The EAMCEF Work Across the Eastern Arc Mountains of Tanzania:

Biodiversity Conservation and Climate Change Mitigation

2021

The EAMCEF Work Across the Eastern Arc Mountains of Tanzania

Biodiversity Conservation and Climate Change Mitigation

EAMCEF (2021). The EAMCEF Work Aross the Eastern Arc Mountains of Tanzania: Biodiversity Conservation and Climate Change Mitigation. EAMCEF, Morogoro, Tanzania.

Endowment Fund Secretariat,

Plot No. 348, Forest Hill Area, Kingalu Road,
P.O. Box 6053, Morogoro, Tanzania.
Telephone: +255 (0) 23 2934274.
Cell phone: +255 (0) 755 330558.
Email: eamcef@easternarc.or.tz.
Website: www.easternarc.or.tz

Production of this book was financed by the Government of the Kingdom of Norway.

The Eastern Arc Mountains Conservation Endowment Fund is a Trust Fund that was established and functions as a long-term and reliable funding mechanism to support Community Development, Biodiversity Conservation and Applied Research Projects, which promote the biological diversity, ecological functions and sustainable use of natural resources in the Eastern Arc Mountains of Tanzania. The Endowment Fund Secretariat is located in Morogoro Municipality.

Table of Contents

Foreword

A compilation of a book like this is very much commended. I am truly humbled to welcome this book on 'Biodiversity Conservation and Climate Change Mitigation' being the product of Eastern Arc Mountains Conservation Endowment Fund (EAMCEF). This book is a helpful compilation that a wide range of stakeholders would find it useful in enhancing and sharpening their understanding of the Eastern Arc Mountains (EAMs) and the work of the EAMCEF in biodiversity conservation and how such work contributes to climate change mitigation. Policy makers, government line ministries, academia, research and development institutions, forest managers, local communities, global communities, donors, private companies and individuals will find it useful to go through the entire book and peruse on pages of their interest. The book characterizes the EAMs ecosystem as an invaluable natural environment providing tangible and intangible benefits to the local communities, the national economy and the global environment. The book provides an opportune moment as Tanzania has just graduated to the low-middle income country category, with an industrialization agenda prioritized, the Vision 2025 leading, the Third Five-Year Development Plan (FYDP III) kicking in with an aspiration of prioritizing sustainable natural resources and environmental management at the heart of development. At this time when Tanzania is setting up its Nationally Determined Contributions (NDC), this book will be useful in linking Tanzania's ambitions to pursue green growth with an ultimate goal of reduced carbon emissions and enhancing the role of forests in global carbon sequestration.

As a leader in conservation, I find this compilation providing key information under one cover thereby making it easy to build a case for conservation of the the EAMs and development of mitigation options in the forest sector – including looking at adequate incentives and options to reduce key drivers of deforestation and forest degradation. The presence of the EAMCEF as a funding mechanism for conservation of the EAMs ecosystem provides a window for the donor community, the government, private sectors and the general public to channel their resources to enhance conservation of the EAMs for biodiversity and climate services. Unfortunately, this potential has not been fully unlocked.

I encourage you to prioritize reading of this book.

Acknowledgements

With financial support from the Government of the Kingdom of Norway and other development partners we have been able to enhance biodiversity conservation of the Eastern Arc Mountains Ecosystem and ensured continued flow of ecosystem services, including carbon sequestration. With the same support, we have compiled our work and experience across the Eastern Arc Mountains of Tanzania into this book. We are grateful to the continued cooperation from the Government of the Kingdom of Norway and other development partners.

We would like to extend our gratitude to the management at E-Link Consult Limited for managing the production of this book – its expertise and dedication are highly appreciated.

To our editors and reviewers – Prof. Eliakimu Zahabu and Shukuru Nyagawa, we sincerely thank you for quality-checking the contents of the book and for additional knowledge brought into it. Your experience in the subject matter has assured credibility of our contents.

The willingness and participation of local communities across our project sites is a great asset to delivering our objectives and theirs– their testimonies included in this book were audio-recorded, transcribed and translated, we thank you for the great exchange of knowledge.

Reported achievements of our projects have been possible due to the good collaboration with our field implementing partners – the Ministry of Natural Resources and Tourism, District and Village Authorities in all project sites, NGOs, CSOs and local community groups. Much of the information regarding the Eastern Arc Mountains and the ecosystem were pooled from existing literature and recent studies funded through the EAMCEF grant support.

Graphic designing, layout and typesetting have been done by Leyuworks Studio Limited, with language editing and proofreading done by Dr. Fatuma Abdallah – we thank you so much.

Francis Sabuni
Executive Director
EAMCEF, Morogoro – Tanzania.

CHAPTER

1 Introduction

1.1. Purpose of this Book

Information about the Eastern Arc Mountains (EAMs) and the Eastern Arc Mountains Conservation Endowment Fund (EAMCEF) is very much scattered – both in print and electronic forms. Putting together this information is important for ensuring that the public is well informed of the importance of the EAMs and the role of the EAMCEF in mobilizing resources to strengthen conservation work across the EAMs ecosystem. The book pulls together information from the EAMCEF documentation, studies and relevant researches, field experience and from the voices of local communities benefiting directly from the projects. The book provides key information about the EAMs ecosystem and how the EAMCEF work contributes to biodiversity conservation of the ecosystems, and how such efforts are important for climate change mitigation. The institutional structure, facilities, available human resources, partners and local networks, and good relationship with the government at all levels make the EAMCEF a partner of choice and a sustainable funding mechanism for conservation of the EAMs ecosystem.

1.2 Organization of the Book

Key topics in this book are presented in eight main chapters.

Chapter 1 - Is an introductory chapter setting the purpose of producing this book focusing at sharing information about the EAMs and the EAMCEF work on biodiversity conservation and how it contributes to climate change mitigation. This chapter also provides a highlight of all other chapters.

Chapter 2 – Provides information about the EAMCEF – the history behind its establishment, vision on creating harmony between the people and the EAMs ecosystem. The founding objectives of establishing the EAMCEF are highlighted linked to its vision and mission with an ultimate goal of ensuring sustainability of the EAMs ecosystem and community development. In this chapter you will read about the three portfolios of work to which the EAMCEF is organized – being: (i) protected areas and climate change management, (ii) community-based conservation and development, and (iii) applied biodiversity and climate change research, are provided with examples of supported projects.

Chapter 3 – This chapter provides key information about the EAMs, providing an understanding of what are they, key features of and distribution of the 13 mountain blocks of North and South Pare, West and East Usambara, Nguu, Nguru, Ukaguru, Uluguru, Malundwe, Rubeho, Udzungwa and Mahenge in Tanzania as well as Taita Hills in Kenya. It is in this chapter where the biological diversity and endemism, economic and environmental values of the EAMs are described in order to stress the need for strong conservation measures.

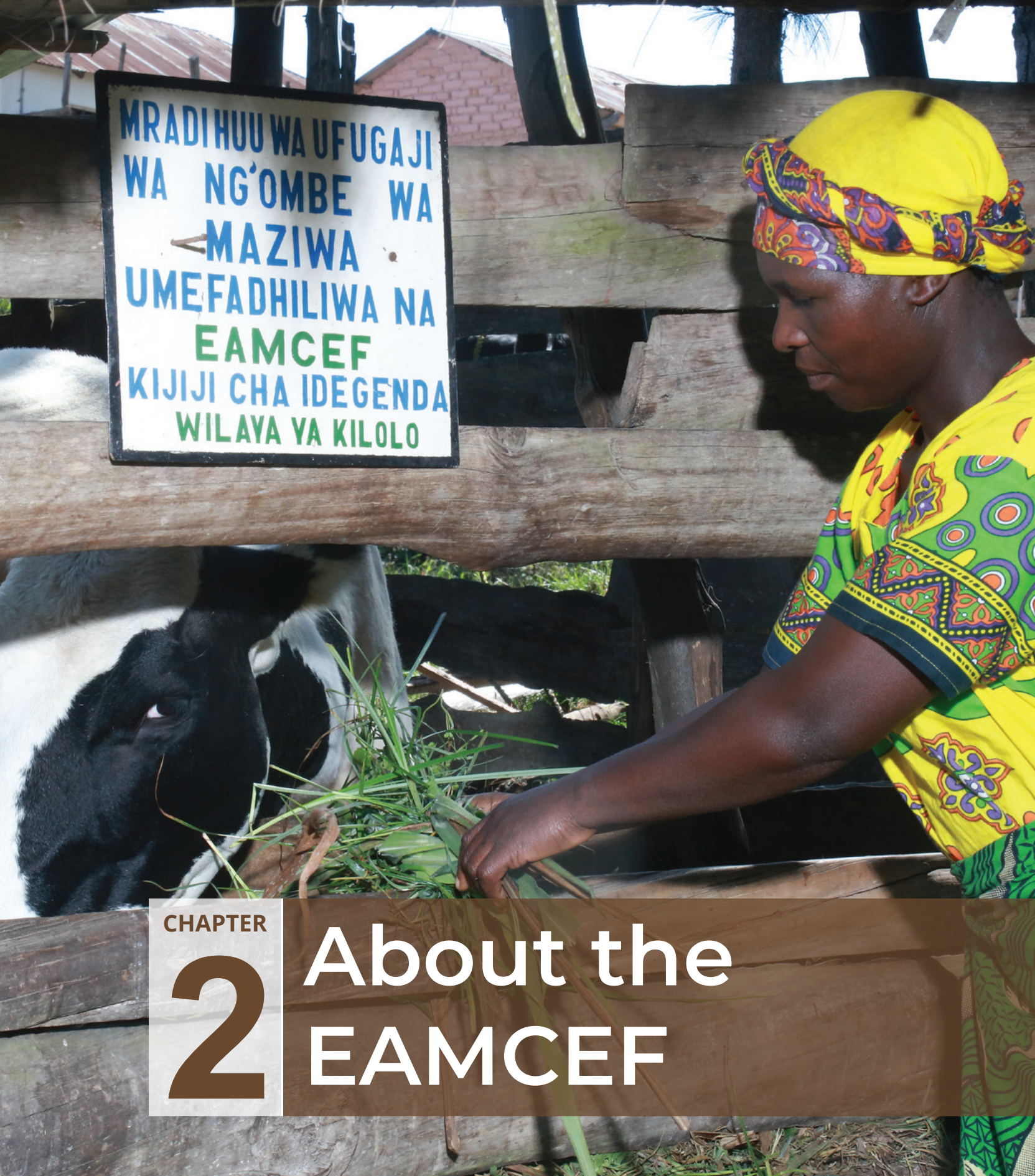
Chapter 4 – This chapter provides a snapshot of the various ecosystem services of the EAMs ecosystem – key services such as biodiversity, water, agriculture, tourism, and carbon sequestration are explained in a nutshell, and further an economic valuation is provided for such services.

Chapter 5 – In this chapter, the book describes how the work of the EAMCEF through grant support contributes to biodiversity conservation in targeted sites across the EAMs. This section also provides some examples of alternative income generating activities that community members surrounding protected areas are engaging in to reduce their dependence on forests for income.

Chapter 6 – In this chapter we try to assess the contribution of the EAMCEF in enhancing the role of forests in carbon sequestration. The EAMs forests ecosystem are carbon sinks absorbing and storing large quantities of atmospheric carbon dioxide thereby contributing to global efforts in climate change mitigation. The chapter contains some analysis of how much investment has been channelled on the biodiversity and climate mitigation components.

Chapter 7 – We included aspects of Payments for Ecosystem Services (PES). In this chapter we look at possibilities of incorporating PES aspects as mechanism to promote resource mobilization for the long-term sustainability of conservation efforts. This chapter provides some ideas on who should pay for ecosystem services, and how such payments can be done.

Chapter 8 – This is the most relevant chapter, it provides information on how the EAMCEF projects are aligned to contribute to the implementation of both national and global policies and related priorities on biodiversity conservation and climate change mitigation, including the Vision 2025, the national climate change strategy, Nationally Determined Contributions (NDCs), and Global Goals – Sustainable Development Goals (SDGs).



CHAPTER

2 About the EAMCEF

2.1 Establishment

The Eastern Arc Mountains Conservation Endowment Fund (EAMCEF) is a Trust Fund that was established and functions as a long-term and reliable funding mechanism to support Community Development, Biodiversity Conservation and Applied Research Projects, which promote biological diversity, ecological functions and sustainable use of natural resources in the Eastern Arc Mountains of Tanzania. The EAMCEF was officially registered in Tanzania on 6th June 2001, under the Trustees' Incorporation Act (Cap. 318, R. E. 2002) of the Laws of Tanzania. The Fund was originally conceived as a joint initiative of the Government of the United Republic of Tanzania, the EAMCEF Board of Trustees (BOT), the World Bank (WB) and the Global Environment Facility (GEF).

The EAMCEF operates as a Not-for-Profit Conservaton Finance Trust Organization and issues project grants to Government Departments (Central and Local Governments), NGOs, CBOs, Local Communities, Research Institutions, Academic Institutions, Private Entities as well as interested individuals. Initially, the EAMCEF operated as a component of the WB financed project entitled 'Tanzania Forest Conservation and Management Project' (TFCMP) under the Ministry of Natural Resources and Tourism (MNRT) whereby a total of USD 2.4 Million credit facility was used to finance activities and operations of its 7 years first phase (2002-2009), the establishment phase. The establishment phase concentrated mainly on getting the Endowment Fund Secretariat in place and functional – staff recruitment, office accommodation, procurement of essential equipment and basic supplies/ materials, mobilization of additional resources and establishment of operational procedures. Pilot funding for community development, biodiversity conservation and applied research projects was as well undertaken during the first phase. Funding of the second phase (the permanent phase) was initially planned to come mainly from incomes generated from the investment of the endowment capital secured from the GEF commitment of USD 7.0 million as well as additional resources acquired from other sources through fundraising activities.

In mid-2011 the EAMCEF secured a significant project grant from the Government of the Kingdom of Norway via the Royal Norwegian Embassy (RNE) in Dar es Salaam followed by a second phase from mid-2016 to May 2019 that was then extended to December 2020 through a Bridging Phase agreement. The grant funding supported the development of the EAMCEF as an effective institution that is well known around the world and able to deliver sustainable funding for the conservation of the Eastern Arc Mountains of Tanzania. It also provided project funding for the improved management of the 8 Nature Forest Reserves and 1 National Park within the Eastern Arc Mountains ecosystem, namely, Amani, Nilo, Chome, Magamba, Mkingu, Uluguru, Uzungwa Scarp and Kilombero Nature Forest Reserves and, Udzungwa Mountains National Park. The total Norwegian grant to the EAMCEF for the last 10-year (2011 – 2020) support period amounted to about USD 10.1 million.

Project support from the RNE has enabled the EAMCEF investment capital to grow from an opening value of USD 7 million (in December 2006) to USD 11 million (by June 2020) therefore, allowing the EAMCEF to realize its sustainability potentials over the next couple of years when the capital reaches the target of USD 30 million. Current efforts to reach the target are in two main lines – one, to mobilize additional resources into the existing capital, and two, to mobilize resources to support operations and projects while re-investing revenues obtained from the endowment capital.

EAMCEF is currently governed by a nine-member Board of Trustees, with a Secretariat managing day to day activities of the Endowment Fund under the leadership of an Executive Director.

The EAMCEF secretariat is based in Morogoro Municipality, Forest Hill Area, Plot No. 348, Kingalu Road.

2.2 Vision and Mission

Our Vision:

To see that, the Eastern Arc Mountains and the people who depend on them live in harmony as one sustainable ecosystem. The forests and mountains will provide goods and services – from water to electrical power, from food and cash crops to medicines - for the people of Tanzania. And the world community will benefit from a protected biodiversity hotspot and a major carbon sink reducing global warming and mitigating climate change impacts.

Our Mission:

We catalyse resources to foster conservation of forest biodiversity in the Eastern Arc Mountains of Tanzania through investment in sustainable community development and livelihood improvement, sustained financing for protected areas management and financial support to applied biodiversity and climate change research.

Our Motto:

Conserving Biodiversity for Sustainable Development

Long term strategic objectives:

- Supporting sustainable conservation and community development throughout the EAMs region through a responsive investment of US$1.5million a year.
- Enabling adjacent communities- more than 1 million people to enjoy better livelihoods and so reduce the pressure on the ecosystem.
- Ensuring that the mountains and forests, with more than 900 endemic plant and animal species, are healthy and sustainable ecosystem that helps to reduce the impacts of climate change.
- Enhancing people at local, national and international levels to understand and appreciate the importance of the Eastern Arc Mountains as a unique resource and join the EAMCEF to secure its effective conservation.

2.3 Aims and Objectives

To promote the protection of biological diversity **in the Eastern Arc Mountains, targeting priority areas of significant diversity.**

To promote the mitigation and adaptation to impacts of climate change in the Eastern Arc Mountains.

To promote the involvement of the local communities in the conservation and sustainable management of the natural resources and biodiversity of the Eastern Arc Mountains and to assist them in benefiting from such conservation and sustainable management.

To ensure benefits, whether financial, technical or material arising from the Trust's activities, pass to local communities in its areas of operation.

To provide long-term reliable support for projects and research which promote the conservation of biological diversity and sustainable use of natural resources in the Eastern Arc Mountains and contribute to the promotion of the economic and social welfare of the communities in the area.

To promote the collection and dissemination of information and advice concerning the Eastern Arc Mountains and their global conservation value.

To engage in fund-raising activities to obtain resources that shall finance the objectives of the Trust.

To enter into covenants or agreements, including but not limited to joint management agreements, leases; and licenses with other identified stakeholders, including: local communities, central and local governments, the business community, private sector and individuals, over any land and immovable property as may have been acquired by the Trust, provided always that such agreements shall be in the long-term interests of the Trust.

To provide liaison between government agencies, civil society and the private sector in conservation and environment matters.

As an insubstantial part of the activities of the Trust and only to the extent permitted by a public charity organization, **to advocate for policies, regulations and laws that are designed to promote sustainable development and conservation.**

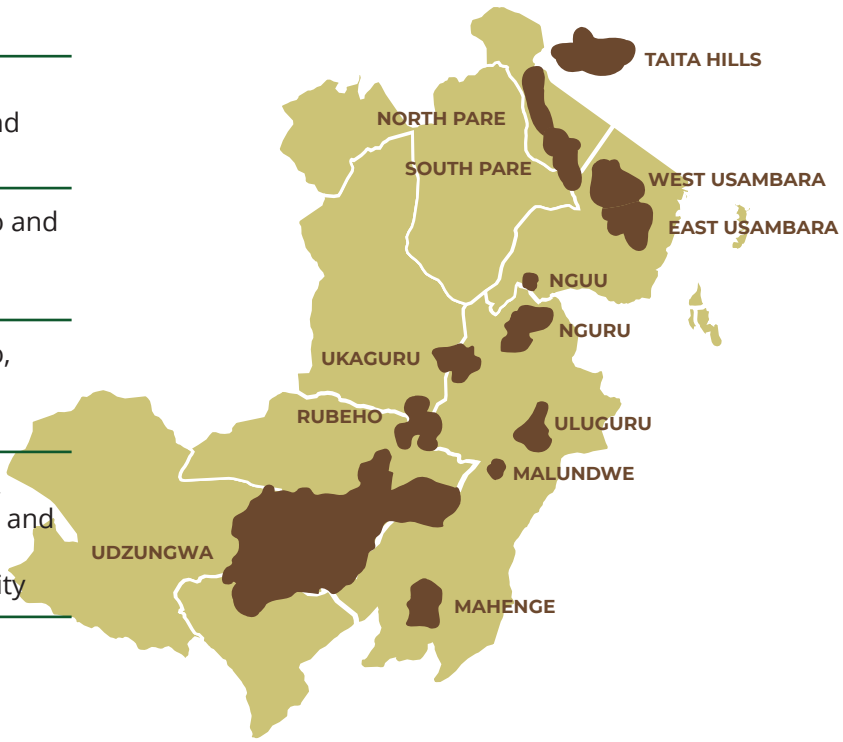
To co-operate with any person or organization with objectives similar to those of the Trust.

2.4 Where we work

We work to promote conservation, community development and biodiversity conservation researches across the Eastern Arc Mountains of Tanzania. Our field interventions have to date supported the management and conservation of the 8 Nature Forest Reserves and 1 National Park across the Eastern Arc Mountains of Tanzania as well as by involving and supporting the target communities in eleven District Councils adjacent to the priority forest sites. The target districts are Mkinga, Muheza, Korogwe, Lushoto, Same, Mvomero, Morogoro, Morogoro Municipality, Kilombero, Mufindi and Kilolo (Table 2.1). Current estimates indicate that a population of around 629,145 people live in the targeted sites where the EAMCEF is operating.

Table 2.1: Areas of work

Protected Area	Mountain Block	Districts
Amani Nature Forest Reserve (ANFR)	East Usambara Mountains	Korogwe and Muheza
Nilo Nature Forest Reserve (NNFR)	East Usambara Mountains	Korogwe, Mkinga and Muheza
Kilombero Nature Forest Reserve (KNFR)	Udzungwa Mountains	Kilombero and Kilolo
Uzungwa Scarp Nature Forest Reserve (USNFR)	Udzungwa Mountains	Kilombero, Kilolo and Mufindi
Uluguru Nature Forest Reserve (UNFR)	Uluguru Mountains	Mvomero, Morogoro and Morogoro Municipality
Mkingu Nature Forest Reserve (MkNFR)	Nguru Mountains	Mvomero
Magamba Nature Forest Reserve (MNFR)	West Usambara Mountains	Lushoto and Korogwe
Chome Nature Forest Reserve (CNFR)	South Pare Mountains	Same
Udzungwa Mountains National Park (UMNP)	Udzungwa Mountains	Kilombero and Kilolo



2.5 Main Thematic areas

The EAMCEF work is organized around three main portfolio or thematic areas intertwined to bring about environmental conservation, knowledge and reduced poverty of communities living adjacent to targeted sites across the Eastern Arc Mountains. This book focuses on Biodiversity Conservation and Climate Change Mitigation, but we would like to provide a highlight of the three thematic areas we work on – as follows:

Thematic Area 1: Conservation of Protected Areas and Mitigation of Climate Change

Under this category our work and support aim at improving the ecological functions of the ecosystem and to strengthen the management capabilities of the responsible institutions – thereby enhancing the resilience of the ecosystem to climate change impacts while maximizing potential mitigation functions. We support Protected Areas (Forest Nature Reserves and National Park) to manage their forest boundaries by installing beacons, planting boundary trees, buffer area management, boundary clearing to allow visibility; to establish and manage nature trails used for walking safaris, forest walk and bird watching. This support also helps protected areas to undertake forest surveillance and joint patrols with local communities; rehabilitation of degraded forest areas resulting from illegal mining activities within the reserves. Through this support, we help the management of the reserves to enhance their financial sustainability by supporting ecotourism and marketing – with activities such as campsite establishment and improvement, tourism promotion, infrastructure development through regular maintenance of driveways (Box 2.1).

