PROTECTING EAST AFRICA'S NATURAL CAPITAL
THE COST OF INACTION

A preliminary synthesis of the economics of natural capital in East Africa

November 18, 2021

USAID
FROM THE AMERICAN PEOPLE

EAST AFRICAN COMMUNITY

Maasai man, Tanzania

PHOTO: PATRICK NEASE

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Front cover photo: *Wildebeest crossing the Mara River during the annual great migration. Every year millions will make the dangerous crossing when migrating between Tanzania and the Maasai Mara in Kenya. Credit: Jane Rix*

Version 1.3

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ACRONYMS

AWF	African Wildlife Federation
CBD	Convention on Biological Diversity
COVID-19	Coronavirus Disease 2019
CBNRM	Community-Based Forestry Management
DRC	Democratic Republic of the Congo
EAC	East African Community
GDP	Gross Domestic Product
GCSA	Gaborone Declaration for Sustainability in Africa
IUCN	International Union for the Conservation of Nature
LVEMP	Lake Victoria Environmental Management Program
KPAC	Kidepo Protected Area Cluster
MRB	Mara River Basin
MW	Megawatt
NBSAP	National Biodiversity Strategy and Action Plan
NCA	Natural Capital Accounting
NGO	Non-Governmental Organization
PES	Payment for Ecosystem Services
PRB	Pangani River Basin
RSS	Revenue Sharing Scheme
SDG	Sustainable Development Goal
SEEA-EEA	System of Environmental-Economic Accounting – Experimental Ecosystem Accounting
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNFCC	United Nations Framework on Climate Change
USAID	United States Agency for International Development
WMA	Wildlife Management Area

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PHOTO: HENDRIK CORNELISSEN

Zebras, Tanzania

i. INTRODUCTION

East Africa's natural capital – its iconic wildlife, forests, grasslands, and waterways – spans across national boundaries, industry sectors, and habitat types, delivering ecosystem services on which many stakeholder groups are mutually dependent. That's why valuing and protecting East Africa's natural capital must occur not only at the site or sectoral level, but rather at the landscape level. With landscape-level thinking, stakeholders can begin to view themselves as part of an interconnected system and understand how they both impact and benefit from shared natural assets.

United States Agency for International Development (USAID) and its EAC partners undertook this first of its kind study to determine the value of natural capital in four priority, transboundary landscapes. The findings will enable stakeholders to make more informed decisions about how to govern natural resources in the same manner as other forms of capital, such as produced goods and services.

While continued research is required, we now have foundational data on the relative value of various ecosystem services in a key portion of East Africa. This landscape-level data is enabling stakeholders to work across boundaries – whether political, social, or geographical – on solutions for protecting their shared natural wealth and enhancing their collective well-being.

In the past six months, this draft report has undergone a peer review process. Also, the team has convened hundreds of stakeholders at the landscape, national, and regional levels to review and validate the data, as well as develop a draft action plan. Under the guidance of the East African Community and Partner States, the action plan will be finalized by early 2022.

1. THE ECONOMIC CASE FOR PROTECTING NATURAL CAPITAL

NATURE: THE FOUNDATION FOR HUMAN WELL-BEING

The benefits humans receive from the natural environment are vast - ranging from food and livelihoods to dean air and water to resilience to climate change and disease. Most natural resources are renewable and could be infinite if we consumed them at a sustainable rate. Hence business leaders and policymakers must treat it like any other form of capital: failing to "spend it wisely" will inevitably diminish social, economic, and human well-being over time.

In the past few decades, there has been a global push to quantify the economic and intrinsic value of the world's natural capital, so that the full benefits of conservation are not only better understood but can be factored into policymaking at every level of society. This means going beyond traditional market assessments, which value nature only by those goods extracted and marketed - such as fish, livestock, honey, and timber. These valuations fail to account for the negative impact of extracting these goods, such as air and water pollution, which are costly to mitigate (Burke, 2013). It also means factoring in the other human and economic costs of degrading ecosystems - including reduced resilience to climate change, storms, floods, and disease. Integrating data on natural capital into budgets and decision-making processes as standard practice will enable policymakers, businesses leaders, and natural resource managers to steward resources more responsibly and sustainably.

Knowing the economic value of nature's benefits can make its contribution to livelihoods and economies visible, enabling smarter, more sustainable policy decisions. Governments can account for nature's role in national and regional economies, as well as in human well-being. Business leaders can manage risks in their supply chains by understanding their impact on and benefits from a larger ecosystem. And communities that rely on natural resources for their livelihoods can better understand the value of these resources, as well as the importance of sustainable practices to ensuring long term prosperity.

At a global level, the United Nations Convention on Biological Diversity has already called on leaders of all nations to protect natural capital by adopting a 2030 target to fully conserve at least 30 percent of the ocean and 30 percent of land areas and inland waters through effectively and equitably managed, ecologically¬representadve, and well-connected systems of protected areas.

The malachite kingfisher sitting on a reed

PHOTO: KAREL BARTIK

Natural capital
The world's stock of natural assets, which include geology, soil, air, water, and all living things.

Ecosystem
Community of interdependent living organisms, including wildlife and wildlife habitat.

Ecosystem service
Any positive benefit, direct or indirect, that ecosystems provide to humans.

HOW DO WE ASSIGN VALUE TO NATURE?

Assigning value to natural capital can be a complex undertaking. But a common approach among economists is to consider the range of services that ecosystems provide humans.

The System of Environmental Economics Accounting - Experimental Ecosystem Accounts (SEEA EEA; UN 2014) typically classifies ecosystem services into three categories - provisioning, cultural, and regulating (see Figure 1).

- **Provisioning services** are the harvestable resources supplied by ecosystems, such as wild foods, raw materials, and forage for livestock production.
- **Cultural services** are the ecosystem attributes (e.g., beauty, rare species) that give rise to the "use values" gained through any type of activity ranging from adventure sports to birdwatching, religious or cultural ceremonies to just passive observation, or the "non-use values" gained from knowing that they exist and can be enjoyed by future generations.
- **Regulating services** are the functions that ecosystems perform that benefit people in surrounding or downstream areas or even distant areas. These services include water flow regulation and water quality amelioration, carbon sequestration, crop pollination, and soil retention.

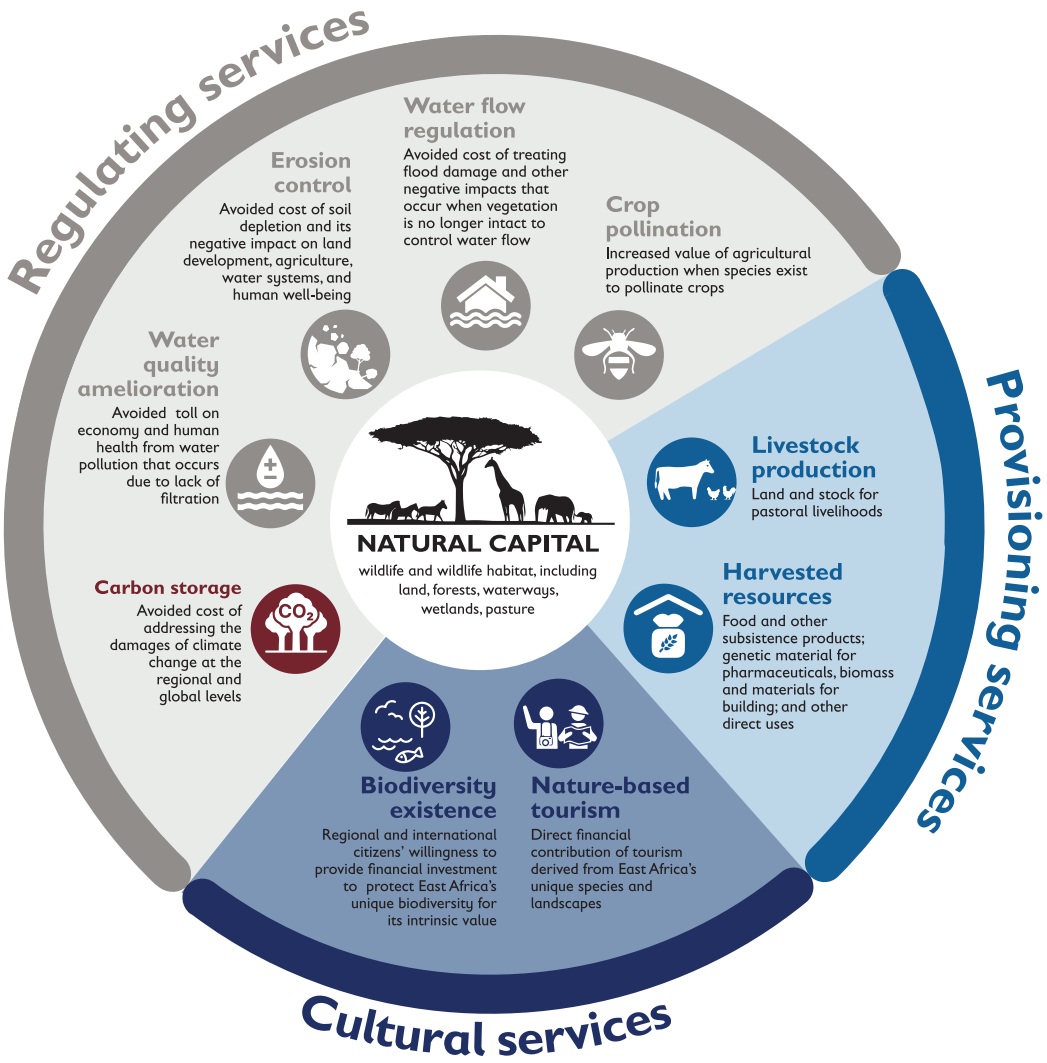


Figure 1. Overview of ecosystem services

FACTORING NATURE INTO ECONOMICS

Ecosystem services underpin the needs of all stakeholders in a landscape

Ecosystem services impact all stakeholders at the landscape level – from smallholder farmers who harvest resources to private sector businesses that rely on the steady flow of water to policymakers who rely on carbon storage to forestall the negative impacts of climate change.

Ecosystem services impact the economy and jobs

Nature-dependent sectors such as tourism, agriculture, and livestock production make substantial contributions to national Gross Domestic Products (GDPs), but the largest contribution to the economy comes from the avoided costs that result from healthy, functioning ecosystems. Ecosystems regulate water flow, reduce pollution, support wildlife, pollinate crops, and store carbon that mitigate damage from climate change. The cost of treating or replacing any of these services can place enormous burdens on economies whose government leaders did not factor natural capital into their budgets and planning.

Businesses also often ignore the value of natural capital in their financial projections – not just the resources they use on site, but the ecosystems upstream that provide water, power, and raw materials. Businesses that are starting to calculate the value of natural capital to their supply chains are better able to mitigate the risks of those resources being depleted. They must also calculate the potential cost to the government, communities, and shareholders when their business practices cause costly environmental damages. In a landmark report in 2013 by The Economics of Ecosystems and Biodiversity (TEEB) – a global initiative focused on making nature's value visible – estimated that the world's primary production and processing sectors incur unpriced natural capital costs totaling $7.3 trillion, which equates to 13 percent of global economic output in 2009 (TEEB, 2013). These costs come from greenhouse gas emissions, water use, land use, air pollution, and waste.

Tourists on an African safari to the Masai Mara and Serengeti national park to watch animals

$7.3 trillion

Unpriced natural capital costs incurred by the primary production and processing sectors globally

Even when natural capital value is known, conservation investment lags behind

Unfortunately, conservation of wildlife and habitat is frequently seen as more cost than benefit to governments and businesses. This results in a conservation investment that is not commensurate with the extensive contributions that the wildlife economy can, and does, make in terms of employment and revenues (ALU, 2020). As an example, in 2019, the tourism sector represented on average 8 percent of the GDP in Kenya, 5 percent in Uganda, 10 percent in Rwanda and 11 percent in Tanzania. However, the budget allocations to conservation (tourism, wildlife and environment) were not commensurate, totaling 1.4 percent in Kenya, 1.7 percent in Uganda, 3.8 percent in Rwanda and one percent in Tanzania of total development expenditure (Xia, 2020).

A natural capital framework helps demonstrate the importance of conservation to economic development.

This synthesis was designed to provide leaders across all sectors with data to help inform how best to integrate natural capital into policy and financial decision making.

"Human economic activity makes extensive use of the ecosystem services nature provides, but these barely feature in measurements of GDP. It is vital to restore nature to economic analysis and policy before the damage to the natural world – and thus to everybody's standard of living – becomes irreparable."

—Award winning economist Diane Coyle, UK

Wildebeests in heavy rainfall, Maasai Mara

PHOTO: DR AJAY KUMAR SINGH

II. TAKING A LANDSCAPE-LEVEL APPROACH TO VALUING AND PROTECTING NATURAL CAPITAL

East Africa's natural capital – its iconic wildlife, forests, grasslands, and waterways – spans across national boundaries, industry sectors, and habitat types, delivering ecosystem services on which many stakeholder groups are mutually dependent. That's why valuing and protecting East Africa's natural capital must occur not only at the site or sectoral level, but rather at the landscape level. With landscape level thinking, stakeholders can begin to view themselves as part of an interconnected system and understand how they both impact on and benefit from shared natural assets.

FIRST EVER LANDSCAPE ASSESSMENT OF NATURAL CAPITAL FILLS EVIDENCE GAP

The wildlife landscapes selected for this study are internationally-renowned as tourism destinations, and so it has been largely assumed that their primary economic value lies in tourism. However, this assumption puts the landscapes in jeopardy from a policy perspective, since the tourism economy is only a fraction of the value of the wildlife and habitat in this region.

This synthesis provides a first regional-scale assessment of a comprehensive suite of ecosystem services in four transboundary wildlife landscapes of the EAC region. These landscapes, as described in further detail on the next page, include the Great East African Plains, the

PURPOSE OF SYNTHESIS

This synthesis supports the Economics of Natural Capital in East Africa Project, an initiative of USAID and the EAC to strengthen regional efforts to address national-level problems that are exacerbating the decline in wildlife populations and habitat loss. This includes strengthening the EAC regional policy dialogue; growing the evidence base on transboundary natural resource management; and providing research, data, and economic analysis on the current and potential value of natural capital in East Africa to the EAC, Partner States, regional governments and institutions, civil society organizations, and end users.

A view of Lake Nakuru, Kenya

CREDIT: VOLODYMYR BURDIAK

Northern Savannas, the Albertine Rift Forests, and the Ruweru-Mugesera-Akagera Wetland system. (See map next page.)

The landscapes were chosen in consultation with the EAC and Partner States based on their economic and cultural importance, as well as their unique species and habitats. While these species and habitats often are a key tourism draw, their very existence is also an important indication of the overall health of ecosystems that serve millions of people living in and around these landscapes.

USAID (2021) found that the four wildlife landscapes provide $11.3 billion in economic value to the region annually. The benefits to the global community are orders of magnitude greater, with total economic values ranging from $32,000 to $56,000/ha/year on average. This difference is largely due to carbon sequestration, which helps the local and global community avoid billions of dollars in addressing the damages of climate change. Whether looking through a regional or global lens, these findings are a clear indication of the high economic value of these landscapes beyond, but certainly not excluding, their conservation importance.

Building on existing frameworks

This synthesis builds on an already evolving framework – developed by a range of partners – for gathering and applying data on the value of East Africa's natural capital in the region. Four EAC Partner States (Kenya, Rwanda, Uganda, and Tanzania) are members of the Gaborone Declaration for Sustainability in Africa (GDSA), signed by African heads of state in May 2012, which is committed to incorporating natural capital into development agendas. These Partner States have made progress in quantification and mapping of natural capital. This includes:

- Kenya developed a Biodiversity Atlas (ACC, 2015) and mapped wildlife dispersal areas and migratory corridors in southern Kenya (RoK, 2012)
- Rwanda published Natural Capital Accounts in 2019 as an important tool for tracking progress on socio-economic, environment, and natural resource indicators with assistance from the World Bank and the WAVES Global Partnership (NISR, 2019)
- In their Third National Development Plan, Uganda explicitly recognized that natural resource and climate change management are central for the realization of sustainable industrialization agenda (RoU, 2020), having mainstreamed the System of Environmental-Economic Accounting – Experimental Ecosystem Accounting (SEEA-EEA, 2014) in response to demands for integrated environmental and economic accounts.
- Tanzania identified building capacity in natural capital accounting as a main priority, and the GDSA is providing support toward achieving the Declaration's five outcomes. The country's success in community-based forest management and Southern Agricultural Growth Corridor has been identified as project demonstration for the Gaborone Declaration (GDSA, 2021).

Aside from national governments, several international non-governmental organizations (NGOs), bilateral and multi-lateral development partners, and communities of practice are playing key roles in generating evidence on natural capital in the region. Their work is cited throughout this synthesis report.

What this synthesis adds to the dialogue

Despite the increase in ecosystem service studies in the EAC region, the data remains slightly siloed – either focusing on ecosystems (mainly forests and wetlands) or sectors (wildlife, water, and food). These studies have been undertaken at different spatial scales, i.e., local, national, and regional, using a variety of modes, such as quantification, qualification, mapping, and economic valuation (Wangai et al., 2016). This synthesis is the most comprehensive analysis to date of the complex and dynamic links between wildlife, wildlife habitats, and the economy. Due to the landscape approach, the assessment includes swaths of historic forests, grasslands, rangelands and wetlands, hence providing natural capital values in a more holistic fashion and providing all facets of ecosystem valuation, i.e., quantification, qualification, mapping, and economic valuation.

OVERVIEW OF THE FOUR LANDSCAPES

Landscapes are iconic

These four landscapes represent 60 percent of total natural capital in EAC countries and contain some of the region's most important wildlife and habitat. The EAC and Partner States were aligned on their cultural importance, particularly as a tourism draw, and their economic importance, as they provide a range of ecosystem services on which millions of people and businesses rely.

