigogo and Lulanda.

The Udzungwa Mountains provide habitat for almost half (46%) of Tanzania's endemic vertebrate species[2], including vertebrate species found only in the Udzungwa Mountains (Table 1). Vertebrate endemism is highest in reptiles and amphibians. Some species are hyper-endemic, meaning that they are restricted to very small areas. For example, the Uzungwa Scarp tree toad *Nectophrynoides wendyae* and Poynton's forest toad, *Nectophrynoides poyntoni* are each found in only one valley, in USNFR. Even within the Udzungwas, geographically distinct populations of the same species can be evolutionarily distinct. For example, the USNFR and UMNP populations of Sanje mangabey are thought to have separated 0.7 million years ago (11). Overall, USNFR has the most single-site endemic vertebrate species (five) i.e. species strictly endemic to that protected area, compared with

[2] There are at least 69 Tanzania endemic vertebrate species in the UM, out of 149 Tanzanian endemic vertebrate species (10).

KNFR (one) and UMNP (zero) (12). There are also at least 37 tree species endemic or near endemic to the Udzungwas (3).

Table 1. Summary of vertebrate (excluding fish) species endemism and richness and threatened status.

Taxa	Udzungwa Endemic	Eastern Arc Mountain Endemic	Regional Endemic	Critically Endangered	Endangered	Vulnerable	Species richness
All	20	26	58	4	11	30	> 518
Amphibian	7	8	14	2	3	14	> 33[a]
Reptile	7	9	9	0	0	3	> 36[a]
Bird	2	6	23	0	4	7	331[b]
Mammal	4	3	12	2	4	6	118[c]

Data source: Rovero et al 2014 (4). Regional endemics are species with ranges in the Eastern Arc Mountains and at least one other area from Kilimanjaro, Meru and the Kenya highlands to the north-northwest and the Southern Highlands to the south-west) and/or in the coastal forests from Kenya to Mozambique.
[a.] Menegon & Salvidio 2005 Udzungwa Scarp FR only.
[b] http://www.exoticbirding.com/tanzania/udzungwa/checklist.html
[c.] Rovero & de Luca 2007 (13).

The Udzungwas have some of the highest invertebrate diversity ever recorded in the Tropics, with many species new to science recorded over the last decade. With 631 species observed, in just 3.5 ha, the megadiverse spider fauna of the Udzungwas is second only to a site in Peru, in terms of species richness, and 85% of the species turned out to be endemic to Udzungwa (14) while research on Udzungwa Mountain millipedes has revealed five new genera and 63 new species, over the last decade (10 and related volumes). No less than 98% of the millipede species are endemic to Udzungwa. Levels of vertebrate diversity are also high, particularly in primates. With 13 primate species, the Udzungwas have the highest primate diversity in Tanzania (13). High diversity and endemism are a product of the Udzungwa's stable history (16). This climatic stability has fostered speciation. Stability has also meant that the mountains may have acted as refugia for lowland species during the Pleistocene, including the economically valuable Saintpaulia or 'African violets', of which there are two Udzungwa-endemic species (17).

The high number of threatened vertebrate species (45 species) and plants (129 species (18)) in the Udzungwa Mountains reflects the limited 'extent of occurrence' of many Eastern Arc Mountains species (Table 1). This makes them particularly vulnerable to habitat loss. The four Critically Endangered vertebrate species are restricted to KNFR (*Congosorex phillipsorum, Rungwecebus kipunji)* and USNFR *(Nectophrynoides poyntoni, Nectophrynoides wendyae*). KNFR and USNFR have 151 and 133 threatened species respectively (12). Only Uluguru and Amani, in the East Usambara Mountains, have more threatened species among Tanzania's Nature Forest Reserves.

Many species are restricted to narrow elevational bands making them particularly vulnerable to climate change and habitat loss. Research on spiders, ants, amphibians and trees shows a high turnover of species with elevation in the Udzungwas (2,14,19,20). Species at low altitude are particularly vulnerable to habitat loss, given the high demand for agricultural land at lower elevations. The Udzungwas are exceptional among Eastern Arc Mountain forests in retaining extensive lowland forest. Species restricted to high altitude areas may be particularly vulnerable to climate change-induced warming, although some may be able to extend to lower altitude (21).

Udzungwa montane grasslands are also ancient habitats with unique species. Some montane grassland areas have persisted for at least thirty thousand years in the Udzungwas (22). Given this habitat stability, grassland dependent species have evolved, including the Udzungwa-endemic lizards *Tetradactylus udzungwensis* (23) and *Cordylus ukingensis* (also recorded in the Ukinga

Mountains) (24) and the herb *Chamaecrista mwangokae* (VU). The Udzungwa montane grasslands are also an important breeding ground for the migratory blue swallow (*Hirundo atrocaerulea*) (VU). In general, the montane grasslands have received less research and conservation attention than the forests. The unprotected Gendawaki Valley has been identified as a priority montane grassland under threat (23,25).

Outside of the core area (UMNP, KNFR, USNFR), other areas of the Udzungwas have important habitats and populations of Endangered, Vulnerable and Udzungwa endemic vertebrate species. Of particular importance are New Dabaga Ulangambi (2 Endangered, 4 Vulnerable, 2 Udzungwa endemic species), Kigogo (1 Endangered, 4 Vulnerable and 7 Udzungwa endemic species) and Lulanda Forests (1 Endangered, 2 Vulnerable, 3 Udzungwa endemic species) (Annex 5) (26).

Some Udzungwa endemic and threatened species are not found in the core area. Two Udzungwa endemic vertebrate species (Keith's striped frog *Phylictimantis keithae* (EN) and the Udzungwa long-tailed seps *Tetradactylus udzungwensis* (EN)), one herb *C. mwangokae* (VU), three shrubs *Dissotis arborescens* (EN), *Keetia lulandensis* and *Coffea kihansiensis* (CR) and one climber *Adenia kigogoensis* (EN) are only found outside of the core area. The assessment of plants outside of the core area is not exhaustive, and it is likely that there are others.

Migratory species, including elephants, require habitat connectivity across their ranges. Udzungwa elephants migrate to / from Ruaha National Park to the north and Nyerere National Park to the south-east (27). However, the Nyanganje and Ruipa migration corridors to Nyerere National Park have become unusable for elephants since 2010 due to habitat loss with implications for gene flow within the Tanzanian elephant metapopulation (28). Some widespread bird species, including the Olive sunbird, Klaas cuckoo and African broadbill, migrate to the warmer, drier lowlands in March at the start of the wet season, while others migrate out of the montane forests during the dry season (29,30). Climate change amplifies the importance of retaining habitat connectivity and should be considered in the landscape strategy.

Flagship species are taxa considered emblematic of a place. Flagship species are valuable in inspiring society to learn about, visit and invest in an area. For the Udzungwas, these include the mammals: kipunji, Sanje mangabey, Udzungwa red colobus and grey-faced sengi. Flagship bird species include the Udzungwa forest partridge and the rufous-winged sunbird.

2.1.2 Population trends

There is evidence of population decline across some Udzungwa species. At the most extreme, one Udzungwa-endemic vertebrate species, the Kihansi spray toad *Nectophrynoides asperginis*, is classified as 'Extinct in the Wild', and one species, Poynton's forest toad *Nectophrynoides poyntoni*, is 'Critically Endangered (Possibly Extinct)'. Other species with evidence of declining populations include: the Udzungwa Forest Partridge, *Xenoperdix udzungwensis* (31), Angola colobus *Colobus angolensis*, and Udzungwa red colobus *Piliocolobus gordonorum* (32).

Population trends vary between reserves, and this is linked to management effectiveness. In a comparative study of primate populations between UMNP and USNFR, Udzungwa red colobus and Angola colobus populations declined in USNFR while remaining stable in UMNP (32). Despite subsequent strengthening of USNFR forest protection, the two USNFR colobus populations have yet to recover to levels comparable with UMNP. Similarly, elephant, buffalo move and bushbuck are more widespread in UMNP than in the Nature Forest Reserves, reflecting higher protection levels in the National Park (33). Populations of forest mammals are generally stable or increasing in UMNP, reflecting the effective management of the park (34).

A summary of research projects and various checklists of vertebrates and butterflies are available from the Udzungwa Ecological Monitoring Centre.

2.2 Direct and indirect threats to forests and biodiversity

2.2.1 Deforestation

Conversion of forest land to agriculture is the main cause of deforestation in the Udzungwas and nationally (35,36). Deforestation has affected ecologically sensitive areas, including the Kihansi Gorge where forest cover has halved since 1990 (37), and the UMNP buffer zone, which has lost at least 21.6% of natural vegetation (109,100 ha) since 1990 (36). Overall, it is estimated that 76% of Udzungwa forest cover has been lost over the last 2,000 years (38). Within UMNP, the forest area has remained stable since its establishment (36). For the two nature forest reserves, small farms are occasionally cleared along the reserve boundaries with marijuana fields affecting forests deeper into the reserves. Threatened areas include forest adjacent to Chita Village for USNFR (39) and Chiwachiwa Village for KNFR (40). Around Chita, the use of part of USNFR by JKT is linked to logging and other disturbances. Riverine forest is particularly threatened, negatively affecting river flows and the ecological connectivity provided by riverine vegetation (41). Woodlands in Udzungwa reserves are at higher risk of deforestation than forest (42). Outside of the core area, lowland forests, including the northern half of the Magombera Forest and most of Kalunga Forest, to the east of the national park, have been cleared in the last few decades. The loss of riverine vegetation in buffer zones is a concern for water quality, ecological connectivity and habitat. Farming is frequently practised right up to the river despite this being prohibited by the Environmental Management Act.

As well as causing natural habitat loss, deforestation threatens ecological connectivity and wildlife migration routes. For example, converting natural habitat to agriculture has restricted connectivity between the Udzungwa Mountains and Nyerere National Parks, including blocking the Ruipa and Nyanganje elephant corridors between the two parks (36).

2.2.2 Forest degradation

Forest degradation is widespread, affects specialist forest species, and includes activities such as logging, pole-cutting, fire and fuelwood collection. Forest degradation involves a human-induced loss of forest biomass and / or other ecosystem services. Forest degradation affects all Udzungwa forest reserves, nature forest reserves and the national park, with forest reserves most severely affected. Many forest specialist species cannot exist in degraded forests. This reduces the habitat area available to them, and therefore their populations. For example, tree hyrax (43), rufous-winged sunbird, Swynnerton's robin and dappled mountain robin are intolerant of disturbed forests (44) .

Although logging intensity has declined since the 1970s, it remains a driver of forest degradation in all protected areas. The Udzungwas were heavily logged during the 1970s, and 1980s when timber from the forests, including *Pterocarpus angolensis*, *Milicia excelsa* and *Khaya anthotheca,* was used in the construction of the Tanzania Zambia Railway (TAZARA), and / or was exported (26,45). Selective logging continued in the 1990s, particularly of camphor trees *Ocotea usambarensis* in Uzungwa Scarp and New Dabaga – Ulangambi. Logging is considered a medium threat in the miombo woodland and lowland forest of KNFR (46); and across all forest types in UMNP, particularly in the Mwanihana Forest (47). It is also present in USNFR (39,48). Logging is generally carried out by people living locally for domestic use and trade. Smaller stems are also cut as poles for house construction, including from USNFR (48), KNFR (40) and, to a lesser degree, in UMNP.

Fuelwood is collected legally and illegally from all reserves. Fuelwood collection affects species dependent on deadwood, including dung beetles. Understanding of the ecological impact of fuelwood collection is noted as a research gap in the KNFR Management Plan (46). The Udzungwa Mountains National Park banned fuelwood collection in 2011. Harvey's duiker and suni have benefited from reduced disturbance following the ban (34). Fuelwood collection is permitted under regulation in KNFR and USNFR (40).

Livestock populations have increased rapidly in the Kilombero Valley with some recent disturbance to USNFR from livestock grazing (48). Livestock also threaten migration corridors and wildlife-livestock disease transmission (47).

Invasive species can threaten the ecological integrity of forests and have caused damage in other nature forest reserves, including *Maesopsis eminii* in Amani NFR and pine in Rungwe NFR. Records of invasive species include teak in USNFR and KNFR (46,48). Using teak to mark reserve boundaries creates a risk that the species will become invasive. Similarly, pine plantations and woodlots increase the risk of pine becoming invasive, as has occurred in Rungwe NFR.

Infrastructure development is also a driver of forest degradation, and the new Kilombero-Ifakara road could therefore be a concern. In the Udzungwa Mountains, the divergence underground of the Kihansi river for hydropower production has altered the forest micro-climate with negative impacts on the Kihansi spray toad (EW) and the endemic bush, *Coffea kihansiensis* (CR) (49). However, forest birds have not been significantly affected (50). Attempts to reintroduce the Kihansi spray toad to the gorge have not been successful (51).

Fire is a key concern for the two nature forest reserves, particularly in the woodlands and lowland forests. Fire limits forest extent and inhibits natural regeneration (25). Fires start naturally or originate from fire use for agriculture, hunting, honey collection and maintaining livestock grazing areas. Dry season fires in Nyanganje FR have threatened the adjacent UMNP.

Artisanal mining is a localised forest degradation driver that also affects water quality. There is some artisanal mining in remote areas on the plateau above Msolwa and Sanje, in UMNP, and in the Golo-Golo Mountains above the Kidatu dam. It is considered a low threat in the UMNP GMP (47).

2.2.3 Species specific threats

Hunting in the Udzungwas has led to the collapse of targeted bird and mammal populations in several forests, including the total loss of the Nyumbanitu population of the Udzungwa forest partridge (EN) (31) and the severe decline in Udzungwa red colobus (VU) in USNFR. There was intensive commercial hunting in the Udzungwas between 1965 – 1975 for bushmeat, pelts (leopards, colobus) and ivory, linked to TAZARA and the area's increased accessibility (52). The loss of elephant and buffalo from USNFR is attributed to intensive hunting in the 1970s (52). When populations of large mammals collapsed, commercial hunting gave way to more subsistence hunting using traps, snares and dogs, particularly in USNFR. Subsistence hunting through snaring and hunting with dogs remains a threat to targeted species. For example, hunting of primates has reduced populations of Udzungwa red colobus (*Piliocolobus gordonorum*), Peter's Angola colobus (*Colobus angolensis palliatus*), Sanje mangabey, suni and Harvey's duiker in USNFR while Sykes monkey are less affected (53–55). High concentrations of snaring in Nyumbanitu (KNFR) are linked to the local extinction of the Udzungwa Forest Partridge from that forest since the 1990s, and to the collapse of Nyumbanitu's larger mammal (elephant, buffalo) populations (31). Tree and bush hyrax are the most frequently hunted species, although hyrax population trends are poorly understood (43,56).

