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SOUTH SUDAN

Natural Resources Review

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Acknowledgments

This review captures the interplay between development and natural resource management in the wider context of political and social instability. The report was developed to promote sustainable and resilient development of South Sudan's renewable natural resources in service of inclusive economic growth and diversification.

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Abbreviations

BBJL	Boma–Badingilo–Jonglei landscape
CAMP	Comprehensive Agricultural Master Plan
CFA	community forestry association
CFM	community forest management
EAC	East African Community
EIA	environmental impact assessment
ETC	Equatoria Teak Company
g	gram
GDP	gross domestic product
ha	hectare
IUCN	International Union for Conservation of Nature
KBA	key biodiversity area
kg	kilogram
km	kilometer
kt	kiloton
kWh	kilowatt-hour
m	meter
mm	millimeter
MLF	Ministry of Livestock and Fisheries
MoEF	Ministry of Environment and Forestry
MT	megaton
$MtCO_2e$	metric ton of carbon dioxide equivalent
MWCT	Ministry of Wildlife Conservation and Tourism
NGO	nongovernmental organization
NRMG	Natural Resources Management Group
NTFP	nontimber forest product
R-ARCSS	Revitalized Agreement on the Resolution of Conflict in South Sudan
SPLM/A	Sudan People's Liberation Movement/ Sudan People's Liberation Army
SSFA	South Sudan Forest Authority
t	metric ton

All dollar amounts are US dollars unless otherwise indicated.

Extended Summary

Natural resources abundance and dependence

South Sudan's extensive renewable natural resources are critically important to its predominantly rural population, which relies on largely subsistence livelihoods and has limited access to the market economy. Until recently, almost all South Sudanese lived directly off the land, while the limited urban centers were inhabited by colonial and then northern administrators and traders. Recent decades of conflict have seen widespread displacement and rapid urban growth, but most of the population is still rural and relies largely on subsistence lifestyles. A low human presence has left the country with vast areas of largely natural habitat that remain critical to sustaining livelihoods. Approximately 75 percent of the population relies directly on local ecosystems for essentials like food, clean water, and energy (Fedele et al. 2021). Large Nilotic tribes like the Dinka, Nuer, and Shilluk all depend on their livestock resources and access to vast areas for grazing,[1] as well as wild foods and medicinal plants (Grosskinsky and Gullick 2000). Populations along the Nile and its major wetlands depend to a large extent on fish, and some communities in areas of richer soils have substantial histories of sedentary agriculture. Communities displaced or cut off from regular livelihoods during conflict often turned to bushmeat for survival.

Fishing is key to the livelihoods of more than one in six South Sudanese, makes a huge contribution to overall nutrition, and generates significant local government income. Roughly 2.1 million people are estimated to be members of households where at least one person is fishing (RSS 2016b), with around a quarter of a million active fishers, some 10 percent of whom are full time. In the states with the most productive fisheries (the Upper Nile, Jonglei, and Unity States), the proportion of the population engaged in the sector reaches 30 percent or more. Fishing is also a vital coping livelihood strategy for communities affected by flooding. Mean per capita fish consumption has been estimated at around 17 kg per year, roughly equivalent to 46 and 20 percent, respectively, of the average animal and total protein consumption in South Sudan.[2] Micronutrients in fish also play an important role in growth and cognitive development.

Harvested products are critical to the livelihoods of the rural population. Wood-based fuels provide around 96 percent of the household energy used for cooking (RSS 2016a). Wild foods from forests and grasslands– fruits, honey, vegetables, nuts, and bushmeat–make significant contributions to dietary diversity and nutrition, and provide a sustainable source of protein and vitamins in local diets, especially during periods of food insecurity. Many forest products are also important sources of cash income, including poles, timber, fuelwood, and thatching; and commercial nontimber forest products (NTFPs), such as shea, gum arabic, honey, and bushmeat. Traditional medicine is also an important element in the South Sudanese society.

South Sudan's formal economy is based on oil production, but mineral wealth has not effectively supported broad-based national development. The oil sector accounts for 70 percent of gross domestic product

[1] Source: United Nations Operation Lifeline Sudan Southern Sector Food Security surveys, 1995–2005, available from the Sudan Open Archive, accessed September 2024.

[2] Source: FAOSTAT, South Sudan–Food Security and Nutrition Indicators, accessed March 2024.

(GDP), almost 90 percent of exports and more than 90 percent of public revenues; but per capita GDP has fallen by over a third since independence in 2011, due to the war from 2013 to 2018 and a variety of oil price and climate shocks.[3] There is little evidence that oil revenues are effectively channeled toward national development. Every auditor general report issued since 2006 has documented systematic corruption, and these reports have not been publicly released since 2008. South Sudan experienced a decrease in adjusted net savings of around 10 percent from 2015 to 2019 (World Bank 2021), largely because the ongoing exploitation of nonrenewable resources has not been used to build other forms of capital. Since early 2024, oil exports have been disrupted because of challenges in maintaining the pipelines through Sudan, resulting in an acute fiscal crisis for government, and emphasizing the ongoing need for South Sudan to diversify its economy away from dependence on oil.

Renewable and nonrenewable natural resources have also been entwined with the almost continual history of conflict in the country since Sudan's independence in 1956. Under Sudanese rule, Southern Sudanese were largely excluded from government and commerce, including the control and use of resources; by the second war for independence, resentments had crystallized around the lack of oil revenue sharing and the development of the Jonglei Canal, which was perceived to threaten the livelihoods of many South Sudanese for the benefit of downstream Sudanese and Egyptian farmers. The new ruling class that emerged from the independence movement was also fractured by old tribal rivalries over land, further exacerbated by competition over access to oil revenues; this precipitated a new civil war in 2013, just two years after full independence. Since the end of the second civil war in 2018, ongoing tribal and political rivalries have continued to fuel low-level conflict, particularly in rural areas, and are often triggered by disputes over land and resources.