Box 2.1. Examples of Projects under Conservation of Protected Areas and Mitigation of Climate Change

- Boundary survey
- Boundary maintenance
- Boundary marking
- Nature trails establishment
- Nature trails maintenance
- Rehabilitation of degraded areas
- Forest surveillance
- Campsite improvement and management
- Infrastructure development
- Campsite establishment
- Ecotourism marketing

Thematic Area 2: Community Development and Conservation

This theme contains projects dedicated to putting local communities at the heart of conservation by supporting alternative economic activities that would accelerate the improvement of rural livelihoods and social welfare of forest adjacent communities. Alternative livelihood activities are keys to reducing total dependency on forest products such as cutting of trees for charcoal and firewood (which results into forest degradation).

The EAMCEF channel grants to support small-scale alternative income generating activities which link well with forest conservation, such as beekeeping activities, production of biogas from animal wastes, butterfly farming, soil and water conservation agriculture, awareness activities and conservation education, fish farming practices, adoption of locally-made fuelwood energy efficient stoves, horticulture farming, land use planning, livestock keeping (dairy goats, dairy cows, pigs and poultry), spice tree farming, sunflower farming for oil production, soya beans farming, mushroom farming and tree planting activities for business (Box 2.2).

Box 2.2. Examples of Projects under Community Development and Conservation theme

- Beekeeping activities
- Tree planting
- Improved stoves
- Fruit production
- Fish farming
- Local chicken keeping
- Capacity building
- Horticulture
- Reforestation and rehabilitation
- Environmental conservation
- Agroforestry
- Biogas technology
- Hybrid chicken
- Dairy goat keeping
- Pig production
- Butterfly farming
- Ex-situ conservation
- Soil and water conservation in agriculture
- Spice tree farming
- Sunflower farming
- Soya beans farming
- Enterprise development
- Land use planning

Thematic Area 3: Applied Biodiversity and Climate Change Researches

The EAMCEF supports scientific and social-economic researches relevant to the conservation of biodiversity and sustainable use of natural resources in the priority Eastern Arc Mountains. This category support studies such as those on: carbon storage potential of the EAMs, Climate Change Impacts and Mitigation researches, Biodiversity conservation, vegetation recovery, economic researches such as on opportunity costs, policy and regulations, and payment for ecosystem services.

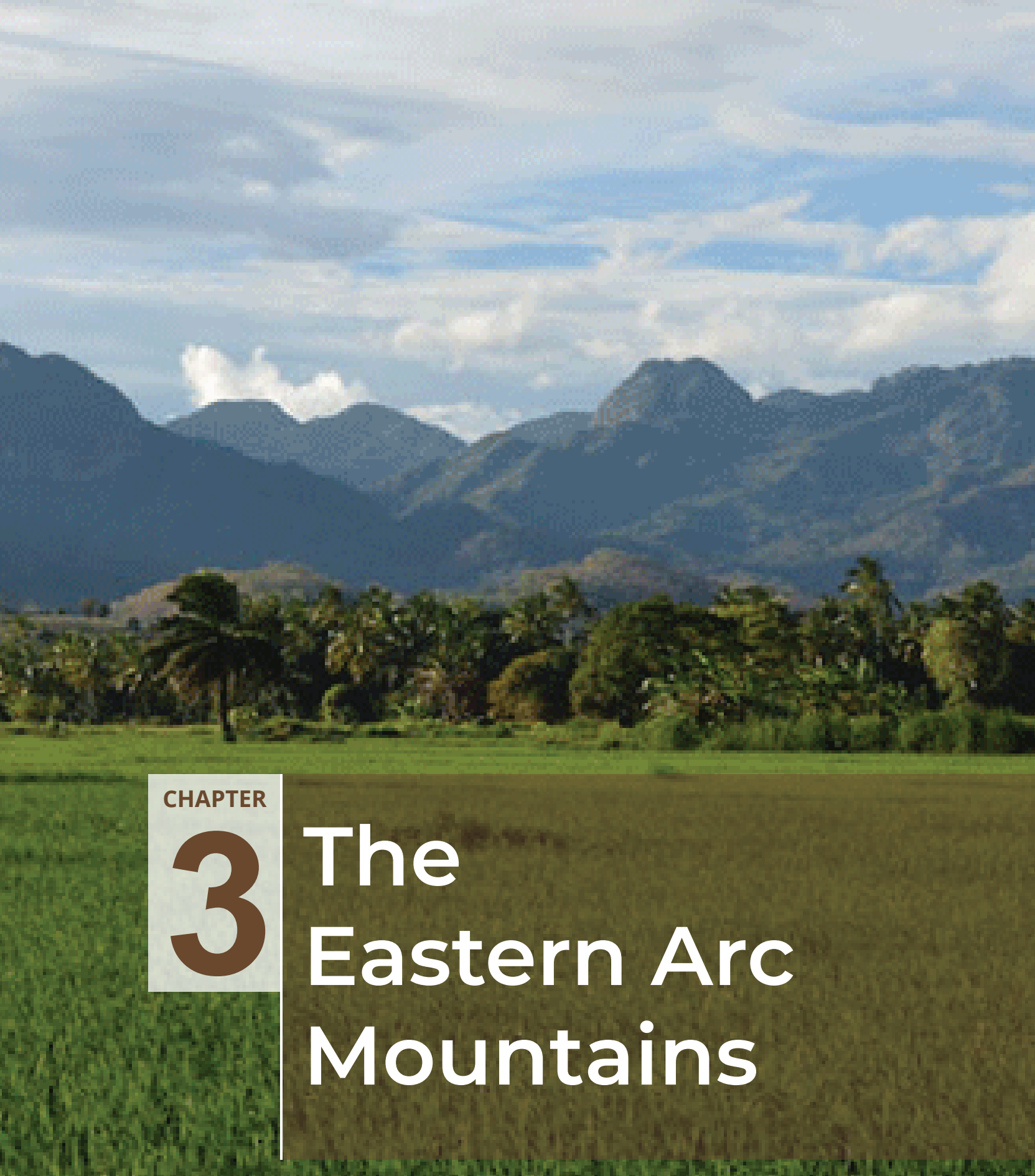
During the 2011-2020 period, over 21 researches supported through the EAMCEF were completed, and their results provided evidence for informed decision making, and shared in-depth understanding of the various issues across the EAMs.

2.6 Types of Grants offered

The EAMCEF provides three types of grants as part of its overall programme efforts – Micro grants, single year or discrete project grants, and multi-year programme grants (Table 2.2). Disbursement of funds for project implementation is currently done in two tranches – 50% at the beginning of the projects and another 50% upon liquidation, reporting and satisfactory delivery of the intended outputs/results. Initially, our mode of disbursement was in three tranches of 40%, 30% and 30%, depending on the financial needs of each project and performance.

Table 2.2. Type of grants offered by EAMCEF

Type of grant	Amount offered	Description
Micro – Grants	TZS. 10 million (eqv. USD 4,348)	The EAMCEF provides a significant amount of its available resources for micro grants to support small-scale efforts within each of the three Thematic Areas. Micro-grants can also be provided to conduct feasibility studies and analyses. **Project duration: 0.5-1 year**
Single Year or Discrete Project Grants	Amounts exceeding TZS. 10 million and up to TZS. 100 million per year (between USD 4,348 – 43,478)	The EAMCEF supports discrete, one-time projects whose project life will generally not extend 18 months within the three Thematic Areas. Generally. Grants are provided per annum, not exceeding TZS 100 million. **Project duration: 1-3 year**
Multi-Year Programme Grants	Amounts exceeding TZS. 10 million and up to TZS. 100 million per year (between USD 4,348 – 43,478)	The EAMCEF will provide multi-year funding for projects, or programmes, that will require several years to yield results, or which require multiple year funding to ensure sustainability and achievement of objectives. Grants are provided per annum, not exceeding TZS 100 million. **Project duration: 3-5 years**



CHAPTER

3

The Eastern Arc Mountains

3.1 What are the Eastern Arc Mountains

Tanzania's natural resources base is invaluable and critical for socio economic development of the present and future generations – from the endless plains of arable lands, the forest landscapes, the deep ocean and extensive fresh water bodies, the rich wildlife resources, mineral deposits and natural gas reservoirs, the solar energy potential, to valleys and mountains across the country, among others, are all painting a colourful picture of this truly endowed East Africa's country. Talking of the mountains which is the focus of this section, the Kilimanjaro free standing mountain with its three main peaks of Kibo, Mawezi and Shira is well known globally as a unique tourism destination and for being the highest point in Africa (5,895 m above sea level) referred to as the 'roof of Africa'. Apart from the famous Kilimanjaro Mountain, we are glad to dedicate this chapter to introduce to you the Eastern Arc Mountains – abbreviated as EAMs.

From the ancient times in history, stretching from Southern Tanzania to South East Kenya, covering an area of up to 23,000 square kilometres, an arc-like chain of mountain blocks exists – hence the name Eastern Arc Mountains. They are formed by 13 Mountain blocks of North and South Pare, West and East Usambara, Nguu, Nguru, Ukaguru, Uluguru, Malundwe, Rubeho, Udzungwa and Mahenge in Tanzania as well as Taita Hills in Kenya. That is to say, the Tanzania's side is covered by 12 mountain blocks with only 1 block standing on the Kenya's side. On the Tanzania's side the mountain blocks are located between 34.5°-36.5° E and 3°-9° S and spread in over fifteen districts in five regions of Tanzania namely, Tanga, Kilimanjaro, Morogoro, Dodoma and Iringa. Most of the mountain blocks derive their names from the main tribes occupying them.

The EAMs are covered by rainforests and grasslands believed to have survived for over 30 million years, and that in biogeography it is believed that these forests and those in Congo Basin and West Africa were once connected as one large ecosystem. In 2010, estimates indicated that over 200 people per square kilometre, and in some cases reaching 300-400 people per square kilometre was estimated (URT, 2010). Globally, the EAMs are among the most important areas for the conservation of biological diversity and for reducing the global carbon dioxide emissions through carbon sequestration activities. At the national level, the mountains are socially and economically critical – more details are provided in following the chapters.

Key features of the EAMs are indicated in Box 3.1

BOX 3.1: KEY FEATURES OF THE EAMs

13 Blocks:
of separate mountain blocks forming the EAMs

12 Blocks:
of the EAMs blocks are within Tanzania

152 million tons of carbon:
Estimated to be stored in the EAMs forests, potential for climate change mitigation

600km:
of a broad arc formed by the EAMs blocks

23,000 Sq. km:
total area covered by the EAMs blocks

40 percent:
of the Tanzania's remaining tropical high forests are within the EAMs blocks

535 Sq. km:
of the EAMs blocks are covered by tropical forests

200 tons of carbon:
Released into the atmosphere per each hectare degraded

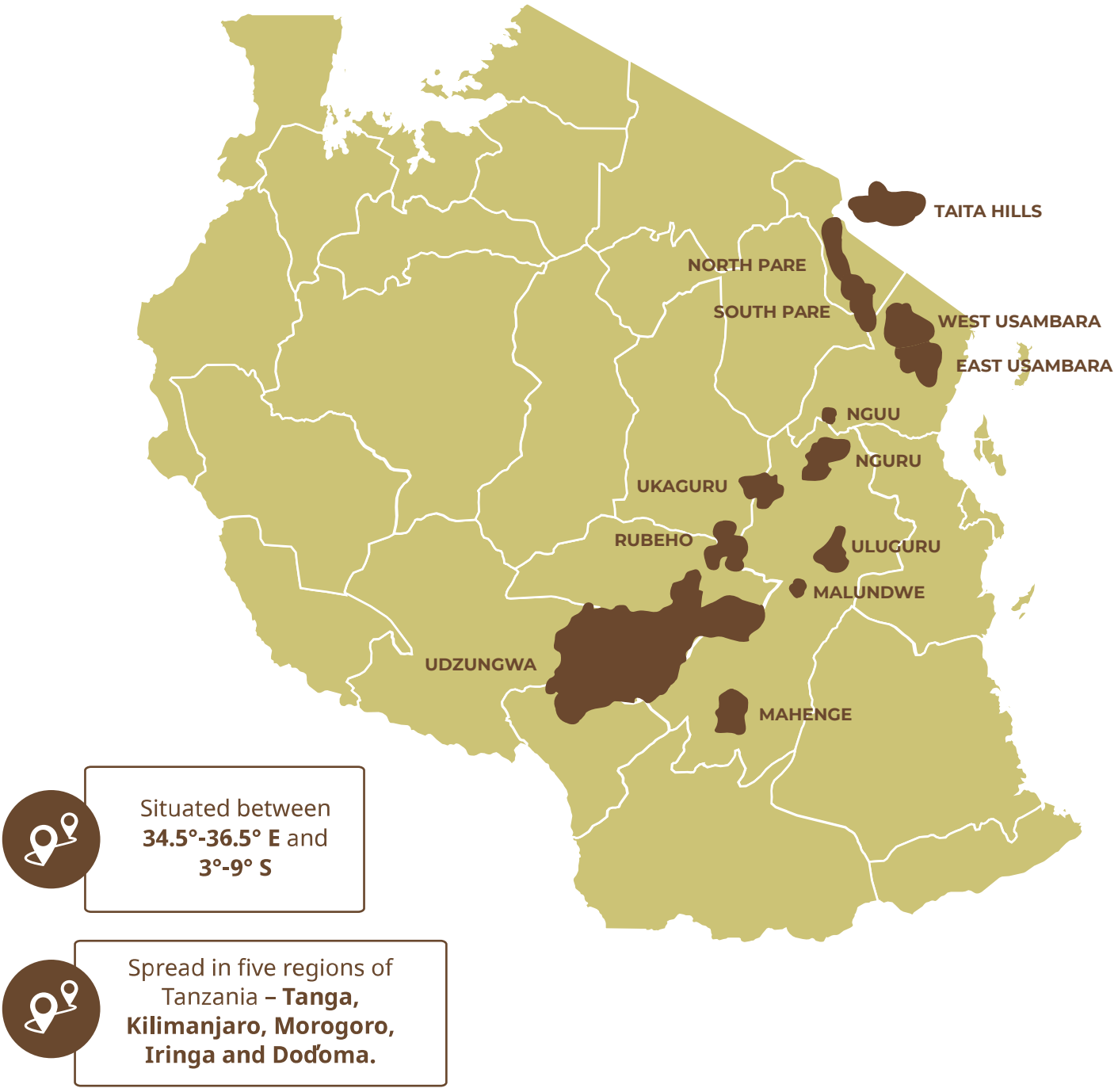
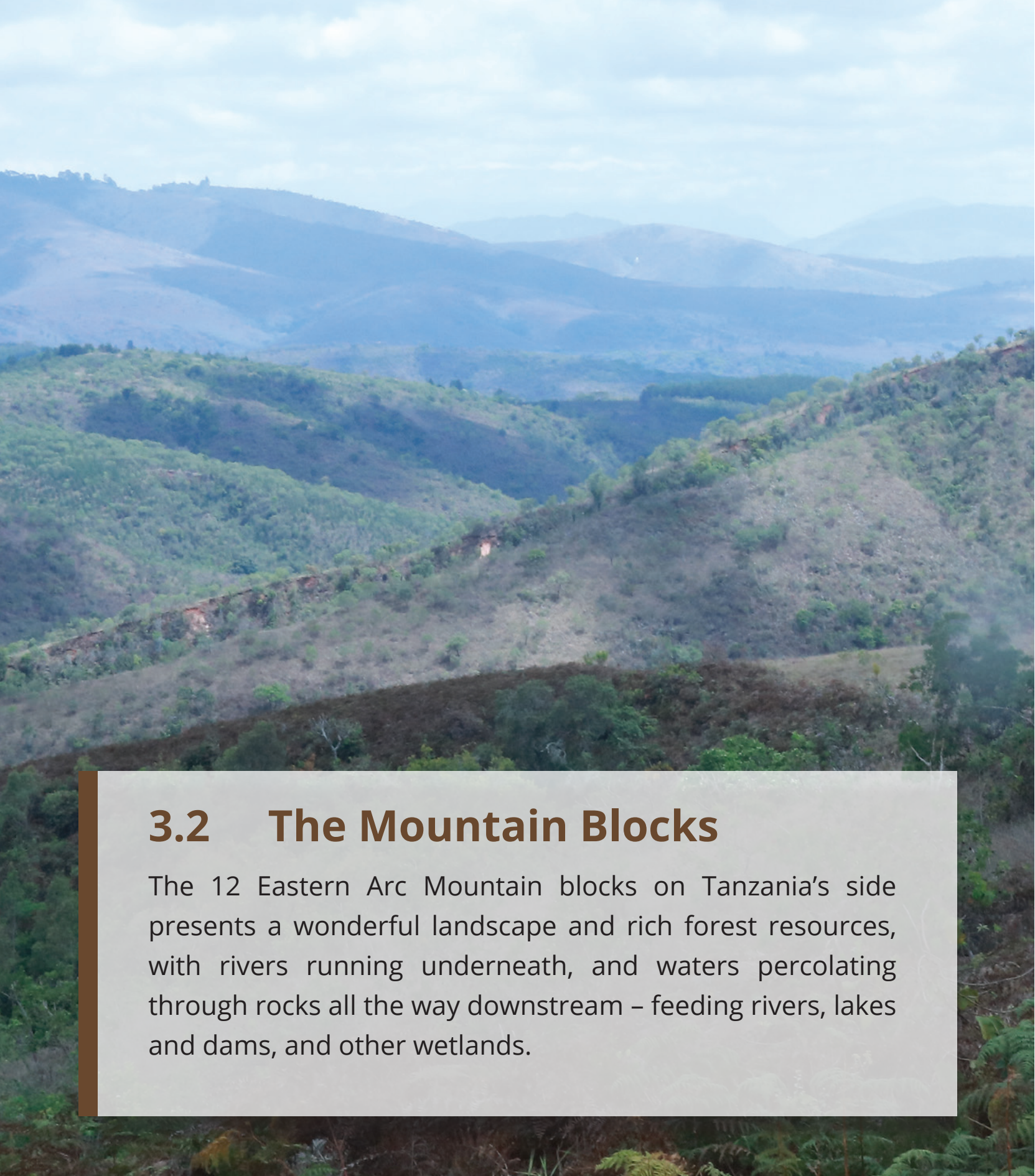


FIGURE 3.1: Sketch map of Tanzania showing an arc-like positioning of the 13 blocks forming the EAMs (Source: EAMCEF, 2020)



3.2 The Mountain Blocks

The 12 Eastern Arc Mountain blocks on Tanzania's side presents a wonderful landscape and rich forest resources, with rivers running underneath, and waters percolating through rocks all the way downstream – feeding rivers, lakes and dams, and other wetlands.

North Pare Block

The North Pare Block is found in Kilimanjaro Region and wholly confirmed to Mwanga District, with heights ranging from 500 - 2,113m above the sea level, the block forms the Northernmost tip of EAMs on Tanzania's side, bordering the South Pare to the South - East and Taita Hills to the North East. The block is covered by six main forests/and forest reserves of Kindoroko, Minja, Mramba, Kiverenge, Kamwella I, and Kamwella II together covering an area of land approximately 7,407 ha – all being under the Central Government ownership as Forest Reserves. Other small forest patches exist. In terms of the habitats, the forests of the North Pare block range from montane forests to dry montane forests and dry woodlands and heathlands with species such as *Prunus africana, Albizia gummifera, Newtonia buchananii*. Generally, this block has quite drier forests unlike other blocks within the Eastern Arc range.

Biodiversity researches conducted in this block revealed the existence of only 3 species of vertebrates that are endemic to the Eastern Arc Mountains, with low rates of endemism in plants. The forests present an opportunity for further researches as many of the forests have not adequately been explored to fully establish their biological diversity, particularly for amphibians, reptiles, and plant species.

South Pare Block

Bordering the North Pare to the North-West, the South Pare mountain block is also found in Kilimanjaro Region but confirmed to Same District, with its highest point reaching an altitude of up to 2463 m above the sea level. It is in the South Pare block where the famous Chome Nature Forest Reserve is found, with ten other forest reserves namely - Chambogo, Kiranga-Hengae, Chongweni, Kankoma, Kisiwani, Vumari, Kwizu, Maganda, Kwamwenda, and Mwala. On the village lands exist three main Village Forest Reserves of Dido, Mambugi, and Ishereto – together making a forest area of more than 27,168 ha. In terms of the habitats, the forests of South Pare range from sub-montane to montane and upper montane, with areas of montane heathlands in Chome Nature Forest Reserve. Common tree species include *Parinari excelsa* in the sub-montane forest and species such as *Octotea usambarensis, Albizia gummifera* and *Podocarpus latifolius* in the montane forests.

Existing information indicates that the biodiversity values of the South Pare Mountains are rated moderate with 1 strictly endemic vertebrate animal - the South Pare white-eye (*Zosterops winifredae*) and three other vertebrate species that are confined to the Eastern Arc Mountains. As it is in the case of North Pare, the South Pare block has similarly low rates of plant endemism, with only one Eastern Arc endemic tree known.

Unlike other forests in this block, the Chome Nature Forest Reserve has been well surveyed and categorized as the most species-rich forest in this block and was gazetted as a Forest Reserve during the colonial time in 1951. More studies on amphibians and reptiles are needed to fully establish the potential of the South Pare biodiversity.