Trade in exotic pets and ivory threaten targeted Udzungwa species, including reptile (especially chameleons) and amphibian species, and elephant (57,58). In KNFR, hunting with rifles has been more common, including elephant poaching for the ivory trade (46). This is also a threat to unarmed TFS staff and patrol teams who must rely on other agencies permitted to carry guns for self-defence against armed poachers. KNFR ranks the threats from poaching and wildlife trade for ivory and chameleons as high to very high (40). While UMNP rank elephant poaching as a high threat (47).

Wildlife disease is a threat, including the chytrid fungus, which has caused population declines in over five hundred amphibian species globally, including 14 African species (59). In the Udzungwas,

the collapse of the Kihansi spray toad population was attributed to a chytrid fungus outbreak, associated with the ecological disturbance from the diversion of the Kihansi River (60).

2.2.4 Climate change

Climate models predict higher temperatures and more seasonal rainfall, including lower dry season rainfall for the Udzungwas. It is anticipated that this will have a particularly damaging impact on montane forests, with losses of 40% - 50% nationally, with concomitant population declines in montane forest species (17,61).

2.3 Indirect threats

Underlying the direct threats listed above are a web of interacting indirect drivers operating at multiple scales. Policy drivers include agricultural policy promoting increased cultivation and livestock-grazing in the Kilombero Valley, and low prioritisation of Nature Forest Reserves in national budgeting. Political drivers include politicians seeking votes by promising increased access to forest resources in protected areas and political interference in law enforcement, particularly linked to the grazing of politician-owned livestock in reserved areas. Political interference has been a particular problem at Chiwachiwa Village. Economic drivers include growing demand for land for commercial and small-scale agriculture to produce crops including rice, sugar, maize, pine and eucalyptus. With in-migration to the Kilombero Valley and an overall net population increase for Tanzania, demand for land has similarly increased, putting pressure on the buffer zones around Udzungwa protected areas.

2.4 Governance and policy context

Various international agreements and national policy documents form the framework for conserving Udzungwa protected areas and biodiversity.

2.4.1 International agreements

Tanzania is a signatory to various international agreements of relevance to the Udzungwas. Of greatest relevance are: the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on International Trade in Endangered Species of wild fauna and flora (CITES), the Nagoya Protocol and the Ramsar Convention on Wetlands.

2.4.2 National policy documents

The most relevant policies and laws are those establishing the Forest Reserves and the National Park. The National Policies for National Parks in Tanzania (1994), the National Parks Ordinance (Cap 412) as superseded by the National Parks Act (2003), provide the legal and policy basis for the Udzungwa Mountains National Park.

The National Forest Policy (1998) and the Forest Act (2002) are the policy and legal tools that provide the framework for the village, local authority and central government forest reserves, including Nature Forest Reserves. Individual reserves are legally established through government notices and official maps (see Annex 3)

Other relevant policies and laws include the National Environmental Policy 2021 and the National Environmental Management Act (2004) for matters relating to international conventions and inter-sectoral environmental issues, including deforestation, biodiversity conservation, pollution and climate change. The Natural Wealth and Resources (Permanent Sovereignty) Act (2017) has implications for Payments for Ecosystem Services, including carbon. The Land Policy (1999), the Land Act (1999), the Village Land Act (1999) and the Land Use Planning Act (2007) have relevance for land tenure, planning and management.

Sectoral policies of relevance include the National Wildlife Policy (2007), the National Water Policy (2002), National Agriculture Policy (2013), National Livestock Policy (2006), National Energy Policy (2015), National Mining Policy, National Water Policy and the National Tourism policy. Relevant strategies and action plans include the National Forest Policy Implementation Strategy 2021 - 2023 (2021), National Climate Change Strategy (2012) and National REDD+ Strategy and Action Plan (2013), the Water Sector Development Programme (WSDP) 2005 – 2025, the National Community-Based Forest Management Action Plan 2021 – 2031 (2022) and the National Human Wildlife Conflict Management Strategy 2020 – 2024 (2020) (62),

2.4.3 Village by-laws

Through the Local Government (District Authorities) Act No. 2 of 1982, villages are empowered to pass by-laws governing land and natural resources use within the boundaries of a village. This provides the legal basis for village land and forest management by-laws.

2.5 Capacity and protection effectiveness

2.5.1 Management effectiveness

Compared with a without-protection scenario, Udzungwa protected areas have effectively reduced deforestation (42). Management effectiveness has improved significantly over the last 20 years for the two nature forest reserves, based on Management Effectiveness Tracking Tool (METT) scores between 2005 and 2021 (Figure 2). Prior to being Nature Forest Reserves, management effectiveness, in 2005, in what is now KNFR was considered 'average' (METT score = 36.5), while Uzungwa Scarp ranked as 'poor' (METT score = 28.1) (63). Other reserves, including New Dabaga – Ulangambi (METT score = 33.3) and Kigogo (METT score = 32.3), also had average management effectiveness in 2005. Since 2005, the increased METT scores reflect the transition from forest reserve to nature forest reserve, investment in management planning and implementation, and increased resources. Breaking the scores down, both reserves score well on planning, outputs and outcomes (status of natural values), with lower scores for inputs (personnel, information, budget) and process (e.g. stakeholder cooperation, management-oriented research) (Figure 3), highlighting areas for potential support through the landscape strategy. KNFR scores slightly higher than USNFR across all management elements. Compared with all 17 nature forest reserves, KNFR and USNFR rank 9th and 13th respectively, for their 2021 METT scores (12). UMNP was not included in the METT scoring. However, the effectiveness of UMNP is reflected in other indicators. For example, disturbance rates are lower in UMNP than in USNFR, with mean signs of disturbance along 200 m transects of 0 signs for UMNP compared with 5.5 signs of disturbance in the USNFR (52).

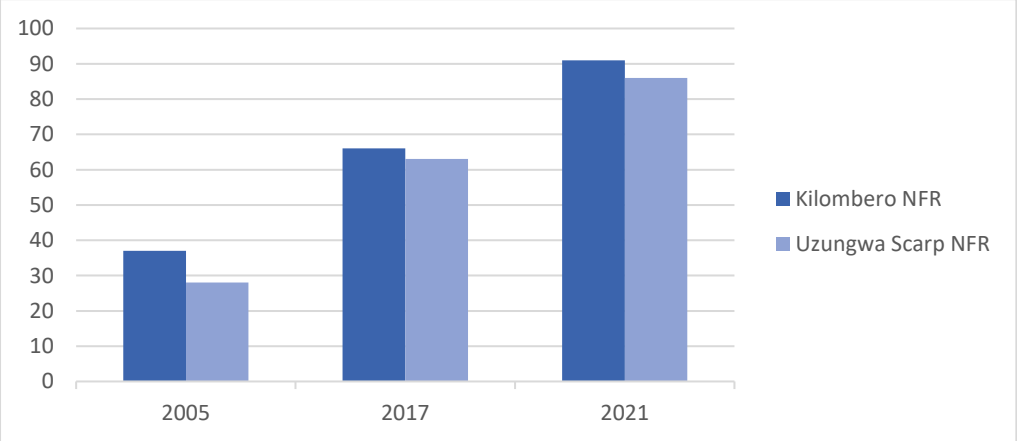


Figure 2. Management effectiveness tracking tool scores for USNFR and KNFR (2005 – 2021)

Data source: Ract et al 2023 (12)

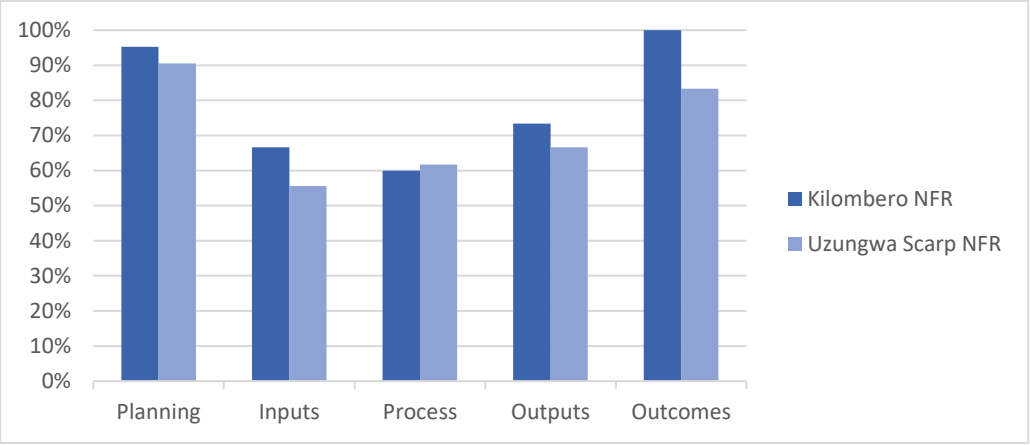


Figure 3. Nature Forest Reserve 2021 METT scores for different management elements.

Data source: Ract et al 2023 (12)

All three core protected areas are in the process of revising their management plans, with draft 5-year plans for USNFR and KNFR reflected in this report. For UMNP, the report reflects the 2012 – 2022 plan. The plans outline challenges facing the reserves and set out management objectives, targets and input requirements. There is potential for the landscape strategy to align with and support these plans, which will be the foundation for management of the core area over the next five (TFS) to ten (TANAPA) years. This could include support in preparing the next 5-year NFR plans (2027 – 2032).

2.5.2 Monitoring

A sophisticated ecological and threat monitoring system in UMNP has well-established linkages between monitoring results and adaptive management. Since 2017, monitoring has also been implemented in USNFR, with consistent protocols. Through the Udzungwa Ecological Monitoring Centre, UMNP monitoring is connected with the Tropical Ecology, Assessment and Monitoring (TEAM) Network, a pan-tropical network promoting standardised monitoring approaches (64). Monitoring includes the Primate Monitoring Programme with transect-based data collected since 2002 (earlier data are available but are not directly comparable); and camera trapping of ground-dwelling mammals, operational since 2009. UEMC monitor both UMNP and USNFR (65).

2.6 Community engagement in PA management

All three core reserves have targets for community engagement in protected area management, including joint patrols and / or joint forest management.

2.6.1 Joint Forest Management

Joint Forest Management (JFM) involves joint management of a protected area by the protected area authority (e.g. TFS or TANAPA) and adjacent communities. JFM is supported by the Forest Act 2002. JFM has improved forest governance but has yet to deliver on benefit-sharing and has had little impact (positive or negative) on livelihoods (66). Formalisation / signing of joint management agreements by the Government has rarely occurred despite JFM investment exceeding US$ 30 million (67). For KNFR, the NORAD catchment project and then MEMA supported joint forest management. Despite low community awareness, Joint Forest Management has also been introduced for USNFR. Both KNFR and USNFR have included joint forest management in their 5-year management plans, including targets relating to joint management agreements. Joint forest management is also in place for other reserves in the Udzungwa Landscape, including Magombera, New Dabaga Ulangambi and Nyanganje.

Despite JFM's shortcomings, it provides a framework for enhancing cooperation between PA managers and communities with positive results in forest governance. It is, therefore, something to be considered in the Udzungwa landscape strategy, including for forests outside of the core area.

2.6.2 Joint patrols

Since 2017, joint 4 – 5-day patrols have been conducted in USNFR involving TFS officers, village game scouts and soldiers from the regional anti-poaching unit (STEP, 2021). More recently, 6-day joint TFS / TANAPA / village game scout patrols have been carried out monthly in KNFR and UMNP (68). This is linked to reduced logging and illegal farming in USNFR, although snaring remains widespread.

2.7 Protected Area needs

Protected area needs are indicated in Table 2. These are based on priorities indicated in the respective PA management plans. Since the UMNP GMP has expired, these needs should be reviewed in the landscape planning process. Overall, USNFR has the least resources of the three reserves. Resolving the deficit in personnel numbers and vehicles for USNFR is the priority, particularly given the high number of threatened and hyper-endemic species in the reserve.

Table 2. Summary of the core protected areas' available and required resources

	KNFR (40)		USNFR (48)		UMNP(47)	
	Current	**Needed***	**Current**	**Needed***	**Current**	**Needed***
Personnel	19 (14 permanent, 5 contract)	21	4 (incl. 1 driver)	11	80	102
Vehicles	3 (2 in poor condition)	3 (replace 2)	1	4	17 (3 beyond repair, 3 in poor condition)	16 (3 need major maintenance, 2 new pick-ups needed)
Motorcycles	7 (3 in poor condition)	7 (replace 3)	2	4	7 (2 in poor condition)	10 (2 need maintenance, 3 additional needed for investigation, tourism, prosecution)
Ranger posts	6	7 (1 ranger post & living quarters at Mhanga planned)	2	3 (Mapanda RP needed)	7	7 (4 need renovation & maintenance)
Other		Computers etc.		Solar energy system	No data available	Water system @ Mbatwa Ranger Post, patrol gear, communication facilities, 45 km access roads, tourist camping, picnic and shaded rest sites
	(million TZS)					

	KNFR (40)		USNFR (48)		UMNP(47)	
	Current	Needed*	Current	Needed*	Current	Needed*
Annual budget	309 [a]	738 [b]	105	276	1,282	2,324

*Needed = the total amount needed, i.e. the deficit is the difference between 'needed' and 'current'.

[a] = 2020 / 2021 data TZS 308,903,000 in expenditure, including 250,563,000 from FBD, 49,000,000 from EAMCEF and 9,340,000 from GEF / UNDP (40).

[b] = TZS 3,689 million over 5 years (40).

Resources are allocated for 1 ranger post, 3 wildlife census, 1 radio communication tower, staff amenities, and patrol equipment for UMNP in the World Bank REGROW project. Engagement with the REGROW team during the strategy development process would be advisable since there have been some amendments to the project.

Increased cooperation and coordination between TFS and TANAPA on issues such as law enforcement, revenue collection and use of ranger facilities is also recognised as a need.

While the joint community – Protected Area patrols have been successful, there is a need for more frequent and better equipped patrolling.

The three reserves have also identified training priorities for reserve staff. These include:

KNFR & USNFR: Computing, Forest Resource Assessment, Climate change, Conservation and Conflict resolution.

UMNP: Customer care, Community outreach, Law enforcement skills and basic wildlife management for new rangers, Rescue skills.

Resources are also needed for community awareness raising, with priorities including:

KNFR & USNFR: Forest policy, PFRA, tree nursery / planting, good governance, gender, project management, forest protection and patrolling, tour guiding, fire management, JFM, beekeeping and other income-generating activities.

UMNP: Fire management, income-generating activities, patrolling and natural resources protection for village game scouts

3 Stakeholder analysis

3.1 Stakeholder overview

A summary of key stakeholders at the national and landscape level is provided in Table 3. Engagement with these stakeholders will be important in developing the landscape strategy. A more detailed profile of Udzungwa Mountain stakeholders, including their mandate, priorities and areas of influence relevant to the strategy, are provided in Annex 6.