[3] Source: African Development Bank, South Sudan Economic Outlook web page, accessed March 2024.

Decades of conflict and displacement have not only left much of the population dependent on local resources, but also undermined their management and the contribution of renewable resources to lifting the South Sudanese out of dire poverty. Despite its wealth of land and resources, South Sudan has not achieved food self-sufficiency since 2009, largely because of conflict and climate shocks (Saidi et al. 2020). Nearly 2 million people are internally displaced, including 600,000 from recent flooding, and over 2 million live as refugees abroad. Despite vast tracts of arable land, only 5 percent is cultivated. As of September 2024, 9 million people, representing 73 percent of the country's population, require humanitarian assistance (WFP 2024), similar to the proportion recently estimated to live in extreme poverty (UNICEF 2023). Over 7 million people were severely food insecure in the April–July 2024 lean season (IPC 2023). South Sudan's human development index value for 2022 is 0.38, positioning it at 192 out of 193 countries and territories.[4] Women and girls are disproportionately affected in terms of poverty, lack of access to basic services, and overall constraints in becoming active participants and contributors to economic activities.[5] Only 7.7 percent of the population has access to electricity (2021), paying some of the highest tariffs in Sub-Saharan Africa at $0.4/kWh.

Renewable natural assets and potentials

Fisheries

South Sudan is estimated to have one of the most productive freshwater fisheries in the world, driven by the highly variable annual flood dynamics. The country is centered on the White Nile floodplain, with the vast Sudd

[4] United Nations Development Programme Human Development Index, accessed November 2024.

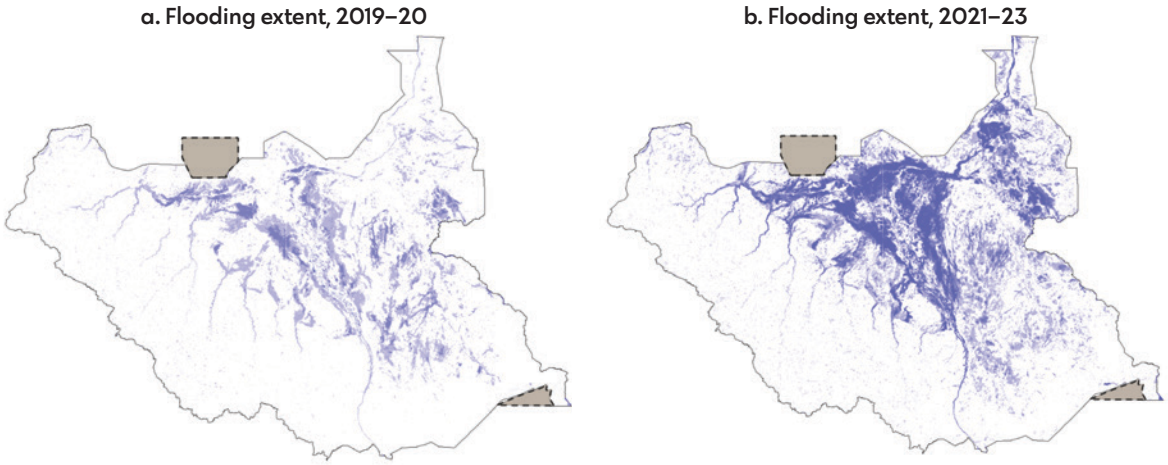
[5] Source: US Agency for International Development, South Sudan: Gender Equality and Women's Empowerment web page, accessed November 2024.

wetland at its heart (map ES.1). Tropical floodplain fisheries are conservatively estimated to produce around 100 kg fish/ha, and are relatively robust to exploitation. In recent times up to 2019, an area of around 40,000 km^2 was often inundated, providing a potential sustainable yield of around 400,000 t. Since 2019, more extreme floods—driven primarily by higher upstream flows in the White Nile, coming from the Lake Victoria and Albertine Great Lakes basins—have inundated areas of between 100,000 and 200,000 km^2. Recent potential yield might therefore be in the range of 1–2 million t, rivaling the most productive inland fisheries on the planet.

Current catch is estimated to be significantly lower, at around 300,000 t per year, with much of its potential value lost due to poor handling and very limited cold chain infrastructure. The catch may potentially be worth at least $300 million at local market prices for fresh fish. However, roughly 70 percent of this potential value is lost through postharvest physical and quality loss, and (accounting for the largest part) the opportunity cost of inability to transport fresh fish to market. Over 80 percent of fish sold is processed to facilitate preservation and transport, involving around a 40 percent loss of value in fresh weight equivalent terms. In addition, foreign traders dominate fish export and capture most of the value added in more lucrative regional markets. Around a sixth of the catch is exported, particularly to the Democratic Republic of Congo, where prices are roughly double those in South Sudanese markets.

Modest improvements in the management of the fisheries sector could potentially generate tens of millions of dollars in added value for South Sudan. Reducing postharvest losses (including opportunity costs) by even a modest amount could save tens of millions of dollars per year at current catch levels. In addition, if robust monitoring and management of fish stocks is established and confirms that a sustainable increase in average catches is feasible, there is considerable potential for expanding exports. Doubling the volume of exports and capturing 50 percent of the value of export markups would grow the value of fish exports from perhaps around $30 million to something closer to $100 million per year. Longer term, there should also be opportunities to access higher-value intercontinental export markets that are already served by the Lake Victoria fishery, such as the Chinese market for swim bladders and the European market for frozen fish fillets. Ultimately, an ability to dramatically ramp up production and exports in high-flood years could generate much more substantial additional value in the sector, and enhance economic resilience to flooding at the national level.