Landscapes are biodiversity rich

The global average mammal diversity at the 10 km x 10 km scale is 58 species, whereas the average for East Africa is 117. In the four landscapes included in this synthesis, the average jumps to 156 species. These landscapes largely comprise protected areas, wildlife migration corridors, and surrounding contiguous areas of primarily natural land cover with wildlife. The landscapes are also Important Bird

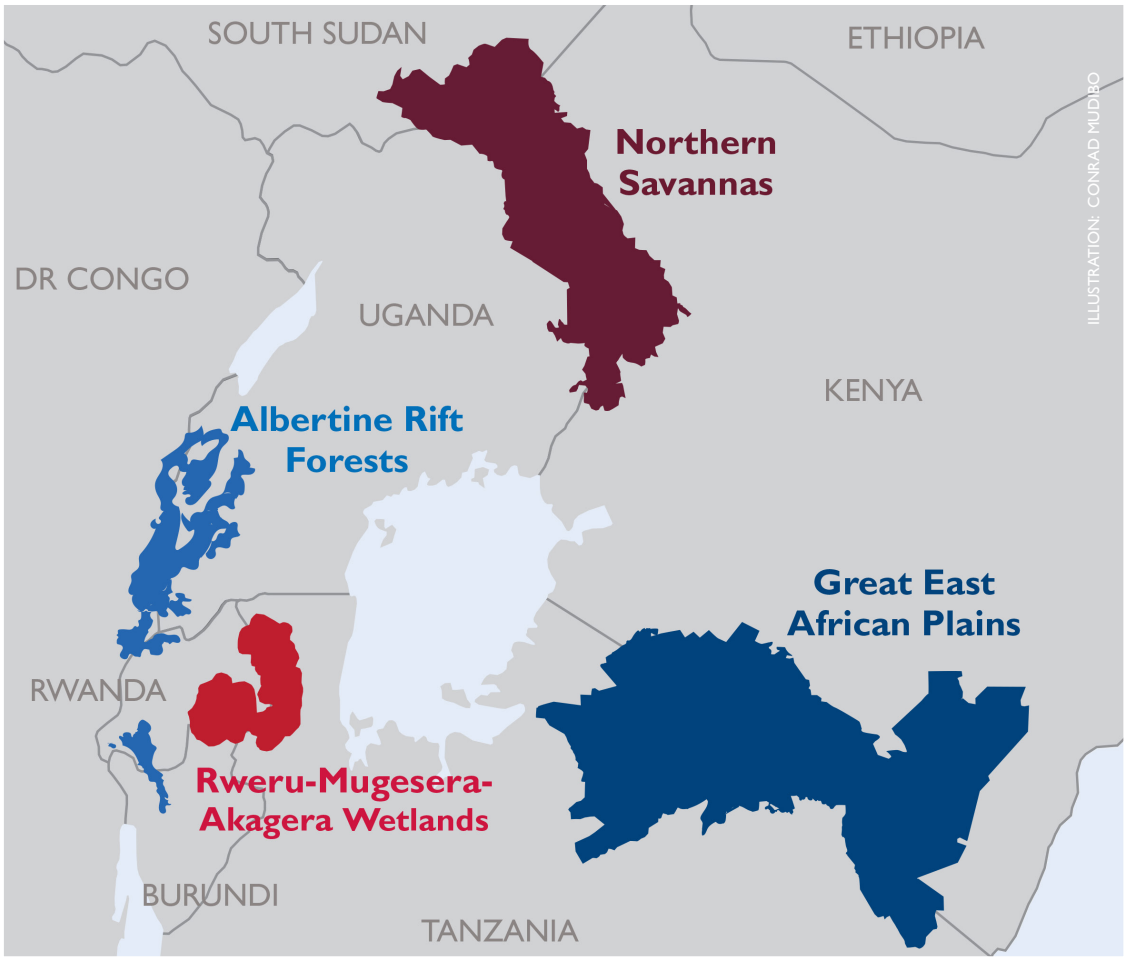


Figure 2. The four landscapes assessed

Snow capped mount Kilimanjaro, Tanzania

PHOTO: PAUL HAMPTON

Areas. The Albertine Rift Forests are also a 56,000 km^2 Endemic Bird Area straddling Burundi, the Democratic Republic of the Congo (DRC), Rwanda, Tanzania and Uganda.

IMPORTANCE OF TRANSBOUNDARY COLLABORATION

National boundaries bisect wildlife habitats, migration routes, watersheds, and dispersal areas. Changes in land cover and ecosystem function, regardless of official state borders, may have ultimate impacts on the ecological health and socioeconomic well-being for all who rely on the landscape. Hence, it is critically important for countries that share landscapes of ecological importance to coordinate in managing these areas to support the long-term viability of ecosystems and wildlife populations.

This landscape-level assessment, as well as the broader data synthesis contained in this report, will help the EAC and its Partner States work collaboratively to advance their goal of integrating natural capital accounting into policymaking. Transboundary approaches can lead to better managed shared resources, economic growth through regional integration and development, fostering community participation in management decisions, promoting peace and security, and embracing the forces of globalization (Chifamba, 2012).

Some specific opportunities for transboundary collaboration

Great East African Plains

Maintaining shared protected areas:

Kenya and Tanzania share two transboundary protected area systems, which are critical to tourism for both countries. In fact, tourism from Mara-Serengeti areas represents 5.3 percent of Tanzania's GDP and 17.8 percent of its foreign exchange earnings, as well as 30 percent of Kenya's GDP (WWF, 2019). The first shared area is the Maasai Mara Game Reserve (Kenya)/ Serengeti National Park (Tanzania) ecosystem. Each year, wildebeest, zebra, and other large herbivores migrate clockwise from the Serengeti to the Maasai Mara and back again. The migration is highly water dependent, as wildebeest require water at least every two to three days. Disruptions to water flow in the perennial transboundary Mara River and the effects of drought can have a large effect on animal populations and the size of the migration from year to year. To the southeast, Tsavo West National Park (Kenya) and Mkomazi Game Reserve (Tanzania) form a second transboundary protected area. The springs at the foot of Mount Kilimanjaro (Tanzania) feed the

Tsavo River, which flows through Tsavo West. Within this complex, the Kenya-Tanzania border also bisects the 30km^2 Lake Jipe, a Ramsar Wetland that supports both fishing and wildlife. Lake Jipe is pressured by agricultural expansion and invasive species. Kenyan and Tanzanian officials are already collaborating on improving the health of these landscapes through joint enforcement of abutting protected areas, as well as joint approaches for conserving land and water resources. Future collaborations could include public-private partnerships to support transboundary tourism, co-branding of tourism opportunities, and blended financing models.

Managing shared water resources: The Mara River flows from the Mau Escarpment in Kenya through both Maasai Mara and the Serengeti to Lake Victoria, another shared transboundary resource and the source of the Nile River. The Mara River catchment is about 13,750 km^2, of which 65 percent is in Kenya and 35 percent in Tanzania. Protection of the river and its watershed, avoiding siltation and eutrophication, is a shared responsibility. Deforestation in the upper catchments, irrigation, industrial water uses for agriculture and mining, pollution, small-scale fishing, and other uses all compete for water and affect its quality and quantity downstream and thus policy interventions require both countries.

Northern Savannas

Within this landscape, South Sudan and Uganda, and Kenya and Uganda, each share a transboundary protected area system. The Nimule National Park in South Sudan is an Important Bird Area contiguous with two designated Important Bird Areas in Uganda – Mount Kei Forest Reserve and Mount Otzi Forest Reserve (Simon & Okoth, 2016). Kidepo National Park (Uganda)/KidepoGame Reserve (South Sudan) are also transboundary protected area systems. Zebras and rhinos, once abundant in this savanna, were hunted to extinction. There are perhaps 2,000 elephants, down from 80,000 recorded 50 years ago. This is why there is considerable motivation for transboundary collaboration to conserve remaining wildlife. The isolated mountain ecosystem of Mount Elgon sits on the border between Uganda and Kenya, where both countries have separately designated national parks in their respective portions of the area. The Mount Elgon Protected Area is endowed with

Several zebras drinking water from the river at the Maasai Mara in Kenya

exceptionally high biodiversity of global importance (Petursson et al., 2006). Communities surrounding the protected area are largely small-scale farmers dependent on various products and services from the forests on the mountain. Balancing conservation and development goals requires a transboundary approach with clear rights and responsibilities to key stakeholders.

Albertine Rift Forests

The Albertine Rift Forest landscape contains some of the most diverse afromontane forests of the world, with several endemic plants, mammals, and birds (Cunningham, 1996). The only remaining connection between the national parks in northern Rwanda and southern Uganda is through corridors of forest that connect these parks to neighboring Virunga National Park in the DRC. Without this connection, these parks would become isolated forest patches. Nyungwe and Kibira National Parks in Rwanda and Burundi are contiguous and form part of the proposed Nyungwe-Kibira Transboundary Conservation Area (TFCA, IUCN ESARO, 2020), but there are no corridors that link these parks to other forested landscapes. Connectivity between protected areas like Volcanos and Queen Elizabeth National Parks within the DRC appears to

Colobus monkey, Rwanda

have been vital for helping to maintain populations of large mammals in this part of the landscape. Substantial habitat loss is occurring in the DRC's Virunga National Park due to armed conflict, the expansion of cultivation and settlement, mining, and oil and gas exploration (Plumptre et al., 2016, 2017; Christensen & Arsanjani, 2020). This threatens to further reduce landscape connectivity in the region, hence the need for regional collaboration.

Rweru-Mugesera-Akagera Wetlands

This landscape is one of the largest wetland systems in the basins surrounding Lake Victoria. Large areas of papyrus swamps cover this wetland, as well as several open water lakes that are home to a wide array of birds and wildlife. Parts of the wetland system are protected in Burundi and Rwanda, and Akagera National Park is one of the largest protected wetlands in East Africa. In Rwanda, these wetlands are reportedly the second richest habitat for mammals outside of national parks (Karame, Alvares & Faustin 2017b). The landscape is within the transboundary Kagera River Basin, covering an area of 59,700 km^2 with a population of over 16.5 million people whose main livelihood is agriculture. It also contributes 33.5 percent of the water inflow to Lake Victoria. This wetlands system is able to remove large quantities of the nutrients that enter as a result of human activities in catchment areas. These nutrients would otherwise reach Lake Victoria, adding to the challenges of eutrophication, hence the need for transboundary collaboration.

Lake Victoria Fishing

Colony of Bee-eaters in their burrows on a clay wall, Uganda

III. SYNTHESIS METHODOLOGY AND APPLICATION

USAID and its partners are working at multiple levels to ensure that factoring the value of natural capital into policy and development decisions becomes standard practice in East Africa. This synthesis report, as well as a range of related stakeholder engagement activities, are key to this effort. Together, they aim to:

- Strengthen the evidence base: USAID has conducted the region's first ever landscape-scale natural capital assessment in order to develop more meaningful, actionable data that can be used by multiple Partner States to integrate and improve their conservation investments. This report synthesizes that assessment with other available research and analysis on the region's natural capital, as well as on the threats and competing interests that are threatening its value. Section IV contains a high level summary of the findings.
- Encourage buy-in among key stakeholders: USAID is also using this synthesis as a convening mechanism – engaging stakeholders at every stage of planning, conducting, and validating a formal assessment of the economic and intrinsic value of the region's wildlife and wildlife habitats. Findings from this synthesis will also be packaged into a range of communication tools that help stakeholders understand, share, and adopt evidence and incorporate it into decision making.

SYNTHESIS METHODOLOGY

The assessment team carried out this study in four distinct phases: 1) landscape selection; 2) data collection; 3) ecosystem delineation and classification; and 4) ecosystem services quantification and valuation.

1. **Landscape selection.** Four broad study areas were selected on the basis of inputs from stakeholders at an inception workshop, including technical experts from the EAC, Partner States and wildlife-related NGOs.
2. **Data collection.** Once the landscapes were identified, information on the wildlife and ecosystem characteristics of the study areas, as well as on the region more generally, was collated and reviewed to understand context and to identify the nature and potential spatial geography of ecosystem services supply and demand. Where multiple data sets were available, they were carefully evaluated in order to select the most appropriate for the study. Based on data availability, the assessment was done for the situation as of 2018. The team also conducted an extensive literature review to augment this assessment, as described in Section VI. Existing global datasets were used to measure natural capital stocks and flows. The estimates presented are therefore only as robust as the underlying datasets.

Mt Elgon, Uganda, a patchwork of habitat types from rainforest to savanna grasslands

3. **Ecosystem delineation and classification.** Ecosystems were then delineated and classified at the regional scale, based on a combination of land cover, vegetation maps, and indicators of vegetation condition. The IUCN's Global Ecosystem typology was used as far as possible in grouping habitat types. The final classification comprised 72 habitat types, which includes a degraded and undegraded form of each natural habitat type where relevant. These were combined into 23 functional groups. The number of habitat types within each study area ranged from 19 in the Wetlands to 51 in the Great East African Plains. The next step was to delineate the boundaries of the wildlife landscape study areas using spatial data. This was based on largely contiguous areas of natural habitats within a biome or broadly similar ecosystem types in and around the key protected areas that had been identified. Boundary delineation was also guided by topography to some extent. Although the areas were largely defined by contiguous natural habitat, the inclusion of some areas of human habitation and agriculture was unavoidable.

4. **Ecosystem services quantification and valuation.** Ecosystem services were then quantified in physical terms where appropriate and valued in terms of US dollars per hectare per year. As far as possible, the approach involved estimating the actual use and value of each service based on the estimated capacity of the different ecosystem types to deliver these services, as well as estimated demand. The approach is spatial because values depend on context and vary in space as well as time. The landscape capacity to supply services varies with topography, climate, and ecosystem type and condition; and the human demand for services varies spatially, with population density, infrastructure, and location. The combined flow of values was used to estimate the asset value of each landscape in terms of its net present value over 30 years.

The System of Environmental Economics Accounting - Experimental Ecosystem Accounts (SEEA EEA; UN 2014), a framework that integrates economic and environmental data, was used in the assessment. This produces internationally comparable statistics on the stocks and changes in stocks of environmental assets, as they bring benefits to humanity (UN, 2021). While it is not an accounting exercise, it aligns with the building blocks of Natural Capital Accounting to provide a framework for producing Sustainable Development Goals (SDG) indicators.

As shown in Figure 1 on page 7, the synthesis quantified the following nine ecosystem services. The SEEA EA's three broadly agreed upon categories of ecosystem services was used to calculate each service:

Provisioning Services

- **Harvested resources:** The value of wild natural resources harvested from ecosystems for subsistence or small-scale agricultural production or building. This ecosystem service was calculated by mapping the stocks of wild resources based on land cover type, as well as the demand for resources based on demographic factors.

- **Livestock production:** The number of livestock supported per hectare. The value was determined by considering the direct contribution of extensive livestock production to GDP and disaggregating this value by a global geographic dataset of estimated livestock density per 10km.

Cultural services

- **Nature-based tourism:** Direct tourism contributions to national GDP. This is mapped across the landscape by mapping the density of geotagged tourism photos posted to social media.

- **Biodiversity existence:** This is measured by willingness to pay for conservation by regional and international donors based on the intrinsic value of biodiversity – i.e., knowing that it exists for human well-being and the enjoyment of future generations.

Regulating services

- **Water quality amelioration:** The avoided cost of having to remove harmful contaminants and nutrients from water supplies, because these elements have already been regulated by healthy ecosystems. This was

calculated using InVEST to compare nutrient runoff based on land cover to what it would otherwise be in a denuded landscape.

- **Erosion control:** The avoided cost of addressing soil depletion over time, due to healthy vegetation holding soil in place. This was calculated by using InVEST to model the expected degree of erosion based on land cover and comparing it to what it would be if the landscape were denuded.
- **Water flow regulation:** The avoided cost of building water infrastructure to service people who were otherwise able to obtain water for domestic use from existing natural sources. This was valued by mapping baseflow (an area's contribution to water flow based on land cover, compared to how water would flow if the landscape were denuded), demand for water, and the cost of developing infrastructure.
- **Crop pollination:** The increased agricultural output of regions that are serviced by pollinators, calculated by using a previously-developed model explaining the relationship between crop productivity and percent of land cover outside of a farm that is pollinator habitat. Previous research shows that greater levels of pollinator habitat are positively associated with higher crop productivity.
- **Carbon storage:** The assessment estimated the social cost of carbon (SCC), a metric of the expected economic damages from carbon dioxide emissions. These are typically estimated in terms of changes in GDP, a directly compatible measure for ecosystem accounting. This is an important number for thinking about impacts of climate change. It provides useful insight into distributional impacts of climate change in the region, and this evidence can be applied to national strategic incentives for green recovery decisions. This valuation relied on up-to-date information about the carbon stocks in the landscapes, as well as economic impacts of carbon contributions to climate change. SCC indicates how much intact habitats are worth to us today to avoid the damage that is projected for the future. Therefore, the SCC, as estimated in the assessment, provides an opportunity for policy makers in the EAC to incorporate the social benefits from reducing carbon dioxide emissions into cost-benefit analyses of regulatory actions that have small, or "marginal," impacts on cumulative global emissions.

Preliminary validation

Due to travel restriction arising from the Coronavirus Disease 2019 (COVID-19) pandemic and the vastness of the four landscapes, researchers were not able to go into the field to ground-truth remotely acquired data by means of in-situ observations. Instead, the team relied on globally-available data and an extensive literature review, using more than 350 articles and reports. This turned up a large amount of data used to fine-tune models, while staying within the validity parameters set by the EAC technical working group.

LITERATURE REVIEW AND SYNTHESIS

After assessing the ecosystem services currently provided by the four landscapes, the team then conducted a literature review to determine what other data already existed from the many public and private sector organizations who measure biodiversity quantity, quality, diversity, and threat to existence in this region. A list of additional third party studies reviewed can be found in Section VI. These studies were critical to informing the economic valuation of natural capital in the East African region, as well as determining the threats that may impact natural capital's ability to provide the social and economic services on which people, households, and businesses depend.

Next steps

This synthesis is a living document, which has since been used to convene stakeholders in conversations through multiple channels. Stakeholders have:

- undertaken data validation
- helped determine how to leverage data and insights to make evidence-based policy and business decisions
- provided guidance on how to ensure a wider understanding of the value of the region's natural capital, the benefits of conservation, and their role in protecting the landscape

Primary data collection

Primary data has since been collected to complement information on capital required to realize service flows (knowledge, practices, etc.), and those that alter demand (e.g., institutional structures). Primary data was collected through key informant interviews and eight stakeholder workshops. Information will be incorporated in the final Synthesis Report. See section V for more details on next steps to engage stakeholders in applying findings and developing strategies to better protect natural capital.

PHOTO: KIKI DOHMEIER

IV. THE VALUE OF NATURAL CAPITAL IN PRIORITY LANDSCAPES

Great blue turaco, Rainforest, Rwanda

IV.A REGIONAL LEVEL VALUES AND INSIGHTS

This first ever landscape-level assessment of ecosystem services in East Africa offers a clear indication of the high economic value of some of the region's most iconic landscapes – value that significantly augments their conservation importance. Using conservative assumptions, the study estimates that – in addition to offering substantial habitat for wildlife populations – these ecosystems generate benefits to economic and human well-being valued at $300, $500, $700, and $1500/ha/year for the wetland, savanna, plains, and forest landscapes, respectively. Benefits to each country vary, ranging from $260/ha/year for wetlands in Rwanda to $2700/ha/year for forests in Burundi. The benefits at the global scale are orders of magnitude greater, with values ranging from $32,000 to $56,000/ha/year on average for the four landscapes.

KEY INSIGHTS

Tourism represents only 11 percent of the total economic value of these landscapes. The largest value? Regulating water, soil, and carbon.

The four landscapes prioritized for valuation are globally recognized for their biodiversity and nature-based tourism. However, their value to the economic and human well-being of the East Africa region is far greater. While revenue from tourism for 2018 was $1.2 billion, the regulating services these ecosystems provide were far more valuable at an estimated $8.18 billion per year. Regulating services include ensuring a reliable and steady flow of water to businesses and communities; filtering out pollutants to keep water clean; preventing soil erosion; and pollinating crops.

A lack of steady access to water would negatively affect livelihoods and industries that include rainfed agriculture, pastoralism, wildlife tourism, honey and charcoal production, and water-dependent private sector enterprises, such as irrigation agriculture, fishing, hydropower generation, and mining. Projections under a business as usual scenario show a potential decline in water availability by 21.2 percent by 2050 – increasing water stress and resulting in freshwater systems becoming more polluted and eutrophic. This projection represents a loss in baseflow of 3,156 million m^3 relative to the current landscape, along with an annual replacement cost of $352 million.

Wetlands in particular play a key role in purifying water, reducing the cost of infrastructure development for water treatment in the region. For example, the Nakivubo Swamp provides ecosystem services to the Greater City of Kampala to a value of $2 million a year in terms of water purification benefits, which is an avoided cost of building a water treatment plant to provide a similar service (UNEP-WCMC, 2016).