Table 3. Stakeholder summary

National	
Government - policy	Members of Parliament, Forestry and Beekeeping Division Ministry of Natural Resources and Tourism, Vice-President's Office - Division of Environment, Ministry of Finance and Planning, President's Office of Regional Administration and Local Government, Ministry of Agriculture, Ministry of Lands, Housing and Human Settlements Development
Para-statals	Tanzania National Parks Authority, Tanzania Electrical Supply Company

NGOs – policy dialogue	Tanzania Forest Conservation Group, MJUMITA, Tanzania Forest Working Group		
Research and training	Sokoine University of Agriculture, Tanzania Wildlife Research Institute, Tanzania Forestry Research Institute		
Landscape level			
Government	Morogoro and Iringa Regional Administration, Rufiji Basin Water Board, Tanzania Wildlife Management Authority, SUMA-JKT		
Reserve Level			
	KNFR	**USNFR**	**UMNP**
Management Authority	TFS	TFS	TANAPA
District Authorities	Kilolo, Kilombero	Kilolo, Kilombero, Mufindi	Kilolo, Kilombero
NGOs	IUCN, MJUMITA, SAGCOT, STEP, TFCG, UEMC		
	EAMCEF, AWF	EAMCEF, FDT	Reforest Africa, KOCD, Associazone Mazingira
Private sector	UCL, KPL		
		Green Resources Limited	Illovo, Mbingu Sisters Farm, KVTC
Tourism	Foxes Safari Camp		Hondo Hondo Udzungwa Forest tented camp

In addition to these entities, there are various time-limited projects relevant to the landscape plan, including the FOLUR, REGROW and 3Cs projects (see Section 4).

3.2 Description of Udzungwa Mountain communities

There are 19, 21 and 33 villages adjacent to USNFR, KNFR and UMNP respectively, with a combined population exceeding 250,000 people.[3] Many more villages lie partially or entirely within the Zone of Interaction (69) (

Figure 4).

Key economic activities including small-scale crop cultivation, particularly maize, beans, tomatoes, potatoes and onions. Tea estates and the timber industry around Mufindi are important source of employment. There is widespread small-scale tree planting, particularly pine and eucalyptus, in Mufindi and Kilolo Districts (70). Several villages have sold land to investors including to KVTC (~2,800 ha from Idete, Namwawala, Kisegese Villages) and the New Forest Company (15,000 ha from Ipalamwa, Ukwega and Kimala Villages) (46). Employment in protected area management is also a source of income (patrolling, boundary clearing and tree planting (46)).

Forest resources are important to the livelihoods of people living in the Udzungwa Mountains. The most widely-used forest products are firewood and building materials (71). Other important forest products include rope, grass, and food (mushroom, fruit, vegetable, meat). Important cultural sites, including burial sites, exist in several reserves (e.g. Nyumbanitu and Ndundulu in KNFR, and Bokela, Mwanihana and various caves in UMNP. Access to water sources, particularly during the

[3] Population data: USNFR 2022-27 Management plan: 19 villages with an estimated population of 70,000 in 2021 (48). KNFR 2022 – 27 Management plan indicates 21 villages with no population data. The Eastern Arc World Heritage Site nomination document indicates 18 villages with a population of 53,346 around KNFR and 31 villages with a population of 139,348 around UMNP using 2002 census data. UMNP reported that there are now 40 villages around the park but no population data was available and the updated list of villages (Annex 8) lists only 33 villages. For consistency, 33 villages are indicated for UMNP. More up to date population figures should be sought during the landscape planning process.

dry season, is also important. Paths across USNFR are important for access between Iringa and Morogoro regions (48).

By limiting access to forest resources, protected areas can negatively impact livelihoods, particularly where no alternative forests are accessible. For example the 2011 ban on fuelwood collection in UMNP has affected household firewood sufficiency (71). Firewood restrictions can also lead to 'leakage' of collection pressure to forests with less effective management.

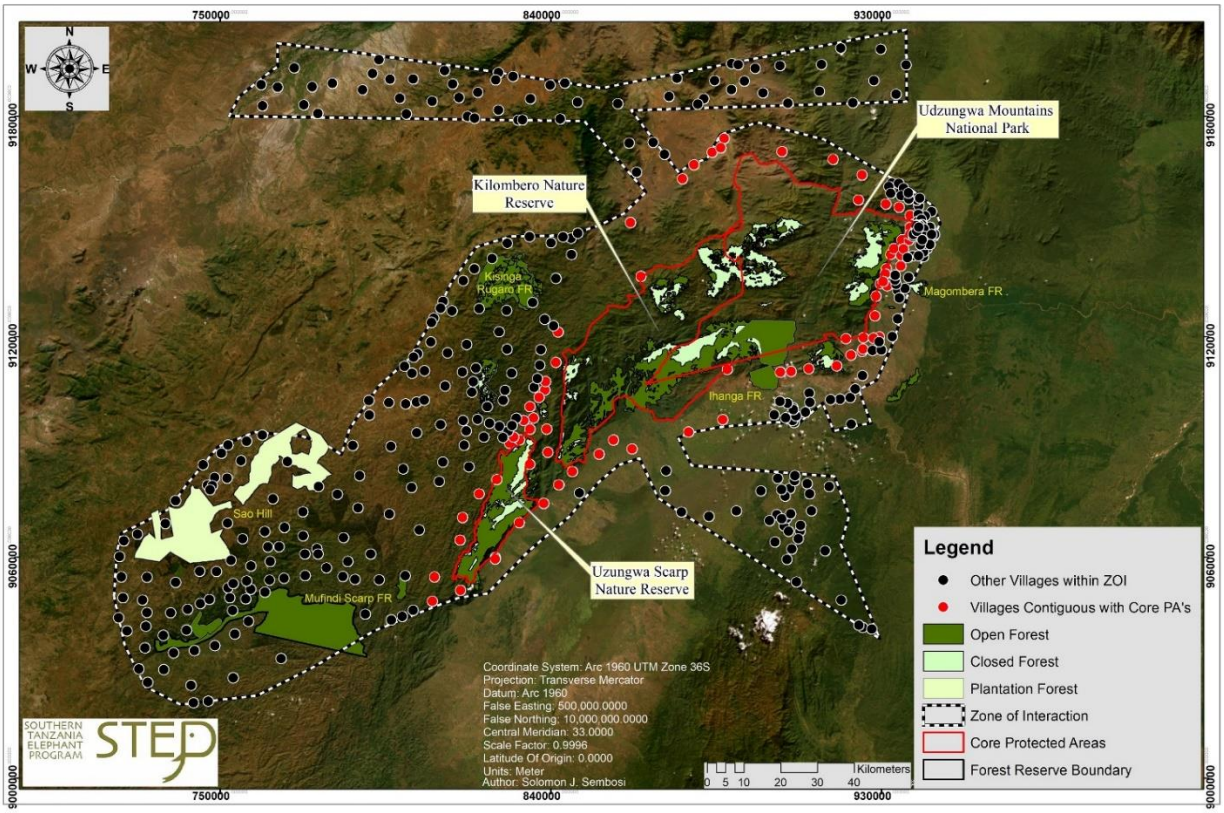
The local government governance hierarchy includes sub-villages, villages, wards, divisions and districts. Village Governments have considerable power to govern the land and natural resources on village land.

3.3 Zone of interaction

The biodiversity and habitats of Udzungwa protected areas are affected by human activities and ecological change beyond the reserve boundaries. This has relevance when deciding on the geographical scope of the Udzungwa Landscape Strategy. Considering the distribution of similar habitats, migration corridors, and human settlements interacting with the reserves, a 'zone of interaction' can be mapped. A zone of interaction includes water flows, movements of organisms, and human interactions that strongly influence biodiversity in a protected area. The zone of interaction for Udzungwa Mountain forests is presented in

Figure 4 based on the mapping process presented in de Fries et al. 2010 (72). It is based on contiguous forest habitat, elephant migration corridors, and human settlements directly influencing biodiversity (a 5-km zone around the protected areas). Local and regional government representatives, consulted during the validation of this situation analysis, recommended that the geographical scope of the proposed Udzungwa strategy extend across the landscape including the zone of interaction. They recommended that adopting a broader geographical scope would help with coordination, cooperation and securing additional resources.

Figure 4. Map of villages in the Udzungwa Mountain forest Zone of Interaction


750000
840000
930000
9180000
9120000
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N
W
E
S
Udzungwa Mountains National Park
Kilombero Nature Reserve
Kisinga Rugaro FR
Magombera FR
Ihanga FR
Sao Hill
Mufindi Scarp FR
Uzungwa Scarp Nature Reserve
Coordinate System: Arc 1960 UTM Zone 36S
Projection: Transverse Mercator
Datum: Arc 1960
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 33.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Author: Solomon J. Sembosi
0 5 10 20 30 40
Kilometers
SOUTHERN TANZANIA ELEPHANT PROGRAM
STEP
Legend
Other Villages within ZOI
Villages Contiguous with Core PA's
Open Forest
Closed Forest
Plantation Forest
Zone of Interaction
Core Protected Areas
Forest Reserve Boundary

4 History of interventions in UMNP, USFR, KSFR

Table 4 provides an overview of recent Udzungwa Mountain projects and initiatives operating entirely or partially in the Udzungwa Mountains. Note that the table includes some projects that had a broader geographical scope than the Udzungwa such that only a fraction of the indicated project budgets were allocated to the Udzungwas.

Table 4. List of recent interventions in the Udzungwa Mountains

Programme Name	Dates	Donor (Funding US$ millions)[a]	Aim	Capacity built and other achievements	UMNP	KNR	USNR	Buffer zone
Catchment Forest Project	1984 - ?	NORAD (?)	Catchment forest protection and JFM	Increased capacity. Enhanced protection for catchment forests		☑	☑	
HIMA	1989 - 2002	DANIDA (~17)	Catchment conservation programme (73)	Increased government NRM capacity; improved economic well-being.		☑	☑	☑
MEMA	1999 - 2003	DANIDA (3.8)	Participatory forest management (74)	Joint and community-based forest management. Forest-based enterprises.		☑		☑ New Dabaga - Ulangambi
WWF – UMNP support	1991 - 2010	DfID through WWF	National Park establishment and support	Establishment and capacity building for UMNP	☑			☑
Improving NR use around UMNP	2006 - 2008	Norway through WWF (0.5)	Participatory land and NR management	Tree planting & stoves; 7 village land use plans and 6 VLFRs (75)	☑			
Conservation and Management of the Eastern Arc Mountains Forest Project		UNDP – GEF (14.9)		Development of the Eastern Arc Mountain Conservation Strategy	☑	☑	☑	☑
Enhancing the Nature Reserves Network for Biodiversity Conservation	2015 - 2019	UNDP – GEF (4.1)	Threat reduction in forest nature reserves			☑	☑	
Eastern Arc Mountains Hotspot Conservation	2004 - 2013	Critical Ecosystem Partnership Fund (8.7)	Sustainable livelihoods, habitat connectivity, biodiversity conservation and research.	Kilombero NR established; Udzungwa connectivity enhanced and biodiversity assessed.	☑	☑	☑	☑

Programme Name	Dates	Donor (Funding US$ millions)[a]	Aim	Capacity built and other achievements	UMNP	KNR	USNR	Buffer zone
FOLUR	2021 - 2025	GEF-UNDP through WWF (7.3)	Integrated land and water management. Reduced deforestation and land degradation.					☑ Kilombero
REGROW	2018-2025	World Bank (150)	Improve natural resources management and improve community livelihoods.	UMNP Capacity building. Livelihood support in 6 UMNP and KNFR villages.	☑	☑		
PROTECT	2015 - 2020	US AID (19.1)	Biodiversity threat reduction & tourism growth.	Government, NGO and private sector capacity building. Policy support.	☑	☑	☑	☑
RESUPPLY	2019 - 2022	IUCN / Germany – IKI (~0.6)	Developing the business case for Kilombero Sugar to invest in forest landscape restoration	Deforestation risk maps produced. Government engagement in FLR.				☑ Kilombero
SUSTAIN	2014 - 2018	IUCN / AWF	Inclusive green growth	Value chain development in Kilombero Valley				☑ Kilombero
SUSTAIN Pro	2022 - 2032	Norwegian Development Agency NORAD (2.5)	Sustainable agriculture and ecosystem restoration					☑ Kilombero
The Restoration Initiative	2022 -	United Republic of Tanzania, Vice President's Office / GEF / IUCN (11.2)	Restoring degraded areas of the Great Ruaha River Basin					
Valuing the Arc	2005 - 2012	Leverhulme Trust	Research on Eastern Arc ecosystem services	Increased knowledge on ecosystem services and their value				
WARIDI	2016 - 2020	US AID (48.8)	Improved health, water resources management	Increased capacity and infrastructure. Improved			☑	☑

Programme Name	Dates	Donor (Funding US$ millions)[a]	Aim	Capacity built and other achievements	UMNP	KNR	USNR	Buffer zone
			and agriculture.	management of USNFR				
Participatory Forestry Plantation Programme	PFP 1 (2014 – 2018) PFP 2 (2019 – 2023)	Finland (10)	Private plantation forestry and wood-based industries in the southern highlands.	Increased capacity in tree growing and wood processing				☑ Mufindi, Mafinga & Kilolo
Community-Centred Conservation (3Cs)	??	BIOPAMA	Livelihoods and park management		☑			
		Aage v Jensen Charitable Foundation						

[a] Funding values reflect total programme value, including investments outside of the Udzungwas.

5 Sustainable financing

5.1 Existing sources of sustainable finance

Sustainable financing is needed to pay for the operations and development of protected areas. Government budget allocations, tourism and payments for ecosystem services are the main sources of sustainable finance for protected areas. These are often boosted by time-limited projects funded through grants or loans (Chapter 4). Currently, the core protected areas receive three types of finance: i. running costs (recurrent budget) from the national budget; ii. development budget from the national budget, and iii. external project finance. The reserves also generate revenue for the government, mainly through tourism. Outside of the protected areas there are three carbon-oriented PES projects.

5.1.1 Finance from the national budget

Government budget allocations are the most important source of sustainable finance for Udzungwa Mountain protected areas. The government provides TZS 1.7 billion (~ US$ 0.5 million) annually to the three reserves. This has increased significantly over the last decade. For example, Udzungwa Scarp's budget has increased fivefold from TZS 19.5 million in 2008/09 (recurrent and development) (69) to TZS 105 million in 2021/22. Given combined tourism revenues of TZS 0.3 billion, the TZS 1.7 billion from the national budget represents a 'net gain' of TZS 1.4 billion for the core area (Table 5). This reflects the value placed on the area's forest ecosystem services by policy- and other decision-makers.

In developing a business case for investing in tourism or PES for the core area, it is important to recognise that, under the current budgeting system, the reserves' budgets are not directly linked to the revenues collected from the reserves. As such, investment in tourism or PES will not necessarily result in an increased budget allocation for reserve management. Under the current financing structure, revenue collected from reserves and budget allocations are de-linked. For example, budgets for the two nature reserves are based on estimated needs, rather than revenue. Reserve staff prepare annual budgets. These are reviewed at Zonal and National levels, and an annual

budget is then authorised. Currently, all reserves are substantially subsidised from other government receipts.