Map ES.1 Extent of recent flooding in South Sudan



Source: United Nations Satellite Center, Flood monitoring over South Sudan, accessed November 2024.

Forestry

South Sudan has extensive forest cover with globally unique ecosystem integrity and low deforestation. South Sudan's forest cover of around 30 percent of the national land area (map ES.2) has been stable, and forests are a carbon sink. However, deforestation hotspots exist locally,[6] particularly associated with charcoal production around urban centers. South Sudanese forests have exceptionally high ecosystem integrity and may still contain commercially valuable native species, which neighboring countries have largely lost.

South Sudan had the oldest and most extensive teak (*Tectona grandis*) plantations in Africa, but after decades of unmanaged harvesting, they are no longer a commercial resource. No systematic inventory has been carried out, but it is estimated that there are only 20,000–30,000 ha of forest plantations remaining on government land. Most of these are unmanaged and in a state of disrepair, although still able to provide some poor-quality teak for local use. The Equatorial Teak Company manages the only long-term active plantation management concession, which covers around 3,000 ha under a 20– to 25-year rotation, with harvesting in the oldest stands scheduled for the early 2030s.

Restoration of the teak plantation industry could generate close to $1 million per year and 150 jobs per 1,000 ha on average. Close to a third of the country has the potential for community forest management (CFM), which could potentially generate over $1 billion per year in sustainable revenue from NTFPs. Sustainable management of forest and woodland resources through community forestry could provide wild food, construction materials, wood-based energy, employment, and income-generating opportunities to local communities. The potential for harvesting commercial timber—for example, mahogany (*Khaya* spp.)—from community forests on a sustainable basis exists in some locations, but cannot be quantified without inventory data. However, rough estimates are available for the production potential of some important NTFPs:

- **Shea** (*Vitellaria paradoxa* ssp. *nilotica*) production potential is estimated at 500,000 t per year, with about 30,000 t consumed domestically. Average annual exports of 100,000 t could generate an average of between $460 to $720 million per year.
- The three key **gum arabic** production states have about 4,596,000 ha of gum acacia resources, with an estimated annual gum production potential of 25,700 MT. The potential export value could reach around $150 million.[7]
- **Honey**'s annual production potential is 100,000 t and 5,000 t of beeswax, which would be worth around $550 million.[8]
- **Bamboo**'s annual production potential could be $452,000 (Indufor 2024).

Wildlife and tourism

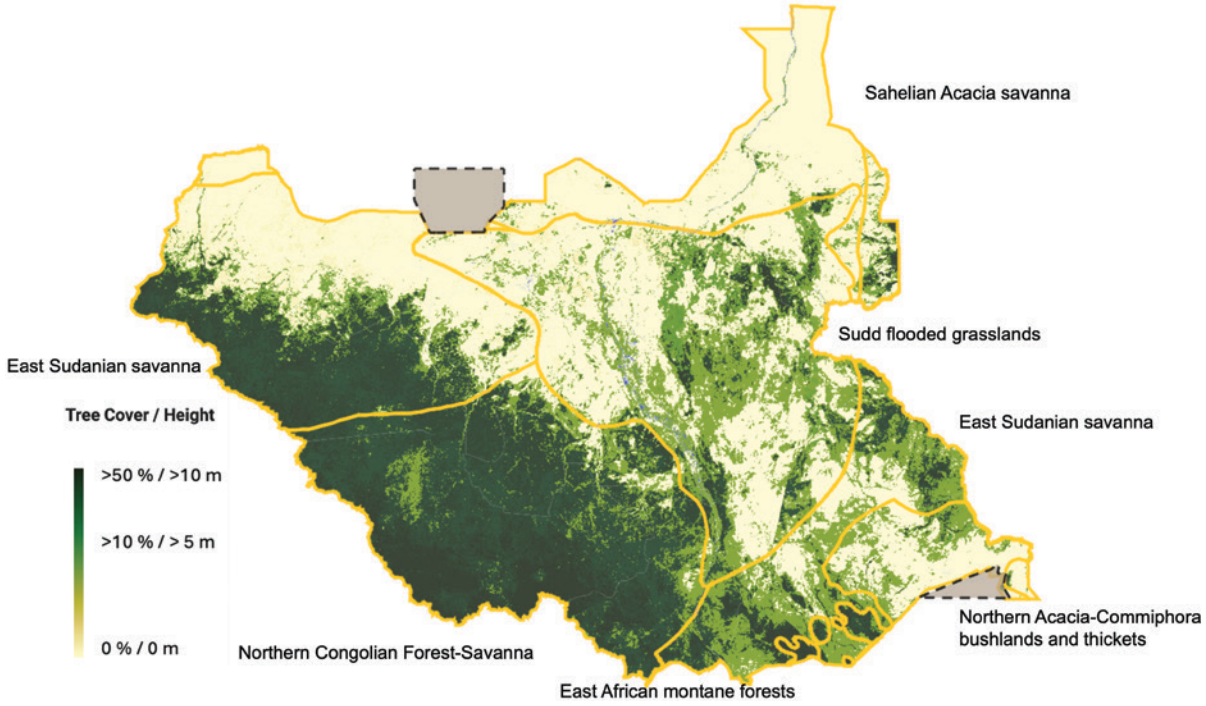
South Sudan retains vast and varied natural habitats with the potential to support world-class nature-based tourism attractions; but in most locations, wildlife populations have been reduced to a tiny fraction of their original numbers. In total, 27 protected areas exist in South Sudan, covering over 98,200 km²(15 percent of the total land area) and a good selection of ecosystems. This includes one of the world's largest seasonal wetlands, the Sudd (map ES.3). However, most of these are typical "paper parks," with little active management on the ground and without clearly defined legal or physical boundaries. Overall, evidence from recent national surveys and historical documentation indicates a 90 percent decline of large wildlife across the country, despite vast remaining natural habitats and low human population densities. The proliferation of automatic weapons since the 1980s and the

[6] Source: United Nations Environment Programme South Sudan Community Forestry web page, accessed February 2024.