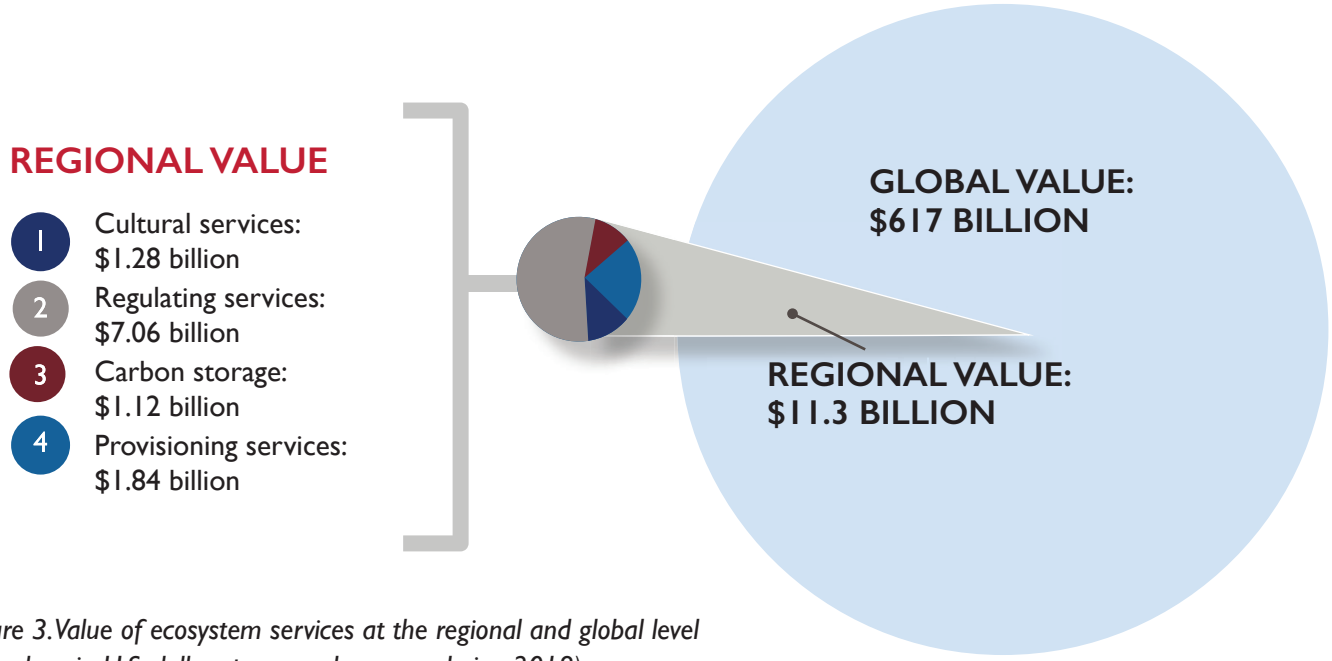


Figure 3. Value of ecosystem services at the regional and global level (all values in U.S. dollars per year, base year being 2018)

These four landscapes also regulate soil and sediment. The projected loss of forests and woody resources under a BAU scenario will lead to 166 million tons of soil and sediment being eroded – reducing soil fertility and increasing treatment costs by $204 million.

Figure 4: Findings at the landscape level

Great East African Plains

Regional annual value: $6.58 billion – More than half comes from nature's regulation of soil, water, and carbon. Another $1.2 billion comes from nature-based tourism.

Northern Savannas

Regional annual value: $3.47 billion – At $2.36 billion, water and sediment regulation are the most valuable services, underpinning livelihoods for millions. Water quality amelioration is also key to livelihoods, including fisheries around Lake Kyoga and agriculture in South Sudan.

Albertine Rift Forests

Regional annual value: $1.19 billion – Erosion control (valued at $685.5 million) and materials harvested from nature ($352.1 million) for livestock, building, sale, or energy represent the majority of value. Landscape is also a global conservation priority.

Ruweru-Mugesera-Akagera Wetlands

Regional annual value: $64.4 million – Majority of value comes from provision of natural material for food, building, and other resources. At $50.2 million, these services are ten times more valuable than nature tourism at $5.3 million.

Intact ecosystems are also critical to crop pollination. Globally, pollinator-dependent crops represent 35 percent of total crop volume with an annual market value of $235-577 billion (in 2015) worldwide. The economic contribution of pollination in East Africa as a whole has not yet been calculated, but it can be expected to be significant (Kasina, 2016). However, this synthesis offers the first comprehensive assessment of the economic contribution of four key landscapes to crop pollination – estimated at $777.2 million per year. Quantifying this value is important, since crop production is projected to contribute most to natural capital wealth in the EAC by 2050 under a business as usual scenario (Lange et al., 2018).

The landscapes also store 7.5 billion tons of carbon. How? Trees, other plants, and soils absorb and keep carbon dioxide from the atmosphere where it would otherwise contribute to climate change. The landscapes continue to accumulate carbon in plants and soils over time thereby sequestering it every year. Disturbing these systems with vegetation conversion, e.g., from land use/land cover changes, can release large amounts of carbon dioxide. Too much carbon dioxide being released into the atmosphere means too much change to our global climate, which brings negative impacts such as extreme temperature fluctuations, drought, and flooding. That's why keeping forests, wetlands, and other nature-rich ecosystems intact is so important. In fact, the study estimates that, without these landscapes, it would cost the region an additional $1.1 billion a year to address the negative impacts of climate change on social, economic, and human well-being.

Together, regulating water, soil, crop pollination, and carbon **saves the region $8.18 billion annually** - 72 percent of the total economic value of these four landscapes.

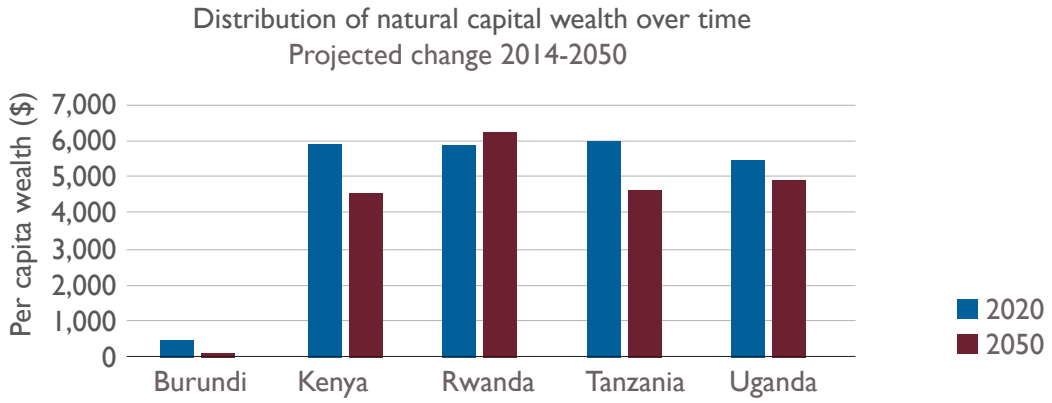


Figure 5. Projected change in natural capital as a percentage of per capita wealth for Burundi, Kenya, Rwanda, Tanzania and Uganda between 2014 and 2050 under business as usual scenario (Lange et al., 2018).

2 While regulating services represent the majority of these landscapes' value, tourism still plays an important role in the regional economy and perceived value globally.

Nature-based tourism contributed $1.2 to regional GDP in 2018, including supporting a significant number of jobs. In 2018, conservation, tourism, and related services – including hospitality, handicrafts, and travel infrastructure – provided 786,663 jobs (34,703 in Burundi, 325,034 in Kenya, 76,980 in Rwanda, 315,260 in Tanzania, and 34,686 in Uganda).

The iconic wildlife in these landscapes are also ambassadors for the region, attracting tourists from across the globe. In fact, an assessment of consumers' willingness to pay for tourism experiences and services vs. current income from this sector revealed an additional $1.5 billion in untapped revenue were the sector to adjust prices and offerings.

Tourism is also a major source of foreign exchange earnings, which are important for macroeconomic stability and debt servicing. In Kenya, for example, international tourism earnings are about 15 percent of total export earnings. Tourism is the third largest source of foreign exchange (after tea and coffee). By contrast, foreign direct investment contributes only 1.9 percent of Kenya's GDP. In Rwanda, tourism contributions constitute approximately 27 percent of export earnings and are far more significant than foreign direct investment which accounts for 3.8 percent of the country's GDP. Tourism accounts for 54 percent of foreign exchange earnings in Tanzania. Annual tourism earnings from these landscapes exceed the net bilateral aid flows in Kenya, Tanzania, and Uganda. Earnings from keeping these landscapes intact for the next 17 years would pay off the national debt of $50 billion in Kenya.

3 Keeping landscapes intact is key to the sustainability of pastoral and agricultural livelihoods.

Provisioning services, including livestock production and harvesting, also contribute to the national economies. For example, in Kenya, annual charcoal production is valued at $1.6 billion, and the honey industry employs 91,000 people directly and supports livelihoods of 547,440 people (African Leadership University School of Wildlife Conservation, 2020). Livestock are culturally and economically important to pastoral communities, who use the vast landscapes for grazing, while providing space for wildlife through community-based natural resource management (CBNRM). CBNRM areas on the Kenyan portion of the Great East African Plains landscape provided direct employment to 1,074 rangers, supported 269,187 households, and made a direct monetary contribution of over $4.4 million to the Maasai Mara communities in 2016 (KWCA, 2016).

When combined with tourism, livestock production and resource harvesting in these four landscapes make a significant contribution to GDP. In 2018, this contribution was valued at 3.8 percent for Burundi, 3 percent for Kenya, 4 percent for Rwanda, 9 percent for South Sudan, 7 percent for Tanzania, and 9 percent for Uganda. In Kenya, this value was $2.9 billion accounting for 40 percent of its forex reserve.

4 Natural capital is declining as a percentage of the region's total wealth.

While many studies focus on contribution to annual GDP of the various types of capital – whether produced, human, or natural – natural capital is a critical barometer of a nation's ability to sustain social and economic well-

Elephants, Kenya

CREDIT: JULIAN HACKER, PIXABAY

being over the long term. This synthesis shows that, under a business as usual scenario, natural capital will continue to decline as a percentage of national wealth (except in Rwanda and Uganda), leaving these countries unable to sustain nature-dependent businesses, provide food security and clean water, and remain resilient to climate change and extreme weather events like flooding.

While an increase in other forms of capital, including human and produced, holds benefits for any given country's economic well-being, the loss of natural capital in certain landscapes – such as those chosen for this assessment – is particularly problematic. That is because these wildlife- and habitat-rich landscapes are providing ecosystem services on which large populations in downstream rural – and increasingly urban – areas rely. The loss of regulating services in these landscapes will significantly impact the health, quality of life, and socio-economic development of this region as a whole.

5 Global value is exponentially greater, offering potential sources of revenue to fund regional development.

The carbon stored by these ecosystems provides the global community an estimated $600 billion per year in value. This value is based on the avoided costs of mitigating climate change damages that would result if the landscapes' capacity to capture carbon from the atmosphere declines and the 7.5 billion tons of carbon stored were released into the atmosphere. An alternative way to value carbon storage is using its value in markets that have developed as a result of government and private efforts to "neutralize" carbon emissions. Some studies calculate both values. In this study, the social cost of carbon was preferred, because the marginal price of carbon in markets is not realistic at scale. However, policymakers should consider carbon markets as one possible avenue for East Africa to pursue for potential funding to augment community earnings, support conservation and development in the region.

Waterfalls in rural Burundi

PHOTO: NATHANAEL BOARER

MAIN THREATS AND POLICY PRIORITIES

The next four sections provide top threats and recommended policy priorities for each landscape. What follows are those that can best be addressed at a regional and/or transboundary level.

Threat: Over-extraction of resources

Over-extraction of resources is a threat across all four landscapes – from fuelwood harvesting that drives forest and woodland degradation to bushmeat hunting that reduces wildlife populations to papyrus harvesting that degrades wetlands. Increase in urban population growth, estimated at 5.7 to 6.6 percent, is a key driver of these threats, particularly bushmeat hunting. The current price of bushmeat in western Tanzania is between $0.85 and $1.0 per kg, which is three to five times cheaper than beef ($2.70 to $4.70 per kg). Affordability and accessibility of bushmeat will increase demand and therefore offtake of wild species, undermining the broader general wildlife populations and increasing risks of novel zoonotic disease transmission. Recent studies have shown annual offtake of 97,796–140,615 wildebeests per year (6–10 percent of 2015 population) in the Serengeti Ecosystem (Rentsch & Packer, 2015). Around the Nyungwe National Park in Rwanda, black fronted duiker is sold at $25 and bush pig at $31 at the local market, while the yellow backed duiker is rarely sold due to local extirpation from poaching (Imanishimwe et al., 2019). Trees collected in the forest are mainly used for timber and sold between $1.2 and $3 per tree, depending on size and species.

Recommended policy focus: Countries must work at the transboundary level to create sustainable livelihood options tied to conservation and improve CBNRM. Although hunting for meat and other animal products has potential in the wildlife economy, it may not be sustainable in the region based on current land tenure and demand for bushmeat, aside being illegal in some countries.

Giraffes in Serengeti National Park, Tanzania

Threat: Land use conversion and degradation

Land uses that convert natural vegetation are leading to land cover changes, increasing erosion and sedimentation, and reducing water flowing through the environment. Such land uses include change in land tenure types, cropping of grasslands, and forest degradation. Land tenure changes from communal to individual is leading to habitat fragmentation, compounded by fencing. Higher stocking in the rangelands is likely to lead to overgrazing, increased human-wildlife conflict and lower tolerance for wildlife. This situation is likely to worsen in the future, with livestock numbers projected to increase by 65 percent (Kenya), 93 percent (Tanzania), and 224 percent (Uganda) by 2050 under a business as usual scenario. The likely outcomes are extirpation of iconic species (e.g., gorilla) and iconic migrations (e.g., wildebeest) due to habitat shrinkage and elimination of connectivity.

Recommended policy focus: Pursuing strategies at a transboundary, landscape level will be crucial. Establishing and promoting cross-border CBNRM offers the most scalable avenue to ensure wildlife habitats are secured, dispersal areas and migration corridors are established, wildlife are afforded protection, and inter-community conflicts are reduced. CBNRM linked to PES is considered a priority avenue to securing natural capital and building the regional economy. In Tanzania, for example, the Tanzania Forest Conservation Group has chosen community-based forest management, a specific type of participatory forest management, as the natural model for implementing REDD+ (Dutschke, 2008). Tapping into global carbon markets, as well as willingness to pay by international donors and development partners, are also viable options. PES schemes, such as the Chyulu Hills REDD+ project in southern Kenya, have demonstrated that PES can provide returns at scale from conservation of natural habitats (Damania et al., 2019). In Tanzania, Carbon Tanzania's REDD+ projects had, by 2018, protected 270,000 ha of dryland forest, incorporating over 8.2 million trees. By keeping 1,536,700 trees in the ground, the equivalent of 95 million paperback books, an additional 291,000 tons of carbon dioxide was prevented from entering the atmosphere, equivalent to 159,590 return flights from London to New York. Of the carbon credit accrued, over $300,000 was paid to forest communities (Carbontanzania, 2021).

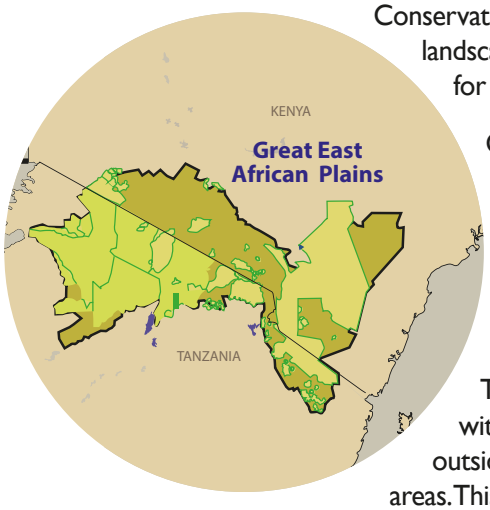
Triple threat of COVID-19, climate, and conflict

All of the threats to these landscapes, as detailed throughout Section IV, will be exacerbated by climate change – with increased temperatures, flooding, and drought further degrading habitat suitability and connectivity, as well as increasing competition for resources. The COVID-19 pandemic has now put resources and people under further strain, reducing nature-based tourism along with the financial viability of protected areas. As the region attempts to recover, as well as prosper in the longer term, wildlife and habitat loss will continue to reduce livelihood and food security; shift wealth distribution; and alter power structures and group identities – all leading to an increase in conflict. As policymakers create COVID-19 recovery plans, they should address the interconnected threats of (1) health pandemics both current and future, (2) ongoing damages from climate change, and (3) rising conflict due to the growing scarcity of resources.

IV.B GREAT EAST AFRICAN PLAINS

NATURE

The Great East African Plains support some of the highest density and most diverse large herbivores on earth, as well as some of Africa's most famous protected areas – drawing more than one million visitors each year to Kenya and Tanzania. Conservationists value this landscape as a global hotspot for vertebrate endemism.



Compared to much of the East African region, this landscape holds exceptional populations of wildlife within a contiguous area of natural habitat. This wildlife is found within and, importantly, outside of formally protected areas. This landscape also hosts world-famous mammalian migrations: more than one million wildebeest, gazelle, and zebra cross plains and rivers in search of greener pasture each year.

Multiple large mountains produced by volcanic activity rise out of the plateaus of this region including Mount Kilimanjaro, the highest mountain in Africa at 5,895 m. The region is primarily semi-arid to arid, with vegetation ranging from the productive, mostly treeless short-grass associations of the Serengeti Plains to wooded grassland, bushland, thicket, Acacia woodland, and montane forests.

LANDSCAPE AT-A-GLANCE

- **Total population:** just under 9 million (more than 2/3 in Tanzania)
- **Population density:** Low (~69 people/ km^2)
- **Rural population within landscape:** Kenya: 97%; Tanzania: 88%
- **Average resource use per hectare:** Low (due to low population density, high percentage of land under protection, and coverage by habitats with moderate to low stocks of most natural resources)
- **Land area:** Kenya—68,720 km^2 (11.8% of total land); Tanzania—60,913 km^2 (6.4% of total land)
- **Protected areas:** Kenya—23,074 km^2; Tanzania—26,657 km^2
- **Area under CBNRM:** Kenya—11,000 km^2; Tanzania—2,293 km^2
- **Transboundary protected areas:** Mara-Serengeti and Tsavo-Mkomazi with joint elephant census
- **Transboundary river basins:** Ewaso Ng'iro River, Mara River, Pangani River

NATURE'S BENEFICIARIES

Nature underpins the livelihoods and well-being of all of the nearly nine million people living in this landscape. Following is a look at key stakeholder groups.

Pastoralists, agro-pastoralists, smallholder farmers

Livestock – mainly cattle, with some sheep and goats – is the most important source of livelihood and food security for communities in this landscape. There are 2.3 million livestock units contributing $247.8 million to Kenya's GDP and $309.6 million to Tanzania's GDP. Specialized pastoralism has been on the decline for some decades, with the majority of households diversifying toward agro-pastoralism or non-farm activities (Homewood, Kristjanson & Trench, 2009).