Despite the net financial gain made by the reserves, there remains a budget deficit, particularly for USNFR. Increasing budget allocations will require evidence-based advocacy on the value to the national economy of investing in improved reserve management. Advocacy, awareness raising and research are central to this. For example, recent media coverage of deforestation near Kihansi has prompted a proposal to include the forest in USNFR rather than remaining under the management of the National Environmental Management Council (NEMC).

Project finance is well-suited to PA development costs (infrastructure, capacity-building) and community interventions. Recent project finance has included at least TZS 166 million to KNFR 2016 – 2020/21). Accessing other project finance should be integrated in the Udzungwa Landscape Strategy. EAMCEF has been a particularly important source of finance for the NFRs.

Table 5. PA average annual expenditure and tourism revenues

	Value in TZS million			
	USNFR	KNFR	UMNP	Total
Annual Budget from Central Government (excluding salary costs)	105	251[b]	900[c]	1,256
Eastern Arc Mountains Conservation Endowment Fund		49[b]		49
Annual tourism revenue[a]	2.3	2.7	327	332

[a] See

Table 6 [b] 2020/21 data (40) [c] 2021/22 data. Arafat Mtui Pers. Comm.

5.1.2 Tourism

Potential benefits of tourism include PA financing, local employment and awareness-raising. In the context of sustainable financing, tourism in the Udzungwas requires clarity on objectives and finding an approach that balances the high operational and infrastructure costs against the current low economic return per tourist-visit and low visitor numbers relative to other parks.

Tourism has steadily increased over the last 30 years, with ~8,155 tourists visiting the core area annually, with an average per visit revenue to the PA authorities of TZS 40,808. Tourist attractions include waterfalls, forests, wildlife, especially birds and primates, and hiking. There have also been plans dating back to the 1990s to build a canopy walkway. Most marketing is online via TANAPA and tour operator websites. Tourism is mainly focused in the eastern Mwanihana Forest of UMNP, with limited visitor numbers to the western edge of UMNP, USNFR and KNFR (

Table 6). UMNP has received 8,064 visitors per year, on average, over the last ten years, an increase from 2,587 visitors in 2007 (69). The park aims to receive 12,000 visitors per year by 2023 (76). Citizen children are the largest single group, reflecting the popularity of the park for environmental education. Compared with other southern-circuit tourist destinations, total annual visitor numbers are significantly less than the 46,517 visitors per year to Mikumi National Park or 19,786 visitors per year to Nyerere National Park (2020/21 figures) (76).

Table 6. Annual visitor numbers and revenue to UMNP, KNFR, USNFR.

Class	UMNP[4]			KNFR[5]	USNFR[6]	Total
	Adult	Children	Sub-total	All	All	Total
EAC Citizens	2,226	2,816	5,042	15	41	5,099
Non-Resident EAC citizens	2,324	211	2,535	11	16	2,562
Expatriate residents[7]	377	110	487			487
Total	**4,927**	**3,137**	**8,064**	**26**	**57**	**8,147**
Average annual tourist revenue (TZS)			327,427,605	2,695,498	2,345,123	332,468,226
Average return per visit (TZS)			40,604	103,673	41,143	40,808 for the 3 PAs
Based on data for the period:	2012/13 – 2021/22			2015/16 – Dec 2021	2014/15 – 2021/22	N/A

Source: This study, interview data with UMNP, KNFR and USNFR. See footnotes.

Entrance fees for the UMNP and KNFR are considered reasonable by the PA authorities. Although, for USNFR, there was a suggestion during the stakeholder consultation that citizen rates be increased from TZS 2,000 to TZS 5,000 / day. This would align with UMNP rates (TZS 5,000 / day / adult citizen). Currently, it is cheaper to visit the Nature Forest Reserves (TZS 2,000 / day / adult EA citizen, US$ 10 / day / adult non-East African citizen) than the National Park (TZS 5,000 / day / adult EA citizen, US$ 30 / day / adult non-East African citizen). That more visitors visit the more expensive PA indicates that relative pricing is not determining the relative popularity of the three PAs. Instead, tourism to both KNFR and USNFR is limited by poor accessibility and no hotels.

Costs of developing and managing tourism are high, including: employing personnel to collect revenues, manage entrance gates, maintain access roads, nature trails and signage, and carry out marketing; construction and maintenance of visitor centres and toilet facilities; and purchase and maintenance of vehicles and other equipment for tourism-related activities. Even with the limited visitor numbers to USNFR, managing tourists is already a challenge for the reserve's small staff team[8]. There can also be negative ecological impacts, including disturbance to sensitive wildlife, litter, pollution, fire risks, path erosion and pathogen exposure. From a purely economic perspective, the significant investment historically from WWF and currently from the World Bank (e.g. part of the US$ 150 million REGROW project) has achieved a poor rate of return if measured on the basis of the current annual revenue of TZS 332 million revenue (~US$ 145,000 / year). Even if UMNP achieves its target of 12,000 visitors / year (made more likely by the tarmacking of the Mikumi – Ifakara road) this will only generate ~US$ 210,000 / year based on the current per visit revenue. Similarly, research indicates limited benefits to the local economy regarding employment (e.g. guiding and portering) or trickle down (77,78). Furthermore, since the PAs do not retain their tourism revenues, and their budgets are not directly linked to the income they collect from tourism, the economic case for investing in tourism, as a sustainable finance source, is weak.

[4] 10-year data for UMNP: Citizens Adults: 22,259. Childrens 28,165; Non-Residents: 23,241. Children 2,109; Expatriate: 3,771. Children. 1, 101; Revenues for past ten years = 3,274,276,.054.58. Richard Hayri, UMNP Tourism Warden 09/03/2023.

[5] 164 (95 Citizen and 69 Non-citizen) visitors to KNFR, in total, in the 6.5 years between 2015/16 and 2021-Dec. Total revenue for the same period: TZS 17,520,740. Elibariki Wilson Akyoo. KNFR Conservator. 08/03/2023.

[6] Data for the last 8 years: Citizens = 332; Non-citizens = 126; Revenue collected = TZS 51,318,308. Oscar Boniface Nkonomagaka, Acting PA Conservator. 07/03/2023.

[7] TFS fee structure does not distinguish between Tz Resident or non-resident non-EAC citizens.

[8] Oscar Boniface Nkonomagaka, Acting Conservator USNFR, 07/03/2023

While tourism revenues do not yet match investment and operational costs, there are other ways that tourism can contribute to sustainable financing in the Udzungwas. Politically, tourism is a high priority for the current government, with the President promoting tourism through initiatives such as the Royal Tour. The development of Udzungwa tourism is aligned with political priorities, including the development of the southern circuit. UMNP contributes to visitor figure targets in national and sectoral plans. This alignment may be necessary for determining PA budget allocations within TANAPA and TFS.

Economically, while Udzungwa tourism may not make a surplus in isolation, it contributes to the southern circuit 'package' by providing alternative, forest-based attractions, in terms of unique species, landscape and hiking experiences. Data on this 'value-added' is not available but would be useful in understanding the broader economic value of Udzungwa tourism.

For the nature reserves, given their inaccessibility and ecological sensitivity, consideration should be given to the development of niche tourism requiring minimal infrastructure and personnel, such as wilderness tourism or specialist bird tourism. Working more closely with a few responsible, high-end tourism operators willing to take on some of the infrastructure costs could be a more cost-effective approach. Existing forest regulations cover establishing tourism facilities, including tented camps, in reserves[9]. Alternatively, the development of community-based tourism, which generates employment and other local economic benefits, could achieve positive economic benefits for adjacent villages, thereby justifying further tourism investment. This requires a deliberate approach to prioritise and build capacity for local businesses.

Finally, the conservation value of the environmental education achieved through the many school visits to UMNP should not be under-estimated. Youth understanding and attitudes towards Udzungwa Mountain forests are critical to the current and future conservation of the mountain's habitats. UMNP has been particularly successful at promoting environmental education through the Udzungwa Ecological Monitoring Centre and in partnership with Associazione Mazingira and STEP. While the immediate economic return of those visits may be low, the broader value of those visits is likely to be considerable and long-lasting. Building capacity and resources to boost environmental education in the Udzungwas, could raise the national profile of the area far beyond its value in terms of park / reserve fees.

5.1.3 Payments for water ecosystem services

The Udzungwa Mountains are an important source of hydropower for Tanzania. Udzungwa hydropower plants (Kidatu 204 MW, Kihansi 180 MW) comprise 23% of the installed capacity of Tanzania's main electricity generation grid (1,695 MW in 2022/23) (79) and 67% of Tanzania's hydropower capacity. Once completed, the Julius Nyerere Hydro Power Project (JNHPP), also dependent on water from the Udzungwa Mountains catchment, is expected to boost national electricity generation capacity by 2,115 MW. There are also privately owned mini-hydropower stations at Mbingu and Mngeta.

Udzungwa forests are particularly important for dry season hydro-power generation. The Kilombero Valley contributes most of the water for the Rufiji River and therefore, for JNHPP. Of the 98 Kilombero sub-catchments, the eight Udzungwa sub-catchments have the highest water yield into the Kilombero River, including for the groundwater flow that is critical for dry season discharge (80). In the Udzungwas, forests play an important role in channelling rainwater into groundwater flow, thereby maintaining dry season flows while reducing overland flow (flooding) during periods of high precipitation. There is some evidence of reduced dry season flow associated with Udzungwa

[9] GN 255 The Forests (Amendment Regulations) 18(4) A indicates US$ 5,000 / ha establishment fee and US$ 3,500 / ha annual fee to operate a tourist facility in a forest reserve.

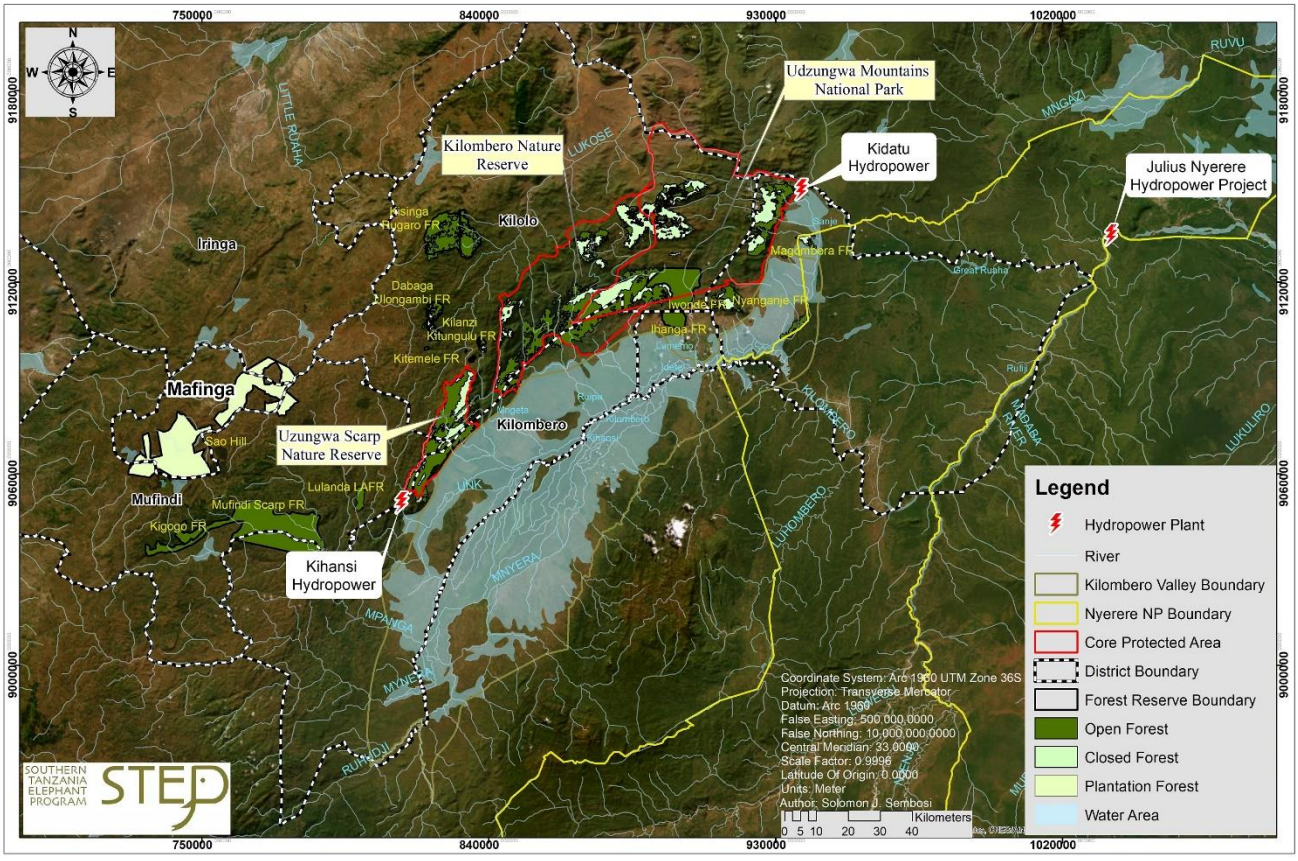
deforestation (81) however, models indicate that climate change is likely to be a greater driver of the reduced dry season, and increased wet season flows. These trends amplify the importance of maintaining forests to moderate high and low extreme flows. For Kihansi Hydropower, deforestation in the catchment has already been identified as a problem.

The Udzungwas are also an essential source of water for commercial agriculture and forestry. Large private sector stakeholders directly dependent on water flows from the core forests include the Kilombero Sugar Company using water from the Great Ruaha, the Kilombero Valley Teak Company from the Kilombero River and Kilombero Plantations – SUMA JKT, who rely on water from the Mngeta River. Small-scale farmers in the Kilombero and Great Ruaha valley, including those involved in outgrower schemes, depend on water from the Udzungwas.

Table 7. List of private sector stakeholders dependent on water from the core protected areas.

Reserve	Examples of private sector downstream water users
UMNP	Kilombero Sugar Company, Kilombero Valley Teak Company (Narabungu and Ichima blocks)
KNR	Kilombero Plantation Limited – SUMA JKT
USNR	Kilombero Plantation Limited – SUMA JKT,

Figure 5. Map of hydropower plants in the Udzungwa Mountains



Recognising the value of the Udzungwa forests to the national economy for hydropower and commercial agriculture, different options exist as to how to pay for this. These include direct payments from the water users e.g. TANESCO, UWASA or large commercial users; or using tax revenues to pay for the protection of the 'public good'. The latter is the current system whereby private sector pay tax to the government and the government pays for the protection of the 'public good' i.e. water catchment.