[7] Source: World Integrated Trade Solution, Natural Gum Arabic exports by country in 2021, accessed July 2024.

[8] Authors' calculations based on prices for the main East African producers from IndexBox (2024a, 2024b), KNA (2022), and Koch and Appotive (2016).

Map ES.2 Forest cover and ecoregions in South Sudan



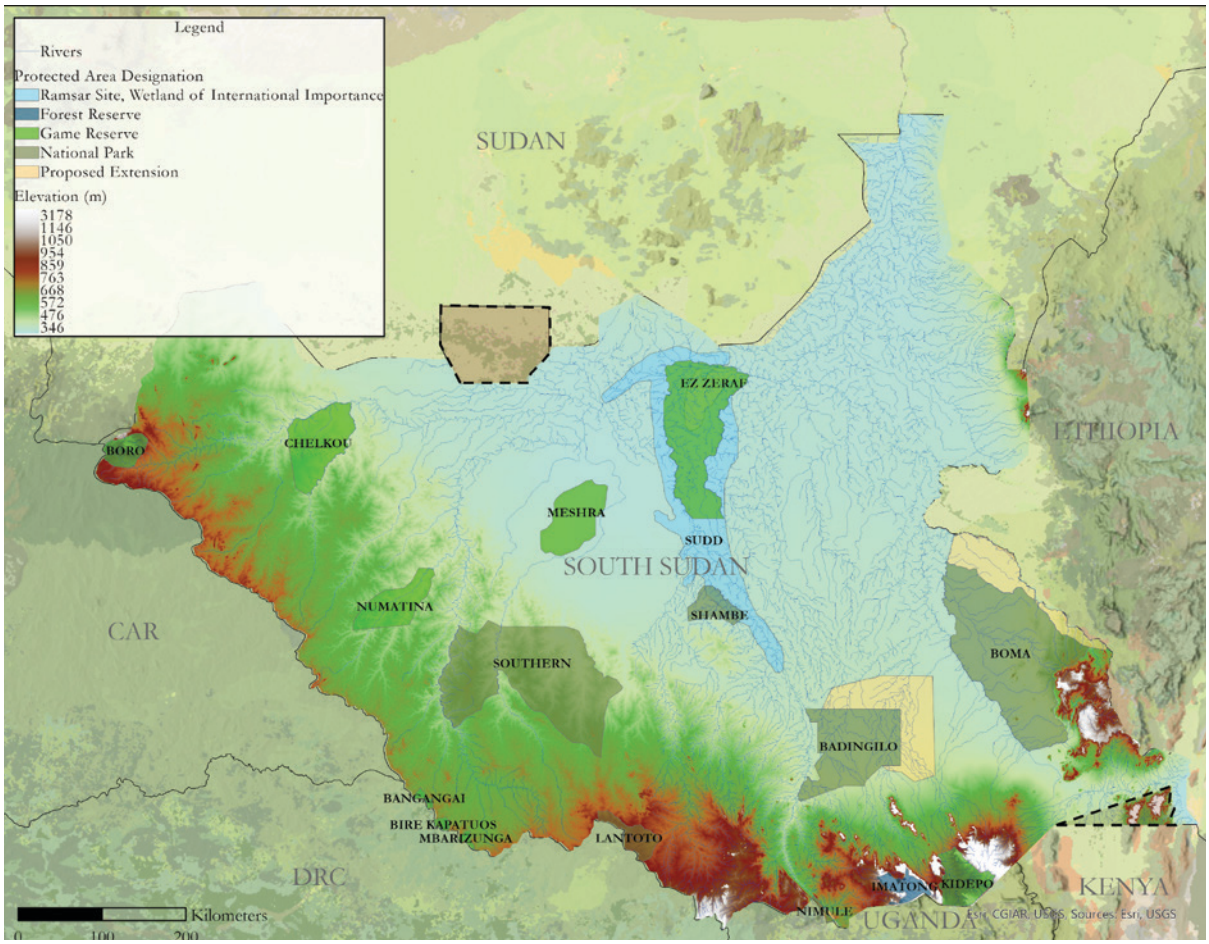
Source: R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

high prices of ivory and rhino horn have been the driving force behind significant declines in sedentary wildlife populations, including the extirpation of rhinos. Throughout the protected area system, permanent water sources are rare and increasingly monopolized by humans, squeezing wildlife into restricted zones.

The Boma-Badingilo-Jonglei landscape (BBJL) in the southeast of South Sudan is an exception to the national picture of decline, supporting around 6 million migratory ungulates—more than twice the number in the Serengeti. The BBJL borders the Sudd and covers ecologically pristine floodplains of over 150,000 km^2 in South Sudan, extending into a much smaller area of Ethiopia. Systematic aerial surveys completed in 2023 revealed that the BBJL is home to approximately 5 million white-eared kob (*Kobus kob leucotis*), making them the most populous species of large ungulate on Earth; 347,000 mongalla gazelle (*Eudorcas albonotata*); 300,000 tiang (*Damaliscus lunatus tiang*); and 160,000 bohor reedbuck (*Redunca redunca*). The mobility of these species allows them to avoid concentrated hunting pressure around dry season water sources, even while populations of sedentary species have declined in the BBJL. The landscape also supports significant populations of predators, especially lions and cheetahs, and probably the largest remaining vulture population in Africa. Including the Sudd, it also contains globally significant populations of waterbirds, including the vast majority of the global shoebill (*Balaeniceps rex*) population.