Smallholder farming is also key to the livelihoods of a significant portion of the population. The main cash crops are cotton, sweet potato, and rice, which produce relatively low yields compared to other study regions. Maize and cassava are grown by most households for their own consumption.

Tourism sector

The total direct contribution to GDP of nature-based tourism was estimated at more than $1.2 billion in 2018, the highest of the four study areas. Nature-based tourism also generated an estimated $1.5 billion in net benefits (consumer surplus) through ancillary goods and services, such as transportation, restaurants, handicrafts, and other provisions for international tourists.

Note: the ecotourism industry has been significantly disrupted in 2020-21 due to the COVID-19 pandemic. Nature-based tourism has declined significantly due to associated travel restrictions and fears, and recovery will be threatened by wildlife losses during the pandemic and current and future climate change.

Other private sectors

There are several other downstream private sector industries that rely on access to natural capital. These include agriculture and mining in the Mara River Basin, fishing in Lake Victoria, and commercial and traditional irrigation facilities, hydro-power, and mining in the Pangani River Basin (PRB).

NATURE'S GUARDIANS

There are a range of stakeholders at the local, national, regional, and global levels, who influence stewardship or directly steward natural capital in this landscape.

Community conservancies

In Kenya, 76 community conservancies provide 11,000 km^2 of space to wildlife. These CBNRM areas provide direct employment to more than 1,000 rangers and have made a direct monetary contribution of more than $4.4 million to the Maasai Mara communities (KWCA, 2016).

In Tanzania, three wildlife management areas (WMA) totaling 2,293 km^2 include: (1) Ikona WMA (242 km^2) comprising five villages to the northwest of Serengeti National Park; (2) Makao WMA (780 km^2) comprising seven villages in the south-western Serengeti Ecosystem; and (3) Enduimet WMA (1282 km^2) comprising nine villages in West Kilimanjaro Basin. The WMAs expand private sector access to conserved areas with potentially more diverse economic opportunities.

National and regional policymakers

The EAC and its Partner States, including Kenya and Tanzania, play a key role in stewarding the region's natural capital. The national governments in Kenya and Tanzania oversee protected area management, employing rangers and other natural resource managers, as well as policies that govern land use and development.

International development partners and NGOs

A range of bilateral, multilateral, and non-governmental organizations are working in this region to value and protect natural capital (see page 10 for more on leaders in this arena).

PHOTO: DELPHIN KING, LAIKIPIA WILDLIFE FORUM

Greening school, Kenya

NATURAL CAPITAL VALUE

This is an overview of the estimated value of each ecosystem service, as well as key insights to guide stakeholders toward improving protection of the natural capital that provides these services. The full assessment contains further details and analysis. **Total estimated value**: $508/ha/yr on average to East Africa; more than $31,600/ha/yr globally.

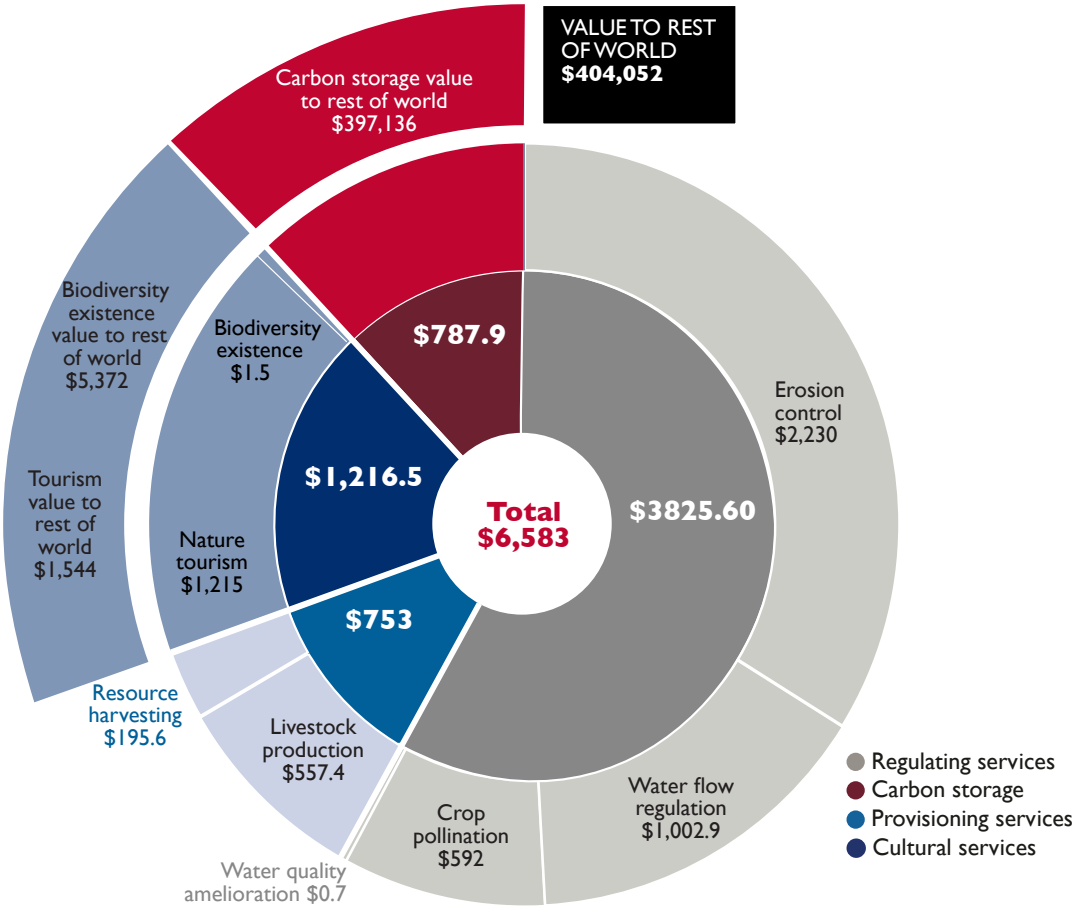


Figure 6. U.S. dollar value of ecosystem services in millions per year in Great East African Plains

REGULATING SERVICES

Water flow regulation: $1B/yr *(through infiltration and storage of 9 million m³ of rainwater)*

Water quality amelioration: $700,000/yr *(in avoided costs from reduction of phosphorous loadings by 853-4,855 tons/year within catchment areas of Lake Victoria)*

Erosion control: $2.2B/yr *(through retention of ~1.8 billion metric tons of sediment per year, which would otherwise end up in lakes, reservoirs, estuaries, and coastal environments)*

Crop pollination: $592M/yr *(in increased crop production)*

CARBON STORAGE

Regional value: $788M/yr *(in avoided costs due to storage of an estimated 4.6 billion tons of carbon – ~$290 million/yr in Kenya and ~$500 million/yr in Tanzania)*

Value to rest of world: $397B/yr *(in avoided costs from storage of same stocks)*

PROVISIONING SERVICES

Livestock production: $557.4M/yr *(in contribution to GDP)*

Harvested resources: $195.6M/yr *(based on 406,000 liters of honey harvested; honey industry also employs 91,000 people directly and supports livelihoods of 547,440 people in Kenya [ALU, 2020]).*

CULTURAL SERVICES

Nature-based tourism: $1.21B/yr *(represents 30% of total national tourism value in Kenya and 41% of total in Tanzania)*

Biodiversity existence: $1.5M/yr to regional community *(5.37B to rest of world)*

1 Water regulation and carbon storage dwarf all other ecosystem services in value

Although the Great East African Plains are renowned for tourism, the regulating services provided by this landscape far outweigh tourism in economic value. In fact, keeping the wildlife habitats in their current natural condition generates cost savings for the region that could be worth approximately $4.02 billion per year, largely through regulation of hydrological processes and atmospheric carbon. Millions of people rely on the flow of water for both household consumption and livelihoods based on agriculture, pastoralism, tourism, hydro-power, and mining.

2 Global value of carbon storage is two times the entire region's GDP

While carbon storage value to the region is approximately $788 million per year, avoided costs of climate damage at the global level are estimated at $400 billion per year – twice the 2018 GDP output of the East African region. That is why one of our top recommendations for policymakers is to consider tapping into global mechanisms to generate revenue for conservation of the East Africa region – whether large international conservation donors or carbon markets.

3 Tourism has a significant impact on jobs

As tourism is a primary source of jobs in the formal sector, investing in conservation of internationally recognized wildlife and habitats is critical to regional jobs and household income. Protected areas accounted for 21percent of Tanzania's and 11 percent of Kenya's total tourism

value in 2018, providing 638,568 jobs across the landscape (323,568 in Kenya and 315,000 in Tanzania). In addition, community conservancies on the Kenyan portion of the landscape provided direct employment to 1,074 rangers, supported 269,187 households, and made direct monetary contributions of $4.4 million to the Maasai Mara communities in 2016 (KWCA, 2016).

4 Impact on GDP from wildlife and habitat loss goes well beyond tourism

The majority of livelihoods in this landscape depend on ecosystem services. For example, livestock production, which is dependent on healthy grasslands, contributes approximately $248 million per year to Kenya's GDP and $310 million per year to Tanzania's GDP. The Mara River Basin contributes $5-7 million per year to Kenya and Tanzania GDPs based on sectors that all depend on ecosystem regulation of water, soil, and nutrients. These include agriculture, livestock, tourism, mining, and fisheries (WWF, 2019).

5 The real value lies in avoided costs

The largest value of healthy ecosystems lies not in what is produced and sold, but in those services the government does not have to pay for because they're covered by nature. Those benefits may not be immediately or even overtly visible to the average person, but the cost of not protecting nature today will be acutely felt by communities in the years to come.

THE COST OF INACTION

PROJECTED OUTCOMES BY 2050 IN A BUSINESS AS USUAL SCENARIO

TOP THREATS	STRESSES ON NATURAL ENVIRONMENT
1 Land conversion	4 Changes to vegetation and soil cover
2 Over-extraction of natural resources	5 Changes to habitat type and connectivity
3 *Impacts from climate change that will exacerbate threats* Drought, flooding, increased temperatures	6 Changes in fresh water quality, quantity, and flow
	7 Changes in animal behavior

1 Land conversion

Demographic and livelihood shifts will drive population growth at 3.5 percent annually. Without intervention, this will lead to land conversion and degradation from increased demand for livestock, charcoal, and fuelwood; greater urbanization and infrastructure development; agricultural expansion; and land subdivision and fencing. Already one percent of the wildlife landscape is being lost annually to the expansion of cultivated area. Livestock biomass is projected to increase up to 65 percent on the Kenyan side and 93 percent in Tanzania by 2050.

2 Over-extraction of natural resources

Population growth will also lead to greater extraction of resources. A 65 percent increase in demand for biomass energy and woody resources is projected, along with a 58 percent increase in demand for bushmeat. (Wildebeest in Serengeti already experience an annual offtake of 98,000–140,000 – 6-10 percent of the 2015 population. (Rentsch & Packer, 2015).

3 Drought, flooding, increased temperatures

The impacts of climate change will vary markedly across the landscape. Lower precipitation and higher temperatures are predicted to cause substantial contraction of areas with suitable climatic conditions for most key charismatic wildlife species, including lion, elephant, and wildebeest. Increased rainfall in some areas and disappearing vegetation will also increase erosion, with implications for soil retention and fertility and water retention and quality.

4 Changes to vegetation and soil cover

The conversion of natural vegetation cover to cropland and its denudation from overgrazing, as well as the ongoing extraction of woody biomass, will decrease the amount of stored carbon and increase the rate of soil loss (and loss of soil fertility). Reduced vegetation will also reduce water penetration and storage, affecting downstream water regulation and flow.

5 Changes to habitat type and connectivity

Habitats for key species will be lost and connectivity disrupted, which will impact species, dispersals, migration and ability to adapt to climate change. An additional 2.4 million ha of habitat is projected to be converted to agriculture, fenced, or overgrazed by 2050. That would be a loss of twice the habitat currently available under CBNRM approaches.

6 Changes in fresh water quality, quantity, and flow

Water quality will be increasingly compromised by the conversion of natural habitats to cropland, which will substantially increase nutrient loads entering water systems. This will result in eutrophication of rivers, wetlands, and lakes, reducing the value of those habitats.

7 Changes in animal behavior

Recent data suggests imminent collapse of four of the five contemporary migrations (Ogutu, 2019). While wildlife populations may remain more stable in protected areas in the short term, protected areas could increasingly become isolated sanctuaries in a sea of agriculture, with little landscape or genetic connectivity between them.

This synthesis assessed the current (2018) threats to wildlife and wildlife habitat and their projected impact by 2050 under a business as usual scenario. Note that projections consider climate change and assume full recovery from the current impacts of COVID-19.

IMPACT ON ECOSYSTEM SERVICES BY 2050	IMPACT ON ECONOMIC AND HUMAN WELL-BEING
8 Reduction in value of cultural services	12 Negative impact on livelihoods
9 Increased cost due to loss of regulating capacity	13 Reduction in food security
10 Increased cost due to loss of carbon storage capacity	14 Water scarcity
11 Reduction in value of provisioning services	15 Negative health impacts

8 **Tourism revenue: -13.3 percent**
Annual losses – Kenya: $76 million; Tanzania: $85 million.

Existence value: -21.4%
Expected decline in willingness to pay: $1.5 million per year to $1.2 million per year by 2050.

9 **Erosion control capacity: -9.2 percent**
An additional 166 million tons of sediment entering rivers and waterbodies would amount to an annual $204 million increase in treatment costs.

Water flow regulation capacity: -35.1percent
Reduced capacity to regulate water flow will impact both households and businesses, with annual mitigation costs rising by $352 million.

Water quality: -33.1 percent
Increase in phosphorus production, leading to an annual replacement treatment cost of $558,000.

10 **Carbon storage: -5.3 percent**
Reduced capacity to store carbon will increase annual mitigation costs of climate damage by $747.6 million regionally and 3.7 billion globally

11 **Follow up studies** can determine the economic impact on provisioning services. Livestock production is projected to increase, while crop pollination and resources available for harvesting are projected to decline.

This assessment valued the cost of inaction associated with the potential loss of nine valuable ecosystem services. Further study is recommended to gauge the broader cost to the economy, jobs, and human well-being under a business as usual scenario. A few initial projections:

12 **Negative impact on livelihoods**
Negatively affected livelihoods and industries will include rainfed agriculture, pastoralism, wildlife tourism, charcoal production, water-dependent private sector enterprises such as the flower industry, irrigation agriculture, and freshwater fishing. Annual job losses from nature-based tourism are predicted at 66,427 in Kenya and 31,430 in Tanzania. Follow up studies will estimate the monetary cost to jobs and GDP across all sectors.

13 **Reduction in food security for projected 14 million people**

14 **Reduction in Water Security**
Water scarcity for 11.9 million people in the Pangani River Basin (PRB) and 2.1 million people in the Mara River Basin

- *PRB in Tanzania will lose capacity to generate 95 megawatt (MW) hydropower (6 percent of national capacity) and 76,000 ha of irrigation (18 percent of irrigated area). Currently, 75 percent of the population is already under water stress.*
- *There will be an est. 8,800 percent increase (2,620 MCM) in water demand for the MRB.*

15 **Negative health impacts**
Increase in zoonotic disease from compromised wildlife; public health burden from rising pollution and bushmeat consumption; increase in violence due to human-wildlife conflict.

POLICY CONSIDERATIONS

Creating solutions for protecting natural capital will take all stakeholders working together across sectors and national boundaries. The team is currently engaging an array of stakeholders in a dialogue about policy priorities and in the development of a transboundary action plan.

Top priority for this landscape: Slowing and reversing land cover change by focusing on sustainable land use strategies

As shown on the previous page, current status and future trends predict increasing degradation of grasslands, reduction of forests, compaction of soils, and other changes to land cover that – if allowed to continue – will negatively impact all stakeholders. If current management conditions and priorities persist, those who live within the landscape should anticipate less provisional resources, lower soil fertility, and reduced tourism income. People and businesses downstream will receive less water, be impacted by lower water quality, and face other disruptions to their livelihoods and preferred private sector value chains. National governments will lose a major source of foreign exchange earnings from the decline in tourism. The global community will not only lose some of the world's most iconic species, protected areas, and natural wonders, but will also experience the costly effects of increased vulnerability to climate change's impacts.

While the needs of these stakeholder groups are different, the call to action is the same: stop or reverse the trend of land cover change through ensuring appropriate land uses; make management decisions with water resources and climate change in mind; and make policy decisions that support these priorities and actions over the long term. This synthesis suggests the following potential strategies for priority consideration.

Tap into this landscape's large economic value to the global community

The global community has a vested interest in minimizing land cover change that releases carbon dioxide into the environment. The Great East African Plains currently provides $400 billion per year in globally avoided costs of adapting to or recovering from climate change impacts. Tapping into this community's willingness to pay for conservation should be a priority strategy. Some investment may come from international donors, but the biggest potential lies in the world's burgeoning carbon markets. However, challenges lie with designing measures that harness sufficient funds from the global community, effectively incentivize conservation among frontline communities, equitably distribute benefits among community-level stakeholders, and accurately verify carbon storage outcomes. Success will depend on engaging multiple stakeholder groups, from policymakers to economists and the private sector to community-based natural resource managers. Transboundary and regional coordination on PES initiatives like REDD+ will be critical to avoid any time-consuming competition for resources. Support from bilateral and multi-lateral institutions will also be key, including the Program on Climate Change Adaptation and Mitigation in Eastern and Southern Africa (implemented through COMESA, EAC, and SADC).

2 Implement other PES schemes that capitalize on and preserve regulating schemes

Some of the highest values this landscape provides are controlling soil erosion, reducing sediment pollution, and regulating the flow of water, particularly during extreme weather events. At the watershed level, users both upstream and downstream are mutually dependent on these regulating services, and strategies like water funds can be used to incentivize both groups to protect their shared natural capital. In this scenario, downstream users, such as private industries, hydropower initiatives, the agricultural sector, and municipalities would fund activities to keep upstream areas in good condition, thus maintaining water access for all.

3 Focus on local, national, and transboundary policies that limit land use change

Conversion of pastureland to agriculture and the erection of fences are key threats to wildlife populations, dispersals and migrations. With the right policies in place, well supported, and enforced, community-based natural resource managers are well positioned to reduce land use changes that disrupt or exclude wildlife and reduce viability of land to support diverse livelihoods over the long term. This includes restricting the amount of grasslands that are converted for agriculture, including subdivision and fencing, that change land cover patterns required for well-functioning ecosystems. Article 3.3.4(iv) of the Wildlife Policy of Tanzania (1998) supports such a strategy by

stating that "encouraging rural communities to establish Wildlife Management Areas in such areas of critical wildlife habitat, with the aim of ensuring that wildlife can compete with other forms of land use that may jeopardise wildlife populations and movements" (URT, 1998). Kenya's Wildlife Policy (RoK, 2020) also recognizes and promotes wildlife as a land use option in private and community lands.

4 Invest in tourism models that optimize both revenue and conservation

While the establishment and promotion of community conservancies offer the most scalable avenue to securing wildlife habitats and establishing migration corridors, their contribution to the tourism industry accounts for only 1.3 percent of total earnings, suggesting considerable potential to expand into sustainable tourism. Designing activities for this market can maximize revenue while minimizing impact on wildlife and habitat. Appropriate policies would provide an enabling environment for sustainable tourism as an engine of social and economic development, income, and investment, contributing to the achievement of the UN Sustainable Development Goals. The tourism sector should also consider revenue-sharing models that directly fund activities that protect the land on which their industry relies. For example, a portion of tourism revenue could be used to support community rotational grazing schemes to reduce human-wildlife conflict and ensure more land is conserved for wildlife.