While direct payments for water ecosystem services have been successful under certain circumstances, they are generally cumbersome to establish and maintain (82). Challenges include valuation of the service, attribution and enforcement. A payment for water ecosystem services project was initiated between Kilombero Plantations Limited (KPL) and the communities in the Mngeta Valley, facilitated by TFCG in 2017 / 2018. However, with the commercial collapse of KPL in 2019, the scheme was no longer viable. There have also been attempts to establish a PES scheme involving the Kilombero Sugar Company and UMNP. However, KSC have been reluctant to make payments additional to their water bills stating that those bills should cover all aspects of water supply. This points to a broader issue that the price of water to consumers does not yet reflect the cost of managing water catchment areas. Instead, water users pay indirectly for catchment protection through their taxes i.e. forest ecosystem services are a public good paid for through taxation. The Government's TZS 1.4 billion annual net investment in the core reserves, is effectively a payment for the forests' ecosystem services. If the cost of maintaining those ecosystem services is higher than TFS and TANAPA's current budgets, this can be negotiated through the process of the national budget.

While beyond the scope of the current project, there is a case to be made for reviewing whether commercial agriculture is paying a fair price for water, and whether the current system of water allocation is equitable. There is evidence that the current system favours large commercial entities over small-holders in the Great Ruaha Basin (83). Issues of water allocation will be exacerbated by climate change and the expansion of commercial agriculture, including out-grower schemes. Currently, there is low awareness on the impact of climate change on water and how this will affect long-term growth (84).

5.1.4 Carbon projects in buffer zones

There is potential for carbon projects to operate in the buffer zones of the core reserves. Currently, there are three carbon projects in the Udzungwa Mountains. Two are active and one is in the pipeline (

Box 1). Two involve exotic tree species (pine and eucalyptus), while one (Mngeta) is using indigenous tree species. Establishing carbon projects requires significant capital to get started. The UCL project requires US$ 33 million in finance, a cost of US$ 4,400 ha^{-1}. The projects are also technically challenging, requiring sophisticated monitoring. In buffer zones, they can work well in combination with other revenue streams. For example, for Green Resources, carbon finance supplements its core work on timber, generating just 3% of Green Resources AS revenue (85). Elsewhere in Tanzania, successful REDD projects have contributed to reducing deforestation in natural woodlands, including projects by Carbon Tanzania. Given rapid rates of regeneration in miombo woodlands, there may be potential for REDD+ in the Kilolo woodlands, particularly if combined with sustainable harvesting. Despite the high carbon storage in Tanzania's montane forests (86), payments for ecosystem services for protected areas are more challenging (87), particularly in demonstrating additionality. Additionality is the REDD+ requirement that *'emissions reductions are "additional to those that otherwise would occur", i.e. additional reductions compared to the "baseline scenario"*.' [10] For protected areas with a mandate and history of forest protection, it is challenging to demonstrate that carbon payments will deliver a emission reductions beyond those that would already occur due to protected areas' pre-existing conservation status.

[10] https://www.un-redd.org/glossary/additionality

Box 1. Carbon projects in the Udzungwa Mountains

	Udzungwa Corridor Limited	Green Resources	New Forests Company
Led by	Udzungwa Corridor Limited, Tz registered company, jointly owned by Reterra and TFCG	New Forests through Green Resources plantation subsidiary in Tanzania, GRL Tanzania Ltd	New Forests Company
Carbon project class	ARR	ARR	ARR
Commercial timber		Pine and eucalyptus (88). FSC certification.	Pine and eucalyptus (89). FSC certification.
Location	Idunda, Mhanga & Uluti Villages, Kilolo District and Kidete Village, Mlimba District.	3 blocks (Uchindele, Idete & Mapanda). Mapanda is in the Udzungwa Mountains. Mufindi District.	Dabaga, Idete and Ukwega Wards (Kising'a, Ng'ang'ange, Kiwalamo and Makungu Villages, Kilolo District (4).
Start date	Planting began in 2022, planting due to be completed by 2029	2001. Crediting period: 2002 – 2100.	Company registration 2007 (90). Timber harvesting from 2022. Carbon component planned for the future.
Validation and Verification system and status	Verra. Registration requested. Validation completed by VVB.	Verra. Verified credits: 753,975 tCO2e. Likely not to issue more credits (85).	Originally planned for FSC or CCBA. Verra / VCS used in NFC Uganda Operation (92)
Area	Forestation 7,500 ha, Natural Forest Protection (VLFRs) 5,047 ha	15,500 ha of planted forest (total landholding: 60,000 ha. Plantable area: 20,000 ha (88)). 20,000 ha to be returned to communities (85)	Lukosi FMU plantation area 1,300 ha. Biodiversity protection area 93 ha. Other 942 ha. (89,90). Obtaining land use rights over Kising'a (3 678 ha) and Makungu (845 ha) plantation areas (90)
Community development	☑	☑	☑
Tree seedling distribution	☑	☑	☑
Employment	66 full-time, 765 contract workers in 2022	☑	111 full-time, 181 contract workers
Other community benefits	50% profit share with local communities, land rent to individual farmers, PES payments for VLFRs	Carbon payments (US$ 0.2 m to 4 communities in 2021/22). Working with Landesa and Haki Ardhi on land return. (85)	
Biodiversity monitoring	☑	☑	☑
Biodiversity and protected area benefits:	Habitat connectivity restoration using indigenous species.		Protection of *Dissotis arborescens* (EN). Review of conservation values due in 2024 (93). Candidate for WWF Forests Forward (92).
Key challenges:	Fiscal policy	Fire (85)	Financing

5.1.5 Recommendations on creating a sustainable and viable business case for tourism and PES and Tourism

In summary, it is recommended that:

- Tourism investment continues in UMNP, focusing on promoting national tourism, linking with environmental education and strengthening linkages to the southern-circuit Tanzania tourist package.
- TFS investigate opportunities to expand low level niche tourism in the nature forest reserves, with a high return per visit but low investment costs. Innovative linkages with tour operators or community-based tourism should be examined.
- MNRT / TFS strengthen its case for increased budgets for the core protected areas, particularly the Nature Forest Reserves, given the forests' high value to the national economy.
- Private sector, communities and local government work together to attract carbon finance for forest protection and forest restoration (mainly through natural regeneration) on village land in the buffer zones.

6 Assessment of conservation and livelihood interventions

6.1 Review of past and present conservation and livelihood interventions

Addressing communities' livelihood needs is routinely integrated in protected area management. This can amplify protected areas' contribution to national development and mitigate protected area livelihood and conservation risks. Objectives for livelihood interventions include poverty alleviation; substitution of forest-based with non-forest products (e.g. fuelwood substitution); incentivising engagement in forest protection; and improving protected area – community relations, including reducing human – wildlife conflict. This section examines examples of past and present livelihood interventions in the Udzungwa Mountains.

6.1.1 Poverty alleviation

Income Generating Projects (IGPs). Income-generating projects generally involve training in economic activities, with or without input support (e.g. bee hives, fingerlings (young fish) or tree seedlings). Past and present initiatives by TANAPA and TFS have included agroforestry and tree-planting, beekeeping, livestock farming (pigs, dairy cattle), fish farming and microfinance. Other NGOs, including Associazone Mazingira, STEP and TFCG have also supported livelihood projects. For example, Associazone Mazingira have supported agroforestry and enterprise development, while STEP have supported 600 bee hives. A community-led evaluation of EAMCEF projects in USNFR villages found that tree-planting projects achieved the most favourable outcomes compared with bee-keeping and fish projects, with rabbit, goat and fuel-efficient stove projects achieving low, even negative outcome scores (94). In contrast, the Iringa Region HIMA project (1995-2002) achieved widespread increases in household incomes and assets, with livestock-keeping and timber production proving particularly successful (95). Some commonly implemented activities, including bee-keeping and fuel-efficient stoves, are considered to have low sustainability (84). However, bee-keeping supported by UMNP contributes an average of 13% of household incomes in a sample of bee-keepers benefitting from UMNP support (96). Projects have generally struggled to measure the livelihood impact of income-generating activities. Nonetheless, there is more evidence indicating the positive impact on livelihoods from tree planting than for bee-keeping, fish farming or livestock-keeping.

Mitigating Human-Wildlife Conflict*:* Various methods have been pioneered by STEP to mitigate risks, including economic / livelihood risks, from human-wildlife conflict. Poverty alleviation is a key goal of human-wildlife conflict mitigation, by reducing economic losses from crop or livestock damage. Initiatives have included beehive fences, metal strip fences, and smelly repellent and solar

light fences. Elephant corridor restoration is being applied to manage elephant movements. For example, tree planting is planned along the whole corridor for habitat connectivity between UMNP and Magombera NFR. An HEC Response Framework (STEP, UMNP, NNP collaboration) has been developed and HEC toolkits (torches, horns, etc) have been distributed. **Tree-planting.** Tree planting has been promoted as an income-generating project and as a substitute for wood extraction from the core protected areas. In Mufindi and Kilolo Districts, various initiatives, including the Participatory Plantation Forestry Programme (PPFP), have promoted pine and eucalyptus woodlots for income generation and employment, with widespread uptake. However, these projects have struggled with poor silvicultural techniques, low prices / limited demand, and limited access to value addition technology (97). However, tree planting was perceived to be the most successful livelihood intervention of the HIMA project, with benefits including reduced workload for women and income from the sale of seedings, poles and timber (73). Tree planting still has potential as an income-generating activity, linking with the timber industry in Mufindi and Kilolo and supplying fuelwood east of UMNP. There also may be possibilities to work with farmers near Mbingu, to grow cocoa trees, linking to the Kokoa Kamili outgrower initiative.

Agriculture. Given the importance of agriculture to the economy of the Udzungwa Mountains, several projects have promoted agriculture-related interventions. One of the largest of these was the HIMA project which promoted sustainable agricultural production on the Iringa side of the Udzungwas (Mufindi and Kilolo). This included training on crop production, agroforestry, soil and water conservation and livestock, with evidence of improved economic well-being and quality of life in HIMA villages (95). More recently, TFCG promoted agroforestry and conservation agriculture in five villages in the Mngeta Valley as part of the WARIDI and SUSTAIN projects. Capacity building on crop diversification has been found to build resilience to climate change in the Usambara Mountains (98). At the same time, the adoption of agroecological practices in villages adjacent to UMNP has been linked to multiple improvements in farmer well-being (99). Targeted support for agriculture remains a pathway to poverty alleviation with potential across the Udzungwa Mountains. Linkages with other initiatives, including SUSTAIN Pro, are recommended.

Forest-based enterprises: While livelihood activities based on the consumptive use of forest products are prohibited in UMNP and heavily restricted in the two NFRs, there is potential to integrate sustainable production in buffer zone forests. For example, with TFCG support, Kilolo District has produced a District Harvesting Plan focused on sustainable charcoal production in unreserved forests (8). Sustainable charcoal production can generate income for local producers and incentivise community-based forest management (100). The plan identifies 64,000 ha with potential for sustainable charcoal production, including through community-based forest management.

Employment: Working with the private sector to create employment opportunities has been another approach to poverty alleviation. In the forestry sector, PPFP has contributed to 1,754 jobs in Iringa and Mbeya, mostly in saw mills and often hired in on a daily or seasonal basis (97). Promoting employment in tourism has been another strategy. For example, the PROTECT project has promoted employment in eco-tourism. However, this has proved challenging, with few new jobs attributable to the project's interventions. The low success rate is attributed to challenges in engaging with the private sector and the overall policy and fiscal environment for tourism (84). Employment in PES schemes, particularly forestation projects, has potential, as evidenced by the 765 jobs created by Udzungwa Corridor Limited (see Box 1).

Microfinance: UMNP have supported community conservation banks (CoCoBA), while STEP and TFCG have supported Village Savings and Loans Associations (VSLA)s in the Kilombero Valley and USNFR, respectively. Drawing on TFCG's experience, VSLAs have generally been a successful way of providing livelihood support that participants can adapt to suit their needs. They

have been particularly effective in supporting women to engage in different enterprises. There is potential to introduce VSLAs to more villages in the Udzungwa landscape as a flexible way for individuals to engage in income-generating activities. It is recommended that VSLAs be included in interventions targeting poverty reduction in the Udzungwa Landscape Strategy.

Conservation Agreements: In early 2023, STEP initiated a programme of Conservation Contracts with villages participating in the Kilombero Elephant Corridor, involving annual payments to the villages dependent on wise natural resource management. This is a tried and tested intervention type from other sites around the world that has potential for the Strategy.

6.1.2 Substitution of forest products

Promoting substitutes for forest products is another common class of livelihood intervention in conservation projects. These interventions assume that if households can access alternative forest products, pressure on forest resources will be reduced, and livelihoods will be more sustainable.

Fuelwood. 86% and 70% of households in the Iringa and Morogoro Regions respectively, use fuelwood as their main cooking fuel, with higher rates in rural areas (101). Fuelwood is the most widely used forest product in Tanzania (102). After the establishment of UMNP in 1992, TANAPA and WWF implemented various interventions to provide households with alternative cooking solutions in preparation for the 2011 ban on firewood collection from the National Park. These included tree planting, community-based forest management, improved stoves and fuel briquette manufacturing. Despite these interventions, firewood sufficiency remains low in villages previously dependent on the national park and lacking access to alternative forests (71). Firewood sufficiency is better for UMNP-adjacent villages with access to other forests, including Village Forest Reserves. Thus, whilst tree-planting has helped in substituting for firewood from the National Park, natural forests are still the preferred source, and CBFM can be a better solution for fuelwood sufficiency than tree planting (71).

Similarly, after the UMNP firewood ban, efficient stoves have not had the expected effect in reducing firewood needs. Instead, household fuelwood consumption is unchanged, but the presence of the stoves improves households' perceived ability to meet firewood needs. Where possible, supporting CBFM or JFM that includes some extractive use to meet household fuelwood needs is recommended for inclusion in the landscape strategy.

6.1.3 Incentivising engagement in forest protection

Different approaches to incentivising community engagement in forest protection include employment, payments for ecosystem services and benefit-sharing.

Employment. Both TANAPA and TFS employ people from the local area to carry out patrols and reserve management tasks, including boundary clearing. Although limited, this provides a direct benefit to the local economy. The Mngeta Valley forestation project is an example of the private sector incentivising forest conservation through employment (among other benefits).

Payments for ecosystem services. PES schemes can provide direct incentives to communities for forest conservation or restoration (see Chapter 5). PES payments to communities can then be used to improve livelihoods by investing in social services, health insurance or infrastructure.

Benefit sharing. This can include revenue sharing between the protected area manager and communities. In Tanzania, communities with Wildlife Management Areas are paid a percentage of the WMA revenue. The initial conceptualisation of Joint Forest Management also included revenue sharing, although this has not been implemented. The structure of Tanzania's national budget makes this approach challenging. Since the reserves' income goes to the treasury, it is difficult for TFS or TANAPA to allocate a proportion of income to communities. This has been an ongoing issue for JFM initiatives that has not been resolved.