South Sudan's natural ecosystems support all rural livelihoods, but current direct financial revenues are very small. The hydrological and climate systems on which all agropastoral livelihoods depend are regulated by the country's vast natural habitats. Although there is no systematic valuation of South Sudan's ecosystems, some initial estimates have valued the ecosystem services of the Sudd alone at around $2.3 billion per year. Direct financial flows from biodiversity and wildlife are very small, however. Although significant profits were undoubtedly made in the past from commercial poaching of wildlife, this rapidly depleted populations on which tribal communities depend without returning value to them. Tourism

Map ES.3 South Sudan protected area network



Source: African Parks 2024.

within South Sudan remains nascent, with a handful of local companies running a total of 200 short tours per year, mostly close to Juba.

The potential for sustainable extractive use is estimated in the tens of millions of dollars, and longer-term potential for nature-based tourism is vast if security conditions were to improve. In the BBJL alone, well-managed harvesting of migratory antelope populations could provide for a sustainable annual offtake valued at around $61 million. If additional sedentary species such as elephant, giraffe, buffalo, zebra, hartebeest, roan, or others could be recovered to the levels of the 1980s, the overall offtake could potentially increase by between 10 and 20 percent. Much of this production would be consumed primarily locally, but opportunities to market sustainable bushmeat are also available. South Sudan has some of the most outstanding potential tourism assets in the world—vast and beautiful landscapes supporting traditional tribal lifestyles and the largest mammal migration on the planet, with ample opportunities to further enrich wildlife populations; and one of the world's largest wetlands supporting globally outstanding bird populations. Connectivity to regional transport hubs and tourist destinations is good, and there are also opportunities for transboundary tourism from Uganda. There may already be opportunities to develop high-end fly-in tented camps in remote locations where security can be managed. If security improves, South Sudan's long-term potential could compare to Kenya, Tanzania, and Uganda, where the tourism sector has in recent years contributed between 6.9 and 11.1 percent of GDP in recent years. For example, in 2024, tourism in Tanzania has recovered from the negative impacts of the COVID-19 pandemic, contributing an estimated $8.15 billion, or 10 percent

of the economy, and is projected to grow to about $12.4 billion over the next decade (WTTC 2024c). Furthermore, in 2023, the sector employed over 4 percent (Uganda), 5.7 percent (Tanzania), and 7.8 percent (Kenya) of the total workforce, showing almost a full recovery to pre-pandemic levels (WTTC 2024d, 2024b, 2024a).

Challenges

Prolonged conflict has undoubtedly had negative impacts on natural assets, and hinders their sustainable development; it has also restricted access to large areas and impeded land conversion. Conflict has weakened traditional authorities and customary management systems, caused a proliferation of weapons and lawlessness, and prevented investment in and establishment of modern management systems—leading to rapid depletion of high-value resources in many locations, including wildlife and teak. Ongoing weak security and governance pose multiple challenges. Unpredictable transport, including multiple checkpoints and informal taxation, greatly hampers the internal movement of goods; this is particularly problematic for highly perishable commodities like fish. Development of a large-scale tourism sector will remain impossible without significant improvements in general security. Nevertheless, instability has restricted access and land development in many parts of the country, allowing natural ecosystems to persist.

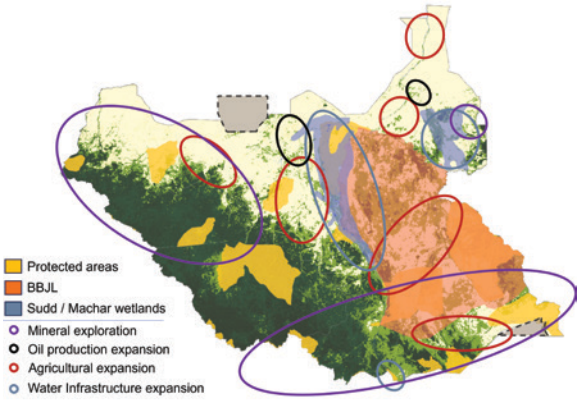
As South Sudan emerges from conflict and builds a modern state, the challenge is to institutionalize robust and inclusive natural resource management—building where possible on traditional systems—before increasing accessibility causes irreparable loss. At present, the main threat—at least to wildlife and forestry resources—comes from poaching by external actors who have no stake in the sustainability of the resource base. But pressures from competing land use, pollution, and increasing access and disturbance are rising and will continue to accelerate as South Sudan stabilizes and develops. Aquatic habitats and fisheries are particularly vulnerable to pollution, the introduction of invasive species, and the cumulative hydrological impacts of water infrastructure. While these threats are undoubtedly lower in South Sudan than in most countries, given low population densities and levels of economic activity, there are very little data and no routine monitoring to actually assess them.

Map ES.4 shows forest cover, major wetlands and protected areas (including the BBJL) in South Sudan in relation to approximate areas of threat from agricultural development, water infrastructure, oil production, and mining.

South Sudan needs to exploit development potential across multiple sectors; it has extensive resources and space to do so without critically affecting its natural assets, but needs to carefully plan and integrate development to avoid unnecessary damage. Significant potential trade-offs with growth of other critical development sectors include the following:

- **Land use change, especially agricultural expansion associated with new roads which could fragment the BBJL.** Modeling suggests agricultural expansion and land conversion will occur primarily in those areas that already have relatively high population densities, but could increasingly encroach on key natural assets. Upgrading the road network

Map ES.4 Major natural resource assets and principal areas of threat from competing development sectors



Sources: Dinerstein et al. 2017; Protected Planet protected areas database, accessed March 2024; R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

would also lead to greatly increased disturbance and rapid extension of the agricultural frontier along the transport corridors passing through the center of the BBJL, posing a major threat to its ability to support large-scale ungulate migrations.