STAKEHOLDER GROUPS

Stakeholder group	Call to action	Benefits to stakeholder
Smallholder farmers	Participate in efforts to bring smallholder farmers into tourism sector in order to open new markets for their produce	Increased income, greater food security, less demand for bushmeat
Pastoralists	Engage in holistic land management plans that provide space for wildlife and enable regeneration of pasture that also bank grass for drought mitigation	Healthier livestock and more valuable, regenerative pastureland
Community conservancies	Rehabilitate degraded rangelands and create policies and best practices for preserving wildlife habitat and migration corridors	Higher wildlife biomass to attract ecotourism
Tourism sector	Adopt sustainable tourism model; allocate portion of revenue to land owners and community conservancies for improved CBNRM	Wildlife/habitat that attract tourists are protected; higher, more sustainable revenue streams; women's empowerment; sectoral linkages; regional integration
Other private sectors (agriculture, mining, fishing, hydropower, irrigation)	Participate in PES schemes (watershed protection, carbon sequestration and storage [REDD+, reforestation/afforestation], and biodiversity conservation); invest in protection of land and resources that are critical to value chain	Continuity of regulating services that provide water, filter pollutants, and reduce soil erosion – all of which are critical to avoiding loss of productivity and revenue
National policymakers	Create policies that incentivize sustainable land use (zoning, alternative livelihoods) and protect land cover; policies on sustainable tourism	Avoided costs of mitigating soil erosion, water scarcity or pollution, climate change damage
Transboundary leaders (EAC and transboundary protected area managers)	Strengthen collaborative mechanisms for co-managing protected areas and shared water catchments, as well as combating illegal killing of wildlife; create policies that tap into carbon markets through avoided nature loss and nature-based sequestrations	Avoided loss of tourist revenue, avoided costs of water treatment and replacement
International donors/ development organizations	Support regional access to, and benefits from, carbon markets, and invest in CBNRM that improves climate resilience in East Africa and globally	Advance international climate agreements and frameworks

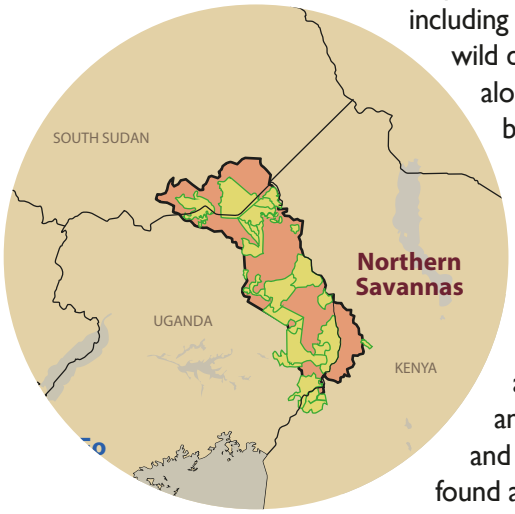
Northern giraffe, Uganda

PHOTO: COULANGES

IV.C NORTHERN SAVANNAS

NATURE

The Northern Savannas landscape is a remote wilderness with a diverse assemblage of mammal and bird species. More than 86 mammal species can be found in the northern part of the landscape, including leopard, cheetah, wild dog, and elephant, along with 500+ bird species. The landscape's grasslands are dotted with iconic tree species, such as red thorn acacias and desert dates, and sausage trees and doum palms are found along important perennial waterways.



LANDSCAPE AT-A-GLANCE

- **Total population:** 6.3 million (97% rural)
- **Population density:** Moderate (~129 people/km^2)
- **Land area:** 48,848 km^2
- **Area under protection:** Kidepo Game Reserve/Kidepo Valley National Park and Nimule National Park/Otze Forest Reserve in Uganda and South Sudan; Karamoja cluster conservation areas in Uganda and neighboring community conservancies in Kenya; and Mount Elgon National Park in Kenya and Uganda

There are a number of transboundary interests in this landscape. The Turkwel Basin encompasses both the Kenyan and Ugandan portions of the study area. It includes the Turkwel Dam, which is the third largest hydroelectric power plant in Kenya, producing 106 MW of power a year (Hirpa et al., 2018). In the Turkana region of Kenya, there are also a number of small-scale irrigation projects that depend on the Turkwel River, which would be negatively impacted by any activities in Uganda that increase sedimentation and/or decrease base flows within the Turkwel Basin. Uganda's Kidepo Valley National Park is a focal point for the relatively small wildlife tourism industry in the landscape and is the main remaining stronghold for savanna wildlife in the area. However, this status is threatened by transboundary poaching from South Sudan. Tourism could also be negatively impacted by deterioration of the security situation in South Sudan.

NATURE'S BENEFICIARIES

Nature underpins the livelihoods and well-being of all of the over 6.3 million people living in this landscape. Following is a look at key stakeholder groups.

Smallholder farmers, pastoralists, fishers, and small-scale miners

The region around Mount Elgon is predominantly agricultural, and it can usually count on bumper harvests from maize, groundnuts, cassava, and other crops. In Kenya, 5,000 people depend on the Mount Elgon forest for subsistence products, such as firewood, poles and posts, water, game meat, and medicinal plants (Ongugo et al. 2002). On the Ugandan side of the mountain, illegal hunting is commonplace, whether for food, use in circumcision ceremonies, or cash income (Jankulovska et al. 2003). Downstream, agropastoral and nomadic lifestyles drive settlement patterns, with some villages becoming heavily depopulated during the dry season. Communities in Kidepo Protected Area Cluster (KPAC) are primarily agro-pastoralist, and fishing is practiced on the shores of Lake Kyoga. Artisanal gold mining is practiced in the Karamoja Districts but limited by insecurity, lack of water, and other basic services in mining areas (Burns et al., 2013). Illegal gold mining has been recorded in protected areas around River Kidepo and Kurao.

Commercial farming

Commercial farming in this landscape is largely focused on rice, coffee, and dairy.

Tourism sector

The value of nature-based tourism in this landscape was estimated at $8.9 million in 2018. Varied landscapes, as well as the presence of unique wildlife in Uganda, are the current draw. The transboundary nature of the KPAC in Uganda and Kidepo Game Reserve in South Sudan offer an opportunity for collaboration on sustainable tourism.

NATURE'S GUARDIANS

There are a range of stakeholders at the local, national, regional, and global levels, who influence stewardship of natural capital in this landscape.

Community groups

There are a few community conservation areas in this landscape, including Karenga Community Wildlife Management Area, Amudat Community Wildlife Area, Iriri Community Wildlife Area, and Bokora Corridor Wildlife Reserve.

National and regional policymakers

National agencies that play key roles in stewarding the region's natural capital include Kenya Wildlife Service, Kenya Forest Service, Uganda Wildlife Authority, Uganda's National Forestry Authority and National Environment Management Authority, and the Wildlife Conservation Directorate of the Government of South Sudan.

International development partners and NGOs

The African Wildlife Foundation (AWF) is working in Imatong, South Sudan, and Wildlife Conservation Society is working in both South Sudan and Uganda in the Kidepo area.

PHOTO: MACIEJ CZEKAJEWSKI

Sunset at savannah plains in Tsavo East National Park, Kenya

NATURAL CAPITAL VALUE

This is an overview of the estimated value of each ecosystem service, as well as key insights to guide stakeholders toward improving protection of the natural capital that provides these services. The full assessment contains further details and analysis. **Total estimated value**: $710/ha/yr on average to East Africa; more than $31,700/ha/yr globally

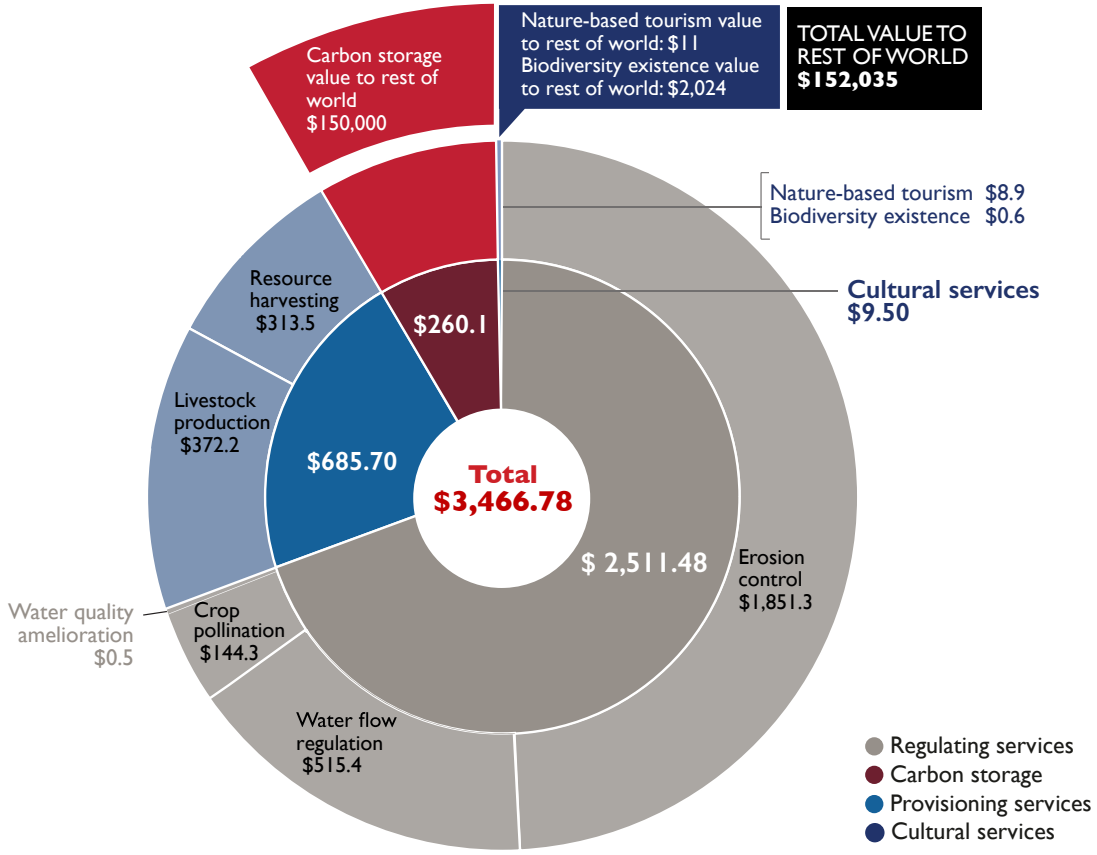


Figure 7. U.S. dollar value of ecosystem services in millions per year in Northern Savannas

REGULATING SERVICES

Water flow regulation: $515.4M/yr

Water quality amelioration: $0.5M/yr *(in avoided costs from reduction of phosphorous loadings within catchment areas of Lake Kyoga)*

Erosion control: $1.85B/yr *(through retention of 1.27 billion metric tons of sediment per year – the highest retention occurring in South Sudan at 398 tons/ha/yr)*

Crop pollination: $144.3M/yr *(majority of value, 67%, is in Uganda; 22% of value is in Kenya and 11% in South Sudan)*

CARBON STORAGE

Regional value: $260.1M/yr *(in avoided costs due to storage of an estimated 2.2 billion tons of carbon)*

Value to rest of world: $150B/yr *(in avoided costs from storage of same stocks)*

PROVISIONING SERVICES

Livestock production: $372.2M/yr
(in contribution to GDP)

Harvested resources: $313.5M *($135.3M in Uganda; $117.9M in South Sudan; $60.3M in Kenya)*

CULTURAL SERVICES

Nature-based tourism: $8.9M/yr
(represents 6,686 jobs in Uganda; 1,466 jobs in Kenya)

Biodiversity existence: $600,000 to regional community/yr
($2.02B/yr to rest of world)

KEY INSIGHTS

1 Hydrological regulation and sediment retention support both livelihoods and nature.

In this landscape, hydrologically-linked ecosystem services have significant local and regional value. Livelihoods in the Mount Elgon region – whose population includes 2.9 million people on the Kenyan side and 1.8 million on the Ugandan side – are dominated by rainfed agriculture (Bonzemo, 2018; UIA, 2018). Sustainable agricultural production is dependent on water flow regulation and water quality amelioration. Natural vegetation in this landscape is estimated to contribute approximately 4.6 million m^3 of rainwater to the annual recharge of base flows (USAID, 2021). In addition, an estimated 1.3 billion tons of sediment is retained per year, ensuring sustained productivity of rice fields downstream. This retention also prevents approximately 795-1,258 tons of phosphorus per year from reaching Lake Kyoga, which prevents eutrophication and supports fisheries.

Natural vegetation also reduces sediment flowing into Lake Victoria and Lake Kyoga, whose headwaters originate from Mount Elgon. Furthermore, sediment retention prevents sediments from filling up Turkwel Gorge Dam, which stores and supplies water to its important hydroelectric facility and to irrigation systems in dry northwest Kenya. If this sediment were not being retained by the landscape, the landscape's replacement cost – i.e., the cost of constructing and maintaining sediment check-dams – is estimated at $1.85 billion per year.

Unpolluted water flowing through the landscape further supports agriculture in South Sudan, a sector that employs 80 percent of the country's workforce (AWF, 2021). The landscape also provides water, grazing, and browsing relish for wildlife throughout the year in the rangelands of both Uganda and South Sudan (UWA, 2015).

2 Tourism offers high potential for private sector investment.

This region is ripe for private sector investment in tourism, and a growing industry already exists in Uganda. Until recently, tourism in the northeastern Karamoja region of Uganda was under-developed and off the radar for even the most adventurous of tourists. The region was largely inaccessible by roads, isolated from the rest of Uganda, and tribal conflicts raised security concerns for potential travelers. However, newly paved roads, a chartered air service, the construction of safari lodges, and a return to peace across the region has resulted in a significant increase in the number of tourists to this remote wilderness. Today, tourism in Karamoja is centered on nature and nature-based activities.

In the war-torn nation of South Sudan, the tourism industry (as well as much of the wildlife) is essentially non-existent. However, the country is emerging from conflict and, with a peace deal in place, is focusing on diversifying revenues with the hope of growing tourism. Without the necessary investment, the industry will likely take decades to develop. However, there is great potential, and if wildlife landscapes are properly managed, they could provide income, jobs, and numerous valuable ecosystem services to the people of South Sudan.

THE COST OF INACTION

PROJECTED OUTCOMES BY 2050 IN A BUSINESS AS USUAL SCENARIO

TOP THREATS	STRESSES ON NATURAL ENVIRONMENT
1 Land conversion and degradation	4 Habitat loss and fragmentation
2 Unsustainable resource and land use	5 Land degradation through loss of natural vegetation and soil cover
3 *Impacts from climate change that will exacerbate threats* Drought, flooding, increased temperatures	6 Changes to mammals and other high-value species
	7 Changes to freshwater systems

1 Land conversion and degradation

Population growth, insecurity, stock theft, and cultivation have increased sedentarization and reduced productive land for livestock (Bintoora, 2016). At the same time, livestock numbers are estimated to increase 65 percent and 224 percent in the Kenyan and Ugandan portions of the landscape respectively. While the trend is more uncertain for South Sudan, productivity of many grazing region is declining. Land conversion for subsistence agriculture is also on the rise; cropland expanded 5.39/ha/yr from 2015 to 2018.

2 Unsustainable resource and land use

Top threats include overharvesting of woody biomass (with demand predicted to increase by 35 percent by 2050) and hunting for local bushmeat consumption (with demand estimated to increase by 30 percent). Fuelwood harvest drives forest and woodland degradation, particularly in Uganda, where demand is growing from urban areas to the west, and in the Mount Elgon region of Kenya. Hunting – facilitated largely by insecurity and poor law enforcement – has also caused substantial declines in wildlife.

3 Climate change impacts

Of the four landscapes in this study, the Northern Savannas are predicted to experience the largest shifts in temperature and precipitation. Expected increase in annual precipitation from 2040-2060 is approximately 13 percent above historical averages. Also predicted: decreased June rainfall, significantly increased December to March rainfall, and a 2.7°C increase in mean annual temperature.

4 Habitat loss and fragmentation

An estimated increase in cultivation area – from 5.1 percent of the landscape in 2018 to 7.4 percent in 2050 – would mean the conversion of an additional 3 to 4 million hectares for livestock and farming. This will diminish and fragment habitat, reduce ecotourism opportunities, and reduce materials for harvesting. An estimated increase in land suitabillity for crops may also expand cultivation and reduce habitat.

5 Land degradation through loss of natural vegetation and soil cover

Projected increase in livestock numbers would lead to stocking densities beyond what the natural fodder can sustain. Land conversion and unsustainable use may also lead to land degradation, reducing the landscape's ability to prevent erosion and retain phosphorus and sediment. This will also diminish the landscape's ability to mitigate climate change through stored carbon.

6 Changes to mammals and other high-value species

Loss of habitat availability and connectivity will reduce wildlife biomass, increase genetic isolation of wild populations in protected areas, and reduce ability for wildlife to migrate in response to drought and climate change. Substantial declines in species richness are predicted from climate change alone, and this will be exacerbated by habitat loss and fragmentation.

7 Changes to freshwater systems

Increased pollution and sedimentation in waterways will negatively impact fisheries, irrigation, hydropower, freshwater availability, and sanitation and hygiene in Lakes Kyoga, Turkana, and Victoria catchments.

This synthesis assessed the current (2018) threats to wildlife and wildlife habitat and their projected impact by 2050 under a business as usual scenario. Note that projections consider climate change and assume full recovery from the current impacts of COVID-19.

IMPACT ON ECOSYSTEM SERVICES BY 2050	IMPACT ON ECONOMIC AND HUMAN WELL-BEING
8 Reduction in value of cultural services	12 No discernible change in ecotourism livelihoods
9 Increased cost due to loss of regulating capacity	13 Change in crop and livestock income
10 Increased cost due to loss of carbon storage capacity	14 Negative health impacts
11 Reduction in value of provisioning services	

8 Tourism revenue: -19.5 percent
Annual losses of $1.4 million in Uganda (22 percent decline); $280,000 in Kenya (12 percent decline).

Existence value: -2.5 percent
Expected decline in willingness to pay from $2 billion per year to $1.9 billion per year.

9 Erosion control capacity: -0.4 percent
An additional 4.8 million tons of sediment entering rivers and waterbodies would amount to an annual $6 million increase in maintenance and lost reservoir storage costs.

Water flow regulation capacity: -4.4 percent
Estimated loss of base flow is 205 million m^3 (2.5 percent of current), increasing annual replacement costs by $23 million.

Water quality: -1.3 percent
For the portion of the landscape that drains into Lake Kyoga, phosphorus export would increase by 4.7 percent, meaning water treatment costs would rise by $223,000.

10 Carbon storage: -0.3 percent
Predicted release of 0.5 percent (10.7 million tons) of carbon will cost the region an additional $560,000/yr in climate change impacts.

11 Follow up studies can determine the economic impact on provisioning services. Livestock production is projected to increase, while crop pollination and resources available for harvesting are projected to decline.