West Usambara Block

The western part of Usambara, mainly in Lushoto District (in Tanga Region) gives rise to West Usambara mountain block, with a smaller portion extending to Korogwe District, rising to an altitude of up to 2200m above the sea level. The West Usambara Mountains contain one Nature Reserve (Magamba) and 20 gazetted Forest Reserves, namely: Mzinga, Baga–I, Baga–II, Kisima Gonja, Balangai West, Mkusu, Ndelemai, Shagayu, Shume plantation, Mweni Gombero, Kisimagonja, Kikongoloi, Manka, Bombo Makole, Baghoi, Kwebagu/Hebangwe, Kwenyashu, Shambalai, Mtumbi, and Kitara ridge. Outside government-owned forest reserves, surrounding villages manage their forests within their village

lands, including one private forest called Mazumbai owned by Sokoine University of Agriculture. The total area of reserves in Lushoto District is 38,087 ha. On the Korogwe side, 7 Forest Reserves of Bumba Mavumbi, Mafi Hill, Mahenzangulu, Vugiri, Balangai East, Mgombani, Ndolwa and 3 Private (tea estate) forests (Ambangulu, Dindira and Lutindi) exist, making coverage of another 11,045 ha of land under some forms of conservation.

In terms of habitats, the forests of the West Usambara block are diverse and range from sub-montane to upper montane in type. These forests are of a wetter type than those of the Pare Mountains further west. Common trees in sub-montane forest are *Newtonia buchananii, Parinari excelsa, Albizia gummifera* and *Allanblackia stuhlmannii.*

The West Usambara Mountains have high biodiversity value and support 5 strictly endemic vertebrates and another 19 species that are only found in the Eastern Arc. There are also 27 Eastern Arc endemic trees. This high biodiversity value is also found in invertebrates, shrubs and, herbs. Some parts of the West Usambara forests have been well studied over the past 100 years but more studies on amphibians, reptiles and plant species are needed.

East Usambara Block

The East Usambara Mountains are almost entirely within Muheza District in Tanga region, apart from some smaller parts in the west that fall in Korogwe and Mkinga Districts. The mountains rise to an altitude of 1,506 metre above the sea level at Mt. Nilo.

In Muheza District, the East Usambara contain two Nature Forest Reserves (Amani and Nilo), 12 Forest Reserves (Bamba, Derema, Kambai, Kwamgumi, Segoma, Semdoe, Mtai, Mkinga, Manga, Mlungui and Longuza Teak plantation), four Village Land Forest Reserves (Kizee, Kizangata, Mfundi and Handei), and two private (tea estates) forests (Magoroto and Kwamtili). The total area covered by these forests is around 31,000 ha. Most of the Nilo Nature Forest Reserve and part of Amani Nature Forest Reserve fall within Korogwe and Mkinga Districts, but the only East Usambara forest reserve that wholly falls within Korogwe is Bombo West with a total area of 3,523 ha.

The forests of the East Usambara Mountains range from lowland areas at an altitude of 300 metre above the sea level on the east side, through sub-montane forests to the montane forests of Nilo. Tree species composition of these forests varies considerably, but species such as *Khaya anthotheca, Milicia excelsa* are found in the lowlands and others such as M*yrianthus holstii, Albizia gummifera, Allanblackia stuhlmannii* and *Newtonia buchananii* dominate at higher altitudes.

The East Usambara forests are globally recognised for their exceptional biodiversity importance. The mountain forests contain at least 7 strict endemic vertebrates and a further 28 species that are confined to the Eastern Arc or East Usambara lowland forests. There are also 40 Eastern Arc endemic trees. Similarly, high rates of endemism are also seen in invertebrate animals and plants such as shrubs and herbs. The montane forests grade into lowland forests on the eastern margin of the mountain, and these lowland forests also have exceptional biological importance. As it was the case with West Usambara, some parts of the East Usambara forests have been well studied over the past 100 years but more studies on amphibians, reptiles and plants species are needed.

Nguu Block

The Nguu Mountains are found in Kilindi District in Tanga Region. This mountain block ranges up to 1550m altitude above the sea level. Most areas of forest outside the reserve network or small patches of forest set aside for traditional purposes have been cleared for farmland.

The Nguu Mountains contain 11 Forest Reserves, covering around 30,337 ha, the Reserves are namely: Kilindi, Kwediboma, Mkuli West of River, Mkuli Extension, Mkongo, Mbwegere, Nguru North, Derema, Pumula, Rudewa South and Jungu. Habitat-wise, the forest of these mountains is primarily sub-montane in character, grading into lowland forests around the mountain bases and along watercourses. Lowland trees include *Milicia excelsa* and *Khaya anthotheca*, and sub-montane forests are dominated by *Newtonia buchananii* with other species such as *Albizia gummifera*.

Existing knowledge indicates that, the biodiversity value of the Nguu Mountains is only moderate, with seven Eastern Arc endemic species occurring. For trees there are six Eastern Arc endemic species recorded. The Nguu block presents opportunity for further studies.

Nguru Block

The Nguru Mountains are located in the Mvomero District in Morogoro Region. There is the main Nguru block and a large isolated outlier at Kanga. These mountains range up to 2,400 m altitude above the sea level in Nguru South. The forest vegetation is estimated to cover up to 31,409 ha, but with highly varying habitats according to altitude. Lowland rain forest occurs between 300-900 m in valleys of the eastern slopes. Submontane forest covers a large area between 900 m and 1400 m in the eastern valleys with fragments on the western slopes at 1400-1500 m.

The Nguru Block contains the Mkingu Nature Forest Reserve and two central government-managed 'catchment' Forest Reserves of Kanga and Magotwe. Montane forest occurs between 1400 and 1800 m with a moss-covered upper montane forest at higher altitudes, and drier montane forests on the western side at 1600-2000 m. Heathland occurs on the upper ridges above 2000 m, with some isolated stands as low as 1200 m where soil conditions do not permit forest growth.

In terms of biodiversity, the Nguru Mountains are rated to have fairly high importance. Current knowledge indicates that there are 15 Eastern Arc endemic species in these mountains. For trees, there are also 25 Eastern Arc endemic species. These totals will increase once findings from various studies undertaken within the Nguru block are described, but this block provides opportunity for further studies.

Ukaguru Block

The Ukaguru block is found within the Kilosa District of Morogoro Region. It is an elongate ridge extending up to 2,250 m altitude above the sea level. In this block, the government of Tanzania declared up to 18,168 ha of six Forest Reserves namely - Ikwamba, Mamboto, Mamboya, Mamiwa Kisara North, Mamiwa Kisara South, and Uponera as forest reserves for water catchment protection. There is also a softwood plantation (Ukaguru) in the mountains that occupies an additional 3,600 ha. In terms of habitats, the main Ukaguru ridge is largely covered by forest with moist forests on the wetter eastern side. Heathlands occur on the summits with upper montane forest. Montane forest and dry sub-montane forest occur on the lower slopes. The drier southwest slopes of the whole ridge are covered by dry evergreen forests, bushes, and wooded grasslands. In terms of biodiversity, the Ukaguru forests support one strictly endemic animal and a further nine Eastern Arc endemic species. For trees, there are at least four Eastern Arc endemic species, with a possibility of two other strict endemic amphibians yet to be described. Some of the forests of this range, in particular, those of Mamiwa-Kisara South are biologically unexplored and might support additional species of interest. Further studies are therefore required for this block

Uluguru Block

The Uluguru Mountains are largely found within Morogoro District, Mvomero District, and Morogoro Municipality – all within Morogoro Region. The main Uluguru Mountain is a ridge running approximately north south and rising to 2,630m altitude above the sea level at its highest point. The greater Uluguru area also includes several of isolated massifs surrounding the main block – Kitulangh'alo, Dindili, Mkumgwe, Mindu, and Nguru ya Ndege

The Uluguru range contains one Nature Forest Reserve (formed of Uluguru North, Uluguru South, and Bunduki Forest Reserves with a corridor across the Bunduki Gap) that is found in both Morogoro and Mvomero districts and Morogoro Municipality. Besides, there are five Forest Reserves supporting Eastern Arc forest habitats within Morogoro District – these Reserves are Kasanga, Mkangala, Mlaliwila, Ngambaula, Tongeni River). Within Morogoro District, the forests are also found in five outlier mountain block reserves (Mkungwe, Nguru ya Ndege, Dindili, Kitulang'halo, Mindu). In total, these reserves cover 35,700 ha.

Within Mvomero District five more Forest Reserves are found on the main Uluguru ridge (namely, Bunduki I-III, Bunduki IV, Bunduki V, Bunduki VI, and Shikurufumi), covering around 280 ha.

The habitat of the Uluguru block is extremely variable, ranging from drier lowland coastal forest habitats, to transitional rainforests, to sub-montane, montane, and upper montane forest types. It also includes an area of Afromontane grasslands on the Lukwangule plateau. All these habitats are rich in endemic species and are all of the high conservation priority.

In terms of endemic species, the Uluguru Mountains possess at least 14 strictly endemic vertebrate species with at least 3 additional species that have not yet been described. Further 16 Eastern Arc endemic species have also been identified in this mountain. There are also at least 26 Eastern Arc endemic trees. The forests of the main ridge are quite well known biologically, although each new survey continues to find additional species. The outlying blocks are poorly known, with some having almost no biological investigation.

Malundwe Block

The Malundwe block is within Mikumi National Park, in Morogoro Region, and is the relatively small (less than 10 square kilometres) area of forest, at an altitude ranging from 800 to 1250 metre above the sea level. The forests of the Malundwe block are less researched, with only 4 known Eastern Arc endemic trees.

Rubeho Block

This mountain range is found on both sides of Kilosa District (Morogoro Region) and Mpwapwa District (Dodoma Region). The Rubeho Mountains include a main highland area and various isolated ridges and massifs, such as Mang'alisa, the Kiboriani Mountains, Pala-Ulanga (East), and Wota (West). The highest point within these areas is 2,225 metres above the sea level.

The Rubeho Mountains contain 2 Forest Reserves in Kilosa District (Pala-Ulanga, and Ukwiva) covering an area of 66,316 ha. The Ilole area on the main massif supports an important area of unprotected Eastern Arc forest habitat. There are also 3 further forest reserves in Mpwapwa District (Mafwomero, Mang'alisa, and Wota) which make up to 9,249 ha of forested land. There is also a proposed Kiboriani Forest Reserve which includes 56,000 ha of woodland with Eastern Arc forest and grassland habitats at higher altitudes.

In term of habitats, the vegetation of the Rubeho Mountains contains a number of different types of forest. In Ukwiva trees include *Agauria salicifolia, Aphloia theiformis, Bridelia micrantha, Catha edulis, Diospyros whyteana, Halleria lucida, Macaranga kilimandscharica, Maesa lanceolata, Maytenus acuminata, Nuxia congesta, Parinari excelsa, Polyscias fulva, Rapanea melanophloeos* and *Xymalos monospora.*

In terms of biodiversity value, the Rubeho block and outliers are known to support 1 strictly endemic vertebrate animal and 10 Eastern Arc endemic species. Much more remains to be discovered on the amphibians, reptiles and especially plant, a thorough scientific investigation is likely to reveal further new species.

Udzungwa Block

This is the largest of the Eastern Arc blocks stretching across four Districts in central Tanzania – a small part is within Kilosa District and a strip of land is within Kilombero District (both in Morogoro Region) and the rest is found in Kilolo and Mufindi Districts of Iringa Region. The Udzungwa Mountains rise to 2,230 m altitude above the sea level and there is a large plateau area above 1,500 m altitude.

The Udzungwas contain several reserves in different categories of management, such as the Udzungwa Mountains National Park found in Kilombero and Kilolo Districts and covers 190,000 ha. There is also the Kilombero Nature Forest Reserve (around 178,000 ha) and the Uzungwa Scarp Nature Forest Reserve.

In Kilombero District there are also three catchment forest reserves (Iwonde, Nyanganje and Ihanga) containing forest. There are also 27 Forest Reserves, Village Forest Reserves and many private forests in Mufindi District. Furthermore, an additional nine Forest Reserves and proposed forest reserves are found in Kilolo District (Mlali, Image, Kilanzi Kitungulu, Kisinga-Lugalo, New Dabaga, Ulagambi, Kitemele, Kawemba, Kitonga and Kimala), containing a mixture of forest and grassland.

The vegetation of the Udzungwa Mountains is exceptionally variable, ranging from lowland forests, through sub-montane, montane and to upper montane forests. There are also extensive areas of montane grassland of various types, montane wetland areas, and heath-lands. At lower altitudes the vegetation grades into various forms of woodlands.

In terms of endemic species, the Udzungwa Mountains support 15 strict endemic vertebrate species (with an additional two species being described), further 27 Eastern Arc endemic vertebrate species and 36 Eastern Arc endemic trees. Some of the forests are relevantly well known, but a number of other forest areas are still largely unexplored biologically. This includes the large forest block on the Luhomero massif and many of the smaller forest reserves. The National Park is also not completely surveyed.

Mahenge Block

The Mahenge massif rises up to 1,040 metre altitude above the sea level. It is entirely located within Ulanga District in Morogoro Region and makes the southernmost isolated outlier of the Eastern Arc Mountains, covering 2,802.3 km^2. This mountain block is bordered by the Kilombero Valley (the largest freshwater wetland at low altitude in East Africa) to the west, separating this mountain block from the Udzungwas; and by the Selous Game Reserve to the east and south. The Mahenge Mountains are continuous with the Mbarika Mountains to the east, part of the mountain complex located to the north of Lake Nyasa.

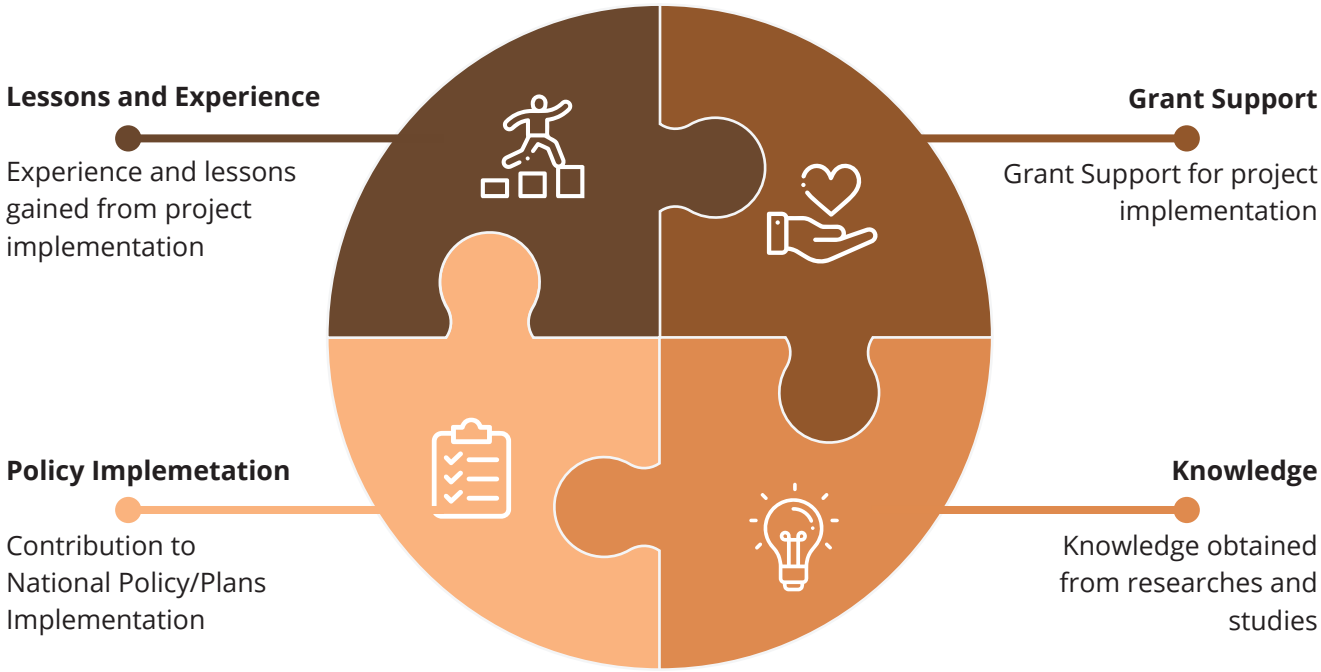
The mountains contain 7 catchment forest reserves covering up to 4,956 ha of land – namely, Ligamba, Mahenge scarp, Mselezi, Muhulu, Myoe, Nawenge, and Sali. These reserves contain lowland, sub-montane and some montane forest, although most of the forests are small and often heavily degraded.

In terms of biodiversity value, the Mahenge massif has relatively low value on endemic vertebrates. It has 2 Eastern Arc endemic vertebrates and 5 Eastern Arc endemic trees. However, not all the forests have been surveyed to fully discover the existing biodiversity.

CHAPTER

4 Forest Ecosystem Services

4.1 EAMCEF Experience



Over the last 10 years (2011-2020), under the Norwegian support, the EAMCEF has gained sufficient experience in managing and issuing grants to implementing partners in order to support projects which contribute to strengthening of conservation of the Eastern Arc Mountains Ecosystem. Through effective conservation, the ecosystem continues to provide various environmental services.

The EAMCEF as a grant administrator provides a platform at regional, district and community levels within project areas to collaborate and join efforts in supporting conservation of the EAMs ecosystem while improving livelihood of the surrounding communities. This has enabled to demonstrate how to achieve ownership and buy-in by local communities.

Through support on research studies across the EAMs, sufficient knowledge has been extracted to provide for more understanding of the important variables and dynamics within the arc, as well as en hancing informed decision-making processes.
By supporting conservation efforts, the EAMs ecosystem maintains a healthier state thus providing habitat for plants and animal species some of which are endemic species. The endemism is important in biodiversity conservation because some species are naturally found only in certain areas. Although some plants and animal species can be taken to and exist in another area, there are ecological differences found only on their natural habitats.

Recently, the EAMCEF has been striving to shift from understanding of biodiversity functions of the EAMs, and its hydrological and ecological roles into economic values of such services, which will ultimately trigger development of economic models of conservation in order to ensure that the EAMs ecosystem pays for itself. This is considered more important in providing for constructive policy advices and recommendations.

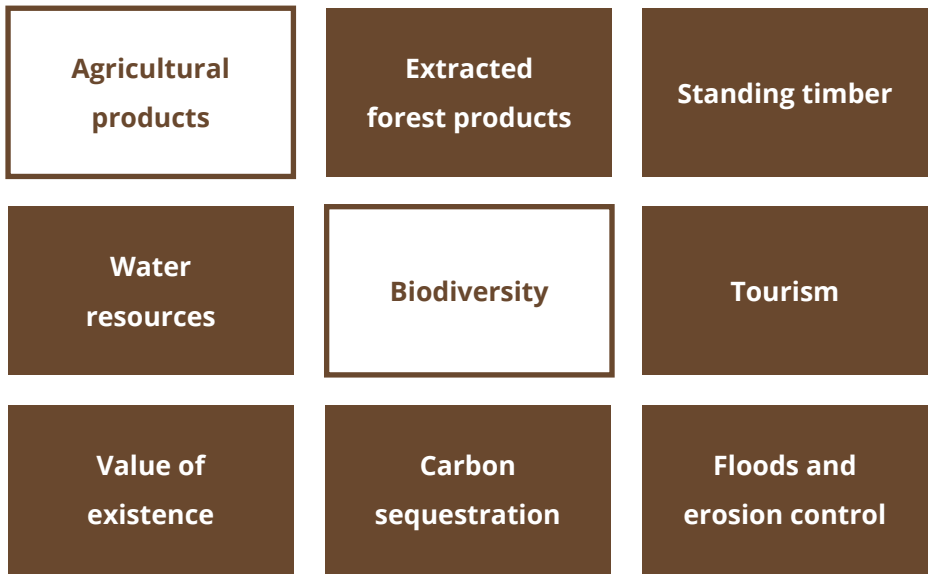
4.2 Ecosystem Services of the Eastern Arc Mountains

Since the beginning of time people have directly and indirectly depended on nature to earn their living, therefore creating strong footprints. People exploit different services provided by nature and the ecosystem to which they interact with as one functional unit. The ecosystem provides essential components for human life and through such interactions, human being modify the ecosystem components in pursuit of development.

The EAMCEF's presence and work within the EAMs Ecosystem has contributed significantly in generating knowledge about the ecosystem and quantification of associated services from across the EAMs of Tanzania – this has been achieved through supported research projects in targeted forest sites over the last 15 years. Lessons gained directly by the EAMCEF and its partners ranging from District Authorities, Conservators, and Communities have helped to provide a better understanding of the EAMs ecosystem. Maintenance of the ecosystem functions has been a great contribution achieved through grant supported on projects. Through supported projects evidence is provided to show reduction in the rate of ecosystem degradation thus a contribution in the enhancement of the ecosystem services.

In line with the definition and categorization of Ecosystem Services provided by the Millennium Ecosystem Assessment Report of 2005 – services are the benefits people obtain from the ecosystem, including: provisioning services such as food and water, regulating services such as flood and disease control, cultural services such as spiritual and recreational benefits, and supporting services such as nutrient cycling that maintain the conditions for life on earth.