- **Major water infrastructure.** Completion of the Jonglei Canal could potentially have major impacts on the Sudd, with the loss of wetlands and functional floodplains not only affecting local fisheries and biodiversity, but also disrupting regional climate and groundwater recharge systems. South Sudan has considerable potential for hydropower, and a number of potential dam projects have been identified, mostly in the more hilly borderlands where the Nile and other rivers enter South Sudan. Development of the larger Fula Rapids scheme would potentially have major impacts on the Nile and surrounding habitats in Nimule National Park. Smaller-scale dam developments on the border with Ethiopia could also have an impact on the hydrology of the Machar marshes.
- **Extractive industries.** Oil infrastructure is currently located in limited areas, but these are close to major wetlands, have been associated with several instances of local pollution, and have been affected by recent flooding. Expanding existing fields would bring them closer to the core areas of the Sudd and Machar wetlands. Development, or even significant prospecting within current exploration blocks, could have major impacts in many parts of the country, including the rest of the Sudd and most of the BBJL. Artisanal gold production already occurs at a significant scale, and affects protected areas in the south. Extensive minerals exploration licenses could lead to a large expansion of mining activities with major impacts to land and rivers in the northwest and the south, including the southern BBJL.

Establishment of environmental risk management systems is critical to maximizing aggregate development potentials across sectors. South Sudan has a critical need to sustainably diversify its economy. The objective is thus not to hinder sectors that could potentially affect renewable natural resources, but to develop them in a way that avoids unnecessarily reducing the benefits and potential from renewable natural resources, and carefully weighs, reduces, and mitigates those trade-offs that remain. The primary tools are environmental impact assessment (EIA) of individual investments, and strategic environmental assessment of sector policies and plans. For landscapes of outstanding importance, such as the BBJL and the Sudd, upstream spatial planning will also be critical. The country's 2013 Environmental Protection Management Bill introduces the requirement for EIA, but has not been ratified. Nor does it specify the detailed technical and institutional requirements for an EIA, and very little human capacity exists at present.

Climate change is an accelerating threat to South Sudan's renewable natural resources, with increased annual flooding being the most obvious and impactful manifestation. Unprecedented (in recent times) flooding has boosted fish production, but more variable and unpredictable fish production will be harder to manage efficiently and sustainably in the longer run. Flooding has also destroyed vast areas of other wildlife habitats, such as acacia savanna, and restricted the ability of wildlife to move within deeper wetlands. The physical and economic displacement of around 600,000 people due to flooding has put additional pressure on natural resources, and could exacerbate natural resource conflict. Drought risks remain significant and unpredictable in South Sudan alongside flooding. These may lead eventually to the dying of forests and spread of forest fire, but also pose a direct threat to wildlife populations—especially migratory species, which depend on predictable patterns of water availability, and will become increasingly vulnerable to heat stress if also water stressed.

Within each renewable natural resource sector, the key constraint is the lack of active and legally institutionalized natural resource management systems, leaving a high degree of open access to resources. Traditional resource management systems have been weakened by conflict and displacement, and cannot effectively manage highly mobile and/or commercial resources

alone. As South Sudan completes its transition from a largely tribal society to a modern state, the role of traditional authorities and the rights of individuals need to be formalized—and supported by government and technical expertise—to provide for secure tenure, adaptive management, and investment in sustainable natural resource exploitation.

Natural resource management legal frameworks exist in some areas, but often lack detailed implementing legislation and contain inconsistencies:

- A **fisheries policy** is under finalization, but will need to be complemented by local fisheries regulations that respond to fishers' needs and build on diverse local tenure systems. Fisheries exports are threatened by the lack of any quality control systems or competent authority to certify exports.
- The **Forest Policy** (2015) recognizes the importance of sustainable management and community participation, but has not been approved by the legislature and remains largely unimplemented. A **Forest Bill** (2023) has been drafted to establish a South Sudan Forest Authority; further clarification of mandates across central and local government will be needed, as well as more specificity on the regulation of private plantation development and the legal definitions and framework for CFM.
- The **Wildlife Conservation and Protected Areas Bill** (2023) is before parliament, but does not define boundaries for protected areas or a clear process for their legal establishment. It does provide for landscape planning and community conservancies outside of protected areas, but does not provide a detailed framework for either—or allow people, including indigenous communities, to use or reside in existing protected areas, despite their long-standing presence in some. A **Tourism Bill (2024) and policy** was recently passed by parliament and is awaiting being signed into law. It provides a legal basis for developing tourism and establishing a directorate of tourism responsible for preparing and implementing a national tourism strategy. However, the legislation contains several gaps, including provision for promotion of community livelihoods and benefits.