This assessment valued the cost of inaction associated with the potential loss of nine valuable ecosystem services. Further study is recommended to gauge the broader cost to the economy, jobs, and human well-being under a business as usual scenario. A few initial projections:

12 No discernible change in ecotourism livelihoods
Tourism revenue is already modest in the region, and the future of this sector is uncertain given insecurity and climate change. The business as usual scenario predicted no significant change in the number of jobs in the ecotourism sector. To achieve employment growth, more investment will be needed.

13 Change in crop and livestock income
Livestock numbers and croplands are both expected to increase, leading to decreased space available for wildlife. However, increased risk in this sector is also likely, due to (1) increased droughts, (2) increased competition for land, and (3) cattle rustling. Crop failures and livestock deaths increase people's reliance on bushmeat and other natural resources during and after droughts. Livestock increases could lead to degradation of new and already-overgrazed areas.

14 Negative health impacts
(1) Increased risk of zoonotic diseases, as increase in bushmeat hunting brings greater numbers of people in contact with meat from wild species; and (2) worsening human-wildlife conflict as populations of people and livestock increase and cultivation expands.

POLICY CONSIDERATIONS

Creating solutions for protecting natural capital will take all stakeholders working together across sectors and national boundaries. The team is currently engaging an array of stakeholders in a dialogue about policy priorities and in the development of a transboundary action plan.

Primary policy goals: Protect Mt Elgon's water tower and improve land-use and wildlife management in the KPAC.

1 Improve transboundary cooperation and coordination

The role of Mount Elgon as a transboundary water tower, supporting the Turkwel Basin and Lake Kyoga Basin, provides an important motivation for transboundary collaboration between Kenya and Uganda. The Turkwel River supports a 106 MW hydropower station and flows into the saline Lake Turkana through an arid environment as a major water resource for pastoralism and wildlife, as well as crop irrigation. The flow to Lake Kyoga similarly supports various livelihood types including fisheries.

To ensure that downstream needs are met for both countries, Kenya and Uganda must work together to ensure that Mount Elgon continues to be healthy and climate resilient to extreme rainfall events (both droughts and high-rainfall years) and rising temperature. A variety of studies to date have highlighted ecosystem-based climate adaptation solutions for Mount Elgon on both sides of the border. The four main climate hazards on Mount Elgon are landslides, drought, flooding, and soil erosion. Projects are ongoing to address these hazards. For example, IIED, IUCN, and Uganda's Ministry of Water and Environment are currently implementing a variety of interventions under the Ecosystem-based Adaptation in Mountain Ecosystems Project, building ecosystem management capacity in the communities and improving water retention using roadside drainage bunds, run-off retention drains and tree planting using an agroforestry approach. As part of the project, Uganda's Ministry of Water and Environment is also promoting better integration of ecosystem-based climate adaptation principles into policy and planning at the national level.

Mount Elgon, Uganda

2 Develop public-private partnerships around insurance schemes for farmers in the Mount Elgon region

Mount Elgon is a key water tower for the Northern Savannas landscape, providing safeguards on water flow and sediment retention. However, due to its steep slopes, intense precipitation, and fertile lands supporting a dense population (1,000 people per km^2) in eastern Uganda, it is one of the most landslide-prone regions in Africa (Broeckx et al., 2019). Poor farming practices may contribute to the frequent landslides that cause damage and fatalities. There is an opportunity for Partner States (Kenya and Uganda) to develop partnerships with the private sector based on insurance schemes for farmers that cover restoration and reforestation (new carbon) and climate smart agriculture. The partnership could be modeled on that between the Government of Rwanda and the World Bank (Rutebuka, 2019).

3 Use CBNRM to ensure solutions that benefit both people and nature

As populations grow and climate change impacts intensify, land and resources grow scarcer and tolerance for wildlife and conservation could decrease, leading to a rise in human-wildlife conflict. Natural resource management strategies that benefit both people and nature will be critical. For example, the KPAC holds great potential to attract private sector investments that tie wildlife conservation to local community benefits, including through the use of CBNRM such as Community Wildlife Areas/Community Conservancies. To be effective in achieving conservation and sustainable development goals, CBNRM requires transboundary collaboration between Kenya, South Sudan, and Uganda, as well as multiple partnerships with local communities, civil society, and the private sector .

KEY STAKEHOLDER GROUPS

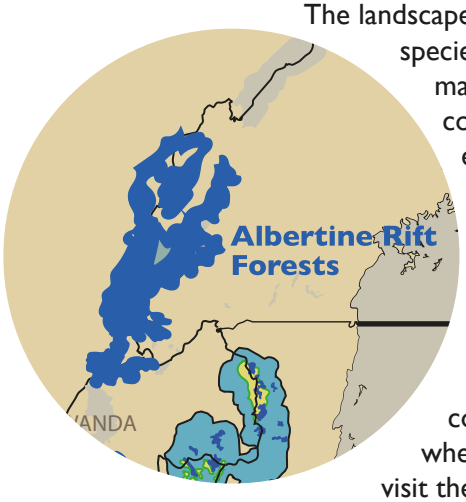
Stakeholder group	Call to action	Benefits to stakeholder
Wildlife managers	Strategies that strengthen CBNRM such as Community Wildlife Areas/Community conservancies; Transboundary (Kenya, South Sudan, Uganda) collaboration and multiple partnerships with local communities, civil society and the private sector to jointly seek creative nature-based solutions to the landscape's environment, economic, and social challenges	Conservancies would benefit communities, while providing a range of ecosystem services including space and security for wildlife. They would also shape a sustainable environment, with reduced inter-ethnic conflicts for grazing land and reduced human-wildlife conflict.
Small-scale agriculture	Reduce activities that accelerate erosion; engage in reforestation activities that prevent landslides; participate in insurance schemes and ecosystem-based adaptation activities	Sustainable livelihoods; new economic opportunities through carbon sequestration; reduced risk of landslides; development schemes, resilience to climate change
Agro-pastoralism	Adopt holistic management practices; engage in ecotourism; avoid land conversion to cropping; avoid overstocking	Improved pasture and stock quality; earnings from ecotourism; space and security for wildlife
Hydropower (large and small scale) and users of this power – especially Turkwel Dam	Advocate for transboundary cooperation for watershed management, focusing on constructive collaboration between Kenya and Uganda	Sustained water and power availability in the region
Tourism sector	Advocate to improve the status of protected areas in the central and southern parts of the landscape, especially around Mount Elgon and in the KPAC	Widened range of areas for ecotourism leading to expanded activities and improved employment
Transboundary leaders (EAC and transboundary protected area managers)	In Uganda and Kenya, focusing on the Mount Elgon area, enter into partnerships with the private sector to develop an insurance scheme for farmers that include coverage to support landscape restoration focusing on reforestation (new carbon) and climate smart agriculture In the KPAC area, support land use planning and wildlife management that ensures ecosystem services are sustained Support development in southern South Sudan portion of the landscape to reduce poaching in the protected areas	Improved NRM and coordination and collaboration between countries and across political boundaries
International donors/ international NGOs/ development partners	Work with communities, protected areas management, governments, the EAC, other donors and partners to support any or all of the above, especially in Mount Elgon and KPAC regions Support diversification of livelihoods of communities highly dependent on natural resources	Fulfill development and conservation agendas; improve the world

Fog in the tropical rain forest at the Nyungwe National Park, Rwanda

IV.D ALBERTINE RIFT FORESTS

NATURE

The Albertine Rift Forests landscape contains some of the world's most diverse afromontane forests, with many endemic plants, mammals, and birds (Cunningham, 1996). The landscape hosts 52 percent of all bird species and 39 percent of all mammal species of the African continent, with more endemic and globally-threatened vertebrates than any other region in Africa (Plumptre et al. 2007).



Rwanda and Uganda are currently the only two countries in the world where tourists can safely visit the critically-endangered mountain gorilla *(Gorilla beringei beringei)*. Just over 1,000 mountain gorillas can be found in Volcanoes National Park in northwest Rwanda and Bwindi Impenetrable National Park in Uganda. This landscape is also home to the critically-endangered endemic plant *Diospyros katendei Verdc.*, which is found only in Kasyoha-Kitomi Central Forest Reserve.

These parks are becoming increasingly isolated in a matrix of agricultural fields and settlements. The only remaining connection between the national parks in northern Rwanda and southern Uganda is through corridors of forest that connect these parks to neighboring Virunga National Park in the DRC.

LANDSCAPE AT-A-GLANCE

- **Total population**: ~10M across Uganda, Rwanda, and Burundi; 97% rural

  Population density: Rwanda (512 people/km^2) and Burundi (449 people/km^2) are the most densely populated countries in mainland Africa (UN 2019). Density in Uganda is moderate at 222 people/km^2.
- **Land area:** 7,772 km^2
- **Area under protection**: Main protected areas include Kibale, Queen Elizabeth, Rwenzori Mountains, Mgahinga, and Bwindi Impenetrable National Parks in Uganda; Volcanoes and Nyungwe Forest National Parks in Rwanda; and Kibira National Park in Burundi. Together, these six national parks cover close to 600,000 hectares.
- **Important ecosystem assets:** High concentration of diverse and endemic species. It is most famous for its gorillas, which provide a lucrative but source of tourism revenue and a catalyst for additional tourism activities in the region source of tourism revenue.
- **Important transboundary assets**: The remaining afromontane forest in Uganda and Rwanda is largely connected via protected areas in the DRC. There is also the Nyungwe-Kibira transboundary area between Rwanda and Burundi.

Without this connection, these parks would become isolated forest patches. Nyungwe and Kibira National Parks in Rwanda and Burundi are contiguous and form part of the proposed Nyungwe-Kibira Transboundary Conservation Area (TFCA, IUCN ESARO, 2020), but there are no corridors that link these parks to other forested landscapes. Queen Elizabeth adjoins Kibale National Park to form a 180 km-long corridor for movement of wildlife between these two parks.

This landscape is an Endemic Bird Area that hosts restricted-range species, including monotypic endemic genera *Pseudocalyptomena, Graueria,* and *Hernitesis*. Nyungwe-Kibira forest is an important habitat for the endangered endemic Congo Bay-owl (*Phodilus prigoginei*) (Birdlife International, 2021).

NATURE'S BENEFICIARIES

Nature underpins the livelihoods and well-being of all of the nearly 10 million people living in this landscape. Following is a look at key stakeholder groups.

Smallholder farmers, hunter-gatherers, cattle keepers, and fishers

Smallholder farming and livestock rearing remain the dominant livelihood activities, despite increasing urbanization across all countries in the study area (Salerno et al., 2018). In Burundi, 85 percent of local communities rely on agriculture. Small-stock farming is important, as are dairy cattle in some areas. Households grow a variety of fruit and vegetables for household consumption, as well as for sale at market. The Twa (Burundi) and Batwa (Uganda) are hunter-gatherers who depend on provisioning food from forests. Forests play a major role in the social-economic development of Rwanda by providing goods and ecosystem services in addition to employment.

When it comes to income from harvested resources for communities in this landscape, charcoal production provides the largest percentage (61.8 percent), followed by wood production at (19.2 percent) (*Rwanda National Forestry Policy,2018*). In 2007, the value of firewood and charcoal totaled $122 million – about 5 percent of the national GDP.

Commercial agriculture sector

The principal crops are coffee and tea, and conservation areas are surrounded by agricultural land and large multinational tea estates.

Tourism sector

The total direct contribution to GDP of nature-based tourism in the landscape was estimated at $50.3 million in 2018. Gorilla trekking is considered an important catalyst for additional tourism activities in the region.

Other private sectors

Other private sector industries that rely on access to natural capital include agriculture, fishing, mining, and oil in the Lake Edward-Albert Basin.

NATURE'S GUARDIANS

There are a range of stakeholders at the local, national, regional, and global levels who influence stewardship of natural capital in this landscape.

Community conservancies

In Rwanda: From 2005-2017, the Rwanda Development Board invested $1 million in 152 community-based conservation projects and integrated conservation and development projects around Nyungwe National Park as part of a revenue sharing scheme (RSS) to strengthen protected area management (Imanishimwe et al., 2019).

In Uganda: The Uganda Wildlife Authority developed community conservation in the 1990s to harmonize the relationship between park managers and neighboring communities, allowing these communities access to protected area resources. For example, in Bwindi Impenetrable National Park, beekeeping for honey collection is the most lucrative of several multiple use program activities for local people.

National and regional policymakers

The EAC and its Partner States, including Burundi, Rwanda, and Uganda, play a key role in stewarding the landscape's natural capital. The National Institute for Environment and Conservation of Nature in Burundi, the Rwanda Development Board, and the Uganda Wildlife Authority oversee protected area management, employing rangers and other natural resource managers and creating policies that govern land use and development.

International development partners and NGOs

A range of bilateral, multilateral, and non-governmental organizations are already investing in generating and applying evidence on natural capital in the Albertine region. Since 2008, ARCOS Network has been managing a regional biodiversity information system (http://arbims.arcosnetwork.org/), which has catalyzed efforts to collect and use biodiversity data.

NATURAL CAPITAL VALUE

This is an overview of the estimated value of each ecosystem service, as well as key insights to guide stakeholders toward improving protection of the natural capital that provides these services. The full assessment contains further details and analysis. **Total estimated value**: $1,530/ha/yr on average to East Africa; more than $54,800/ha/yr globally.

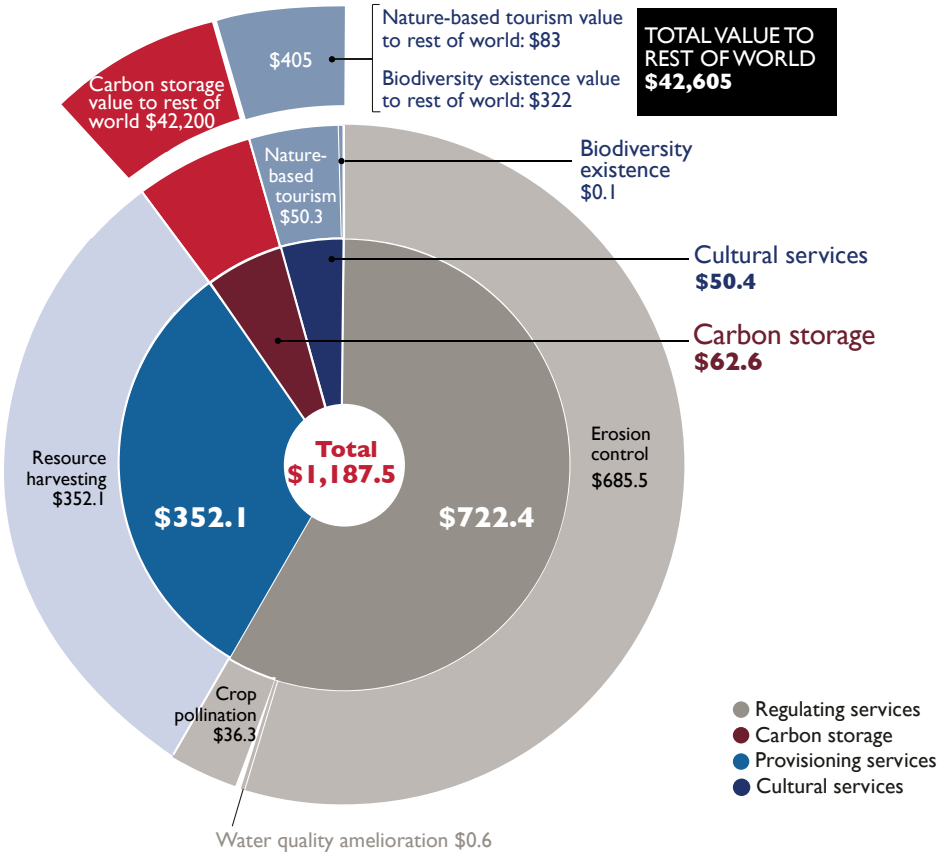


Figure 8. U.S. dollar value of ecosystem services in millions per year in Albertine Rift Forests

REGULATING SERVICES

Water quality amelioration: $600,000/yr *(in avoided costs from reduction of phosphorus loadings; if available landscape is converted to agriculture, treatment costs could rise to $682,469/yr)*

Erosion control: $685.5 *(through retention of sediment)*

Crop pollination: $36.3M/yr *(estimated increase in crop production)*

CARBON STORAGE

Regional value: $62.6M/yr *(in avoided costs due to storage of an estimated 643 million tons of carbon)*

Value to rest of world: $42.2B/yr *(in avoided costs from storage of same stocks)*

PROVISIONING SERVICES

Harvested resources: $352.1M/year

CULTURAL SERVICES

Nature-based tourism: $50.3M
(sector also creates 104,980 jobs for the region – 28,800 in Burundi; 48,180 in Rwanda; 28,000 in Uganda)

Biodiversity existence: $100,000/yr to regional community
($322M/yr to rest of world)

KEY INSIGHTS

1 Erosion control and material harvested from nature are the most important ecosystem services.

Although the Albertine Rift Forests are renowned globally for their rich biodiversity, the value of this landscape to local livelihoods and well-being far outweighs the economic value provided by tourism. Aside from carbon sequestration, the highest economic value lies in sediment retention. The high rainfall (1,000-1,400 mm per year) across most of this region, often falling on steep slopes, results in a high potential for soil erosion. Natural vegetation here retains 619 tons of sediments per hectare per year, saving the landscape an estimated $685.5 million per year in erosion control.

Harvested resources are also key to local livelihoods. Rural households secure income by cultivating crops and raising livestock. A wide variety of wild resources are harvested for nutrition and health, energy, and raw materials from the forested habitats that remain in this region. Woody resources are particularly important, as more than 95 percent of households use firewood or charcoal as a main fuel source. Collection of wild fruits, vegetables, and mushrooms is also important for livelihoods. Access to forest products has been shown to increase household incomes by up to 35 percent per year (Albertine Rift Program WCS, 2021).

Man and cow, Uganda

PHOTO: JASON HOUSTON

2 Global value of biodiversity existence for this landscape is high.

Valued at $322 million per year, this landscape ranks exceptionally high as a global conservation priority. Because of its endemic and globally-threatened species, the global conservation community started an eco-region conservation planning process across the landscape in Uganda, Rwanda, Burundi, DRC, and Tanzania in 2003 (GoU, 2007). Transboundary policies that would ensure connectivity of habitats that sustain iconic gorilla populations, based on protected area conservation, would be more sustainable than maintaining business as usual.

3 Gorilla trekking is an important catalyst for regional tourism.

Tourists who primarily come to see this landscape's mountain gorillas also visit other wildlife areas and tourist attractions, spending time hiking in the Rwenzori Mountains National Park (Uganda), birdwatching in Nyungwe National Park (Rwanda), or going on safari to spot large game in Queen Elizabeth National Park (Uganda). Parks considered most important for the protection of mountain gorillas, Volcanoes National Park (Rwanda) and Mgahinga Gorilla National Park (Uganda), had the highest tourism value at $837 per ha per year. If current gorilla conservation efforts remain effective, annual tourism value could increase by $5.3 million in Rwanda and $4.2 million in Uganda by 2050. In contrast, annual tourism value is predicted to decline by $400,000 in Burundi due to poorly developed tourism products, insecurity, and forest encroachment.