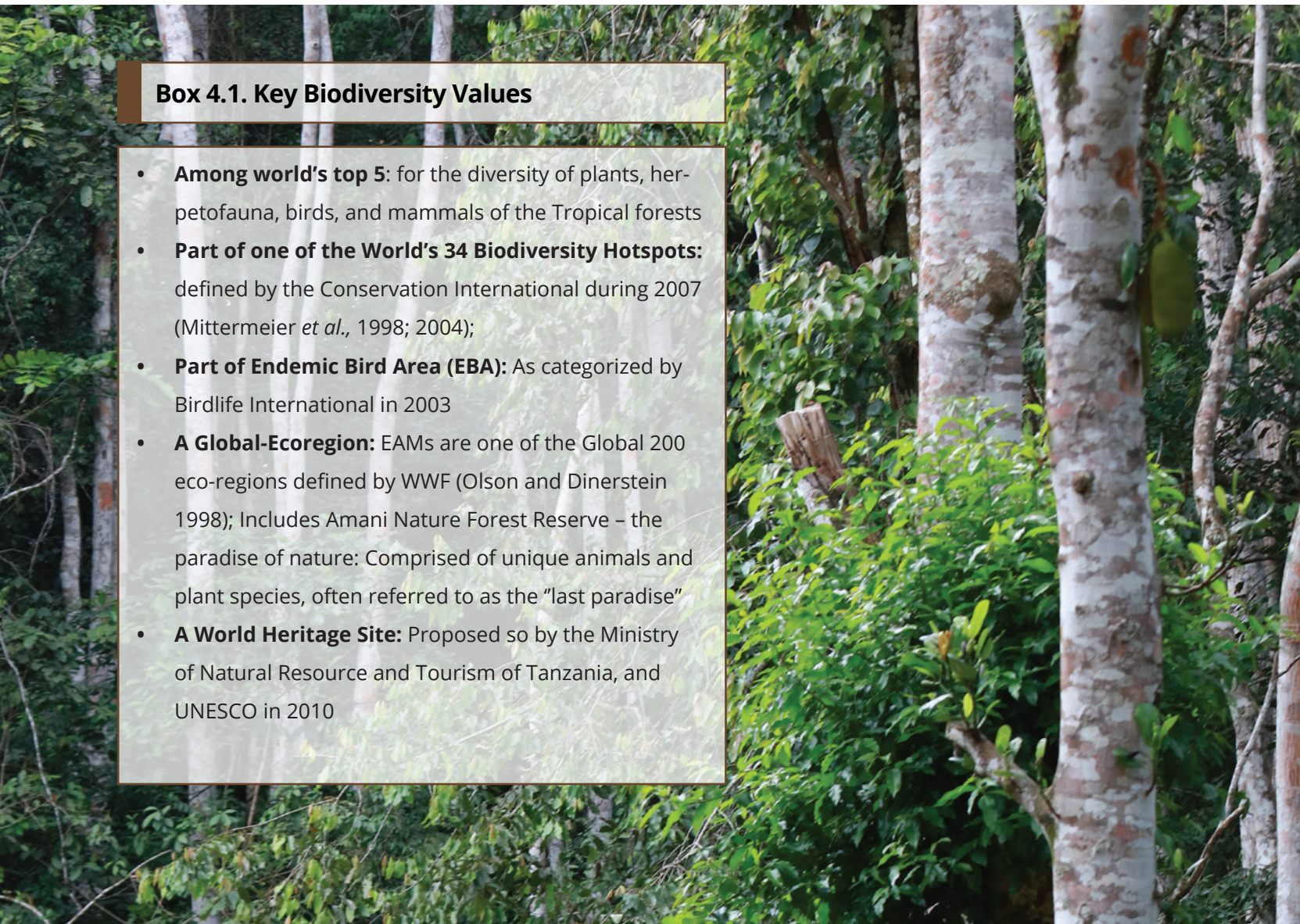
Through studies supported by the EAMCEF and other parties, key services of the EAMs ecosystem were identified, and total economic value estimated, for services categorized as – agricultural products, water resources, extracted forest products, biodiversity, standing timber, tourism, value of existence, carbon sequestration, and floods and erosion control. In this book, some of these services are explained more in details.



4.2.1 Biodiversity value

The EAMs forested landscape is a home to thousands of diverse plants and animals unique to this particular ecosystem, presenting an exceptional abundance of species endemic to the area – that is, at least recently, not occurring elsewhere on earth, including over 100 species of mammals, birds, amphibians and reptiles, and hundreds of species of insects and millipedes. Over 500 species of large and small plants are unique to the EAMs, thereby making this ecosystem a global centre of biodiversity.

Globally, the EAMs qualifies as a major part of one of the 34 Biodiversity Hotspots in the world categorized based on its high endemism and level of threat to the natural vegetation. On birds, the EAMs are known to host restricted-range bird species making them native (endemic) to these areas. In 2003 the Birdlife International – a global partnership of conservation NGOs, categorized EAMs as part of the Endemic Bird Areas (EBA). In 2010, due to the ecological and cultural significance of the EAMs, the Ministry of Natural Resources and Tourism of Tanzania proposed the EAMs to be considered by the United Nations Educational, Scientific and Cultural Organization (UNESCO) amongst the World Heritage Sites Box 4.1).



Box 4.1. Key Biodiversity Values

- **Among world's top 5**: for the diversity of plants, herpetofauna, birds, and mammals of the Tropical forests
- **Part of one of the World's 34 Biodiversity Hotspots:** defined by the Conservation International during 2007 (Mittermeier *et al.,* 1998; 2004);
- **Part of Endemic Bird Area (EBA):** As categorized by Birdlife International in 2003
- **A Global-Ecoregion:** EAMs are one of the Global 200 eco-regions defined by WWF (Olson and Dinerstein 1998); Includes Amani Nature Forest Reserve – the paradise of nature: Comprised of unique animals and plant species, often referred to as the "last paradise"
- **A World Heritage Site:** Proposed so by the Ministry of Natural Resource and Tourism of Tanzania, and UNESCO in 2010

Key features on Endemism

A complete list of species endemic to the EAMs is yet to be exhausted given the huge diversity of plants and animals spreading across the ecosystem. From the 1970s the EAMs were already identified as an Afromontane archipelago-like regional centre of endemism (White, 1983) and also listed as a Global 200 Eco-region of WWF (Olson and Dinerstein 1998), part of a biodiversity hotspot of Conservation International (Mittermeier et al., 1998; 2004) and part of an Endemic Bird Area of BirdLife International (ICBP 1992; Stattersfield et al., 1998). With these properties and many others, the government of Tanzania made efforts to apply for nomination of the EAMs for inclusion into the World Heritage List during 2010.

This wilderness is a home to endemic plants and animals' species found nowhere else in the world, including the presence of rare and threatened species. The endemism goes far as to the block level where some species of plants and animals are only found in a specific block and not in other blocks. Data compiled during preparations of the application dossier for World Heritage List (URT, 2010) suggested that, for example:

Plants: at least 3,473 species (4,234 taxa) compiled in 800 genera in the Eastern Arc Mountains, of which at least 453 species (554 taxa) and around 40 genera are believed endemic, including trees, shrubs and herbs. There are also high rates of endemism in the non-vascular plants, with 32 known endemic bryophytes. Endemic plants are not only found in the forests, but also in the montane grasslands, wetland areas, rocky outcrops, and in the drier 'rainshadow' (west and north) areas. All eight recognized species of African Violets (*Saintpaulia spp*.) are found in the Eastern Arc Mountains – these are threatened species of plants.

Vertebrates comprise several hundred species, of which at least 118 are endemic to the Eastern Arc Mountains.

Amphibians: 50 Eastern Arc endemic species concentrated in the reed treefrogs (*Hyperolius*), forest treefrogs (*Leptopelis*), viviparous toads (*Nectophrynoides*), narrow-mouthed frogs (family *Microhylidae*), and *caecilians*. The Eastern Arc Mountains are home to 50% of the members of the *caecilian* family, *Scolecomorphidae*, among which the *genus Scolecomorphus*, with three species, is endemic. New species of amphibians continue to be discovered in the Eastern Arc Mountains.

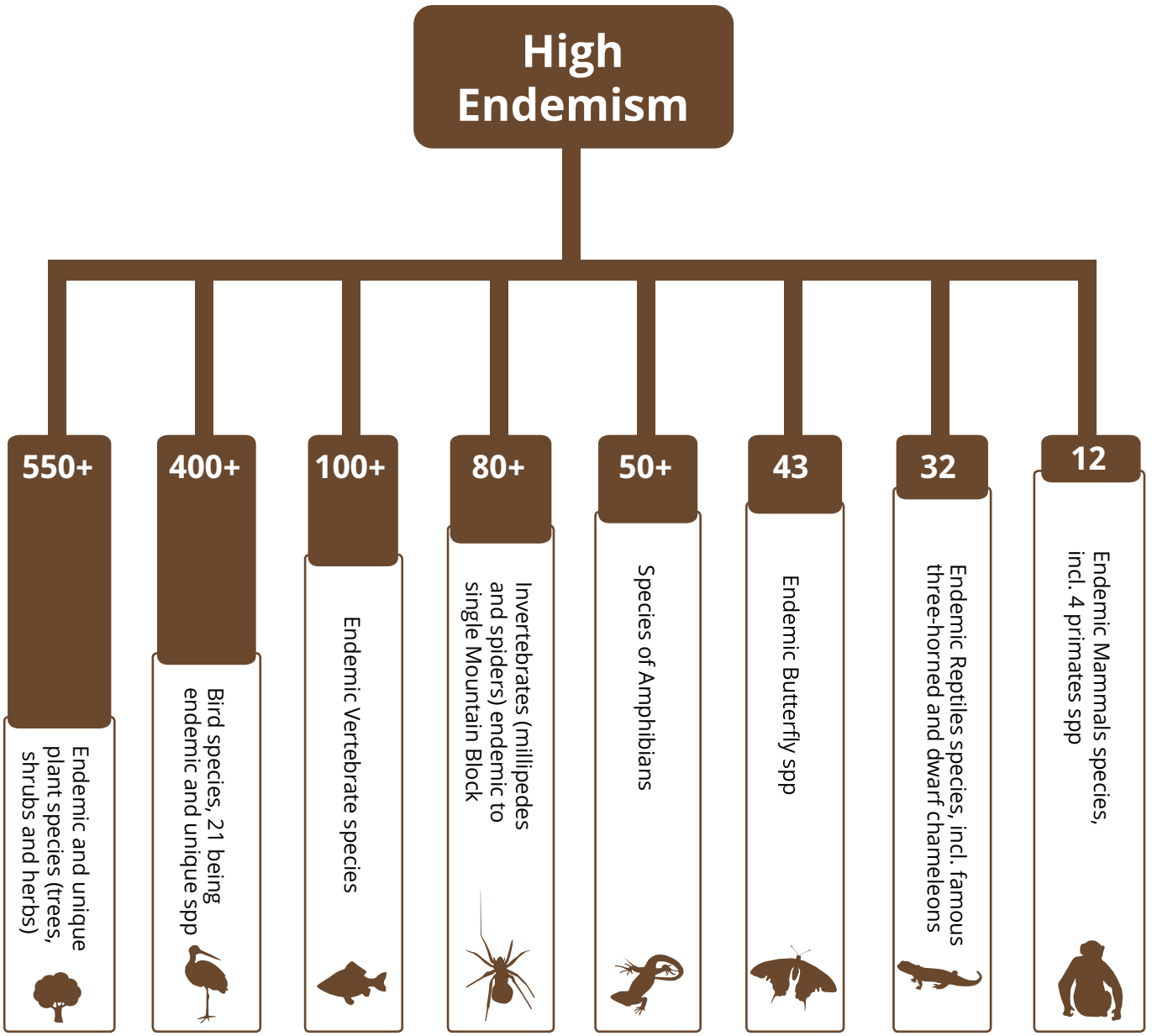
Reptiles: At least 32 species of reptiles are endemic to the Eastern Arc Mountains, the majority of these being chameleons in the genera *Chamaeleo, Rhampholeon* and *Kinyonga*. Reptile endemism is particularly high for an African mountain system as cool and moist habitats are not ideal for *exothermic* reptiles. New species of reptiles also continue to be discovered in the Eastern Arc Mountains.

Birds: There are 21 Eastern Arc endemic species of birds and four endemic genera (*Xenoperdix, Sceptomycter, Modulatrix* and *Swynnertonia*). Some bird species have extremely limited distributions, for example the Taita thrush (*Turdus helleri*, CR) and Usambara akalat (*Sheppardia montana*, CR) occur only in a few square kilometres of forest in the Taita Hills and West Usambaras, respectively. In addition, the Uluguru bush-shrike (*Malaconotus alius*, CR) is confined to one nature reserve in the Uluguru Mountains, with less than 100 km^2 of suitable habitat remaining. Some bird species have disjunctive distribution patterns covering parts of the Eastern Arc, the Southern Rift and the Zimbabwe Highlands; for example, the monotypic genus *Swynnertonia* and the Long-billed tailorbird (*Orthotomus moreaui*).

Mammals: Eastern Arc mammals total 12 endemic species, including three species of primate, the Sanje mangabey (*Cercocebus sanjei*, EN), Udzungwa red colobus (*Procolobus gordonorum*, EN), and the Mountain dwarf galago (*Galagoides orinus*). There are also newly described species in the Eastern Arc, such as the giant elephant shrew (*Rhynchocyon udzungwensis*,

VU), the shrew *Congosorex phillipsorum* (CR) and the near-endemic highland mangabey (*Rungwecebus kipunji*, CR), which is also a new genus of monkey.

I**nvertebrate fauna:** The Eastern Arc Mountains also support an invertebrate fauna that is exceptionally rich in endemic species, although it remains poorly known. Information on spiders and millipedes indicate that up to 80% of invertebrate species (and many genera) may be strictly endemic to a single mountain. These patterns seem to be repeated across other invertebrate groups, including butterflies. 78 butterfly species are either endemic (43) or near endemic (35) to the Eastern Arc. Among the dragonflies are two species strictly endemic to the East Usambara.



4.2.2 Water value

Forests of the EAMs are important water catchment areas – or simply referred to as watersheds. By being watersheds, the forests collect rainwater and or run-off waters and channel them into rivers, dams, lakes or into underground water systems – thereby controlling flow of water into the ecosystem and beyond at all times. Water as a critical environmental service is important to the survival of the existing biodiversity and for human activities downstream. Often people see rivers flowing across, but they do not ask themselves where the water comes from. Many rivers of the eastern Tanzania source their waters from the EAMs. Estimates indicate that around 25% of Tanzanians depend on water supply from the EAMs – be it on agriculture, domestic or industrial uses.

The EAMs are the catchment areas for many of the important rivers of eastern Tanzania. For example, the Uluguru Mountains give rise to the Ruvu River that supplies most of its waters to the three regions of Morogoro, Coastal and Dar es Salaam before emptying its waters in the Indian Ocean. The Ruvu River is joined by a chief tributary – the Ngerengere River, which rises in the northern part of Uluguru Mountains and flows in Morogoro city. The East Usambaras (in Amani Nature Forest Reserve and Handei Mountains) are the sources of Zigi River that supplies water to Tanga City. The Wami, Kilombero, Little Ruaha and Pangani Rivers also flow from different ranges within the EAMs and supplies water for rural activities, large scale agricultural activities, and industries in the lowlands. Towns and cities of Dodoma, Iringa, Tanga, Dar-es-Salaam, Morogoro, Ifakara, Lushoto, Mwanga, Same, Mombo, Korogwe, Soni, Kilosa, Muheza, Kibaha, Mpwapwa, Mvomero, Turiani, Kilindi, Gairo, Mikumi, Chalinze, Handeni and Kilolo rely on water tapped from the EAMs.

The EAMs are a source of water responsible for over 90% of the Tanzania's Hydro Electric Power produced in major power stations – for example, rivers from the Udzungwa Mountains Block inputs its water in Kidatu

and Mtera power stations (both within Great Ruaha River) and the Kihansi power station (within Kihansi River). The North, South and West Pare Mountain Blocks supplies water to Pangani Falls and Hale power stations and 'Nyumba ya Mungu' Dam. The Julius Nyerere Hydropower Station (JNHS), at Stiegler's Gorge site depends upon The EAMs for water supply.

The total economic value of the hydropower potential of the EAMs ecosystem is estimated at USD 66 billion which is 28% of the total economic value of the entire ecosystem. Hydropower being almost entirely emission neutral presents the opportunity to mitigate climate change. Without proper measures to protect the EAMs watershed, drop in water levels in hydropower dams results into inadequate power generation and closure of dams – with serious consequences in the national economy, for example; the closure of Mtera dam during 2011 and 2015 and Kidatu (2015) as a result of reduced water flows had major economic and social consequences.

Hydropower is emission neutral thus enabling Tanzania to support efforts to reduce carbon dioxide emissions. Apart from reliable power supply, conservation of the EAMs is a direct contribution to the implementation of national climate change policies such as the Nationally Determined Contributions (NDC), and Climate Change Strategy in Tanzania. Both the NDC and the Strategy put emphasize on the role of forest in climate change mitigation.

4.2.3 Agriculture

The EAMs provide favourable environmental conditions for agricultural activities - the soils, nutrients, water, and weather conditions support production of both food and cash crops consumed locally and across the country. Large scale farming of cash crops within the EAMs ecosystem is an important contributor to the national economy for crops such as sisal, tea and sugarcane – the famous Kilombero and Mtibwa Sugar Estates benefit from soil and climatic attributes of the EAMs. The total agriculture economic value (including livestock keeping) is estimated to be more than USD 4 billion. The 'Agriculture First' (known in Swahili as Kilimo Kwanza) – a policy declaration to accelerate agriculture transformation in Tanzania resulted, among other things, on an international-private partnership earmarked an area covering about one-third of mainland Tanzania (about 287,000 Sq.Km) as a corridor known as "Southern Agricultural Growth Corridor of Tanzania (SAGCOT)" with a vision to bring up to 350,000 ha into profitable agricultural production through intensive irrigation over a 20-year period. Six clusters identified for the SAGCOT area – Kilombero, Mbarali, Ihemi, Ludewa, Sumbawanga and Rufiji overlaps in eight of the EAMs blocks of Nguu, Nguru, Uluguru, Ukaguru, Rubeho, Malundwe, Udzungwa and Mahenge. These mountains provide, among others, watershed services feeding the river basins and wetlands for majority of the land in the SAGCOT area – e.g. the Ruaha/Rufiji River Basin with its three main sub-catchments of Great Ruaha, Kilombero and Luwego and wetlands of Kilombero flood plan, Usangu flats and Rufiji Delta spread across the corridor, serving large part of the corridor. Other important rivers within the corridor include the Wami-Ruvu, Lake Rukwa and Lake Nyasa basins.

Conservation of the EAMs is critical for agricultural development, such as through reduction of soil erosion, improved water flow necessary for irrigation activities downstream, and reduced flooding events.

The EAMs supports both small farmers and large-scale plantations who capitalize on its high rainfall and fertile soils to produce cash crops that include tea, sugar cane (Kilombero and Mtibwa sugar estates), rice, sisal and forest estates, amongst others. Benefits of conserving the EAMs for agriculture include reliable rainfall; reduced soil erosion; surface water for irrigation; enhanced ground water systems; and reduced flooding.

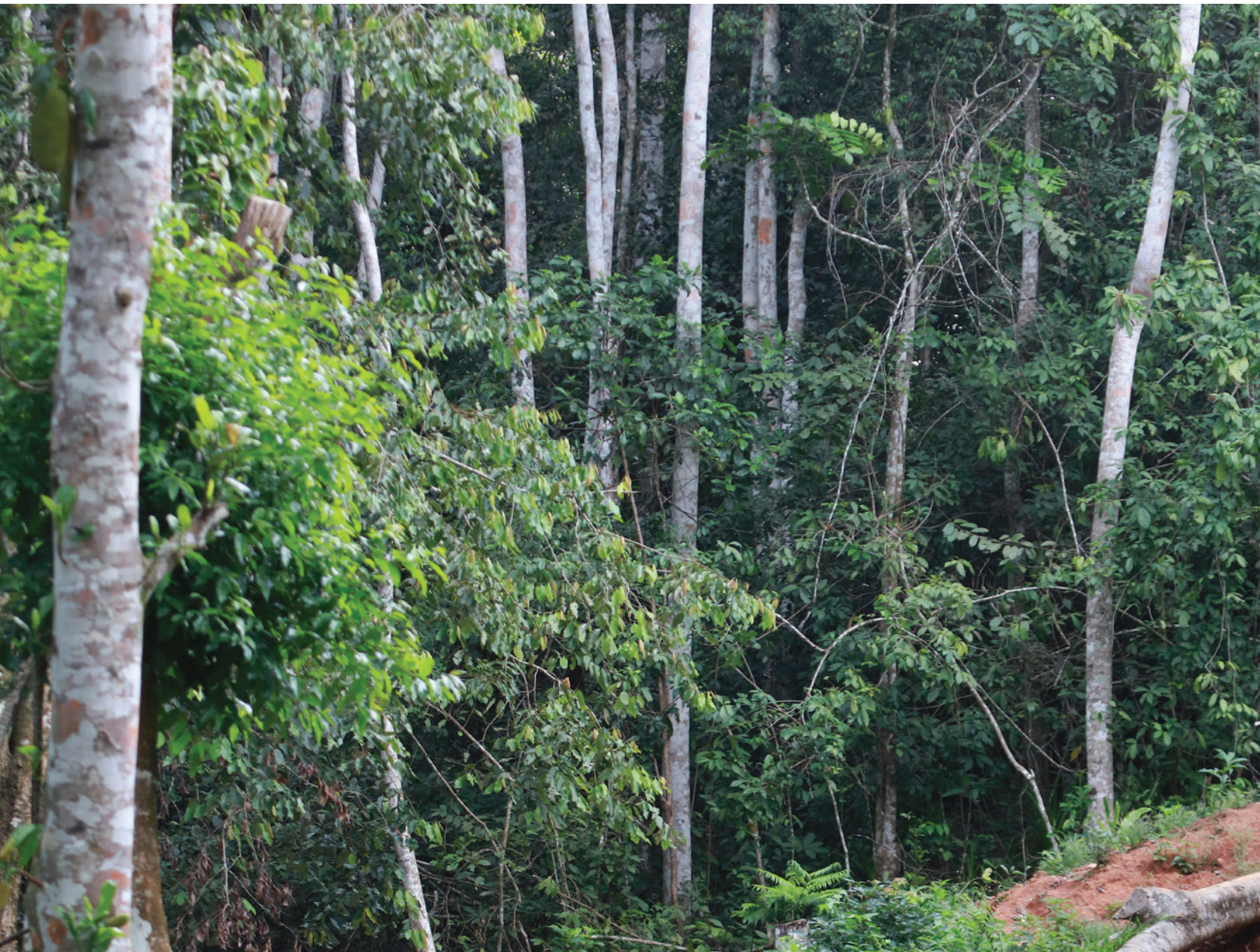
4.2.4 Tourism

The EAMs as a non-consumptive tourism destination offers incredible landscape and unique features - The 12 mountain blocks on Tanzania's side, forming 600 kilometres of a broad arc, covering an area of over 23,000 sq. kilometres, with more than 500 sq. kilometres covered by tropical forests harbouring high diversity of plants and animals, all together form an endless story about nature. The EAMs offers an incredible landscape for walking safaris and game drive, daylight bird watching activities and mid night reptile wondering. The tall and old trees provide wonderful scenery, the wildflower gardens remind one of the stories of Eden, mountain peaks provide a height enough roofing the nature, hot water springs and amazing waterfalls joins the flow to endless rivers.