Capacity is lacking at the government, private sector, community, and individual levels:

- **Government institutions** are critically weak, lacking financial and operational resources and qualified staff, especially at subnational levels. Very few routine functions, such as monitoring natural resources, take place, except where supported by external projects. Agencies responsible for fisheries and forestry at the central and local levels have very few staff. The Ministry of Wildlife Conservation and Tourism has over 10,000 staff, but these are mostly ex-combatants who are poorly trained; often located far from conservation areas; and typically left without transport, operational budget, or even a salary. Poor coordination between communities and government institutions at all levels results in fragmented resource management, with plans often excluding key stakeholders, particularly at the local community level.
- **Community leaders and chiefs** lack the necessary organizational and technical skills for reducing conflicts, and institutions vary across the country with local cultures and the impacts of conflict and displacement. Communities have limited awareness of the benefits of scientific sustainable management practices in fisheries, forestry, and wildlife, or experience of effective external support—leading to limited confidence and participation in natural resource management programs.
- The still-emerging **private sector** faces severe capacity and institutional challenges including a poor governance environment; lack of access to finance, including to foreign exchange for exports; lack of entrepreneurial and management skills; and marketing and branding challenges in light of the country's largely negative image.
- There is also a critical lack of **individual capacity** to manage resources, and to identify and exploit market opportunities. There is a general lack of technical expertise in scientific natural resource management concepts and systems beyond a small cadre of academics. There is little technical expertise in hygienic handling or high-quality processing of fish or NTFP harvesting, processing,

and markets. High-quality management of plantations is dependent on foreign managers. Education opportunities exist for all sectors, but attractive job opportunities and technical/vocational training are lacking.

Investment needs in the renewable resource sectors are substantial, and require state investment to establishment core management systems for public assets, as well as to facilitate community involvement and private investment in developing supply chains and products:

- In the **fisheries sector**, in addition to participatory resource management and monitoring systems, there are substantial investment needs in value chain facilities—including functional landing sites, feeder roads, cold chain storage, and market structures—in order to facilitate a wider range of private investment to retain more value in the sector. Institutional investment is required to support training and capacity, as well as quality control and certification of fish products.
- **Forest sector** investments would need to cover: (1) building a national institutional and regulatory framework, and institutional capacity; (2) improving management of existing forest resources, particularly in natural forests, notably in developing and implementing CFM systems; (3) reestablishing productive capacity of plantation forests; and eventually (4) establishing domestic processing and value-addition timber, mostly from the private sector with support from an improved business environment.
- In the **wildlife and tourism sector**, substantial investments are required for management facilities, infrastructure, staff training, and tourism infrastructure development. New parks generally require more capital expenditure in the early years to establish systems and infrastructure, and local conditions (taxes, logistics, and insecurity) demand a premium over typical protected area management costs. The total estimated requirements to manage South Sudan's protected area network comes to around $50 million per year; a comprehensive management program in the BBJL, based on a network of conservancies, would add a similar amount.

Poorly developed **general infrastructure** is a major hindrance to the development of all sectors, particularly fisheries and wood processing, given rapid spoilage in the absence of hygienic cold chains and the need for electricity to power sawmills, respectively. Transport costs and delays are a major barrier to export and accessing hinterland domestic markets for fish traders, exacerbated by informal taxation at roadblocks. A lack of clean water is another cause of concern and quality loss.

Action agenda

Renewable resource potentials in South Sudan remain vast, and could play a significant role in diversifying the economy and delivering appreciable increases in rural living standards, if developed in a manner that supports stabilization and livelihoods. The country context is complex and fragile. Insecurity and weak governance may continue to act as significant constraints on natural resource development, including the ability to access key export markets—for example, for fresh products or tourism. It is also important that sectoral interventions support broader efforts to enhance stability and governance, necessitating adherence to cross-cutting principles and safeguards:

- **Ground up and inclusive.** Natural resource management must be based around the active participation of communities, and ultimately deliver benefits to them. It must be inclusive of all ethnic groups with customary rights to resources, and promote the inclusion and benefit of marginalized groups including women and youth. Applying a gender lens to interventions, and strengthening women's tenure rights, will be key.
- **Pro-peace.** Management systems should actively contribute to peace and stabilization in rural areas through (1) establishing the credibility of government as a service provider, (2) formalizing

tenure rights through consultative systems that support conflict resolution, (3) supporting the development of effective and responsive community-level institutions, and (4) enhancing employment opportunities for young men.

- **Integrated and balanced.** Development of natural resources cannot come at the expense of vital growth sectors including transport, energy, and agriculture; conversely, natural resource management must respond to a wide range of potential challenges. South Sudan is in desperate need of basic infrastructure, which can either support or harm the renewable natural resource sectors. Coordination is key (1) at the national level through the reestablishment of interministerial coordination structures, and the development of environmental and strategic environmental assessment systems; (2) at the regional/landscape/watershed level through the use of integrated land use and development planning instruments, and (3) at the community level through the establishment and capacitation of integrated resource user/management groups.
- **Resilient.** Management systems should be climate-informed and responsive, and robust to natural, social, and market shocks. Diversifying resource management and livelihood systems will be important.
- **Partnerships.** As internal technical capacity remains very weak, South Sudan should continue to collaborate with external partners that can mobilize international expertise and support increased exposure and training for national experts. A history of working with international conservation nongovernmental organizations (NGOs) can be built on in the wildlife sector, but there are few international partners currently engaged in fisheries and forestry—although Equatoria Teak Company is providing a model for modern teak plantation management. Government should also aim to enable private sector investment in natural resource value chains, while providing the regulatory base to support robust resource management, competitive markets, and environmental and social safeguards.

Governance

Any efforts to enhance **fisheries production**, either directly or indirectly, must be predicated on core monitoring and management systems for fisheries resources and the aquatic ecosystems on which they depend:

- **Policy framework.** Update and implement the fisheries policy (with guidance for a new sector strategic action plan) in a way that formalizes local resource tenure and dispute resolution systems, supported by local government.
- **Collaborative management models.** Develop a number of Boma fisheries management models, including enacting simple area-specific bylaws on the use of fisheries and wetland habitats, with the broad consent of local users. Map and agree on Boma management boundaries.
- **Training and capacity building.** Train local leaders (including in dispute resolution), government, academic, NGO, and value chain actors in the ecosystem approach to fisheries.
- **Data collection and monitoring.** Develop a simple and affordable community-based fisheries and aquatic environmental data collection system.