THE COST OF INACTION

PROJECTED OUTCOMES BY 2050 IN A BUSINESS AS USUAL SCENARIO

TOP THREATS	STRESSES ON NATURAL ENVIRONMENT
1 Land conversion	4 Loss of vegetation and soil cover
2 Unsustainable resource and land use	5 Habitat loss, fragmentation, and degradation
3 *Impacts from climate change that will exacerbate threats* Temperature and precipitation changes	6 Changes to primates and other high-value species
	7 Changes to freshwater systems

1 Land conversion

Ever increasing food demand has driven increased land cultivation (Salerno et al., 2018). Intensive cropping has already expanded right to the edges of protected areas. Farming on steep slopes is also impacting forest cover, with the Global Forest Change dataset indicating a clear upsurge in deforestation rates since 2014 (USAID, 2021). Rising urbanization is causing increase in production of charcoal, as well as bricks for building materials – both of which put further pressure on forests. As pressure grows on protected area borders, human-wildlife conflict is also a growing challenge (Hill et al., 2002b; Tolbert et al., 2019).

2 Unsustainable resource and land use

Fuelwood scarcity is driving illegal harvesting of wood from protected areas (Harrison et al., 2015; Plumptre et al., 2016). Over-harvesting of other forest resources have also caused degradation of key habitats. With population growth, demand for woody resources could increase by approximately 75 percent. Excessive hunting pressure – including rampant bushmeat offtake, inadequate conservation law enforce-ment, and commercial hunting for illegal wildlife trade – has also had a severe impact on wildlife. Livestock grazing an additional threat to wildlife, most notably in Queen Elizabeth National Park.

3 Temperature and precipitation changes

Total annual precipitation is expected to increase by 1.9 percent by 2040-2060, and mean annual temperature by 2.7°C. The August-November short rainy season is predicted to get wetter, with increased risk of flash floods and landslides. The long rainy season is predicted to get marginally drier.

4 Loss of vegetation and soil cover

Approximately 89,000 ha of forest could be lost (15.5 percent of existing forest cover). Due to the landscape's extreme slopes, deforestation would lead quickly to high levels of erosion (USAID, 2021).

5 Habitat loss, fragmentation, and degradation

Certain protected areas are already totally isolated due to cultivation, and landscape connectivity could be further compromised, threatening the viability of wildlife populations (USAID, 2021). Forest loss will impact the exceptionally high number of IUCN red-listed species found in the landscape (Plumptre et al., 2016). As climate changes, models predict increased suitability for most crop species, which will increase land conversion and habitat loss, particularly in higher-lying protected areas, which currently have low suitability for cultivation.

6 Changes to primates and other high-value species

Intensive cultivation around protected areas will prevent high-value species from moving to escape the pressures of climate change (USAID, 2021). Ongoing habitat conversion in the DRC may erode the critical landscape corridors between Rwanda, Uganda, and the DRC.

7 Changes to freshwater systems

Freshwater systems will become more polluted due to increased cultivation of land adjacent to the wildlife landscapes of Rwanda and Uganda, and to a lesser extent Burundi where farmers apply less fertilizer.

This synthesis assessed the current (2018) threats to wildlife and wildlife habitat and their projected impact by 2050 under a business as usual scenario. Note that projections consider climate change and assume full recovery from the current impacts of COVID-19.

IMPACT ON ECOSYSTEM SERVICES BY 2050	IMPACT ON ECONOMIC AND HUMAN WELL-BEING
8 Reduction in value of cultural services	12 Impact on jobs and livelihoods
9 Increased cost due to loss of regulating capacity	13 Change in food security
10 Increased cost due to loss of carbon storage capacity	14 Decreased water availability and quality
11 Reduction in value of provisioning services	15 Negative health impacts

8 Tourism revenue: +18.7 percent

If gorilla conservation efforts remain effective: $5.3 million increase in Rwanda; $4.2 million increase in Uganda. However, decline predicted in Burundi.

Existence value: -7.9 percent

A decline in willingness to pay from $322.2 million (current value) to $296.7 million by 2050.

9 Erosion control capacity: - 1.3 percent

An additional 6.5 million tons of sediment entering rivers and waterbodies would amount to an annual $8 million increase in treatment costs.

Water flow regulation capacity: -3.1 percent

Baseflow predicted to decline 3.1 percent. Reduced capacity to regulate water flow will impact both households and businesses, with the cost of reservoir storage to retain this amount of water rising by $13 million.

Water quality: -39.4 percent

Addition of 179,000 tons of phosphorus export over the current landscape, leading to an increase of $338,000 in annual water treatment costs due to nutrient pollution.

10 Carbon storage: -7.6 percent

Reduced capacity to store carbon will increase mitigation costs by $4.7 million regionally and $3.2 billion globally.

11 Follow up studies can better determine the economic impact on provisioning services. Livestock production is projected to increase, while crop pollination and resources available for harvesting are projected to decline.

This assessment valued the cost of inaction associated with the potential loss of nine valuable ecosystem services. Further study is recommended to gauge the broader cost to the economy, jobs, and human well-being under a business as usual scenario. A few initial projections:

12 Impact on jobs and livelihoods

If gorilla conservation remains effective, nature-based tourism is projected to increase (except in Burundi), although it may plateau around 2040 due to ongoing population growth and encroachment pressures on remaining habitat. Tourism benefits will have an estimated global value of $99.1 million per year – a 19 percent increase from 2018 – providing more than 11,500 new jobs to the region.

13 Change in food security

The 15.5 percent loss of forest cover means reduced availability of forest resources , including woody biomass, wild foods, and medicine, which will impact food security and nature-based livelihoods. This may be supplemented by agricultural expansion and other development efforts in and around the landscape.

14 Decreased water availability / quality

There will be reduced support for fisheries and water, sanitation, and hygiene in the Lake Edward and Lake Albert basins, whose catchment covers an area of approximately 622,472 km² and supports a population of approximately 12 million.

15 Negative health impacts

Increase in zoonotic disease from compromised wildlife; public health burden from rising pollution and bushmeat consumption; increase in violence due to human-wildlife conflict.

POLICY CONSIDERATIONS

Creating solutions for protecting natural capital will take all stakeholders working together across sectors and national boundaries. The team is currently engaging an array of stakeholders in a dialogue about policy priorities and in the development of a transboundary action plan.

Primary policy goals: Continue the positive trajectory of gorilla conservation efforts, while also prioritizing forest cover (especially on slopes) to maintain erosion control.

Following are recommended focal areas for discussion as stakeholders consider strategies for achieving these goals.

1 Strengthening RSS that benefit communities and nature

RSS around protected areas provide local communities with incentives to support conservation, particularly when they might be adversely impacted by the loss of nature through reduced livelihoods or greater susceptibility to human-wildlife conflict. There are a number of existing models that can be strengthened or replicated. Following are just a few:

- **Burundi:** Although there is no record of formal RSS in Burundi, there are local groups known as *Association Dukingiribidukikije*. Created in 2012 by local volunteers, these groups are actively protecting the environment, while seeking solutions to address poverty (Fuhnwi, 2017).
- **Rwanda:** The government of Rwanda has created tourism revenue sharing programs to advance poverty alleviation, health improvement, and economic empowerment. To date, the government has invested $5.3 million in rural communities. In 2019, RSS were increased to 10 percent of tourism revenue, so that out of $400 million in total revenue, communities received $40 million (Rwanda's 6th national report to CBD). The Sabyinyo Community Livelihood Association (SACOLA), located at the foothills of the Volcanoes National Park, was the first RSS engagement between government and community. Using tourism revenue, SACOLA has supported over 5,800 households. Since 2004, SACOLA has generated jobs, created community cooperatives, promoted tourism products, undertaken profit sharing with surrounding communities, and constructed houses for the poor and vulnerable, among other activities.
- **Uganda**: An RSS was established in 1995 at Bwindi Impenetrable National Park, in which 20 percent of total revenue was shared with park-adjacent communities. The Uganda Wildlife Authority has since developed national revenue sharing guidelines applicable to all of its parks (Franks & Twinamatsiko, 2017). The scheme is generating between $195,000 and $260,000 annually in total revenue to be shared – enough to ensure that people living in 'front-line' villages would earn approximately $10/year. Despite the relatively low income, this project is showing a positive impact on conservation and the communities (Franks & Twinamatsiko, 2017).

2 Tapping into global willingness to pay for wildlife and habitat conservation and carbon sequestration

The global community has a vested interest in addressing the species extinction crisis, conserving this important landscape for future generations, and mitigating climate change. Tapping into this community's willingness to pay for conservation and forest management should be a key strategy. However, challenges lie with designing measures that will allow for this transfer of value, and ensure funds sourced from the global community are indeed used to fund conservation activities. Investment would come from international donors, but community ownership of the resulting nature conservation strategies will be key to success. In addition, transboundary and regional coordination on PES initiatives like REDD+ will be critical to avoid any time-consuming competition for pooled regional resources.

One way to engage the international community and tap into biodiversity existence value is through engagement in international agreements and treaties. Rwanda has ratified various multilateral environmental agreements that promote proactive, sustainable environmental management and biodiversity conservation. These include the UN Convention on Biological Diversity (CBD), the Convention to Combat Desertification, the Framework Convention on Climate Change (UNFCCC), and the Kyoto Protocol. In 2016, Rwanda also signed the Paris Agreement on climate change and ratified it.

Forest mapping is also a fundamental step toward engaging with the international community on PES and REDD+. Entering carbon markets in particular requires understanding each country's carbon stocks. In the 2010s, Rwanda conducted two forest mapping efforts, resulting

in two reports (2012, 2019). The 2012 report measured forest cover as 24.5 percent of the country's total land area. Rwanda's 2020 Vision, finalized in July 2000, was to increase forest cover to 30 percent of its total land area. The 2019 report indicated that forest now covers 30.4 percent of Rwanda's total land area. This increase in forest cover has enhanced the carbon storage and sequestration potential in the country.

3 Investing in transboundary tourism models based on gorilla conservation

Due to the inextricable link between gorillas and tourism, the loss of one will lead to the collapse of the other. Fortunately, gorilla tourism is currently well managed, but continued investment in the sector's infrastructure, as well as in habitat conservation, are key to long term sustainability. Currently, connectivity of suitable gorilla habitats depends on a path through the DRC – an area under threat from agriculture and mining. A sustainable investment strategy will require enhanced collaboration between Burundi, Rwanda, Uganda, and the DRC. Because gorilla conservation catalyzes tourism to other sites throughout the region, transboundary strategies will benefit all countries, as well as local community livelihoods that are tied to nature-based tourism.

KEY STAKEHOLDER GROUPS

Stakeholder group	Call to action	Benefits to stakeholder
Smallholder farmers, hunter-gatherers, cattle keepers, and fishers, as well as community conservancies	Restore and safeguard environments that support livelihoods, taking into account the needs of women,and the vulnerable groups. Harvest resources sustainably. Advocate for RSS and PES to promote sustainable resource use.	Access to natural resources; Additional sources of income or access to markets become available
Commercial agriculture sector	Harness opportunities to funds that support community initiatives through measures like water funds to restore and safeguard natural vegetation. Support strategies related to PES for erosion and water quality control around protected area boundaries and downstream.	Natural vegetation sustains the high value of soil erosion control and flow regulation provided by the landscape Sustainable provision of water and pollination, as well as soil erosion control
Tourism sector	• Advocate for RSS and PES to promote sustainable resource use • Continue to support investment in the sector's infrastructure, as well as in habitat conservation • Prepare for impacts of climate change on gorillas and other important flora and fauna	Continued expansion of gorilla tourism and visits to other parks
Other private sectors	Support strategies related to PES for erosion and water quality control downstream; invest in green infrastructure	Lack of sedimentation and eutrophication in lakes, rivers, and dams
National and regional policymakers	• Enhance share of National Parks' financial revenue earned through tourism or other activities with local communities by expanding models for RSS and PES that work at country and transboundary levels • Integrate the economic value of biodiversity and ecosystems into national accounts, local development strategies and planning processes. • Engage in international agreements and treaties	Continuity of regulating services that provide water, filter pollutants, and reduce soil erosion – all of which are critical to avoiding loss of productivity and revenue
International development partners and NGOs	Create policies that incentivize sustainable land use (zoning, alternative livelihoods) and protect land cover; policies on sustainable tourism	Avoided costs of mitigating soil erosion, water scarcity or pollution, climate change damage

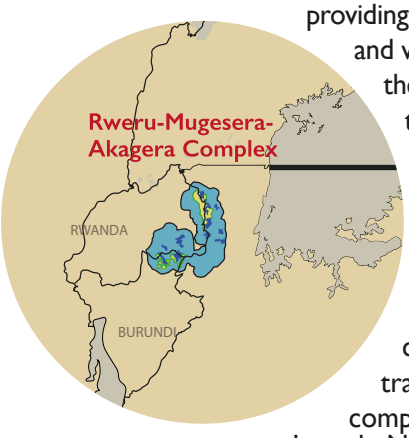
Hippopotamus (Hippopotamus amphibius), Akagera National Park, Rwanda

PHOTO: ROSTASEDLACEK

IV.E RWERU-MUGESERA-AKAGERA WETLAND SYSTEM

NATURE

The Rweru-Mugesera-Akagera wetland complex in Burundi, Rwanda, and Tanzania is one of the largest wetland areas in the basins surrounding Lake Victoria. Large areas of papyrus swamps and several open water lakes cover this area, providing home to a wide array of birds and wildlife. Evergreen bushland is the dominant natural vegetation type in the terrestrial areas around the wetlands, interspersed with grassland. Only small patches of forest occur.



This landscape comprises interconnected transboundary wetland complexes encompassing the Lacs du Nord-protected landscape in Burundi, the Akagera National Park in Rwanda, and the wetland ecosystem of Burigi-Chato National Park in Tanzania. For this study, delineation of this landscape extended 20 km from the wetlands into the surrounding area. Beyond the landscape, the Kagera River and its tributaries contribute 7.5 billion m^3 of water per annum into Lake Victoria (Hagai, 2019), supporting 40 million people.

The swamp-fringed lakes contain incredible biodiversity and rare species like the shoebill stork. More than 400 bird species have been recorded here. Akagera National Park supports a rich, recovering wildlife population that

LANDSCAPE AT-A-GLANCE

- **Total population:** 7.5 million (5.4M in Rwanda; 1M in Tanzania; 1.1M in Burundi)
- **Average population density:** Very high ~3,495 people/km^2 (largely due to proximity of Kigali in Rwanda)
- **Rural population:** 99% in Burundi; 88% in Rwanda; 99% in Tanzania
- **Land area:** 2,146 km^2
- **Area under protection:** Akagera National Park in Rwanda, one of the largest protected wetlands in East Africa (1,122 km^2); Lacs du Nord (187 km^2) in Burundi; Burigi-Chato National Park (4,707 km^2) in Tanzania
- **Important transboundary assets:** Finding transboundary solutions to conserving these wetlands is critical to the well-being of millions of people who live in and around this landscape. The wetland complex is part of the Kagera River Basin that contributes 7.5 billion m^3 of water per annum into Lake Victoria (Hagai, 2019). The nearly 40 million people the lake supports comprise one-third of the region's population (IPSI, 2018).

includes reintroduced populations of lion and black rhinoceros, which makes it the only Big Five park in Rwanda and a tourism draw for international gorilla visitors. The restoration of this park from its previously degraded status 20 years ago has been a success story for Rwanda and the region. Populations of large wildlife species such as elephant and buffalo also remain in Tanzania's Ibanda-Kyerwa National Park and Kimisi Game Reserve (Masalu, 2008).

NATURE'S BENEFICIARIES

Nature underpins the livelihoods and well-being of all of the 7.5 million people living within this landscape, as well as the additional 32.5 million people living in areas around Lake Victoria that are impacted by the health of these wetlands. Following is a look at key stakeholder groups.

Smallholder farmers, cattle keepers, fishers, and handicraft artisans

Agriculture is the dominant livelihood activity. Pastoral and agro-pastoral groups are present and most households own some livestock (FEWS NET, 2012). The southeastern region of Rwanda, northeastern region of Burundi, and northwestern region of Tanzania have become known for the large-scale production of bananas, which provides a source of food and income for most households. Market access is good throughout this region and other cash crops include beans, maize, cassava, and in some areas, coffee. Particularly in the Rwandan portion of the landscape, wetlands have also become the sites of large-scale agro-industrial developments like sugar cane plantations, resulting in substantial habitat loss (Nsengimana, Weihler & Kaplin, 2017).

The landscape's fisheries support more than three million livelihoods and bring in $500 million in revenue annually (WB, 2016). Local communities depend on natural capital in numerous other ways, including water for domestic use, rice growing, cattle grazing, raw materials for handicraft-making, and medicinal plants.

Energy sector and national water supply agencies

The wetland supports the 80 MW Regional Rusumo Falls Hydro-electric Project. This is located at Rusumo Falls along the Kagera River on the border between Rwanda and Tanzania and about 25 km downstream of Burundi. Downstream, the landscape provides the largest inflow into Lake Victoria and therefore impacts water supply for major urban centers like Kampala, Mwanza, and Kisumu. The invasive water hyacinth weed and pollutants flowing into this lake from the wetland affect water quality and therefore increase costs of water treatment for supply to these urban centers.

Tourism sector

Nature-based tourism directly contributed $5.3 million to GDP in 2018. The biggest contribution (49 percent) of this income was from Akagera National Park, tropical Africa's largest protected wetland.

Other private sectors

There are several other private sector industries that rely on access to natural capital. These include agriculture, fishing (within the wetland complex, along the Kagera River, and downstream in Lake Victoria), and mining.

NATURE'S GUARDIANS

There are a range of stakeholders at the local, national, regional, and global levels, who influence stewardship of natural capital in this landscape.

Community groups

Co-management initiatives – where the community collaborates with the Lake Victoria Environmental Management Program (LVEMP) – also support watershed management.

National and regional policymakers

The EAC, Lake Victoria Basin Commission, and Partner States, including Burundi, Rwanda (REMA), Tanzania (EMA), Kenya (NEMA), and Uganda (NEMA), play a key role in stewarding the region's natural capital.

International development partners and NGOs

LVEMP is conducting a program to revive the basin by restoring livelihoods, which involves communities in all five countries in watershed management and land rehabilitation. A total of 600 community-driven development projects involving 200,000 people are getting support for environment-friendly livelihoods.

NATURAL CAPITAL VALUE

This is an overview of the estimated value of each ecosystem service, as well as key insights to guide stakeholders toward improving protection of the natural capital that provides these services. The full assessment contains further details and analysis. **Total estimated value**: $300/ha/yr on average to East Africa; more than $34,600/ha/yr globally.