Access to Protected Area benefits. Access to the benefits of protected areas can incentivise engagement in protected area management. For example, TFS allow: the collection of some forest products, including firewood (USNFR and under consideration for KNFR), vegetables, mushrooms, medicinal plants and fruits (40); use of paths through the NFRs, e.g. through USNFR linking Iringa and Morogoro Regions (48) and placing beehives in the reserves. The current management plan for KNFR is considering how to improve access to cultural sites such as Nyumbanitu, Ndundulu, Ukami, Kombagulu forest and Magombelema caves.

There is potential to expand the direct benefits of Udzungwa forests to communities, particularly in the water sector. For example, US AID recommends stronger linkages between integrated water resources management and improved Water, Sanitation and Hygiene (WASH). To encourage communities to participate in protecting catchment forests and limiting riverbank agriculture, providing safe and reliable access to the water from those forests is essential. Linking WASH and IWRM has been seen as a 'missed opportunity' in US AID's project portfolio (84), with potential to integrate this in the Udzungwa Landscape Strategy alongside strategies to protect water courses and riverine vegetation. Linkages with the Water Sector Development Programme Phase 3 (2022/23 – 2025/26) are recommended.

Improving protected area – community relations

Community project. For UMNP, enhancing collaboration with park-adjacent communities is a key aim of the TANAPA Support to Community Initiated Projects (SCIPs). By supporting social services such as health and education projects, communities develop a more positive attitude towards TANAPA. However, in other cases, these are perceived as services that should be provided by the government anyway, and TANAPA is just an alternative way of channelling national budget support into health and education (84).

Governance. There is growing recognition that strengthening community governance delivers multiple positive outcomes, including both livelihood and conservation benefits (84). TFS, TANAPA, STEP and TFCG have worked with Village Natural Resources Committees to improve forest and land management in villages adjacent to the core reserves, with positive results. Interventions can include general capacity building on governance, village land use planning, strengthening land tenure through certified customary rights of occupancy (CCROs), community-based forest management, conflict resolution and gender. Strengthening governance in communities adjacent to Udzungwa forests has the potential to bring multiple benefits in the context of the Udzungwa Landscape strategy.

Communication, education and networking. Investing in dialogue and community outreach is needed to build community – Protected Area trust and understanding, as is recognised by both TFS and TANAPA. Lack of support from adjacent communities is cited as a challenge by both TFS and TANAPA in the management plans for UMNP, KNFR and USNFR.

Environmental education in schools has been an effective way of changing community-wide knowledge and attitudes towards forests. In Mufindi and Kilolo Districts, TFCG have supported the eco-schools programme in primary and secondary schools with positive, community-wide impacts. This has included capacity building at District level and the Ministry of Education supports the initiative. There is potential to scale this up across the Udzungwas, linked to the Udzungwa Landscape Strategy.

Community networking and awareness raising can also have positive livelihood impacts. For example, in a recent impact analysis of a climate adaptation project in the Usambara Mountains, the most positive interventions were those linked with community networking and building the capacity to learn (98).

Mitigating negative impacts of Protected Areas on livelihoods: while the Udzungwa forests and their biodiversity influence livelihoods in many positive ways, they also have negative impacts, including human-wildlife conflict and the zoonotic disease transmission. As protected areas become more ecologically isolated, these negative impacts will increase (103). TANAPA and STEP have proactively addressed human – elephant conflict including the development of an effective response framework, awareness raising, bee hive fences to protect farms, and identifying and restoring an elephant migration corridor (104). TANAPA also includes problem animal control, consolation procedures for loss of life or property and livestock vaccination in its management plan (47). Reducing threats to livelihoods from the protected areas is as important as reducing threats to protected areas, in building long-term community support for conservation.

6.2 Community perceptions

Around the two nature forest reserves, there is community support for joint forest management. In a recent consultation exercise led by TFS and facilitated by STEP, communities expressed support to revive joint forest management. Communities also mentioned benefit-sharing expectations and disappointment that this still needs to be resolved. This is a broader national problem that will need to be considered carefully if JFM in the two NFRs is to avoid the 'start-stop' trajectory that has characterised its implementation so far. For example, it may require moving away from a monetary transaction and focusing instead on access rights[11].

Negative community perceptions of forests derive from human wildlife conflict including crop raiding by elephants and primates, and restrictions on access to forest products, particularly firewood. In the context of community relations, both TFS and TANAPA highlight the need to address 'inadequate support and commitment' and 'conflicts that need to be solved', in their respective management plans (47,48). Governance issues have a strong influence on communities' perceptions of protected area impact on livelihoods and community development (105). Communities who perceive that they are treated unfairly are unlikely to support conservation. Investing in communication and conflict resolution mechanisms provides an important foundation for building cooperation between communities and protected area managers.

In summary, different initiatives have proved effective, depending on the goal of the initiative. For poverty alleviation, agroforestry, agro-ecology and micro-finance have been particularly successful. Employment and providing access to forest benefits have helped to incentivise community engagement in forest protection, while environmental education, governance support and mitigating protected-area related risks have helped in community-protected area relations.

6.3 Recommendations on sustainable livelihood interventions

This section presents recommendations on sustainable livelihood interventions, building on the experiences of past and present interventions in the Udzungwas.

1. **Be clear about the objective of livelihood interventions and monitor and evaluate progress towards the objective.** Overall, it is important to be clear about the goal of livelihood interventions and any assumptions underpinning the selection of interventions. Continuous monitoring and evaluation, preferably with the participation of the intended beneficiaries, can help to keep interventions 'on track'. This also requires adaptive management and flexibility in project design.
2. **Equitable treatment of villages.** The governance and perceived fairness of livelihood interventions is important. For example, villages that experience more negative effects from

[11] Godfrey Nyangaresi pers. comm. 2023

a protected area may feel a right to more support than villages minimally effected. Equitable treatment of villages is highlighted in various impact evaluations (84).

3. **Pay attention to gender.** Ensuring that women benefit from conservation and livelihood interventions requires deliberate strategies to address gender issues, including barriers to women's access to land and capital (106). Many projects, including HIMA, have struggled with this (95).
4. **Improving livelihoods takes time.** This applies both to planning and implementing interventions (98). This includes allocating sufficient time for participatory planning and evaluation.
5. **Consider interventions that operate at different scales.** Although household livelihood benefits have the greatest impact on attitudes (84), it is important to consider interventions that operate at different scales, including household, village, district, national. This includes alignment with district-level and national priorities and programmes. For example, alignment with Kilolo, Kilombero and Mufindi District plans and, at a national scale, with the National Forest Policy Implementation Strategy will add sustainability for livelihood interventions. Similarly, it is important to identify and communicate the value of livelihoods, from local to national scales, of Udzungwa forests and biodiversity (107)
6. **Take a broad view of livelihoods.** Livelihoods are multifaceted. Interventions that address governance or access to learning or capital may have more impact than training on specific IGAs (84,98).
7. **Build intersectoral coordination.** Invest in coordination between sectors, particularly at the local government level. While forests have relevance across the land, natural resources, energy and water sectors, it requires deliberate strategies to align these different sectors.
8. **Prioritise interventions that will build resilience to climate change.** Given the detrimental impact that climate change is expected to have on the livelihoods of Udzungwa communities, it is important to build climate change resilience into livelihood interventions, including building adaptive capacity and disaster preparedness.

7 Assessment of risks

7.1 Risk analysis

The planning and implementation of the Udzungwa Landscape Strategy will incur risk. Identifying and planning mitigation strategies for those risks will enhance the effectiveness of the strategy. The main risks to the success of the Udzungwa Landscape Strategy are listed in Table 8.

Table 8. Risk assessment for the Udzungwa Landscape strategy.

Risk	Mitigation Strategy
Governance	
Stakeholder conflict. The strategy will affect sensitive land, natural resources and livelihood issues. This can lead to conflict, including violence.	Include stakeholder conflict identification and resolution processes. Involve stakeholders in planning and implementation, particularly local and regional government. Allocate resources for conflict resolution. Build stakeholder capacity on conflict resolution. Ensure rangers and joint patrol groups responsible for law enforcement are well-trained, equipped and supported. Clear, regular stakeholder dialogue and communication.
Gender, youth and marginalised groups. The strategy could exacerbate social marginalisation. Vulnerable groups include women, youth and the poorest households.	Include deliberate actions to engage with and benefit marginalised groups. Build capacity among implementers and stakeholders on gender and broad social engagement.
Economic and financial	

Risk	Mitigation Strategy
Global and national economy. Macroeconomic change can affect the availability of funds for PA management. Changes in market conditions can affect private sector engagement, including in PES.	Diversify funding streams for PA management and strategy implementation.
Local economy. Introduction of economic activities that threaten Udzungwa natural values or local livelihoods, including extractives or agricultural commodities.	Advocacy and policy engagement at national and local level. Broad stakeholder awareness on Udzungwa natural values and sensitivities. Buffer zone management.
Local livelihoods. Changes to land and natural resources tenure and access can negatively impact local livelihoods.	Community participation in the planning, implementation and evaluation of the strategy. Investment in livelihood activities.
Financial sustainability. Insufficient longer term funding to sustain strategy impact.	Strong sustainability planning from the outset. Alignment with existing structures. Broad and strong local and national stakeholder buy-in and ownership.
Policies and politics	
Policies (at all levels e.g. by-laws, regulations, budgets, laws and national policies). Policy change (or existing policies) negatively impact elements of the strategy. This includes changes in political priorities and budget allocations.	Assess alignment of the strategy with existing policy tools. Monitor policy change. Invest in advocacy. Link the strategy to existing policy tools, including government / protected area programmes and plans (e.g. reserve management plans).
Politics. Party politicisation of land and natural resources issues, including promises by politicians to increase access to sensitive areas.	Broad stakeholder participation, particularly regional and local government. Party political neutrality. Training for strategy implementers on mitigating political risks. Advocacy. Clear, regular stakeholder dialogue and communication.
Climate change	
Ecological. Populations of threatened / endemic species decline / go extinct. More and more intense fire. Ecological stress leads to more disease, invasive species.	Ecological monitoring (including grasslands). Research on climate-related risks. Fire risk mitigation. Access to rapid response funds for emergency situations.
Livelihood. Weather extremes negatively affect agricultural / forestry-based livelihoods. Natural disasters (e.g. floods, landslides from more intensive rainfall) threaten life and property.	Awareness raising. Early warning systems and community-based disaster preparedness. Livelihood diversification. Capacity building.
Indirect exacerbation of anthropogenic threats. Climate change impact on livelihood can lead to increased pressure on forests e.g. livestock grazing in forest areas during drought.	Awareness raising. Early warning systems and community-based disaster preparedness. Livelihood diversification. Capacity building.
Internal	
Competition or even conflict between implementing parties, fraud and corruption, insufficient funding for parts of the strategy, poor service delivery, limited stakeholder 'buy-in'.	**Participatory planning.** Strategy coordination processes. Adaptive management. Strong monitoring and evaluation. Communication and implementation of anti-corruption policies and procedures. Multi-donor approach. Clear, regular stakeholder dialogue and communication. Institutional and technical capacity building for implementing partners.

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Annex 1 Terms of Reference

Situation Analysis of the Udzungwa Mountains Landscape

Terms of Reference

Consultancy with: Southern Tanzania Elephant (STEP)

Work location: Desk study

1.0 BACKGROUND

The Hempel Foundation is supporting a project from January to December 2023, entitled *Developing a long-term protection strategy for the Udzungwa Mountains landscape*, implemented by STEP, UEMC and NHMD in collaboration with other key stakeholders in the landscape. The objective of the project is to develop a holistic, long-term protection strategy for the Udzungwa landscape that has the buy-in of all key stakeholders and will attract the significant, long term funding required to implement the strategy.

In support of this process, STEP is seeking a short-term consultant to develop an in-depth situation analysis of the Udzungwa Mountains that can provide the basis for future activities, and ensure the inclusion of all relevant stakeholders in the landscape. The situation analysis will be a desk study.

2.0 OBJECTIVES

The overall objectives of the situation analysis are the following:

2.1 Provide a baseline and good understanding of the current situation in terms of relevant biodiversity trends, capacity of the protected area management (UNNP, KNR, USNR but also other forests), protection effectiveness of these PAs, needs and the main threats, and the drivers behind them.

2.2 Provide a thorough understanding of engagements in the Udzungwa Mountains up until today. This should provide a clear understanding of what former projects and work this project can build on.

2.3 Provide a good understanding of other relevant stakeholders engaged in the landscape and their former and current work.

2.4 Provide a good understanding of existing and potential sustainable financing activities and options related to the landscape, e.g., Payment for Environmental Services (PES) and tourism. Identify possible opportunities, obstacles and risks within these areas.

2.5 Provide a review of past, present and potential future conservation and livelihood interventions and strategies designed to effectively reduce threats to the Udzungwa forests and support people living adjacent to them, including a review of community perceptions and attitudes towards the forests and PAs.

2.6 Provide an overview and good understanding of potential risks to the success of an Udzungwa Landscape Strategy, whether political (including Government policies), anthropogenic (e.g. climate change, human population increase, extractive industries, etc) or natural.

Objectives 2.1 to 2.3 will mostly involve a review of existing literature with limited consultations, while objectives 2.4 and 2.5 will be the focus of more in-depth assessment as there is more scant material. Objective 2.6 will be based on the synthesis from the above ones.

3.0 REQUIREMENTS OF THE STUDY

3.1 The final study should provide a report that meets the objectives above and include the following outputs:

a) A stakeholder analysis identifying key stakeholders for the project and their priorities
b) Overview of former projects, their results and clear entry points and recommendations for this project
c) A baseline of the current status of the landscape in terms of biodiversity, knowledge of most relevant biodiversity patterns and trends, and organisational capacity for forest protection
d) A threat analysis identifying main threats to forests and biodiversity, the drivers behind them, and how community attitudes are conducive for enhancing protection efforts
e) Recommendations on creating a sustainable and viable business case e.g., via PES, tourism, other environment-related IGAs
f) A risk analysis identifying main risks for the project

3.2 Furthermore the consultant should address the following questions:

Landscape and Forest Management

- What political agreements / documents / statements today form the framework for the protection or persistence of the Udzungwa Mountains' biodiversity values?
- What is the current knowledge and understanding of biodiversity in the landscape and how is biodiversity monitored?
- What are the main gaps for a satisfactory management of the landscape?
- What are the main threats to long-term sustainable management of the landscape?

Community and livelihoods strategies

Based on previous studies and new information, evaluate the relevant ‘zone of interaction’ and connectivity areas (or zone of human-nature interaction) that needs to be engaged to ensure long-term protection of the landscape (mapping support is available)

- How many households and people are located in or around the Protected Areas’ zone of interaction?
- Description of population composition in the area, main livelihood activities, and overview of governance structures of non-PA land in the landscape
- Review/assess past and present community conservation and livelihoods interventions, and propose preliminary recommendations for future priority long-term interventions to secure the integrity of the Udzungwa landscape

Tourism and Payment for ecosystem services (PES)

- Provide baseline review of current tourism revenue and infrastructure of the main PAs in the landscape, and assessment of tourism potential for each PA
- Evaluate and recommend on potential for PES from private sector stakeholders to each PA (as alternative/supplement to tourism revenue)
- What are the other potential revenue streams that each PA could tap into for long-term sustainable financing (e.g. carbon credit schemes, biodiversity payments, UN/GEF biodiversity/restoration financing, etc)?