Tourism across the EAMs provides a photographic opportunity to enjoy the unique and endemic species of both plants and animals – for example, the Udzungwa Mountains National Park is home to Iringa Red Colobus Monkey and the Sanje Crested Mangabey Monkey. Tree lovers never miss a visit at Amani Nature Forest Reserve which is estimated to have about 2,000 vascular plant species per hectare.

4.2.5 Carbon Sequestration

In addition to providing the watershed services, the EAMs and the forests offers conducive weather conditions for the survival of diverse species of plants and animals, including provision of micro-habitats for thousands of small organisms. On climate, the EAMs rich forest resources plays the roles of carbon sinks, that is absorbing large quantities of carbon dioxide from the atmosphere through the process called photosynthesis – the process that helps the plant to manufacture its own food thereby fixing carbon in its biomass and releasing oxygen to the atmosphere. This climate-important role of absorbing carbon from the atmosphere is referred to as carbon sequestration. The key question here is why these forests are carbon sinks and not carbon emitter/source? This is because most of the forests of the EAMs are protected forests and little emission is happening through threats such as forest fires and selective harvesting for various purposes. The EAMCEF support on enhancing alternative livelihood activities has helped surrounding communities reduce pressure on protected forests. The forests would be referred to as carbon emitters/sources if they were emitting more carbon than they absorb. More details on this important climatic role are provided in proceeding chapters.



4.3 Economic Value of EAMs Ecosystem Services

The value derived by people across the EAMs and beyond is incompatible and invaluable. An aggregation of function-based values of the EAMs ecosystem – direct and indirect use values, non-use values, optional values and existence values make the total economic value of the EAMs. Environmental economists' estimates a total economic value of the EAMs ecosystem services of at least USD 237 billion, with a net present value of around USD 28 billion during 2019 – this was estimated for 8 key categories of ecosystem services supplied by the EAMs ecosystem, that are agricultural products, extracted forest products, standing timber, water resources, biodiversity values, value of existence, tourism and carbon sequestration (Table 4.1, 4.2 and 4.3).

Table 4.1. Aggregated total economic value of the EAMs ecosystem services

Category of the ecosystem service	Type of the ecosystem services	Estimated Total Value (USD)	% of total value
Agricultural products	Crops	3.19billion	1.34%
	Vegetables	106.86million	<1%
	Fruits	933.3million	<1%
	Livestock	165.12million	<1%
Extracted forest products	Natural forests	51.51million	<1%
	Planted forests	18.83million	<1%
Standing timber	Natural forests	88.77billion	37.44%
	Woodlands	58.88billion	24.84%
	Planted forests	13.49billion	5.69%
Water resources	Water (domestic, irrigation, livestock & industrial uses)	321.14million	<1%
	Hydropower	66.67billion	28.12%
Biodiversity	Biodiversity value	3.52million	<1%
Value of existence	Bequest value	0.78million	<1%
Carbon sequestration	Forests	2.55billion	1.07%
	Woodland	1.94billion	<1%
Tourism	Tourism	0.021million	<1%
Total value		**237.07billion**	**100%**
Net Present Value (NPV)		**28.79billion**	

Table 4.2. Aggregated Total economic value of the EAMs by mountain blocks

Mountain Block	Total economic Value (USD)	% of Total value
Udzungwa	122.18billion	51%
Uluguru	26.28billion	11.08%
Rubeho	21.89billion	9.24%
West Usambara	15.40billion	6.50%
Ukaguru	12.09billion	5.10%
Nguru	12.04billion	5.08%
Nguu	10.33billion	4.36%
South Pare	7.45billion	4.14%
East Usambara	7.01billion	2.96%
North Pare	1.90billion	0.8%
Mahenge	0.49billion	0.21%
Total Economic Value	**237.07billion**	
Net Present Value	**28.79billion**	

Table 4.3. Estimated quantity of water abstracted from the EAMs for various uses

Type of use	Quantity used (m3)
Hydropower generation	220.46 billion
Irrigation – plantations	490.88 million
Domestic use – urban	93.83 million
Domestic use – rural	87.47 million
Industrial use	64.93 million
Irrigation – household level	31.98 million
Livestock use	14.27 million
Irrigation – small scale	0.82 million
Total quantity used	**221.24 billion**

Source (Table 4.1, 4.2 and 4.3): EAMCEF, 2019. Economic Value of Ecosystem Services from Eastern Arc Mountains of Tanzania.

4.4 Key threats

Since the beginning of time, people and nature have been inseparable – despite growth in towns and cities, our footprints to the nature are incredibly visible. The importance of the EAMs to the local, national and international communities has been growing over time with increasing population, market forces, industrialization, political dynamics and international negotiations on the role of forests in regulating the global climate. With the fact that local communities surrounding the EAMs derive their day-to-day living needs largely and directly on resources within their vicinities – such as firewood and charcoal for cooking and lighting, timber and poles for building and furniture, need for pasturelands, agricultural lands etc. The current forests of the EAMs are said to represent only 30% of the original forest area, much of the original forests have been converted to other land uses.

Across the mountain blocks, general threats and drivers of deforestation and forest degradation, and biodiversity loss includes illegal logging, firewood and charcoal burning, agriculture expansion into forests, overgrazing, traditional hunting using fire, mining activities, firewood collection, etc. Estimates indicate that the original forests of EAMs covered 18,000 square kilometres and have been shrinking over time to 4,750 square kilometres during the second half of the 19th century, then to around 3,450 square kilometres as of 2000, with a deforestation rate of 0.1% per year.

The presence of the EAMCEF in the areas has contributed significantly to addressing major drivers of deforestation and forest degradation and has helped to strengthen management activities and enhanced meaningful involvement of local communities. More efforts are needed to sustain efforts made to protect this global heritage especially through community-based interventions that would ensure a permanent change of behaviours and livelihood activities.

CHAPTER

5 Contribution of the EAMCEF on Biodiversity Conservation

5.1 Our support on conservation

One of the core objectives of the EAMCEF establishment is to promote the protection of biological diversity in the Eastern Arc Mountains, targeting priority areas of significant diversity. Promotion of protection is done through supporting actions that address key drivers of biodiversity loss and those that address key threats. This objective is pursued through involvement of surrounding local communities in the conservation and sustainable management of natural resources and biodiversity of the EAMs – this ensures that conservation is not approached in isolation but rather in a more holistic manner which combines aspects of livelihood improvement, energy efficiency, land management and applied biodiversity researches.

Over the last 10 years (2011-2020), our projects and operations support came from the Government of the Kingdom of Norway through the Royal Norwegian Embassy in Dar es Salaam. Our implementing partners have been a great resource in ensuring great progress in attaining our conservation objectives, the cooperation and active participation of the communities we work with have made it possible for the EAMCEF to ensure adequate delivery of resources and technical support.

On Protected Areas conservation:

Our support in Protected Areas (PAs) has helped to strengthen the capacity of responsible authorities to manage PAs against threats from encroachment, destruction, and allowed rehabilitation of degraded areas and reclaim of grabbed lands. Our grant support has enabled agencies mandated to manage the forests such as District Councils, Ministry of Natural Resources and Tourism, Tanzania Forest Services (TFS) Agency and Tanzania National Parks in the Eastern Arc Mountains to improved coordination, communication and rapid response. Notable Outputs that have contributed to these results include:

311 ha of degraded areas rehabilitated by refilling of mining pits and planting of indigenous trees – the discovery of minerals in some protected areas (PAs) have attracted the attention of local communities across the EAMs, but due to restrictions to performing mining activities within PAs local communities have been encroaching the forests in search of minerals thus degrading forests. the EAMCEF support enables extensive reach through joint patrols.

1,793 km of boundaries cleared and maintained in 9 reserves reducing forest encroachment and fire outbreaks – unclear and invisible boundaries have been a source of land conflicts with local communities surrounding the forests. Due to inadequate budget allocation from the government, responsible authorities could not afford the cost of human resources required to clear long boundaries. The EAMCEF support enabled short term employment and compensation of local communities who helped to clear forest boundaries.

27,100 trees

27,100 trees planted on 15,120 kilometres boundary to make such boundaries visible and create a buffer between protected areas and village lands.

150 km

150 km of boundaries resurveyed - resurveying of forest boundaries were critical in addressing boundary conflicts with local communities as old boundary marks disappeared/or became invisible. Population change and growth of demands for land resulted into extensive encroachment of protected areas considering that most of the villages are not surveyed and do not have land-use plans. The EAMCEF support facilitated conflict resolutions and resurvey and marking of boundaries with concrete beacons.

227 ha

227 ha of narcotics and illegal farms in protected areas destroyed – due to inadequate financial capacity, only limited forest patrols took place leaving remote areas uncovered and free from encroachment activities. Remote forest areas became fields for agricultural activities. With management support and joint patrols, illegal farms were discovered deep into the forests and destroyed.

52,738 People

52,738 community members sensitized on conservation resulting in increased participation of local communities in conservation activities, tourism and ecotourism infrastructure development and improvement.

On community livelihoods:

We have empowered local communities living adjacent to protected forests through co-designing and introduction of alternative source of income that helped to improve their status of life. At the local level, agriculture is the main source of household income. However, due to poor technology, lack of agricultural inputs and poor farming practices local communities do not earn more from agricultural activities, leading to food insecurity and low income. Food insecurity pushes community to expand their farms and shift to virgin and fertile lands mostly found in protected forests of the EAMs – causing massive deforestation and forest degradation. The EAMCEF support has helped to empower communities to do away from forest encroachment through activities described under Section 5.2.

On improved energy efficiency

The EAMCEF support enabled building of capacity of local communities to construct improved fuel-efficient stoves cutting firewood demands by over 50%. Local communities use fuelwood (charcoal and firewood) as their main source of energy for cooking. A traditional three-stone cooking stove for example, uses firewood but due to inefficiencies, large volumes of firewood are consumed thereby increasing demands from the forests.

Notable Outputs on energy efficiency

1,702 People

EAMCEF trained 1,702 local artisans to construct energy efficient stoves in order to spread wide adoption of this innovation - training of local artisans ensured reliability, affordability within the local settings.

14,187 HH

Over 14,187 households (HH) adopted use of fuel-efficient stoves leading to over 50% cut in firewood consumption, employment to local artisans and reduced pressure on the forests.

On Land Tenure:

Our support has strengthened land tenure issues and reduced conflicts over land. Lack of clear land boundaries between village lands and protected area lands resulted into greater tension between protected area management and local communities. Unclear boundaries contributed to forest encroachment and degradation. The EAMCEF has been at the forefront of resolving the conflicts. Notable Outputs that have contributed to these results include:

954
Conflicts

954 land conflicts were resolved during the last 10 years

112
Certificates

112 certificates of customary rights of occupancy provided under the EAMCEF facilitation, thereby strengthening tenure right among local communities.

5.2 Examples of community interventions linked to biodiversity conservation

5.2.1 Beekeeping

Situated just on the foot of Udzungwa Mountains, villagers of Msufini Village in Kilombero District enjoys the magnificent view of the forest of Udzungwa Mountains National Park just at their vicinity. In this village, the EAMCEF selected a small group of farmers to demonstrate how beekeeping through modern beehives can be a profitable economic activity that would change lives of the people, provide them with alternative income that would incentivize them to stop invading protected forests for the same purpose. Ten years earlier prior to the EAMCEF intervention, a group of ten farmers – 6 being males – agreed to form a beekeeping group named *'Wosia wa Baba'.* The group gathered 10 locally-made beehives, normally made from tree logs, and hanged them in the forest – a nearby protected forest owned by the government. Each beehive produced only 5 litres of honey a year. The group therefore generated around TZS. 50,000 – 60,000 per year! The group never owned any honey processing equipment. During honey harvesting period, beekeepers normally light fire to chase away the bees. In the process, fire is left uncontrolled and spread to nearby trees and even further deeper into the forest. The forest authority in the area prohibited such beekeeping activities and put strong measures to prevent people from entering the forests. The group, being among the victims was left without any other option than hanging hives on nearby trees within the village. The group chose a small area and decided to plant trees to serve the purpose, but still this was not economically viable.

To make beekeeping a profitable business that would withdraw villagers from invading protected forests, the EAMCEF intervened and took advantage of the existing group to introduce modern beekeeping techniques.

5.2.2 Tree Planting

The beautiful landscape of Kilolo District is blessed by the cold weather and rich soil supporting tree growing business (soft wood – pine), however, and for many years the key challenge has been the 'waiting time'. From planting to harvesting and sales of a mature tree one needs to wait for at least 15 years. While waiting for more than a decade, local communities in Idegenda Village, one of the villages in Kilolo District, engages in various farm and off farm activities to generate income. Among the off-farm activities, tree cutting (timber and poles) and other income generating activities, result into the degradation of the Uzungwa Scrap Nature Forest Reserve.

To address the problem, the EAMCEF through a participatory approach interrupted the 'waiting time' by introducing fast growing pine trees (7 years) that would act as alternative sources of income to save forests from destruction. Apart from planting, villagers raise and sell tree seedlings.

5.2.3 Dairy Cow keeping

Hearing of a forest conservation project one thinks of key actions such as forest patrols, boundary clearing and forest management plans. Agatha Kipingi and her colleagues forming the dairy cow keeping group in Idegenda Village (Kilolo District) tells their story on how (through) dairy cow keeping supported by The EAMCEF has changed their lives and avoided heavy dependency on forests for household income.

"Our group consisting of 25 people was formed in 2013 during the Village Assembly meeting when the EAMCEF arrived in our village. We received trainings

on dairy cow keeping and construction of proper shelters for the cows. The EAMCEF gave us nine cows and one bull to start the project, as a group we now [2017] have twenty three animals in total."

"In my house we managed to install a small biogas feeder that utilizes animal dung to generate energy for cooking. I bought a stove and constructed a good kitchen. In the past, I used to spend hours – up to six hours in the forests collecting firewood. With biogas, I use the 'saved' hours to attend my cows and my farm. I no longer go to the forest as it used to be, but I also enjoy my new smoke free kitchen, and my husband is now comfortable to join me while cooking. The new kitchen has reduced up to 75% firewood consumption thereby reducing pressure on surrounding forests. If all households in Idegenda Village keep cow and switch to biogas... our surrounding forests [The Uzungwa Scrap Nature Forest Reserve] will forever remain intact."

5.2.4 Pig Farming

The EAMCEF supported pig farming in Ukwega Village to prove if communities can generate income from alternative sources other than forests, they would reduce their direct dependency on forests for that purpose, thereby enhancing biodiversity conservation in Kilombero and Uzungwa Scrap Nature Forest Reserves. Pig farming was selected as the best option that would provide sustainable solution to accelerate poverty alleviation through provision of multiple benefits – incomes through sales, as a source of protein, manure for gardens and for biogas production. In 2013 the project started to implement the idea by providing conservation education and training on pig husbandry and later provided 'seed' pigs in four villages, to 168 villagers. To spread the impact to many villagers, villagers agreed to share one new-born piglet to the neighbouring household not supported by the project. By close of phase one of the project support in 2016, the project witnessed improved livelihood status of the supported community, including significant reduction in the number of people reported to have encroached the forests.

Pig meat (pork) became the easily available meat in the village butcheries compared to bush meat which was obtained from illegal hunting in the Nature Reserves – through burning of grasses to scare animals, but with detrimental effects on the forests. Income from sales of piglets and/pork has improved household income, while manure has been instrumental in improving home gardens.

5.2.5 Goat Keeping

Just a few people in Mkalanga Village believed that goats can be a good source of milk... just like dairy cows, and that the income from goat husbandry can change lives of the poor villagers. Dairy goat husbandry seemed unusual and strange undertaking. Through sensitization and training meetings villagers were convinced that dairy goat husbandry is a feasible undertaking that they wished to try. Mr. Seth Chavala, a resident of Mkalanga Village shared his story below:

"Our dairy goat husbandry group is called 'Mshikamano', members were selected by the Village Assembly. I am a farmer, but I can clearly say that I used to get very little from agricultural activities than it is now with goats. I started keeping goats in 2015 through the EAMCEF support, I have an assurance of getting 1.5 litres of milk daily, out of which I sell one litre for TZS. 1,000 and the family consumes the rest. In the past, my family and most people in this village were not able to afford milk as it was obtained somewhere far from here and a bit costly. The income I get from goats is used to cover for household needs, school fees, stationeries, etc. Apart from milk, it was not easier to get farm manure than it is now. We were used to industrial fertilizers which destroyed our land, but now I get manure from goats and I can grow vegetables. I no longer buy industrial fertilizers."

5.2.6 Chicken Keeping

Like in many other forest reserves, residents of Mkanga Village living adjacent to Mkingu Nature Forest Reserve have continually depended on forests within their vicinity to satisfy their needs for wild meat as the main source of protein. To obtain wild meat, villagers normally go into the forests for hunting small animals – preferably cane rats (known locally as *Ndezi*). Despite being a small animal – 6-10 kg, *Ndezi's* meat is much preferred due to its tenderness and delicious taste like that of local chicken. To make the hunting job easy, hunters do not only hunt using dogs but also burn grasses to scare and easily chase *Ndezi.* It is the burning that results into detrimental forest fires, destroying the valuable forests and associated biodiversity, leaving the forests into patches.

To address the challenge, in 2013 the EAMCEF project grant supported introduction of improved local chicken and brooding techniques by providing trainings to a group of 25 people in the village. Of the greatest interest at the local level was the introduction of locally made chick brooders (known locally as *Vinengunengu*). A start-up capital of 5 chickens and a cock was handed over to each trainee. The EAMCEF believed that local chicken would replace *Ndezi* and consequently save the forests from fire. Since then, villagers have witnessed tremendous results in the production of eggs and chicken – the use of *Vinengunengu* has assured raising of up to 248 chicks per chicken per year. Increased production has assured availability of protein (meat and eggs) at household and at the village levels – thereby reducing forest fire incidences.

It is the sales of chicken and eggs that has transformed the livelihood of participating villagers. Income from sales has been used to cover household needs, but most importantly covered pressing needs like school fees, health services, repair and construction of modern houses and improved toilets.

Some villagers have used income from sales of chicken and eggs to:

- Install solar panels and illuminate the households, allowing pupils to earn extra study hours at home thereby improving overall performance.
- Expand agricultural activities by buying more acres of land, employing casual labourers – resulting into increased production and stable food security; and
- Buy dairy cows and ensure sufficient milk for the household and availability of manure for gardening activities.

5.2.7 Conservation agriculture

The EAMCEF believed that, if local communities in Mbomole Village (Muheza District) are food-secured, little degradation happens on forests, and vice versa. Food insecurity drives villagers to invade nearby forests in search for commercial timber, poles and wild meat so they can afford buying food for the families or pay school fees. In this village, food insecurity is caused by inadequate harvests resulting from poor farming techniques on slopes of the village land. Since slopes cannot retain water for long time, most crops die, soil nutrients get washed away; soil erosion destroys crops resulting into poor harvests and food insecurity. In the state of food insecurity, the forests become the easiest victim, the free source of income. The EAMCEF intervened through introduction of soil and water conservation techniques using bench terraces.

5.2.8 Butterfly farming

"When butterfly farming project was first introduced in our village most people were laughing and considered it as a weird undertaking [....] it is very embarrassing for a grown-up man/woman to walk around catching butterfly," said Msese E. Elifuraha of Bwambo Village in Same District. Mr. Elifuraha and his colleagues constituting the Butterfly Farming Group are so happy to have proved that the project is a softer and economical way of making alternative income – no hustles!

The EAMCEF introduced butterfly farming to help communities adopt an alternative means of making income as a strategy to reduce heavy-dependence on forests – the Chome Nature Forest Reserve. Members of the Butterfly Farming Group were trained and visited one of the butterflies keeping sites in Amani Nature Forest Reserve for further learning. Back from the training, the group started planting food plants [flowering plants] that would attract and provide food to butterflies.

What do farmers do with butterflies?

In this project, farmers catch female butterflies and place them in a breeding cage containing food plants (flowering plants). The butterfly lays her eggs on the food plant and the farmers carefully harvest the eggs and place them on a clean container. In 14 days, the eggs hatch into a larva – called caterpillars (the most active feeding stage). The farmers transfer the caterpillars to their particular food plant and cover the branches to avoid any loss. In another 14 days the larvae attach themselves on leaves or branches and shed off their skin (pupate) to form pupa (prular pupae or pupas). It is this pupa that the farmers harvest for sale oversees through a middleman/company based in Amani Nature Forest Reserve. When the pupas reach oversees, they are used for zoos and live exhibitions as ornaments.

In 2017 butterfly farmers managed to sell up to 865 pupa which earned them TZS. 1,186,530 – this translates to an average price of TZS. 1,371.7 per pupa.