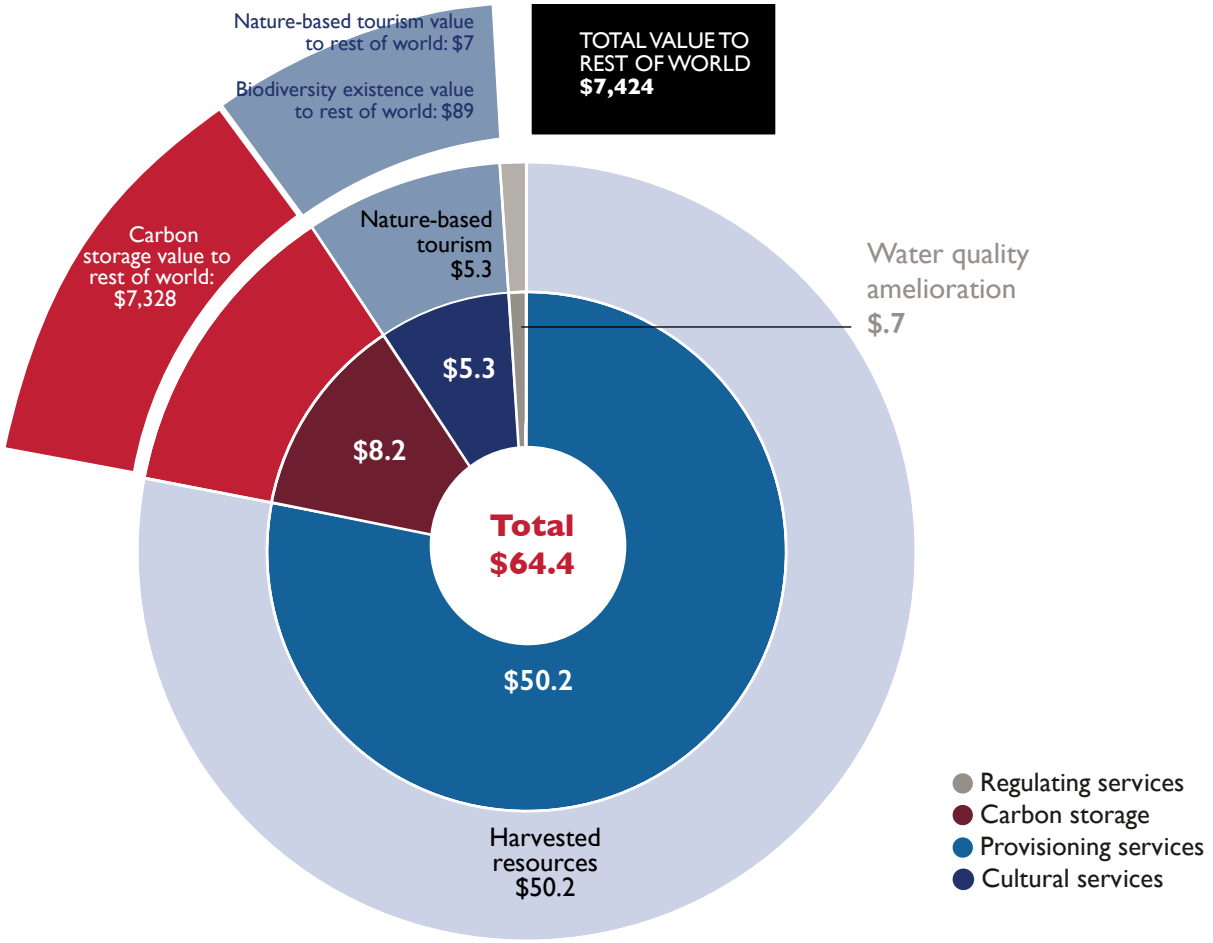


Figure 9. U.S. dollar value of ecosystem services in millions per year in Rweru-Mugesera-Akagera Wetland System

REGULATING SERVICES

Water quality amelioration: *$0.7M/yr*

PROVISIONING SERVICES

Harvested resources: $50.2M *($12.4M in Burundi; $26.1M in Rwanda; $11.7M in Tanzania)*

CARBON STORAGE

Regional value: $8.2M/yr *(in avoided costs due to storage of an estimated 92M tons of carbon)*

Value to rest of world: $7.33B/yr *(in avoided costs from storage of same stocks)*

CULTURAL SERVICES

Nature-based tourism: $5.3M/yr *($4.5M and 28,800 jobs in Rwanda; $0.7M and 260 jobs in Tanzania; $0.08 and 16,703 jobs in Burundi)*

KEY INSIGHTS

1 Harvested material is the most important ecosystem service.

Although wetlands are important for providing buffer, to flooding or overflow plains, reducing maximal flow rate, during the rainy season, and maintaining relatively high flow rates during the dry season, this wetland system is most valuable to the surrounding communities through provision of natural material for food and building. At $50.2 million, these provisional service, were 10 times more valuable than nature tourism at $5. 3 million in 2018 (USAID, 2021).

2 Sediment and phosphorus retention support fisheries in Lake Victoria.

Downstream from this landscape in Lake Victoria, fisheries support more than three million livelihood, and accrue $500 million in revenues annually (WB, 2016). The catchment areas of the wetlands play a significant role in preventing excess nutrients from reaching this important lake by capturing 2,700 tons of phosphorus and 7,000 ton, of nitrogen per year. If these nutrient loads reached the lake, water quality amelioration costs would be an estimated $726,000 per year (USAID, 2021).

3 Tourism has great potential in this wetland.

The Burundi-Rwanda-Tanzania wetland confluence shows great potential as a growth area for tourism. Rwanda's Akagera National Park, whose northern section shares a border with Tanzania. 's Ibanda Game Reserve, is currently the country', most visited national park. Akagera National Park generated $1 million in 2018 from 44,000 largely (60 percent) local tourists. The Burundi portion of the wetland has the Lacs du Nord protected area, which earn, $0.03 million per year, while Ibanda-Kyerwa National Park in Tanzania's portion has minimal tourist activities. This wetland system is crucial for the protection of birdlife and supports a number of globally threatened species and restricted range species. The transboundary 100km^2 Lake Rweru in northern Burundi and south eastern Rwanda is famous as the most distant startpoint of the Nile River. The Kagera River arises, from the northern part of the lake, on the Rwandan side. Eighty percent of the lake is in Burundi and provides an opportunity for nature tourism.

In 2018, while global tourism was recording on average 6 percent growth, the sector in Tanzania experienced 13 percent growth. In tlhat year, there were 1.5 million visitors and $24 billion in revenue. The government of Tanzania upgraded Ibanda-Kyerwa from a game reserve to a national park.

PHOTO: BGSTOCK72

Akagera National Park in Rwanda

THE COST OF INACTION

PROJECTED OUTCOMES BY 2050 IN A BUSINESS AS USUAL SCENARIO

TOP THREATS

1. Reduction and fragmentation of wetland habitat
2. Over-extraction of natural resources
3. *Impacts from climate change that will exacerbate threats*
   Temperature and precipitation changes

STRESSES ON NATURAL ENVIRONMENT

4. Changes in habitat type, connectivity, and biodiversity
5. Changes in aquatic flora
6. Changes in vegetative and soil cover
7. Changes in hunting pressure on wildlife populations
8. Changes in freshwater quality, quantity, and flow

1 Reduction and fragmentation of wetland habitat

Fertile soils and enhanced water availability throughout the year make wetlands attractive sites for cultivation (Kassenga, 1997; Dixon & Wood, 2003; Khan et al., 2019), causing extensive conversion of habitats. Ongoing population growth and increased scarcity of land have also pushed people into more marginal areas (Dixon & Wood, 2003). Urbanization and infrastructure development are also key threats.

2 Over-extraction of natural resources

Extensive use of reeds and sedges is a distinguishing feature of this landscape, with resources extracted for handicrafts, building, food, and medicine. It is estimated that demand for papyrus from communities surrounding the wetlands will increase by 84 percent by 2050 in a business as usual scenario, which could have a substantial impact on papyrus stocks. Bushmeat is also harvested for consumption and sale, with 7 percent of households harvesting small mammals and birds. In Burundi, fishing is extensive, with catch totaling 3,600 tons in 2018 (Ministry of Environment Agriculture and Livestock, 2020). Demand for fish is predicted to rise, with a 113 percent projected increase by 2050.

3 Temperature and precipitation changes

Mean annual precipitation will increase by only 9 mm. Rainfall will decline 6-8 percent (mostly in August-September), but will increase 12-15 percent in the December - January wet season. Mean annual temperature is expected to increase by 2.7°C on average, with an increase by at least 2.8°C in June-October.

4 Changes in habitat type, connectivity, and biodiversity

Approximately 30 percent of swampland (90,000 ha) has been lost to cultivation in the Rwandan portion of the Akagera Basin (Republic of Rwanda, 2010). Remnants of non-aquatic natural habitat are limited to the remaining portion of Akagera National Park and surrounding areas, as well as parts of the Tanzanian portion of the landscape.

5 Changes in aquatic flora

Invasive species add to habitat degradation. Water hyacinth has spread extensively (across an estimated 100,000 ha), displacing native papyrus vegetation, invading open water and contributing to reduced water levels in lakes and within Akagera National Park.

6 Changes in vegetative and soil cover

Vegetation is being converted to numerous other land uses as a result of several pressures. Forest, woodland, and swamp are being converted at a rate of approximately 500-1,000 ha per year.

7 Changes in hunting pressure on wildlife

Wildlife are under threat from hunting and habitat conversion. Though enforcement has reduced hunting pressure in Akagera National Park (Apio et al., 2015), only a few wildlife species live outside the park.

8 Changes in freshwater quality, quantity, and flow

Expanded cultivation degrades wetlands through increased export of sediments and nutrients (Khan et al., 2019; Wasige et al., 2012). Urbanization drives toxic chemical runoff in waterways (Nabahungu, 2012). The invasive water hyacinth has also reduced water availability and filtration capacity.

This synthesis assessed the current (2018) threats to wildlife and wildlife habitat and their projected impact by 2050 under a business as usual scenario. Note that projections consider climate change and assume full recovery from the current impacts of COVID-19.

IMPACT ON ECOSYSTEM SERVICES BY 2050	IMPACT ON ECONOMIC AND HUMAN WELL-BEING
9 Reduction in value of cultural services	13 Negative impact on livelihoods
10 Potential increase in cost due to loss of regulating capacity	14 Reduction in food and water security
11 Increased cost due to loss of carbon storage capacity	15 Negative health impacts
12 Potential reduction in value of provisioning services	

9 Tourism revenue: +1.8 percent

This assumes Akagera National Park continues to be effectively managed. Value will plateau around 2040 due to limited size of park and loss of wildlife attractions elsewhere in wetlands. (Increase is in Rwanda; estimated revenue decline of 9 percent in Tanzania and 8 percent in Burundi.)

10 Capacity to maintain water quality and quantity: decrease (more study needed)

Continued land conversion to agriculture and intensification of cultivation will lead to greater sediment and nutrient runoff into wetlands. Increased water abstraction to meet demands by industry and growing population could lead to substantial reduction in available water. Population growth will lead to more sewage and other contaminants entering the system. Papyrus swamps play a key role in removing sediments, nutrients, and other pollutants. However, as vegetation is removed or outcompeted by the invasive water hyacinth, the ecological function of the wetland system could be compromised, creating greater costs for water treatment infrastructure.

11 Carbon storage: -1.5 percent

Wetland degradation is expected to increase the severity of local and global climate change. Carbon storage could decline with a release of 5.9 MtC, representing an increase of $110,000 in damages.

12 Follow up studies can determine the economic impact on provisioning services. Livestock production is projected to increase, while crop pollination and resources available for harvesting are projected to decline.

This assessment valued the cost of inaction associated with the potential loss of nine valuable ecosystem services. Further study is recommended to gauge the broader cost to the economy, jobs, and human well-being under a business as usual scenario. A few initial projections:

13 Negative impact on livelihoods

The Kagera River inflow to Lake Victoria supports an estimated 153,066 fisherfolk and 798,000 jobs in the fishing industry (for Kenya alone). These livelihoods are at risk of disappearing as water quality and fisheries decline. 80 percent of tourism jobs in Burundi and 8 percent in Tanzania could be lost, while Rwanda would see an increase in 46 percent due to investments in the landscape.

14 Change in food security

With demand for fish predicted to increase by 113 percent, people may be unable to meet their nutritional needs. As invasive species and eutrophication threaten the integrity of the wetland to regulate water quality, people may become water insecure.

15 Negative health impacts

The Akagera River is highly polluted with nutrients beyond the recommended level for aquatic life development in fresh water (Wali et al., 2011). Also, schistosomiasis (Bilharzia) risk is high in the wetlands, where infection is transmitted by snails living in the water. This is a risk to socio-economic development and quality of life. Though data were not available, a recent assessment suggests that eliminating sickness and death from bilharzia and soil-transmitted helminthiasis in Rwanda by 2030 could boost the countries' Gross Domestic Product (GDP) by $0.4bn (Kuteesa, 2020).

POLICY CONSIDERATIONS

Creating solutions for protecting natural capital will take all stakeholders working together across sectors and national boundaries. The team is currently engaging an array of stakeholders in a dialogue about policy priorities and in the development of a transboundary action plan.

Primary policy goals: Reduce unsustainable resource and land use and clear invasive alien hyacinth.

The wetland's potential economic and ecological value has been eroded by the encroachment of agriculture and livestock, overharvesting, and the invasion of the alien hyacinth. It could sustain a much more significant wildlife landscape if some of the surrounding areas were restored to suitable habitats. Hence, tourism value is currently limited – centered primarily on Rwanda's Akagera National Park. At present, this landscape's most important local benefit appears to be the provision

of natural resources that are typically harvested by poor households, which support subsistence needs and commercial ventures. The estimated value of these services is particularly high considering the small area covered by the wetlands relative to the other landscapes in the study.

To reduce unsustainable resource and land use, policy discussions should focus on the following priorities:

1 Taking a transboundary approach to protecting and ensuring wise use of wetlands

This wetland system plays a significant role in preventing excess nutrient loads from reaching Lake Victoria and in supporting the livelihoods of people who live in and around the landscape in Burundi, Rwanda, and Tanzania. More sustainable wetlands management is needed to combat a range of threats that affect all three countries. This will require a transboundary engagement that harmonizes policies on wise use of wetlands, e.g., categorization of wetlands as protected zones where no infrastructure developments or other wetland-degrading activities are allowed.

In Rwanda, the enactment of Environmental Law No 48/2018 of 13/08/2018, which contains explicit provisions on sustainable wetlands management, was a step in the right direction. But it requires complementary legislation in Burundi and Tanzania. Community involvement and improved awareness of the value of natural capital will be critical to achieving a similar, sustainable policy-level result.

The NBSAPs of all countries propose granting access permits to local communities living adjacent to protected areas for sustainable harvesting and extraction of medicinal plants (CBD, 2020). But due to inadequate regulations and weaknesses in the implementation of existing laws and regulations, wetland conversion and over-harvesting of high-value plant species persist (CBD, 2020). Coordinated improvements in NBSAP implementation, as well as the enforcement of existing laws and policies, is needed.

2 Enhancing nature tourism and diversifying people's livelihoods

One-third of the Lake Victoria Basin population, including those in this landscape, are poor (living on $1.25/day or less (WB, 2016). Poverty is a key driver of unsustainable wetland resource harvesting. Programs that incentivize or facilitate alternative, environment-friendly livelihoods would draw pressure away from nature. The landscape's unique biodiversity, combined with livelihood-focused interventions to support it, have the potential to radically transform the local economy.

Tourism is one possible engine for transformational change. However, while the funding of Akagera National Park has resulted in growth and benefits, the Lacs du Nord protected area and Ibanda-Kyerwa National Park are not meeting their tourism potential due to insufficient funding. Private sector investment and marketing could enable the development of attractive tourism services and products that incentivize wetlands conservation.

Other interventions could focus on the fisheries sector, which is at risk due to eutrophication and invasive alien species. One successful intervention, the World Bank-funded LVEMP established in 2016, is currently in its second phase and offers a potential model. The program has initiated over 600 community-driven development projects that support environment-friendly livelihoods – including stall feeding to reduce dependence on grazing; fish farming to reduce pressure on Lake Victoria wild fisheries; and using biogas to lower dependence on fuel wood. To date, the project has supported more than 200,000 people (WB, 2016).

3 Controlling invasive alien species

Controlling invasive alien species and their impacts is a major challenge, particularly the water hyacinth (*Eichhornia crassipes*), a noxious aquatic weed that deprives the waters below of oxygen and affects brooders and juveniles of tilapia, a key fisheries species. This weed also creates numerous hazards for local residents. In Rwanda, the species has driven Lake

Kishanju to evaporate to the point of a wetland, along with the fisheries-based livelihoods it supported (REMA, 2016). Water hyacinth continues to spread to other water bodies with ease, affecting biodiversity and livelihoods and necessitating urgent control and eradication measures.

Downstream in Lake Victoria, the weed has had a multitude of direct and indirect effects on many aspects of human life following its invasion in 1989, including on fisheries (impairing fishing, breeding, and nursery grounds), water supply, hydroelectric power generation, human health, agriculture, transport, aquatic biodiversity, evapotranspiration, and increased cost of water treatment (Makhanu, 1997). As a regional problem, the EAC Partner States need a joint approach to its management.

KEY STAKEHOLDER GROUPS

Stakeholder group	Call to action	Benefits to stakeholder
Smallholder farmers, cattle keepers, fishers, and handicraft artisans	• Promote sustainable extraction and rehabilitation of natural resources, including lucrative medicinal plants • Address bush burning in Tanzania • Clear alien invasive species and rehabilitate degraded areas	Continued sustainability of livelihoods and natural resource based income-generating activities
Energy sector and national water supply agencies	Advocate for continued upstream management to preserve downstream flow	Continued profitability and power generation capability using existing infrastructure
National water supply agencies	Support PES for clean water and reduced water hyacinth invasion	Continued availability of water to clients
Tourism sector	• Continue investing in Akagera National Park as a Big Five destination • Invest more in tourism for the other two protected areas, including pursuing private sector investment in new offerings • Reinvestment of profits into wildlife conservation	Increased opportunities for revenue, as well as broadening and stabilizing of the market
Fisheries sector	• Within landscape – practice sustainable fishing and address water hyacinth removal • Downstream (in Lake Victoria) – support PES for controlling eutrophication and invasive water hyacinth	Increased catches of key fisheries species and sustainable income
Community groups	• Identify community priorities for sustainable use of resources and participate in development of management plans for the wetlands • Capitalizing on gorilla tourism, participate in CBNRM and community-based tourism endeavors to restore additional areas around the current wetlands to wilderness status	Sustainable access to natural resources like papyrus and other key wildlife products, as well as more livelihood opportunities or jobs
National and regional policymakers	• Harmonize policies across borders on wise use of wetlands and controlling invasive species • Improve enforcement • Support environment-friendly livelihoods	Support for integrated water resources management, as well as the process driven by the Lake Victoria Basin Commission
International development partners and NGOs	Support local and regional agendas	Conservation of biodiversity and carbon storage

Elephants, Kenya

Silhouette of a lion against the African sunset

PHOTO: EO

V. NEXT STEPS

The value of these four iconic landscapes is indisputable. It lies not just in their intrinsic beauty and cultural significance, but, as this synthesis shows, in the services their ecosystems provide to support economic and human well-being across the region. However, the threats to natural capital in East Africa are significant. In addition to population growth placing ever-increasing pressure on resources, climate change stands to exacerbate environmental and economic challenges on an unprecedented scale.

There are many stakeholders who benefit from and steward natural capital in this region. They share a mutual dependence on preserving the ecosystems that underpin all aspects of life, and therefore need to unite around shared solutions to conservation and sustainable development. That's why this study was conducted at the landscape level. Because upstream actions have downstream consequences, and the interests of each country, sector, community, and species are intimately connected.

A transboundary approach is critical to ensuring conservation of East Africa's natural capital. The team has already convened hundreds of stakeholders at the landscape, national, and regional levels to review and validate the data, as well as develop a draft action plan. The draft plan emphasizes the importance of prioritizing nature-based solutions, which the UN's International Union for the Conservation of Nature defines as: "actions to protect, sustainably manage, and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits." In other words, decision makers in both the public and private sectors should work together to invest in healthy ecosystems that provide benefits to people, business, and nature. Under the guidance of the East African Community and Partner States, the action plan will be finalized by early 2022.

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PHOTO: GUDKOV ANDREY

Close up of an African lion

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