4.0 DELIVERIES AND DEADLINES

4.1 The consultant shall develop a first draft by 30th March 2023 for comments (feedback will be provided by 15th April 2023), and the final report shall be delivered by 30th April 2023.

4.2 The consultant will be responsible for submitting the final report to STEP via the requirements below:

- a report in English of no more than **25 pages**, excluding annexes
- a summary of 2-3 pages
- a PPT with the highlights of the report (10-15 slides)

Annex 2 List of stakeholders consulted in the preparation of the report

The following people were consulted in the development of this document. Protected Area Managers (TFS, TANAPA) completed questionnaires, while interviews were carried out with STEP staff members.

Name	Position	Organisation
Arafat Mtui	Project Manager, Udzungwa Landscape Strategy	STEP
Trevor Jones	CEO	STEP
Godfrey Nyangaresi	Senior Protection Officer	STEP
Oscar Boniface Nonomagaka	Acting Conservator, Uzungwa Scarp Nature Forest Reserve	Tanzania Forest Services Agency
Elibariki Wilson Akyoo	Conservator, Kilombero Nature Forest Reserve	Tanzania Forest Services Agency
Richard Hayri	Tourism Warden	TANAPA

Annex 3. List of protected areas with natural forest in the Udzungwa Mountains.

Reserve	Area (ha)	Date of establishment	Districts
National Park			
Udzungwa Mountains National Park	199,000	Previously Mwanihana (1958), Iwonde (1958), Nyanganje (1958) and parts of Matundu (1958) and the West Kilombero Scarp Forest Reserves. National Park since 1992. GN 39 20/03/1992	Kilolo (80%) and Kilombero (20%)
Nature Forest Reserves			
Kilombero Nature Reserve	134,511	Previously West Kilombero Scarp FR (1967), Nyumbanito (1930), part of Matundu FR and Iyondo FR (1958). NFR since 2007. Established as a Nature Forest Reserve through Government Notice no. 182 of the 17/08/2007 (map JB no. 2525).	Kilolo and Kilombero
Uzungwa Scarp Nature Reserve	32,763	Uzungwa Scarp was notified a Forest Reserve in Gazette Notice 198 (1929). Boundaries are delineated on Map JB 24 - 2740 (1:100,000) 1931; JB 68 (1:100,000) 1952 covers the eastern boundary. The boundary of the proposed Nature Reserve was re-mapped in 2009 (JB 2564) (69). FR since 1929. NFR since 2016.	Kilombero, Kilolo, Mufindi
Sub-total	**167,274**		
Central Government Forest Reserves			
Kawemba	69	Protective Cap. P. 1366	Kilolo
Kilanzi-Kitungulu	1,092	Protective Cap. P. 1367	Kilolo
Kitemele	273		Kilolo
Kisinga-Lugalo	14,160	Protective 1934 GN 31	Kilolo
New Dabaga	3,728	Protective 1932 GN 210	Kilolo
Ulangambi	2,057	Protective 1930 GN 204	Kilolo
Idewa	291	Protective 1965 GN 294	Mufindi
Mufindi Scarp East	15,887	Protective 1954 GN 450	Mufindi
Mufindi Scarp West	1,852.0	Protective	Mufindi
Kigogo	2,522.0	Protective 1952	Mufindi
Nyanganje	18,980	Productive 1958 GN 555	Kilombero
Sao Hill	31,135	Productive. Plantation. 1962 GN 349	Mufindi
Sub-total	**60,911** (excluding Sao Hill Plantation)		
Local Authority Forest Reserves			
Ihanga	3,467	Protective 1958 GN 557.	Kilombero
Igoda	33		Mufindi
Kidegemsitu	218		Mufindi
Lugoda-Lutali	108		Mufindi
Luhunga	252		Mufindi
Lulanda	197		Mufindi

Reserve	Area (ha)	Date of establishment	Districts
Sub-total	**4,275**		
Village Forest Reserves			
Idunda	64	2017	Kilolo
Itongoa	2562		Kilombero
Itonya	30		Kilolo
Kimala	336		Kilolo
Mhanga	850	2017	Kilolo
Mngeta	737		Kilombero
Ukwega	290		Kilolo
Uluti	178	2017	Mufindi
Itundangulu	46.5	2008	Mufindi
Ilangamoto	6.0	2008	Mufindi
Ikangamusi	1.7	2008	Mufindi
Mnyangala	14.7	2008	Mufindi
Sub-total	**5,116**		
Grand total	**436,576**		

Note this list excludes productive reserves such as Kibao, revoked reserves such as Ihang'ana or proposed but not gazetted reserves such as Kimala and Kitonga, in Mufindi District.

Annex 4. Checklist of endemic and threatened vertebrate species from the Udzungwa Mountains (Source; Rovero et al. 2014 (4))

Species	Authority	Endemism	Threat Status (2011)
AMPHIBIANS			
Afrixalus morerei	Dubois, 1986 "1985"	UE	VU
Afrixalus uluguruensis	Barbour & Loveridge, 1928	RE	VU
Amietia viridireticulata	Pickersgill, 2007	UE	DD
Amietophrynus brauni	Nieden, 1910	E	EN
Petropedetes yakusini	Channing et al., 2002	E	EN
Arthroleptis affinis	Ahl, 1939	RE	LC
Arthroleptis reichei	Nieden, 1910	RE	NT
Callulina kreffti	Nieden, 1911 "1910"	E	LC
Hoplophryne uluguruensis	Loveridge, 1925	E	VU
Hyperolius kihangensis	Schiøtz and Westergaard *In* Schiøtz, 1999	UE	EN
Hyperolius minutissimus	Schiøtz, 1975	RE	VU
Hyperolius pseudargus	Schiotz & Westergaard, 1999	RE	LC
Hyperolius puncticulatus	Pfeffer, 1893	RE	LC
Leptopelis barbouri	Ahl, 1929	RE	VU
Leptopelis parkeri	Barbour & Loveridge, 1928	E	VU
Leptopelis uluguruensis	Barbour & Loveridge, 1928	E	VU
Leptopelis vermiculatus	(Boulenger, 1909)	RE	VU
Mertensophryne uzunguensis	Loveridge, 1932	RE	VU
Nectophrynoides asperginis	Poynton et al., 1999	UE	CR
Nectophrynoides poyntoni	Menegon et al., 2004	UE	CR
Nectophrynoides tornieri	Roux, 1906	RE	LC
Nectophrynoides viviparus	Tornier, 1905	RE	VU
Nectophrynoides wendyae	Clarke, 1988, 1989	UE	CR
Phlyctimantis keithae	Schiøtz, 1974	UE	VU
Phrynobatrachus uzungwensis	Grandison & Howell, 1983	E	VU
Probreviceps loveridgei	Parker, 1931	E	VU
Probreviceps rungwensis	(Loveridge, 1932)	RE	VU
Scolecomorphus kirkii	Boulenger, 1883	RE	LC
Spelaeophryne methneri	Ahl, 1924	RE	LC
REPTILES			
Afrotyphlops nigrocandidus	Broadley & Wallach, 2000	E	
Atheris barbouri	Loveridge, 1930	RE	VU
Atheris ceratophora	Werner, 1895	E	VU
Buhoma procterae	(Loveridge, 1922)	E	
Cnemaspis uzungwae	Perret, 1986	RE	
Cordylus ukingensis	(Loveridge, 1932)	RE	
Crotaphopeltis tornieri	Werner, 1908	RE	
Dipsadoboa werneri	(Boulenger, 1897)	E	
Kinyongia magomberae	Menegon et al., 2009	UE	
Kinyongia oxyrhina	Klaver & Böhme, 1988	E	

Species	Authority	Endemism	Threat Status (2011)
Kinyongia tenue	Matschie, 1892	E	
Leptosiaphos rhomboidalis	Broadley, 1989	UE	
Lycophidion uzungwense	Loveridge, 1932	UE	
Melanoseps uzungwensis	(Loveridge, 1942)	UE	
Philothamnus macrops	(Boulenger, 1895)	RE	
Rhampholeon moyeri	Menegon et al., 2002	E	
Rieppeleon brevicaudatus	(Matschie, 1892)	RE	
Scelotes uluguruensis	Barbour & Loveridge, 1928	E	
Tetradactylus udzungwensis	Salvidio et al., 2004	UE	
Trioceros goetzei	(Tornier, 1899)	RE	
Trioceros laterispinis	(Loveridge, 1953)	UE	VU
Trioceros tempeli	(Tornier, 1899)	RE	
Trioceros werneri	(Tornier, 1899)	E	
Urocotyledon rasmusseni	Bauer & Menegon, 2006	UE	
Urocotyledon wolterstorffi	Tornier, 1900	RE	
BIRDS			
Arizelocichla chlorigula	(Reichenow, 1899)***	RE	LC
Arizelocichla masukuensis	Shelley, 1897***	RE	LC
Arizelocichla milanjensis = striifacies	(Shelley, 1896)***	RE	LC
Anthreptes pallidigaster	Reichenow, 1905	RE	EN
Anthreptes rubritorques	Sclater & Moreau, 1935	E	VU
Apalis chapini	Friedmann, 1928	RE	LC
Apalis chariessa	Reichenow, 1879	RE	VU
Arcanator orostruthus	(Vincent, 1933)	RE	LC
Artisornis metopias	(Reichenow, 1907)	RE	LC
Batis crypta	Fjeldså, Bowie & Kiure, 2006	RE	LC
Bubo vosseleri	Reichenow, 1907	E	VU
Cisticola nigriloris	Shelley, 1897	RE	LC
Cisticola njombe	Lynes, 1933	RE	LC
Laniarius fuelleborni	(Reichenow, 1900)	RE	LC
Lanius marwitzi	Reichenow, 1901	RE	LC
Modulatrix stictigula	Reichenow, 1906	RE	LC
Nectarinia fuelleborni	Reichenow, 1899****	RE	LC
Nectarinia moreaui	(Sclater, 1933)	E	LC
Nectarinia rufipennis	Jensen, 1983	UE	VU
Nectarinia sp.nov.	Unpubl.	E	EN
Oriolus chlorocephalus	Shelley, 1896	RE	LC
Ploceus nicolli	Sclater, 1931	E	EN
Poeoptera kenricki	Shelley, 1894	RE	LC
Scepomycter winifredae	(Moreau, 1938)	E	VU
Serinus melanochrous	Reichenow, 1900	RE	LC
Serinus whytii	Shelley, 1897	RE	LC
Sheppardia lowei	(Grant & Mackworth-Praed, 1941)	RE	VU

Species	Authority	Endemism	Threat Status (2011)
Sheppardia sharpei	(Shelley, 1903)	RE	LC
Stactolaema olivacea	(Shelley, 1880)	RE	LC
Swynnertonia swynnertoni	(Shelley, 1906)	RE	VU
Xenoperdix udzungwensis	Dinesen et al., 1994	UE	EN

Endemisim classes: UE = Endemic to the Udzungwa Mountains; E = Endemic to the Eastern Arc Mountains; RE = Regional Endemic i.e. species that occur in the Eastern Arc Mountains and adjacent mountains (Kilimanjaro, Meru and the Kenya highlands to the north-northwest and the Southern Highlands to the south-west) and/or in the coastal forests from Kenya to Mozambique (4).

Annex 5. Endemic and threatened vertebrate species in other Udzungwa Mountain forests.

Forest	Udzungwa endemic vertebrate species	Eastern Arc endemic species	Regional endemic	IUCN Endangered [a]	IUCN Vulnerable
Idewa[b]	0	0	2	0	0
Ifupira	1	0	8	1	2
Igoda	0	0	0	0	0
Lupeme	1	0	5	0	0
Ihang'ana[b]	0	0	4	0	0
Ipafu	1	0	9	1	2
Kidegemsitu	0	0	5	0	0
Kigogo	7	5	15	1	4
Kiranzi-Kitungulu[b]	1	0	2	0	3
Kising'a-Rugaro[b]	0	0	6	1	2
Kitemele[b]	1	0	1	0	1
Lulanda	3	4	10	1	3
Mufindi Scarp East	1	0	4	1	1
Mufindi Scarp West	0	0	8	0	2
New Dabaga / Ulangambi	2	5	18	2	4
Nyanganje	0	0	0	1	0
Village belt	4	1	5	1	1

Source: New Dabaga-Ulangambi (108); Kiranzi-Kitungulu, Kising'a-Rugaro and Kitemele (Birds: (109), Primates and duikers: (26,110)); Idewa and Ihang'ana (111); all other forests: Doggart et al. 2008 (112). Some red list data is updated relative to source data, including for Angolan colobus and Abbott's duiker

See Annex 4 for a definition of endemic classes.

[a]With the exception of New Dabaga-Ulangambi, the Endangered species recorded in these forests was the shrew Myosorex kihaueli. For New Dabaga Ulangambi, Endangered species are: Abbott's duiker *Cephalophus spadix* and Keith's striped frog *Phylictimantis keithae*.

[b] Birds only.

Annex 6. List of Udzungwa Mountain stakeholders

Stakeholders	Mandate	Priorities relevant to the strategy	Areas of influence relative to the strategy
Policy-makers, Central Government, Executive Agencies and Parastatals			
Members of Parliament	Approval of national policies, laws and budgets. Constituencies include: Kilolo, Mufindi South, Kilombero and Mikumi.	National development	Government budget allocations Supportive policy.
Ministry of Agriculture	Agricultural policy development and implementation.	Modernisation and commercialisation of agriculture	Capacity building. Mainstreaming forest and biodiversity conservation in agricultural policy. Agriculture as Tanzania's main deforestation driver.
Ministry of Finance and Planning	Macroeconomic policy development and implementation	Inclusive sustainable economic growth	Government budgets, fee / tax rates and structures affect PA budgets, staffing and revenues from tourism and PES.
Ministry of Lands, Housing and Human Settlements Development	To facilitate effective management of land and human settlements, including through policy.	Secure land tenure, improved housing and sustainable development.	Rural land use planning
Ministry of Natural Resources and Tourism	Natural resources and tourism policy development and implementation.		Protected Areas fall under the mandate of MNRT. Influence on budget allocation, staffing, fee structure, marketing and policy.
Rufiji Basin Water Board	Water resources monitoring, assessment and planning. Water allocation. Water stakeholder coordination across the Rufiji Catchment, including the Udzungwas.	Water basin management plans and implementation for the Rufiji catchment (113) Coordination of inter-sectoral water resources management	Water stakeholder coordination across the Rufiji water basin. Monitoring of water and land use. Integrated water resources management initiatives.
President's Office for Regional Administration and Local Government	Supporting decentralisation to enable improved service provision by regional and local government.	Improved public service provision. Intersectoral coordination. Poverty reduction.	Guidance to Regional Administration and local government on development projects and supporting coordination between natural resources, land and agriculture sectors.
Tanzania National Parks Authority (TANAPA)	Sustainable conservation of National Parks. Established in 1959 through the national parks ordinance. Now under	Conservation of ecosystem services and optimisation of tourism development.	Authority responsible for the management of UMNP.