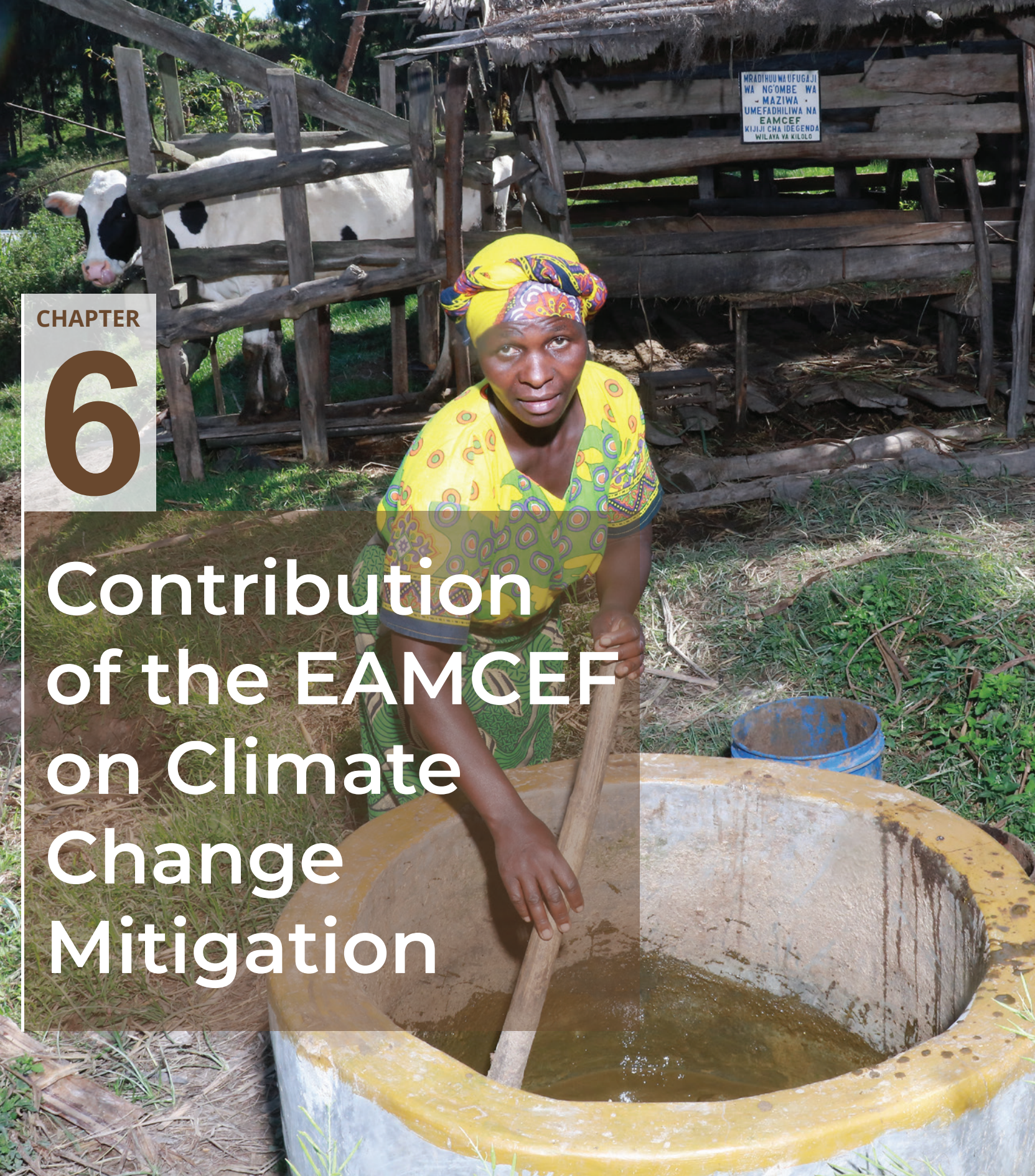
5.2.9 Energy efficient stoves

One of the tricky questions in addressing drivers of forest degradation in Tanzania is on how to deal with growing fuelwood demands especially in local settings where over 98% or the entire population depends on firewood and charcoal for cooking, lighting and heating – all sourced from the natural environment surrounding them – no plantation or woodlots are dedicated for this purpose. Families would travel miles and miles in search for firewood, spending 30 minutes to 4 hours depending on availability and distance to where the wood is available. This routine continues over and over and becomes part of life. Nowadays in some villages, young people do collect firewood and bring them close to the village for sale, but the big question has been on affordability. Another question has been on where to find firewood or charcoal – the answer is obvious – any nearby forest or trees. Harvesting of trees for firewood is unfortunately not or poorly regulated, and in protected forest harvesting is not allowed. As a result of this weakness, most forests have suffered severe degradation starting from their edges inwards.

To address the firewood challenge across Eastern Arc Mountains, the EAMCEF in partnership with local NGOs introduced local solutions that addressed the energy needs by cutting down firewood consumptions and empowered women groups with multiple benefits – that is to make cook stoves work for women and forests. To achieve 50% reduction in firewood consumption innovative and local solutions were put into play. The solutions intervened at the 'cook stove' stage where firewood is directly consumed. Traditionally local communities, until recently, use a three-stone cook stove, and cooking is done under open air thereby resulting into rapid consumption of firewood due to uncontrolled movement of air. The proposed solution involved construction of a mud-and-brick made cook

stove consisting of a long chimney that funnels the smoke outside the kitchen. Unlike the traditional three-stone stove, the introduced stove has its one side open for inputting firewood and has 'plates' on top (1-3 plates to provide the user with enough space for cooking more than one dish at a time, separately). The design of this 'new' stove ensures control of wind into the cookstove. Adoption of this new cooking technology spread widely as local trainers rolled out construction of the same in all interested households, at a low cost. This solution was scaled in villages of Korogwe, Muheza, Mkinga, Same, Mvomero Districts and Morogoro Municipality.

Unlike the traditional cook stove, fuel efficient stoves have additional health benefits – no smokes in the kitchen, all smoke is thrown over the roof via a long chimney and hence making the cooking environment clean and conducive.



CHAPTER

6

Contribution of the EAMCEF on Climate Change Mitigation

6.1 The role of the EAMs forests in climate change mitigation

As already highlighted in earlier chapters, the forests provide climate services by regulating the level of carbon dioxide in the atmosphere thereby absorbing large quantities of carbon dioxide from the atmosphere through the process called photosynthesis – the process that helps the plant to manufacture its own food. In this case the EAMs forests are referred to as carbon sinks. The targeted nine Protected Areas where the EAMCEF work is focusing have total area of forests occupy 144,204 ha and woodlands 143,525 ha as per baseline studies done in 2013 (Table 6.1).

Table 6.1. Size for each nature forest reserve and coverage of forest and woodland (as of 2013)

SN.	Nature Forest Reserve/ National Park	Forest Area (ha)	Woodland (ha)
1	Amani	6,416	24
2	Nilo	4,393	42
3	Chome	10,835	785
4	Magamba	8,636	283
5	Mkingu	14,781	1,232
6	Uluguru	21,516	149
7	Uzungwa Scarp	20,232	10,691
8	Kilombero	25,582	79,332
9	Udzungwa Mountains	31,812	50,989
	Total	**144,204**	**143,525**

The EAMs forests are estimated to contain a total economic value of 509.5 million tons of carbon dioxide (tCO_2) whose total economic value is around USD 2.5 billion, with a net present value (in 2019) of USD 309.5 million and 387 million tCO_2 whose total economic value is USD 1.9 billion, with a net present value of USD 235 million for woodlands (Table 6.2 and 6.3 respectively)

Table 6.2. Economic value of carbon stocks in the EAMs Forests

Name of the Mountain Block	**Estimated Total tCO_2**	**Total value (USD), price=USD 5 per tCO_2**
East Usambara	30.72million	153.60million
West Usambara	44.73million	223.64million
South Pare	21.35million	106.77million
North Pare	3.62million	18.11million
Nguru	40.75million	203.75million
Nguu	29.20million	146.01million
Uluguru	38.78million	193.93million
Ukaguru	22.75million	113.74million
Rubeho	63.68million	318.38million
Mahenge	2.54million	12.72million
Udzungwa	211.41million	1.06billion
Total Economic Value	**509.54million**	
Net Present Value (NPV)		**2.55billion**
Note: tCO2 was calculated as 3.67 x tC		

Table 6.3. Economic value of carbon stocks in the EAMs Woodlands

Name of the Mountain Block	Estimated Total tCO_2	Total value (USD) at a price of USD 5 per tCO_2
East Usambara	0.47million	2.34million
West Usambara	35.04million	175.21million
South Pare	18.32million	91.59million
North Pare	6.14million	30.70million
Nguru	34.82million	174.09million
Nguu	25.94million	129.67million
Uluguru	134.41million	672.06million
Ukaguru	46.01million	230.43million
Rubeho	82.64million	413.211million
Mahenge	-	-
Udzungwa	3.20million	15.99million
Total Economic Value	**387.06million**	
Net Present Value (NPV)		**1.935billion**

Note: tCO2 was calculated as 3.67 x tC

6.2 The EAMCEF support in enhancing conservation of forest carbon stock

The EAMCEF's mission is to catalyse resources to foster conservation of forests of the EAMs through a holistic approach integrating community livelihoods and biodiversity researches. Related to climate change, the EAMCEF work that promote mitigation of climate change through the forest sector is mainly centred at addressing drivers of forest degradation – through such measures, the protected forests enhance its role in carbon sequestration.

The EAMCEF support has generated knowledge on the contribution of the EAMs ecosystem in the climate mitigation in terms of mitigation potential. The investment needed to generate this knowledge is expensive but useful in understanding changes that are happening.

On carbon stocks, the baseline study estimated that the standing parameters in terms of number of stems, basal area, volume, biomass and carbon per hectare had a stocking which were relatively higher compared to previous studies. The study also found that woodlands' carbon stock ranged from 27 to 40 t/ha while that of montane forest ranged from 45 to 337 t/ha. Carbon changes were determined based on the two periods of 1980s - 2000s and 1999/2003 - 2010/11. The determination accounted carbon loss due to deforestation.

Over the last 15 years, the EAMCEF support on conservation of forests has been centred at the core of addressing key drivers of deforestation and forest degradation from the community end, and by strengthening management capabilities of the responsible government institutions in managing protected forests against destructive activities. A baseline study was done in 2013 to establish the status of each protected area included in the support, the study identified key threats and extent of deforestation and forest degradation. Despite that a follow up study has not been done to assess the change in terms of how much deforestation and forest degradation has been avoided, available indicators and evidences from the field indicates great reductions in forest disturbance. This reduction ensures that the forest carbon stock is protected from conversion.

Below are a few examples.

1. Frequent forest fires mostly resulting from traditional hunting practices (burning forests to scare small animals) have been reduced considerably, with only one or no occurrence in a year in targeted sites. This allows natural regeneration of vegetation and ensures the carbon stock is conserved.

2. Adoption of improved 'mkombozi' cook-stoves that has high efficiency and cuts down firewood consumption by 50% - this has reduced increased demands for firewood which was threatening forests.

3. High adoption of alternative income generating activities has helped forest adjacent communities generate adequate income to meet, at least, their day to day household needs

4. Reduced shifting cultivation, slash-and -burn practices which were initially expanding to forests

5. Strengthening of management effectiveness and forest patrols helped to fight against encroachment and degradation resulting from illegal mining activities.

With these indicators of reduced forest disturbance, the forest conditions have improved but research studies are yet to be done to establish the increase in carbon stock.

6.3 Financial investment related to Biodiversity conservation and climate change mitigation

During its early years of establishment, the EAMCEF operated as a component of the World Bank financed project entitled 'Tanzania Forest Conservation and Management Project' (TFCMP) implemented under the Ministry of Natural Resources and Tourism (MNRT) at a credit facility amounting to USD 2.4 million, dedicated to finance activities and operations crucial for its early establishment phase (2002-2009).

Since mid- 2011 up to now (2020), support to the EAMCEF on operations and project activities has been fully funded by the Government of the Kingdom of Norway in order to ensure that the EAMCEF delivers a sustainable funding for the conservation of the EAMs of Tanzania. The total Norwegian grant to the EAMCEF (from 2011-2020) amounts to US$ 10.1 million.

The grant dedicated to project support was further distributed into three main thematic areas of support - Conservation of Protected Areas and Mitigation of Climate Change, Community Development and Conservation, and Applied Biodiversity and Climate Change Research.

It is interesting, and yet challenging, to track finances dedicated for Biodiversity conservation and climate change mitigation given that the entire grant support (covering operational costs and project implementation) is aimed at strengthening conservation of the EAMs forest ecosystem – either directly or through addressing drivers of forest loss. Grant allocation in the three main thematic areas provides a general picture on how the finances have been flowing:

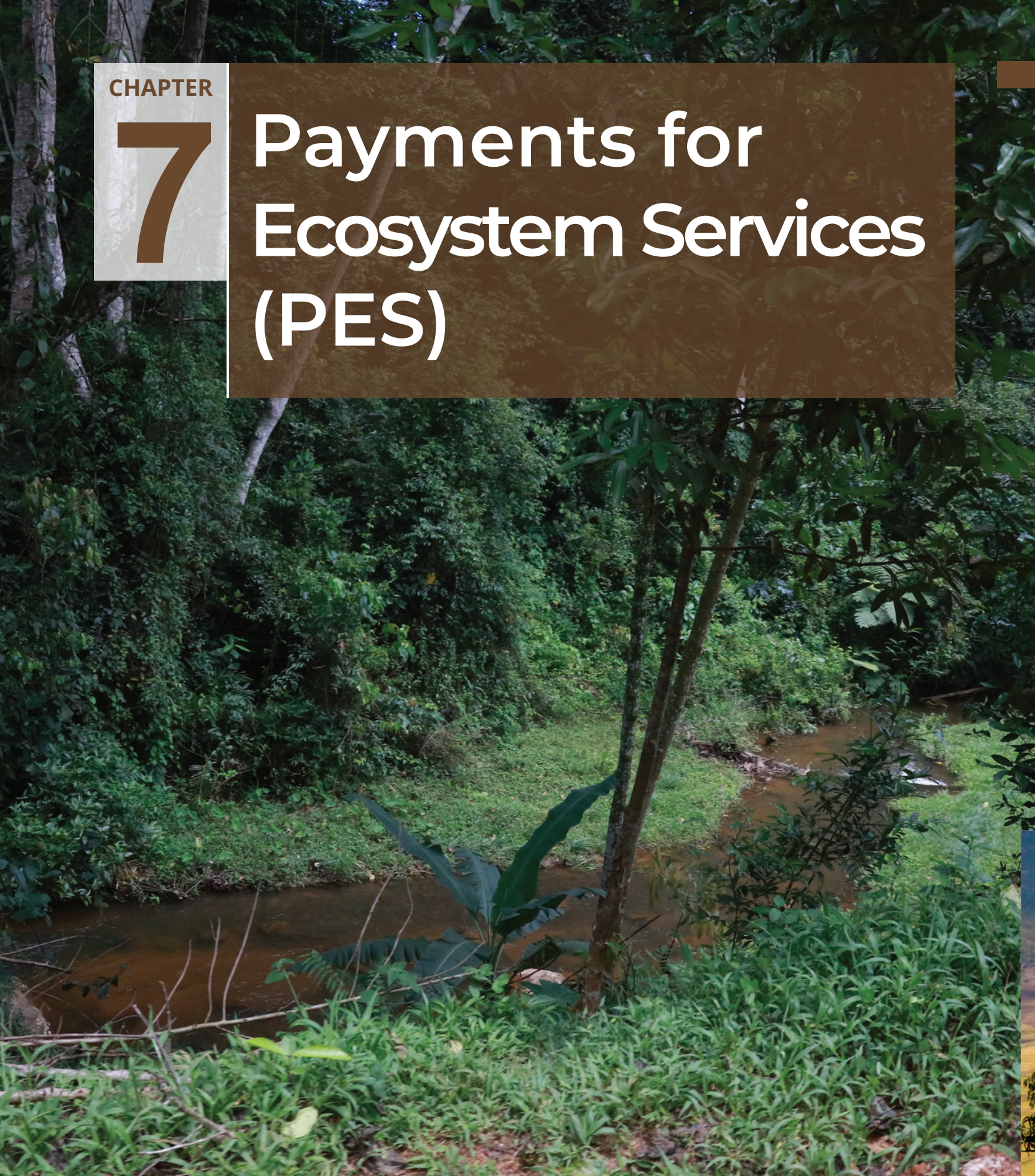
During the first phase (2011-2016) of Norwegian support through a project entitled 'Improving conservation of the Eastern Arc Mountains Forests of Tanzania', with a total budget of USD 5,947,700 allocated grants in three main components.

The second phase (2016-2019) of Norwegian support through a project entitled 'Conservation and Restoration of the Eastern Arc Mountains', the largest amount of grants was disbursed for the community development projects amounting to TZS 702.5Million (USD 0.3Million) – which is equivalent to 50% of the total grant.

The second phase was further extended for 13-month (referred to as bridging phase), with a total budget of USD 1.1 million.

Total amount disbursed

	Phase 1 (2011-2016)	Phase 2 (2016-2019)	Bridging Phase (Phase 2 extension) (2019-2020)
	USD	USD	USD
Community development	1,204,945	852,809	482,280
Conservation	843,461	596,966	106,454
Research	361,483	255,842	94,606
TOTAL	**2,409,889**	**1,705,617**	**683,340**



CHAPTER

7 Payments for Ecosystem Services (PES)

7.1 The EAMCEF as a potential model programme for PES

Payment for Ecosystem Services (PES) is defined broadly as a scheme, which involves payment to the owners/managers of land and natural resources in exchange for the services provided by the land/ natural resource, over-and-above what would otherwise be provided without such arrangements. Having read the various services provided by the EAMs ecosystem, PES in this case would mean setting up an effective mechanism where the services (such as maintenance of water quality and flows, flood and siltation control, pollination, and habitat maintenance for existing biodiversity – mostly not listed in markets and prices) provided by the ecosystem are paid for, in return, to allow for owners and managers to enhance availability of such services and/ or to compensate for the opportunity costs for conserving and protecting such areas for the services provided. In one way or another, ecosystem services are being paid for in some ways, but the objective and mechanisms are not necessarily directed to operationalize PES.

Who pays for What? When? And how?, have always been some key questions on PES management. EAMCEF experience in grant management for conservation, climate change and community development across the EAMs ecosystem presents the organization as the possible fund for channelling payments for Ecosystem Services in support of conservation activities. The EAMCEF is strategically positioned to offer the mechanism through which payments can be managed from the payer to communities who manage these ecosystems or forest authorities who tirelessly work to protect the forests. The EAMCEF grant funding approach provides a model, which can be customized to meet PES attributes. The approach has proved to deliver both social and economic benefits to communities who in turn provide the management roles to the ecosystem.

The EAMCEF grant management arrangement can incorporate designing of a workable PES scheme through collaboration with both national and international experts on PES and environmental economics. Considering a wide range of ecosystem services that the EAMs provide, the scale of PES can range from international, national, landscape and local levels.

Quantification of ecosystem services from EAMs is reflected through an approach of costing purchasing of such services if they were not provided by the ecosystem. For example, water is the primary service one can easily relate to this quantification. As most rivers feeding major hydropower dams originates from the EAMs, one may ask – how much would it have cost to generate power using alternatives such as coal, gas, or fuel?

7.2 Towards a viable PES programme across the EAMs

A number of initiatives have been experimented in Tanzania and other parts of the world on how PES model works. In Tanzania, CARE international and WWF facilitated projects in the EAMs on PES. By drawing lessons from studies to valuate ecosystem services combined with implemented projects supported under the EAMCEF, we are proposing models that will be used for ecosystem services. The main questions in developing these models are divided into three. First Who is to be paid? Second, Who should pay? And third, How much and how should such payment be done?

However, apart from key design issues, a high-level policy commitment is needed on aspects of operationalization and sensitization of buyers of the services. The PES agenda requires spearheading by the government and its line ministries. High level discussions on PES are needed in order to engage various stakeholders at the national level. Across the board, users of ecosystem services and those who generate benefits from such services should understand and build confidence on paying for ecosystem services.

Innovative solutions are needed to design workable PES, including how manufacturing, transport and airline sectors can compensate the important carbon offset function of the forests for the EAMs. Depending on the design idea of a particular ecosystem service, ideas to promote behaviour changes of consumers such as through development of product certification schemes can play a great role.

A starting point in designing a viable PES scheme includes – five key steps :

Details for each step are provided in table 7.1

Who is to be paid?

The owner of the ecosystem where a particular ecosystem service is generated has the rights to determine the price, modalities of payments and receive all payments charged against the service being delivered or offered. Most of the forests of the EAMs are owned by the government (as Nature Forest Reserves) and are mainly protected for their biodiversity value and water catchment services among others. Similarly, payment for tourisms activities are made through responsible authorities as entry fees for someone to enjoy the nature. This payment is done to owners of the resource e.g. the Tanzania National Park Authority (TANAPA) which is a government entity, or to the Ngorongoro Conservation Area Authority (for access to Ngorongoro Conservation Area).

The protected forests of the EAMs are owned and managed by the government. In areas where local communities surrounding the protected forests enter into some forms of agreements for joint management of the government-owned forests, these communities (e.g. villages) then become co-managers sharing management responsibilities with the government, but not the ownership.

In this case, payments for various ecosystem services generated by the EAMs forests are to be paid for to the government. For example, under the carbon trading arrangement the owner of the carbon credits stored in the forests of the EAMs is the government and therefore has all rights to engage in global carbon business through both voluntary and obligatory mechanisms. Decision on how much payments (or benefit) are shared with participating communities depends on the nature of the agreement between the two parties. In areas where nature generates revenue, sharing with surrounding villages is done through support to extension services and through community development projects. Communities adjacent to the EAMs provide the immediate support in the

management of these resources. Services are sustained if these communities maintain good relationship with nature and remain friends to the ecosystem.

Facilitating payment to communities has governance challenges. One way seemingly working is to make available financial resources from which communities can apply with the purpose of implementing projects that have connection to the improvement of management of the ecosystem. This approach segregates between those who are willing to bear the management cost from others and consequently deserves the benefit.

Availability of a financial resource to support community projects relates to an approach similar to that of EAMCEF. Thus, support to projects by EAMCEF over 15 years provides one possible illustration on how payment for ecosystem services can be channelled.

By bordering these ecosystems, local authorities have the responsibilities to prevent and monitor illegal activities taking place adjacent to these ecosystems. EAMCEF involves local authorities in the entire grant support from application, implementation, monitoring and reporting.

The central government units mandated to oversee management of these ecosystems, experiences budget deficit to fully implement management plans for various protected areas. EAMCEF has a special window which is used to support conservators in nature reserves within EAMs thereby complementing the available financial resources. This window can also be used to channel payments for ecosystem services.

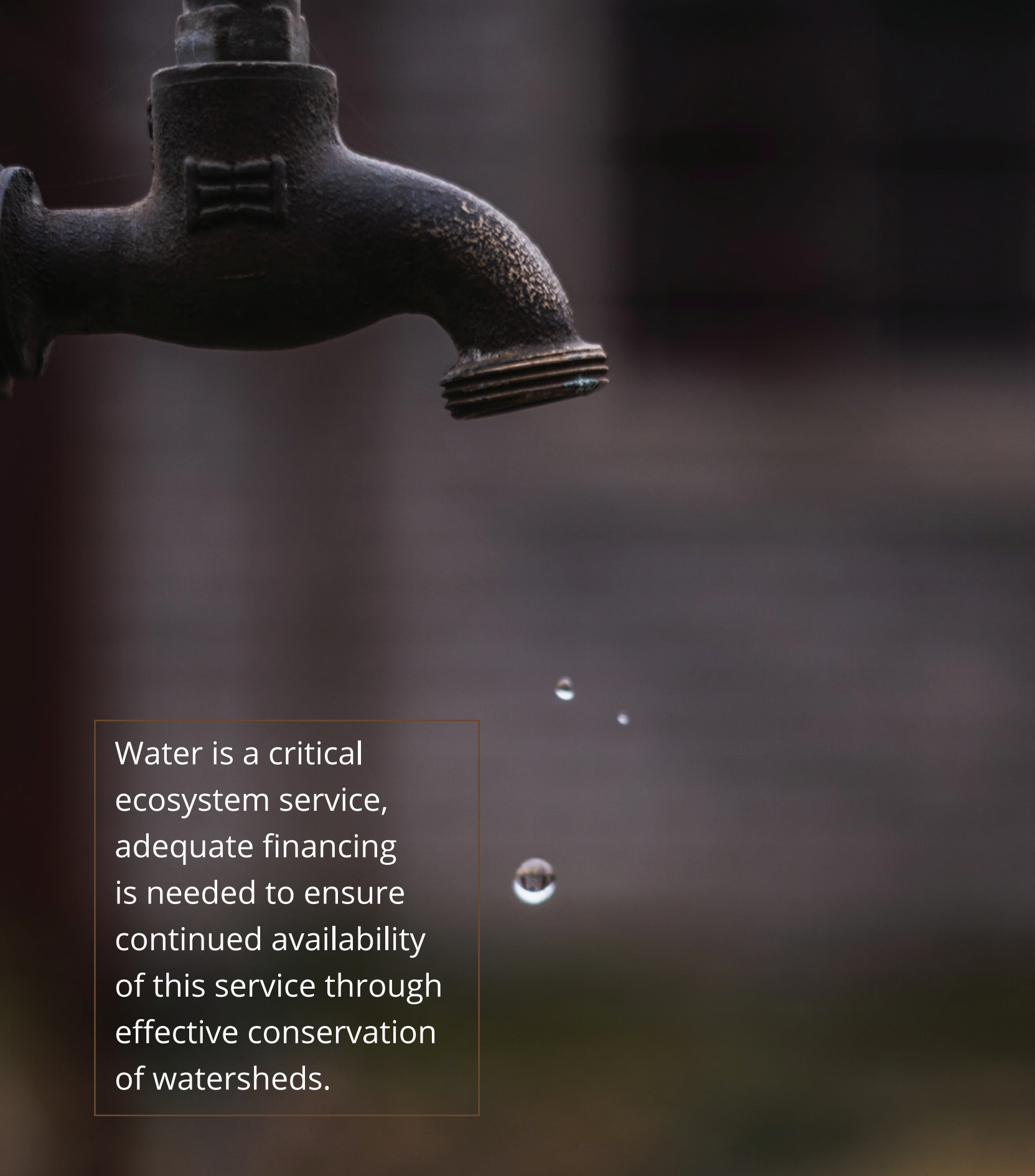
Who should pay?

From upstream to downstream, a range of users of a particular ecosystem services enjoy the availability of the same. Imagine a river flowing kilometres downstream, providing water for industries, for large scale irrigation, for power production – to what extent are water fees reach communities and protected area managers who conserve the resource and ultimately ensure continued flow of water services. Water and carbon services are potential examples which can attract payments. To begin this, it is recommended that a small amount (in percentage) should be charged to large water users such as agricultural plantations, electricity authorities, manufacturing industries (such as soft drinks and liquor) and water authorities in Dar es Salaam, Coastal, Morogoro, Tanga and Iringa.

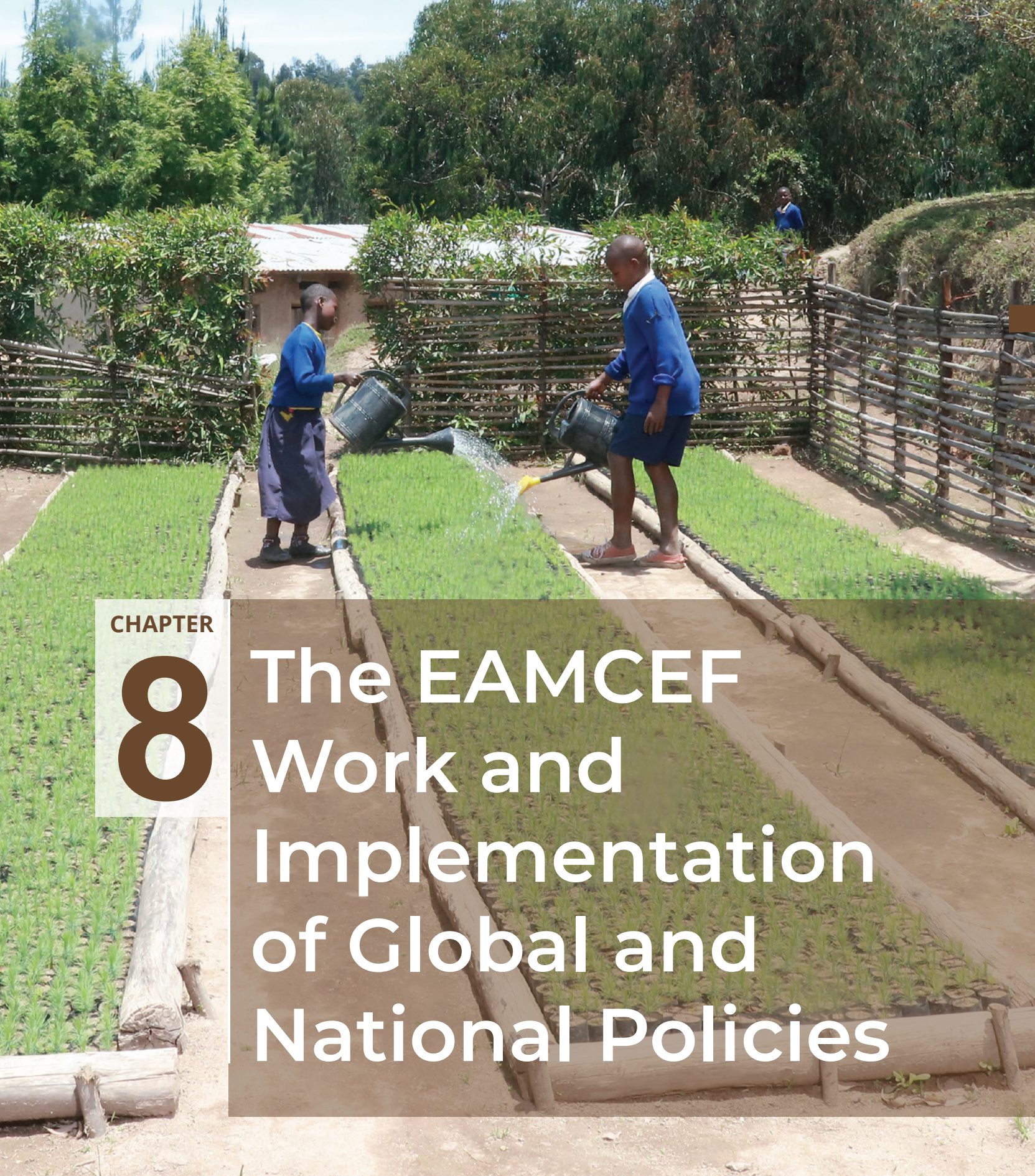
Arrangements should also be in place that requires all production firms and institutions working in the EAMs areas to offset their carbon footprints – thereby investing on available forest carbon schemes such as REDD+ (Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries) and tree planting. The EAMCEF is the most relevant institution with an operational fund mandated to channel resources back to the ecosystem.

Table 7.1. Key steps to establish a viable and long-term PES scheme arrangement

	Mapping out of available ecosystem services within the EAMs: This is a stock-taking exercise, an expensive undertaking and involves clearly defining each service and determining which of these services is intended for sale. Identified services then are assessed and quantified and market value determined. Some examples in this case for the EAMs include key services such as watershed protection and carbon credits. Some information is already available through various projects/researches conducted in the EAMs.
	The next step is to identify individuals, groups and institutions benefiting from these services (refer the example of watershed protection and carbon credit) for further lobbying to identify potential buyers of the particular service. These buyers can be private companies for example within the SAGCOT area, government, NGOs, donor agencies, individuals etc. Since this arrangement is voluntary, challenges are always there but strategic lobbying is required. Environmental services such as carbon sequestration are important not only for the surrounding ecosystem but also for the global climate, and therefore identification of potential buyers from both voluntary buyers and compulsory markets presents a great opportunity. The EAMCEF has already collected some information on carbon potentials of key forests.
	Designing a project document/project design document for PES scheme with clear management structure and 'business plans' for the identified tradable services. Since potential buyers have been identified, lobbying continues and contracts and partnerships are developed to operationalize the plan, with clear options for payment types agreed. This also goes together with designing a benefit sharing mechanism with the surrounding communities.
	Operationalization of the PES scheme in line with agreed contracts for each tradable environmental service such as water used for irrigation, hydropower generation, industrial activities, and carbon potential of the EAMs forests.
	Monitoring, Evaluation and Review of implementation. At this stage, the performance of PES scheme is reviewed and monitored to check whether the intended objectives are being met, including compliance to set principles and standards. Data from monitoring activities provides information for decision making and adaptive management. Decisions on PES may include options to address multiple benefits from the scheme.



Water is a critical ecosystem service, adequate financing is needed to ensure continued availability of this service through effective conservation of watersheds.



CHAPTER

8 The EAMCEF Work and Implementation of Global and National Policies

Indirectly, global and national policies and programmes that support management of ecosystems aiming at enhancing the services they offer to support livelihood and sustainable development. Supporting implementation of these policies, plans and programmes is therefore a contribution to the enhancement on the ecosystem services. The highlight below shows how the EAMCEF work links with globally agreed agenda.

8.1 EAMCEF and the Paris Agreement

Tanzania signed the Paris Agreement in April 2016, joining international efforts to reduce greenhouse gases emissions, through adaptation and mitigation activities and financing of the same.

Adoption 55 of the Paris agreement states that;
Recognizes the importance of adequate and predictable financial resources, including for results-based payments, as appropriate, for the implementation of policy approaches and positive incentives for reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks; as well as alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests; while reaffirming the importance of non-carbon benefits associated with such approaches; encouraging the coordination of support from, inter alia, public and private, bilateral and multilateral sources, such as the Green Climate Fund, and alternative sources in accordance with relevant decisions by the Conference of the Parties;

The EAMCEF grant support in addressing drivers of deforestation and forest degradation through community-development approaches and strengthening management capabilities of responsible institutions is in line with the Adoption 55 of the Paris Agreement – thus contributing to Tanzania's efforts in fulfilling its international obligation.

Article 5(1-2) of the Paris Agreement emphasizes a need for.

- Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests.

- Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.

Conservation actions by the EAMCEF ensures that the forests of the EAMs sustains its role as carbon sink and supplements government efforts in conservation.

8.2 EAMCEF and SDGs

The new development agenda – the 2030 Agenda for Sustainable Development was decided at the United Nations Sustainable Development Summit, of September 25th -27th, 2015. The Agenda consisted of a set of 17 Goals – called Sustainable Development Goals (SDGs) and 169 Targets that would end poverty, fight inequalities, promote peace and justice, and tackle climate change by 2030. The new Goals and Targets were agreed to come into effect on 1st January 2016. The Goals are characterized as integrated and indivisible with three-balanced dimensions of sustainable development – economic, social and environmental (United Nations, A/RES/70/1).

Sustainable Development Goals

Goal 1: No Poverty: "End poverty in all its forms everywhere."
Goal 2: Zero Hunger: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture."
Goal 3: Good Health and Well-Being: "Ensure healthy lives and promote well-being for all at all ages."
Goal 4: Quality Education: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"
Goal 5: Gender Equality: "Achieve gender equality and empower all women and girls."
Goal 6: Clean Water and Sanitation: "Ensure availability and sustainable management of water and sanitation for all."
Goal 7: Affordable and Clean Energy: "Ensure access to affordable, reliable, sustainable and modern energy for all."
Goal 8: Decent Work and Economic Growth: "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all."
Goal 9: Industry, Innovation and Infrastructure: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."
Goal 10: Reduced Inequalities: "Reduce income inequality within and among countries."
Goal 11: Sustainable Cities and Communities: "Make cities and human settlements inclusive, safe, resilient and sustainable."
Goal 12: Responsible Consumption and Production: "Ensure sustainable consumption and production patterns."
Goal 13: Climate Change: "Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy."
Goal 14: Life Below Water: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."
Goal 15: Life on Land: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss."
Goal 16: Peace, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels."
Goal 17: Partnerships for the Goals: "Strengthen the means of implementation and revitalize the global partnership for sustainable development."

Results of EAMCEF supported projects link well and contributes to the attainment of SDGs Targets within the EAMs and at the national level scales. Linked to biodiversity conservation and climate change mitigation, the EAMCEF work links well with objectives of SDGs, more specifically Goals 6, 7, 13 and 15.

Goal number 6

The EAMCEF work contributes to the achievement of SDG number 6 on clean water and sanitation. "Ensure availability and sustainable management of water and sanitation for all" by contributing to the achievements of 3 targets namely Target 6.1: "by 2030, achieve universal and equitable access to safe and affordable drinking water for all", Target 6.6: "by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes" and Target 6.B "support and strengthen the participation of local communities for improving water and sanitation management". Supported projects have contributed to the protection of the Eastern Arc Mountains forests as catchment that provides water that in turn supports about 25% of Tanzania's population downstream.

Goal number 7

The EAMCEF work has contributed to SDG 7: "Ensure access to affordable, reliable, sustainable and modern energy for all" by contributing to Target 7.1: "By 2030, ensure universal access to affordable, reliable and modern energy services", Target 7.2: "by 2030, increase substantially the share of renewable energy in the global energy mix", Target 7.3: "by 2030, double the global rate of improvement in energy efficiency" and Target 7b: "by 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries". EAMs provides water for up to 90% of the hydro- power generated by the Government of the United Republic of Tanzania and EAMCEF work has contributed to ensure the ecosystem is protected. Projects supported by EAMCEF have also promoted biogas, solar energy as well as energy efficient stoves as alternatives to wood fuel thus supporting the achievement of the SDGs while conserving the forests.

Goal number 13

The EAMCEF work has contributed to achieving SDG 13 by supporting Target 13.3; "improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning". Supported projects included sensitization campaigns to create awareness amongst surrounding communities on forest conservation and climate change thus strengthened the communities of its partners to carry out some climate change adaptation activities.

Goal number 15

The EAMCEF work contributed to achieving SDG 15: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" by supporting; Target 15.1: "by 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland water ecosystems and their services, in particular forests, wetlands, mountains and drylands…", Target 15.2: "by 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and sustainably increase afforestation and reforestation globally", Target 15.4: "by 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development", Target 15.5: "take urgent and significant actions to reduce the degradation of natural habitats, halt the loss of biodiversity, and by 2020, protect and prevent the extinction of threatened species", Target 15.6: "promote fair and equitable sharing of benefits arising from the utilization of genetic resources and promote access to such resources, as internationally agreed" and Target 15.7: "take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products". The project conservation activities supported the achievement of this SDG.

8.3 The EAMCEF and the Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is a multilateral environmental agreement with three main goals of conserving biological diversity, sustainable use of biodiversity components, and fair and equitable sharing of benefits arising from genetic resources. The EAMCEF contributed directly to almost all articles of the CBD. Although the convention was agreed in 1992, forest conservation related laws and policies prepared in Tanzania reflect this convention. Article 20 is specifically on financing and states that "Each Contracting Party undertakes to provide, in accordance with its capabilities, financial support and incentives in respect of those national activities which are intended to achieve the objectives of this Convention, in accordance with its national plans, priorities and programmes"

8.4 Link with National Macro and crosscutting policies, laws and strategies

8.4.1 Tanzania's Vision 2025

The EAMCEF project work contributes to Tanzania's Vision 2025 which states that "It is also envisioned that the fast growth will be pursued while effectively reversing current trends in the loss and degradation of environmental resources (such as forests, fisheries, fresh water, climate, soils, biodiversity) and in the accumulation of hazardous substances". The conservation activities of the EAMCEF projects therefore are in line with Tanzania's Vision 2025.

- **National Environmental Policy (1998)**
  Some of the policy statements of the National Environmental Policy aims to "prevent and control degradation of land, water, vegetation and air which constitute our life support systems"; "to conserve and enhance our natural and manmade heritage, including the biological diversity of the unique ecosystems of Tanzania" and "to raise public awareness and understanding of the essential linkages between environment and development, and to promote individual and community participation in environmental action[1] . The policy points out key environmental problems that require urgent attention, including land degradation, environmental pollution, loss of wildlife habitats and biodiversity, and deforestation. The document also states that "The private sector and the community of Non-Governmental Organisations therefore offer a national network that should be tapped, enabled and strengthened in support of efforts to achieve environmental objectives. EAMCEF's conservation approach and activities support these policies.

- **Environmental Management Act (2004):**
  EMA provides for "legal and institutional framework for sustainable management of the environment; to outline principles for management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement; to provide basis for implementation of international instruments on environment; to provide for implementation of the National Environment Policy; to repeal the National Environment Management Act, 1983 and provide for continued existence of the National Environment Management Council; to provide for establishment of the National Environmental

1 The National Environmental Policy (December 1997). The United Republic of Tanzania, Vice Presidents Office

Fund and to provide for other related matters". Through its objective to promote the enhancement, protection, conservation and management of the environment - this Act then provides legal basis for implementation of environmental projects financed and coordinated by EAMCEF through enabling environment set by the environmental policy and other related policies.

- **National Land Policy**

  The project supports the **National Land Policy**[2] that is against the allocation of sensitive areas such as water catchment areas, mountains, forests, national parks, rivers, river basins and banks, seasonal migration routes of wildlife, national heritage and areas of biodiversity to individuals. The policy calls for creation of mechanisms to protect sensitive areas. By reclaiming land that has been encroached on and restoring forests, EAMCEF supports this policy.

- **Tanzania's Rural Development Strategy**

  Tanzania's Rural Development Strategy[3] notes that "the challenge of reversing the loss of environmental resources remains. Significant progress will not be made on the effective utilisation of natural resources until their potential for assisting with the reduction of poverty is fully recognised". The strategy emphasizes economic diversification in rural areas despite heavy dependency on agricultural activities. It also supports fish farming which is one of the activities that will be supported by the project. The EAMCEF project works in rural areas supports livelihoods and encourages the sustainable use of natural resources to tackle poverty thus supporting this policy.

- **The National Science and Technology Policy**

  The National Science and Technology Policy[4] for Tanzania recognises the link between sustainable development and sound environmental management. The EAMCEF project activities support this policy by capitalizing on environmentally friendly technologies to support livelihoods and conservation.

- **National Climate Change Strategy**

  Under the **National Climate Change Strategy (2012),** enhancing conservation of forest diversity is recognized as an important strategic intervention to enhance climate change adaptation in the forest sector. The strategy recognizes the invaluable contribution of forests to the national income and the role of forests as a carbon sink. Recognizing that climate change causes impact on forests and ecosystems, the strategy sets interventions to ensure protection and conservation of the forests through application of best practices for example, in expanding forest cover conserving soil and water. The EAMCEF project's activities contribute to the strategic goal of building resilience and adaptive capacity of the sector to climate change.

---

2 National Land Policy. Ministry of Lands and Human Settlements Development, Dar Es Salaam, Tanzania. 1997

3 Rural Development Strategy. Prime Minister's office, Tanzania. December 2001

4 The National Science and Technology Policy for Tanzania. Ministry of Science, Technology and Higher Education. 1996

- **National REDD+ Strategy**
  The **National REDD+ Strategy (2013)** recognizes the role of forest and forest conservation efforts in mitigating climate change through REDD+. The strategy envisages to unlock the forest potential through benefits arising from internationally approved system of forest carbon trading. The strategy identifies major causes of deforestation and forest degradation such as energy needs (charcoal and firewood demand), illegal and unsustainable harvesting of forest products, forest fires, agriculture expansion, settlements, and resettlements among others. It is part of the Nationally Appropriate Mitigation Actions (NAMAs) to reduce greenhouse gas emissions as agreed by Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The EAMCEF project work contributes to achieving REDD + objectives by fighting deforestation and forest degradation.

- **The Nationally Determined Contributions (NDCs)**
  The NDC is a key document setting path and government's commitments on Mitigation and Adaptation actions necessary to contribute to the global Green House Gas (GHGs) reduction stipulatde in the Paris Agreement on Climate Change – Tanzania is amongst 195 nation signatories to the Paris Agreement.

  NDCs recognizes the role of the forestry sector in climate change adaptation and calls for implementation of measures, such as (i) enhancing participatory sustainable forest and wildlife management and protection of forest and wildlife resources, including among others, through participatory fire control and management; and (ii) Safeguarding the ecosystem services, including through the promotion of alternative livelihood options to forest dependent communities.
  The work of the EAMCEF in collaboration with both protected area management and local communities, in protecting the valuable resources of the EAMs is relevant to and in line with the national priorities in NDC.