Stakeholders	Mandate	Priorities relevant to the strategy	Areas of influence relative to the strategy
	the National Parks Act Cap. 282 of 2002.		
Tanzania Forest Services Agency (TFS)	Management of national forest and bee resources.	Management of national natural forest reserves.	Authority responsible for the management of KNR and USNR.
Tanzania National Service Corporation (SUMAJKT)	Economic wing of JKT whose mandate is capacity-building of youth for national security	Projects to support JKT economically, including food production for JKT and the army.	Chita JKT rice farming uses water from USNR. Also linked to wood cutting and bushmeat hunting. SUMA JKT took over the management of the former KPL Mngeta Plantation. rice and maize in 2021 using water from KNR and UMNP.
Tanzania Tourist Board	Tourism promotion	Promotion of the Udzungwas as a tourist destination	Support on tourism component.
Tanzania Wildlife Management Authority (TAWA)	Management of Game Reserves and conservation of wildlife outside National Parks.	Management of Game Reserves and Game controlled areas.	Management of wildlife corridors around UMNP, KNR and USNR.
Vice-President's Office, Environment Division	Policy guidance and coordination for sustainable environmental management.	International environmental agreements. Biodiversity conservation, pollution and climate change.	Buffer zone environmental protection, including protection of riverine areas. Environmental impact assessments for new developments. Coordination and policy oversight on REDD+ and carbon projects.
Regional and Local Government			
Iringa Regional Administration **and Morogoro Regional Administration**	Coordination, administration and oversight of policy implementation at regional scale to achieve national development.	Supporting LGAs to perform their mandated functions. Security, intersectoral coordination and good governance at Regional level.	Advise on the alignment of the strategy with national development goals. Support LGAs to fulfil their roles in the strategy. Security issues.
Kilolo, Mlimba and Mufindi District Councils	Maintain peace, order and good governance; and promote economic development.	Community development.	Provide technical support to communities in livelihood components and participatory forest management. Advise on linkages with other district-level initiatives and alignment with local priorities.
Ward Councils for areas contiguous with the reserves	Implementation of District Council Decisions.	Community development.	Provide technical support to communities in livelihood components.

Stakeholders	Mandate	Priorities relevant to the strategy	Areas of influence relative to the strategy
			Advise on alignment with location priorities and other initiatives.
Village assemblies and village councils of villages contiguous with the reserves	Promote economic and social development of the village. Establish village by-laws.	Community development.	Participatory forest management (joint and community-based). Support in capacity building on livelihood activities. Support for improved forest governance.
Research and training institutes			
National Carbon Monitoring Centre			
Tanzania Forestry Research Institute (TAFORI)	Coordination, regulation and implementation of forest research and dissemination of findings.	Priority research themes include natural forest management, monitoring, community forestry and forest resource assessment.	Support on research and dissemination of research findings. Monitoring.
Tanzania Wildlife Research Institute **(TAWIRI)**	Coordination, regulation and implementation of wildlife research and dissemination of findings	Priority research themes include wildlife and water monitoring, wildlife corridors and conflict, wildlife threats and fire.	
Sokoine University of Agriculture (SUA)	Training, research and service delivery in agriculture, natural resources and allied sectors.	Increasing quality and volume of research. Improved teaching and learning.	Support on research and training.

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
Private Sector			
Foxes Safari Camps	Tourist lodge in Mufindi.	Socially and ecologically responsible tourism.	Tourism promotion. Sustainable livelihoods.
Green Resources Limited Tanzania	12,000 ha of pine and eucalyptus plantation (60,000 ha total landholding) in Kilombero and Mufindi Districts. 1 block is between Uzungwa Scarp NR and Mufindi East FR. Green Resources AS also own Sao Hill	Maximising returns on wood products. Carbon offsets through afforestation. Environmental conservation and social development.	Sustainable livelihoods. Buffer zone management. Engagement in PES.

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
	Industries with two modern sawmills and a briquetting factory.		
Hondo Hondo Udzungwa Forest Tented Camp	Tourist camp next to UMNP. Support to Mang'ula Primary School.	Socially and ecologically responsible tourism. Community development.	Tourism promotion. Sustainable livelihoods. Environmental education.
Kilombero Sugar Company	Growing and processing sugar around the Great Ruaha River to the east of UMNP.	Sugar production. Water stewardship. Sustainable livelihoods.	Sustainable livelihoods. Buffer zone management. Engagement in PES.
Kilombero Valley Teak Company	Growing and processing teak to the south of UMNP. Management of 20,000 ha of native forests and wetlands.	Sustainable teak production. Out-grower programme. Biodiversity and habitat conservation.	Sustainable livelihoods. Buffer zone management. Engagement in PES.
Kilombero Plantation Limited	A 5,818 ha rice and maize plantation in the Kilombero Valley managed by SUMAJKT	Rice and maize production.	Buffer zone management. Engagement in PES.
Kokoa Kamili	Cocoa smallholder outgrower scheme in Mbingu Village, adjacent to UMNP	Socially responsible cocoa production.	Sustainable livelihoods. Buffer zone management. Engagement in PES.
Mbingu Sisters Farm, Franciscan Sisters of Charity	Cocoa farm, fish farm and water project in Mbingu Village, adjacent to UMNP.	Community development in Mbingu Village.	Sustainable livelihoods in Mbingu Village. Buffer zone management.
Mufindi Tea and Coffee Limited	Tea and coffee production including outgrower scheme north of Mufindi Scarp East (Itona).	Socially responsible tea and coffee production.	Sustainable livelihoods. Buffer zone management. Engagement in PES.
New Forests Company	Timber and pole production (pine and eucalyptus) at Lukosi, Kilolo District including out-grower scheme. Planned carbon component.	Socially responsible timber production.	Sustainable livelihoods. Buffer zone management. Engagement in PES. Biodiversity monitoring.
Unilever Tea Tanzania Limited	Tea production near Mufindi Scarp East.	Socially responsible tea production.	Sustainable livelihoods. Buffer zone management. Engagement in PES.
Udzungwa Corridor Limited	Afforestation and reforestation in Mngeta Corridor.	Socially and ecologically responsible forest restoration project.	Sustainable livelihoods. Buffer zone management. Engagement in PES.

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
Wild Things Safaris	Tour operator offering trips to the Udzungwas.	Socially and ecologically responsible tourism.	Tourism promotion. Sustainable livelihoods
Development Partners and Funding agencies			
Critical Ecosystem Partnership Fund	Conservation-related grants to CSOs between 2004 - 2013	Historic funding for connectivity, sustainable livelihoods and research.	Learning and stakeholder capacity from CEPF grants.
Eastern Arc Mountains Conservation Endowment Fund	Trust fund supplying regular grants to Nature Reserves for livelihood projects, tree planting, tourism development and boundary work.	Funding for community development, biodiversity conservation and applied research in the Eastern Arc Mountains.	Source of funds for strategy implementation. Sustainable financing.
GEF – UNDP	Conservation and Management of the EAM Forests (2003 – 2008) Enhancing the Forest Nature Reserves Network for biodiversity conservation in Tanzania (2015 – 20120)		
Hempel Foundation			
NORAD			
USAID	Various large projects including Promoting Tanzania's Environment, Conservation and Tourism (PROTECT) WARIDI, REGROW		
Rainforest Trust	Supported the establishment of Magombera Nature Reserve.	Habitat and biodiversity conservation.	Co-funding
World Land Trust	Support to gazettement of Magombera Forest. Technical support to TFS.	Protection of threatened habitats and species including new protected area.	Co-funding
NGOs and CBOs			
African Wildlife Foundation **(AWF)**	Sustainable agriculture, forest and water management around KNR.	Improving local agriculture.	Sustainable livelihoods.
Associazione Mazingira	Environmental education, livelihood activities, improved studies, women's empowerment and eco-tourism		Sustainable livelihoods. Tourism development

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
Foxes Community and Wildlife Conservation Trust	Community development support in Mufindi District	Health, education, life skills support in Mufindi.	Links to community development in Mufindi District.
Forestry Development Trust	Support for smallholder tree planting around Mufindi, including research, capacity building and market development.	Improving wood product quality. Increased income for smallholder tree-growers.	Sustainable livelihoods.
IUCN	SUSTAIN programme implementation on governance, integrated natural resources management and business development in the Ihemi area of the Udzungwas.		Sustainable livelihoods. Good governance.
Kilombero Organisation for Community Development (KOCD)	Community service provision for women and children, including accountability and governance in agriculture in Kilombero District.	Environment, agriculture, good governance, health and education.	Sustainable livelihoods. Good governance.
Mtandao wa Jamii wa Usimamizi wa Misitu TanzaniaM (MJUMITA)	Community networking on participatory forest management and livelihoods, including Udzungwa communities.	Good forest governance Sustainable livelihoods Participatory forest management	Sustainable livelihoods. Buffer zone management. Policy dialogue and advocacy Community engagement in PA management. Good governance.
PAMs Foundation	Law enforcement capacity building	Anti-poaching and ranger support Human-wildlife coexistence	Sustainable finance. Community engagement in PA management. Good governance.
Reforest Africa	Forest restoration strategy development for Udzungwa – Kilombero. Magombera Nature Reserve management support. Forest restoration research.	Restoration of natural forests Sustainable livelihoods from natural forests Research	Sustainable livelihoods. Buffer zone management. PA management. Research.
SAGCOT	Public-private partnership to boost agricultural productivity in the Kilombero Valley.	Inclusive, environmentally sustainable agribusiness development.	Sustainable livelihoods. Buffer zone management.
Southern Tanzania Elephant Program (STEP)	Joint forest patrols among PAs and VGS. Enhancing human-wildlife coexistence, HEC response and mitigation. Livelihood and microfinance projects in Kilombero Valley.	Forest protection. Enhancing livelihoods. VSLAs and Conservation Agreements. Education. Kilombero Elephant	PA management. Forest protection. Buffer zone management.

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
	School and adult education programs. Conservation of elephant migratory routes in the Udzungwas. Monitoring. Led development of National HWC Strategy.	Corridor. Monitoring and research.	Community livelihoods. Education.Research.
Tanzania Forest Conservation Group (TFCG)	Environmental education, participatory forest management, reforestation and sustainable livelihood support around USNR, KNFR and Mufindi. Operational in the Udzungwas since 1995. TFCG are the Eco-School partner for Tanzania and a partner in the Mngeta reforestation project. Extensive experience in advocacy and communication work.	Sustainable livelihoods. Conservation of high biodiversity forests	Sustainable livelihoods. Environmental education. Buffer zone management. Community engagement in PA management. Policy dialogue and advocacy
Udzungwa Ecological Monitoring Centre	The field station and monitoring centre of UMNP. Established in UMNP. A partnership between UMNP, MUSE, NHMD and UNIFI.	Ecological monitoring Environmental Education Centre for researchers	Biodiversity monitoring Research Environmental Education Capacity building
WWF	Historic involvement in establishment of UMNP.	No longer active in the Udzungwas.	Policy dialogue at national level.
Overseas research institutions			
Natural History Museum of Denmark	Interdisciplinary, collection-based research. Co-manager of UEMC.	Botanical and entomological research.	Biodiversity research and monitoring.
Trento Museum of Natural History, Italy	Biodiversity research and monitoring. Co-manager of UEMC.	Long-term ecological monitoring. Primate, duiker and sengi research.	Biodiversity research and monitoring.
UNEP-WCMC, Cambridge, United Kingdom	Support to gazettement of Magombera Forest. Technical support to TFS.	Conservation monitoring	Biodiversity research and monitoring.
University of Florence, Department of Biology, Italy	Biodiversity research and monitoring. Co-manager of UEMC.	Long-term ecological monitoring. Primate, duiker and sengi research.	Biodiversity research and monitoring.

Stakeholder	Former and current work	Priorities	Potential influence on the strategy
University of Leeds, School of Earth and Environment, UK	Socio-economic research in the Udzungwas and Kilombero Valley.	Research on climate change resilience; forest and land governance.	Socio-economic research.

Annex 7. List of rivers receiving water from the three core protected areas.

River	KNFR (40)	USNFR (39)	UMNP
Chita		X	
Great Ruaha	X	X	X
Kihansi		X	
Kilombero	X	X	X
Kiluwese	X		
Londo	X		
Lukosi	X	X	
Mngeta	X	X	
Msolwa			x
Msosa			X
Mwaya			X
Njokomoni			X
Ruaha		X	
Ruipa	X		X
Rumemo	X		
Sanje			X
Sonjo			X
Uzungwa		X	

Annex 8. List of villages contiguous with the core protected areas

#	Village	UMNP	KNFR	USNR
1	Ching'anda			x
2	Chita			x
3	Ichonde	x		
4	Idegenda			x
5	Idete	x		
6	Idete A		x	
7	Idete B		x	
8	Idunda		x	
9	Ifuwa		x	
10	Igima		x	
11	Ihimbo			x
12	Ikule			x
13	Ilutila			x
14	Ipalamwa		x	
15	Isanga			x
16	Itongoa			x
17	Itonya			x
18	Kanoro	x		
19	Kibaoni	x		
20	Kiberege	x		
21	Kidatu	x		
22	Kidayi A	x		
23	Kidayi B	x		
24	Kimala		x	
25	Kipanga			x
26	Kirama	x		
27	Kisawasawa	x		
28	Kisegese	x	x	
29	Kitede			x
30	lufulu			x
31	Lulindi		x	
32	Lumemo	x		
33	Makutano			x
34	Mang'ula A	x		
35	Mang'ula B	x		
36	Mbalaji	x		
37	Mbawi			x
38	Mbingu		x	
39	Mchome		x	
40	Mhanga		x	
41	Mkalanga		x	

#	Village	UMNP	KNFR	USNR
42	Mkamba	x		
43	Mkula	x		
44	Mkula misufini	x		
45	Mngeta		x	
46	Mpofu		x	
47	Msolwa misufini	x		
48	Msolwa ujamaa	x		
49	Msosa	x		
50	Mtandika A	x		
51	Mtandika B	x		
52	Mwaya	x		
53	Namwawala	x	x	
54	Ngojengwa		x	
55	Njogi		x	
56	Nyandeo	x		
57	Ruipa	x		
58	Sakamaganga	x		
59	Sanje Barabarani	x		
60	Sanje Shuleni			
61	Siginali	x		
62	Sole	x		
63	Sonjo	x		
64	Sururu	x		
65	Udagaji			x
66	Udekwa		x	
67	Uhafiwa			x
68	Ukami			x
69	Ukwega		x	
70	Uluti			x
71	Worarisori		x	
	Total	**33**	**21**	**18**