8.5 Sector specific laws and policies

- **[1]The National Forest Policy**
  The National Forest Policy notes that "Tanzania is one of the fourteen biodiversity hotspots in the world". "Apart from the national parks, the country has other rich variety of ecosystems of economic, scientific and aesthetic value. The outstanding ones are the Eastern Arc Mountains which have a high level of endemism". It goes stating that "most of them have important genetic resources for medicinal plants, timber tree species and other plants of economic importance. Forests contribute to agricultural stability by regulating water balances, protecting the soil and pollinating the crops. The ecosystems are threatened by a variety of human activities, including the heavy pressure for agricultural expansion, livestock grazing, wildfires and over exploitation of wood resources. These human activities have caused deterioration of ecosystems and soil fertility, reduced water flows and loss of biological diversity". The Government of Tanzania recognizes that it cannot protect the forests on its own and that it requires community and NGOs support. The project therefore supports this policy given its conservation activities.

1 The National Forest Policy, March 1998.

- **National Water Policy**

  According to the **National Water Policy (2002)**[2] , "Tanzania has about 33.5 million hectares of forests and woodlands. Out of this, about two thirds consist of woodlands on public lands that are under enormous pressure from expansion of agricultural activities, livestock grazing, fires and other human activities. The forests offer habitat for wildlife, beekeeping, unique natural ecosystem and genetic resources, and have an important effect on the conservation of water resources". The policy stresses the need to protect water as a vulnerable resource facing pressure from increasing multi-sectoral demands of the rapidly growing population, environmental degradation and growth in economic activities such as irrigated agriculture, industrial production, hydro-power production, mining, livestock keeping, fisheries, environmental sanitation and for wildlife water use. The EAMCEF project work contributes to Tanzania's water security and its economic development by conserving the EAMs that supply about 25% of the Tanzanian population with water.

- **Forest Act**

  The EAMCEF project's activities are also in line with the **Forest Act (2002)** which seeks to promote/ enhance the contribution of the forest sector to sustainable development, to encourage participation of citizens in conservation, and to facilitate greater public awareness on forestry issues. The Act encourages stakeholders' participation in planning, management, use and conservation of forest resources and delegates powers to communities and individuals to exercise their rights to use and manage forest resources. Effective implementation of the Act is envisaged to enhance conservation of forest biodiversity, water catchment, and soil fertility as well as greater public awareness of the value of conserving forests. The EAMCEF project work supports the Act by enabling community participation in the management and conservation of the EAMs, fighting encroachment and funding restoration.

- **Wildlife Policy**

  The EAMCEF project work supports the **Wildlife Policy (1998)** on management of protected areas. It contributes to achieving wildlife protection objectives which stresses the need for maintenance and development of a protected area network in order to enhance biological diversity. The policy addresses national challenges such as conservation of areas with great biodiversity, support and expansion of Protected Area networks, integration of wildlife conservation with rural development, improving income from wildlife resources, enhancing the recognition of intrinsic value of wildlife to the rural people, as well as creating enabling environment for international co-operation in wildlife conservation. The EAMCEF project conservation activities in protected areas support this policy.

- Na**tional Tourism Policy**

  The **National Tourism Policy (1999)** aims to increase revenues and contribution of tourism to foreign currency earnings, tourism infrastructure development (with specific focus on eco-tourism), job creation and awareness within the public sector. The EAMCEF project's conservation activities, support for eco-tourism infrastructure such as nature trails, camps and roads, community participation in the management of tourism attractions support this policy.

2 National Water Policy. Ministry of Water and Livestock Development, July 2002

- **National Beekeeping Policy**
  The EAMCEF project work supports the **National Beekeeping Policy (1998)** which recognizes the role of forests in providing shelter and food for bees. The policy also covers beekeeping for ecosystem conservation and management as well as beekeeping in areas such as public lands, national parks and game reserves, forest reserves and plantations. The EAMs are an important habitat for bees and their conservation therefore supports this policy. The EAMCEF projects supports beekeeping activities among local community groups as an environmentally friendly strategy to increase income and promote community support to conservation initiatives.

- **Agriculture and Livestock Policy**
  The **Agriculture and Livestock Policy**[3] notes that "Agriculture involves the management of natural resources for the production of commercial goods. It is crucial for the long-term future of the country that Tanzania's natural resources (Soils, Water, forests, wildlife) be managed so that agricultural production is sustainable and negative externalities are kept to a minimum." This is consistent with the sustainable approaches taken by the EAMCEF project which promotes conservation agriculture and environmentally friendly and sustainable agricultural activities that support conservation and address poverty.

- **National Energy Policy**
  The **National Energy Policy**[4] notes that the heavy dominance of fuelwood continues to be a major threat to forests such as those in the EAMs. The policy aims at creating enabling conditions for provision of secure, reliable, affordable, safe, efficient, cost effective and environmentally friendly modern energy services to all. The project encourages communities to adopt alternative sources of energy and efficient energy use technologies. This includes the promotion of energy efficient stoves and biogas digesters. It is also fighting to conserve the EAMs that accounts for 90% of Tanzania's hydroelectric power thus supporting this policy.

---

3 Agriculture and Livestock Policy. Ministry of Agriculture and Cooperatives. Dar-es-salaam. 1997
4 National Energy Policy. Ministry of Energy and Minerals. 2003

Our Key Partners

The success of the EAMCEF work has been contributed by a number of partners we have worked with;

Main funders:

The Government of the Kingdom of Norway	The Governent of the Kingodom of Norway has been funding the EAMCEF operations and project interventions over the last10 years (2011-2020)
World Bank and the Global Environment Facility (GEF)	Between 2002 and 2009, EAMCEF was fully funded by the World Bank (WB) and the Global Environment Facility (GEF) through the Government of Tanzania

Investment Management Consultants/Financial advisors and Banks:

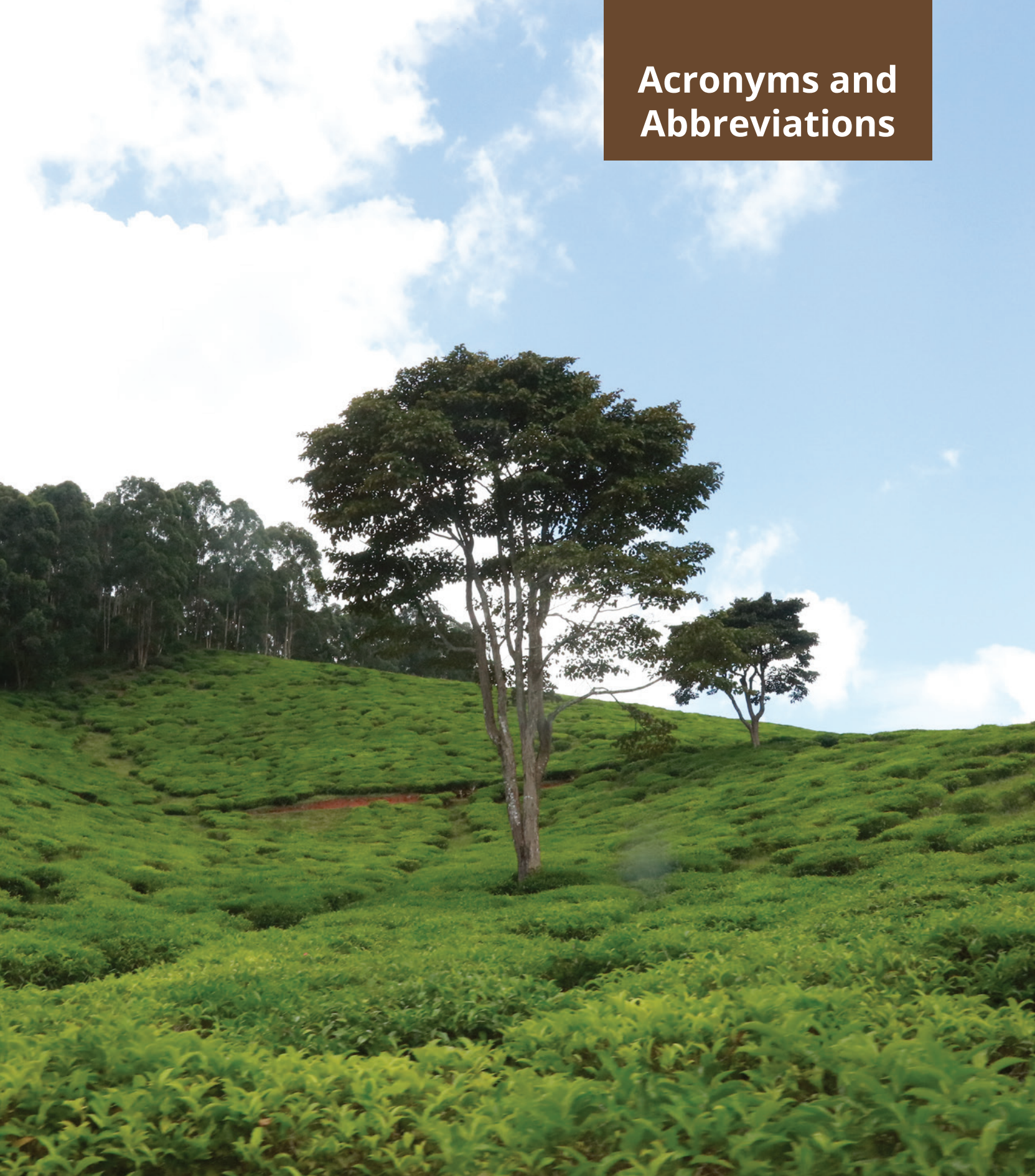
- UBS
- CRDB Bank PLC
- ABSA
- Exim Bank

Implementing Partners:

Government Ministries:	Ministry of Natural Resources and Tourism – Forestry and Beekeeping Division Vice President's Office- Division of Environment (DoE)
Government Agencies:	National Environment Management Council (NEMC) Tanzania Forest Services (TFS) Agency Tanzania National Parks (TANAPA)
Research and Academic Institutions	Sokoine University of Agriculture (SUA) Tanzania Agricultural Research Institute (TARI) Tanzania Forestry Research Institute (TAFORI) Tanzania Wildlife Research Institute (TAWIRI) Mzumbe University (MU) University of Dar-es-Salaam (UDSM)

Local Authorities (Target Districts) and local communities in project sites:	Korogwe District Council Kilombero District Council Kilolo District Council Lushoto District Council Muheza District Council Mkinga District Council Mvomero District Council Morogoro District Council Morogoro Municipal Council Mufindi District Council Same District Council
Non-Government and Community-Based Organizations	Care-Tanzania ENEPA Green Consultancy Emerge-Tanzania Chama cha Mazingira na Maendeleo ya Umma Tanzania (CMMUT) Friends in Development (FIDE) Livelihood Development Tanzania (LIDET) Mtandao wa Jamii wa Usimamizi wa Misitu Tanzania (MJUMITA) Morogoro Environmental Conservation Action (MECA) Group, NAKYA Group Same Community-Based Organization (SCBO) Same Mwanga Environmental Conservation Advisory Organization (SMECAO) Society for Women and AIDS in Africa (SWAA) Tanzania Forest Conservation Group (TFCG) Tanzania Association of Foresters (TAF) Tanga Energy Development Association Trust (TEDA) Umoja wa Wahifadhi Mazingira Kihuhwi Zigi (UWAMAKIZI) Victory Youth Support Organization (VIYOSO) World Wildlife Fund (WWF)
Private Companies	SONGAS Unilever Various consulting companies and consultants

Acronyms and Abbreviations



ANFR	Amani Nature Forest Reserve
AGG	Agriculture Green Growth
BEST	Biomass Energy Strategy
CA	Conservation Agriculture
Cap.	Chapter
CBOs	Community-Based Organizations
CCRO	Certificate of Customary Rights of Occupancy
CNFR	Chome Nature Forest Reserve
CO2e	Carbon dioxide Equivalent
CREAM	Conservation and Restoration of the Eastern Arc Mountains
DED	District Executive Director
EAMCEF	Eastern Arc Mountains Conservation Endowment Fund
EAMs	Eastern Arc Mountains
EBAs	Endemic Bird Areas
EMA	Environmental Management Act
FYDP	Tanzania's Five-Year Development Plan
GEF	Global Environment Facility
Ha	Hectare – Unit of area
IGAs	Income Generating Activities
IUCN	The International Union for Conservation of Nature

JFM	Joint Forest Management
JNHS	The Julius Nyerere Hydropower Station
KM/km	Kilometer
KNFR	Kilombero Nature Forest Reserve
LACs	Local Advisory Committees
LUP	Land Use Plan
MDGs	Millennium Development Goals
MkNFR	Mkingu Nature Forest Reserve
MNFR	Magamba Nature Forest Reserve
MNRT	Ministry of Natural Resources and Tourism
NAMA	Nationally Appropriate Mitigation Actions
NCCS	National Climate Change Strategy
NEAP	National Environmental Action Plan
NDC	Nationally Determined Contributions
NGOs	Non-Governmental Organizations
NNFR	Nilo Nature Forest Reserve
NSGRP	National Strategy for Growth and Reduction of Poverty
NOK	Norwegian Krone
NR	Nature Reserve
PAs	Protected Areas

PES	Payment for Ecosystem Services
PFM	Participatory Forest Management
REDD+	Reduced Emissions from Deforestation and Forest Degradation, including conservation of forest carbon stocks, sustainable management of forest and enhancement of Forest carbon stocks
RNE	The Royal Norwegian Embassy
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SDGs	Sustainable Development Goals
TANAPA	Tanzania National Parks Authority
tC	Tons of carbon
tCO2	Tons of carbondioxide
NPV	Net Present Value
TFS	Tanzania Forest Services Agency
TFCMP	Tanzania Forest Conservation and Management Project
ToT	Training of Trainers
TZS	Tanzanian Shillings
UMNP	Udzungwa Mountains National Park
UNESCO	The United Nations Education, Science and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFR	Uluguru Nature Forest Reserve
URT	United Republic of Tanzania
USNFR	Uzungwa Scarp Nature Forest Reserve
USD	United States Dollar
VLUM	Village Land Use Management
VNRC	Village Natural Resource Committee
VICOBA	Village Community Banks
VPO	The Vice President's Office, Tanzania

Bibliography

Baker, N.E. & E.M. Baker (2002). Important Bird Areas in Tanzania: A First Inventory. Wildlife Conservation Society of Tanzania, Dar es salaam, Tanzania.

Burgess N.D, Butynski T.M, Cordeiro N.J, et al. (2007). The Biological Importance of the Eastern Arc Mountains of Tanzania and Kenya. Biological Conservation 134(2): 209–231.

Burgess N.D, D'Amico Hales J, Ricketts T, and Dinerstein E (2006). Factoring Species, Non-species Values and Threats into Biodiversity Priority-setting Across the Ecoregions of Africa and its Islands. Biological Conservation 127(4): 383–401.

EAMCEF, 2011. Improving Conservation of the Eastern Arc Mountains Forests of Tanzania: A Project Document Funded by the Royal Government of Norway- Dar es salaam, Tanzania. May 2011 – unpublished.

EAMCEF, 2013. Baseline Survey Report for 8 Nature Reserves and 1 National Park in the Eastern Arc Mountains of Tanzania, April 2013. Final Draft Report by Forconsult – unpublished.

EAMCEF, 2014. Mid-Term Progress Report and Financial Statements (June 2011-November 2013).
EAMCEF, 2019. Economic Value of Ecosystem Services from Eastern Arc Mountains of Tanzania. Morogoro. Tanzania.

EAMCEF, 2016. Assessment Report of the Project Results and Impacts of Improving Conservation of the Eastern Arc Mountains Forests of Tanzania, April 2016.

EAMCEF, 2016. Endline Survey Report in 8 Nature Reserves and 1 National Park in the Eastern Arc Mountains of Tanzania, Draft Report of 16th August 2016.

EAMCEF, 2017. Project Completion Report and Financial Statements (June 2011-May 2016), for the project Improving Conservation of The Eastern Arc Mountains Forests of Tanzania, TAN 08/078.

EAMCEF, 2017. Project Completion Report and Financial Statements (June 2016-May 2019), for the project Conservation and Restoration of the Eastern Arc Mountains (CREAM), TAN 15/0016.

EAMCEF, 2019. Economic Value of Ecosystem Services From Eastern Arc Mountains Of Tanzania. Available at http://www.easternarc.or.tz/wp-content/uploads/2020/08/EAMCEF-Valuation-Final-report_08Feb2019.pdf

EAMCEF, 2020. Sustaining Conservation and Restoration of the Eastern Arc Mountains (SCREAM) Project. A Project Proposal for Funding Consideration by The Royal Government of Norway. August 2020 version.

EAMCEF: Annual Progress Report and Financial Statements (2011 – 2016), for the project Conservation and

Restoration of the Eastern Arc Mountains (CREAM), TAN 15/0016.

EAMCEF, 2020. Guidelines for Preparation Of Project Proposals And Procedures For Making Grants

ERM, 2013. Southern Agricultural Growth Corridor of Tanzania: Environmental and Social Management Framework (ESMF). Tanzania.

Fisher B, Kulindwa K, Mwanyoka I, Turner RK, and Burgess N.D (2010) Common Pool Resource Management and PES: Lessons and Constraints for Water PES in Tanzania. Ecological Economics 69: 1253–1261.

ICBP, 1992. Putting Biodiversity on the Map: Priority Areas for Global Conservation. ICBP, Cambridge.
Indufor, 2016. End-Review of Improving Conservation of the Eastern Arc Mountains Forests of Tanzania Projects, Case No. 207701915 – Final Report.

Lovett, J.C., Pócs, T., 1993. Assessment of the Condition of the Catchment Forest Reserves, a Botanical Appraisal. Catchment Forestry Report 93.3, Dar es Salaam. 300 pp. www.easternarc.or.tz.

Mbilinyi, B., Kashaigili, J., 2005. A Forest Area Baseline for the Eastern Arc Mountains. Technical Report – Conservation and Management of the Eastern Arc Mountain Forests, Forest and Beekeeping Division, Ministry of Natural Resources and Tourism.

Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-Being: Current State and Trends. Washington DC: Island Press.

Mittermeier R.A, Robles-Gil P, HoffmannM, PilgrimJ, et al. (2004) Hotspots Revisited: Earth's Biologically Richest and Most Endangered Ecoregions. Mexico: Cemex.

Mittermeier, R.A., Myers, N., Thompsen, J.B., da Fonseca, G.A.B., Olivieri, S., 1998. Biodiversity Hotspots and Major Tropical Wilderness Areas: Approaches to Setting Conservation Priorities. Conservation Biology 12, 516–520.
Mittermeier, R.A., Robles-Gil, P., Hoffmann, M., Pilgrim, J.D., Brooks, T.M., Mittermeier, C.G., Lamoreux, J.L. & Fonseca, G. (eds) 2004. Hotspots Revisited: Earth's Biologically Richest and Most Endangered Ecoregions. Cemex, Mexico.

Mwihomeke, S. & Msangi, T. & Mabula, C. & Ylhäisi, J. & Mndeme, K., (1998). Traditionally Protected Forests and Nature Conservation in the North Pare Mountains and Handeni District, Tanzania. Journal of East African Natural History. 87. 279-290.

Olson, D.M., Dinerstein, E., 1998. The Global 200: A Representation Approach to Conserving the Earth's most Biologically Valuable Ecoregions. Conservation Biology 12, 502–515.

PEM Consult, 2019. End Review of EAMCEF II Conservation and Restoration of the Eastern Arc Mountains Case no. 201900299.

Regalia Media Consult, 2015. Communication, Marketing and Resource Mobilization Initiative Accomplished by the Regalia Media for the EAMCEF, July 2011-June 2015.

SAGCOT, 2012. Southern Agricultural Growth Corridor of Tanzania: A Green Growth Investment Framework for SAGCOT – The SAGCOT Green Print. Draft of August 2012.

SAGCOT, 2011. Southern Agricultural Growth Corridor of Tanzania: Investment Blueprint, January 2011.

Scanteam, 2014. Review of the Eastern Arc Mountains Conservation Endowment Fund, Final Report. Oslo. Norway. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. A/RES/70/1.

United Republic of Tanzania, 2011. The Tanzania Five Year Development Plan 2011/2012-2015/2016 – Unleashing Tanzania's Latent Growth Potentials, Ministry of Finance and Planning. Dar es Salaam, Tanzania.

United Republic of Tanzania, 2016. The Tanzania Five Year Development Plan 2016/2017-2020/2021 – Nurturing Industrialization for Economic Transformation and Human Development, Ministry of Finance and Planning. Dar es Salaam, Tanzania.

United Republic of Tanzania, 1996. The National Science and Technology Policy for Tanzania. Ministry of Science, Technology and Higher Education. Dar es Salaam, Tanzania.

United Republic of Tanzania, 1997. National Land Policy. Ministry of Lands and Human Settlements Development, Dar es Salaam, Tanzania.

United Republic of Tanzania, 1997. Agriculture and Livestock Policy. Ministry of Agriculture and Cooperatives. Dar-es- Salaam. Tanzania

United Republic of Tanzania, 1997. National Fisheries Sector Policy and Strategy. Ministry of Natural Resources and Tourism. Dar es Salaam. Tanzania

United Republic of Tanzania, 1997. The National Environmental Policy. The Vice President's Office. Dar es Salaam, Tanzania.

United Republic of Tanzania, 1998. The National Forest Policy. Ministry of Natural Resources and Tourism. Dar es Salaam. Tanzania.

United Republic of Tanzania, 2008. The National Employment Policy. Ministry of Labour and Youth Development. Dar es Salaam, Tanzania.

United Republic of Tanzania, 2010. Nomination of Properties for Inclusion on the World Heritage List Serial Nomination: Eastern Arc Mountains Forests of Tanzania. Ministry of Natural Resources and Tourism. Dar es Salaam, Tanzania.

United Republic of Tanzania, 1995. National Land Policy. Ministry of Lands and Human Settlements Development, Dar es Salaam, Tanzania.

United Republic of Tanzania, 2019. Nationally Determined Contribution (Final Draft, 2019). The Vice President's Office. Dodoma, Tanzania.

Production of this book was financed by the
Government of the Kingdom of Norway.