The key elements in building **forest sector** regulatory certainty and capacity include the following:

- **Update Forest Bill.** Incorporate missing technical elements (climate change, forest carbon, clearer definition of key concepts, etc.) into the update of the Forest Bill and implementing legislation. Revise the Forest Policy of 2015 to ensure alignment.
- **Strengthen government implementation capacity at all levels.** Capacity needs assessments at selected sites could help develop a capacity-building plan.
- **Establish a forest information management system.** This should include demarcating and mapping national forest reserves, carrying out forest management planning, and mapping and assessing woodlots and plantations under farm

forestry. A national forest inventory would provide the baseline data needed in sector planning.

- **Define a CFM approach and build systems.** Broad consultation would be required, but robust CFM models are already in existence. Piloting and experimentation within South Sudan should be kept to a minimum before rights, guidelines, and operating procedures are codified to provide clarity and reliability. Both government and practitioner capacity would need to be built; given the vast areas of community forests and woodlands, critical community forest areas should be prioritized.

Wildlife and tourism governance improvements should center around the following:

- **Policy framework.** To strengthen and implement the policy framework, clarification and enactment of the Wildlife Conservation and Protected Area Bill (2023), the Tourism Bill (2023), and the Environmental Bill (currently in draft) should focus on (1) processes for formal and collaborative delineation and gazettement of protected areas, (2) the legal framework for community conservancies, (3) retention and use of eventual protected area revenues, and (4) wildlife-friendly environmental safeguards for development planning and investments. Government should also consider clarifying and separating the regulatory role of the ministry from the implementing role of a protected area authority, as has proven more effective elsewhere in Africa, including in neighboring Uganda.
- **Partnerships.** Collaborative partnerships with specialist NGOs are likely to remain critical to supporting the protected area system in the short to medium term. These should be strengthened, including with development partner support where possible.
- **Training.** Training the wildlife service is critical and should go beyond monitoring and enforcement skills to include collaborative approaches, social risks, and human rights. Much can be learned from experienced wildlife services in East Africa, including the Uganda Wildlife Authority.

Restoration

Fisheries and natural forests are generally considered to be in good condition. However, the **forest plantation sector** requires significant investment for restoration—ultimately from the private sector—but with government support, including the following:

- Facilitating **community/smallholder commercial tree growers** in targets areas (e.g., in Western Equatoria) would involve (1) strengthening service delivery (seedlings, etc.) to smallholders through initial project-type interventions and engaging formal private sector operators; (2) building the capacity of smallholder tree growers; and (3) engaging entrepreneurial smallholders in the rehabilitation of government plantations.
- Promoting plantation development through **private sector investment in industrial forestry** involves much larger individual transactions than in smallholder plantations, and public actions are more likely to be tailor-made to individual investor needs. Key steps would include (1) promoting awareness of investment opportunities, (2) preparing standard operational practices for soliciting and responding to proposals, and (3) de-risking investments through improving the physical safety and business climate.

Restoration of **wildlife** populations is critical to the future development of tourism and sustainable use:

- The top priority should be **securing and restoring the BBJL** through the development of a network of community conservancies anchored by well-managed protected areas (including Ez Zeraf Game Reserve in the Sudd). African Parks has proposed establishing up to 21 community conservancies, following tried and tested approaches in Kenya and Namibia; as well as up to 19 conservation service nodes equipped with offices, basic equipment, airstrips, communications, and trained community conservancy liaison staff. Strengthening community resource tenure will be essential to ensuring the continued functionality and productivity of ungulate migration and other wildlife in harmony with local

cultural norms to provide long-term and sustainable benefits for local communities. This will require protection and maintenance of breeding, grazing, and movement spaces; targeted habitat restoration; reintroduction of sedentary species that have largely been extirpated from the landscape, such as buffalo and elephant; and introduction of regulated sustainable offtake agreements at the conservancy level.

- Additional priority areas include **restoring remaining major protected areas**—Nimule National Park and its associated training center, Southern National Park, Imatong Forest Reserve, Lantoto National Park, Kidepo Game Reserve, Shambe National Park and surrounding lands, and the wider Sudd wetland system. Although there is general understanding of the status, challenges, and ballpark management costs, focused and costed management plans should be prepared.

Value addition

A set of coordinated interventions are necessary to reduce postharvest loss and **capture additional value in fisheries**:

- **Key value chain infrastructure.** Upgrade landing sites and trading structures at key nodes (e.g., Bor, Malakal, and Munga ports) to include potable water, proper storage facilities and cold chain systems. Public investment is to provide a minimal base of critical infrastructure to catalyze business engagement and investment.
- **Business environment.** A favorable business environment is needed to crowd in private sector investment, including general pro-business and sector-specific reforms, including high tax rates, such as the 18 percent tax fish exports, and exposure to roadblocks and informal taxes.
- **Training.** Institutional and vocational training should be offered for collectives and small enterprises to help fishers, including women, establish collectives and develop basic business skills. Incubation centers—local business and technical skills training centers to train community-based trainers and provide networking hubs—can lower the costs of traditional extension services.
- **Credit and insurance.** Offer credit and insurance services tailored to the needs of women, youth, and others with limited access to collateral. Create village savings and loan associations to support microenterprise ventures.
- **Access to export markets.** Improving access to export markets would involve (1) establishing a competent authority to promote and regulate fishery product quality, safety, and trade, including setting up accredited laboratories; (2) improving critical river and all-weather road transport infrastructure; (3) assessing the feasibility of establishing secondary fish markets in strategic border towns, such as Nimule, to encourage easier access and competitiveness within the export trade; and (4) securing access to existing trade arrangements, notably the African Continental Free Trade Area, and arranging for provision of sealed container transshipment of fish through Uganda to the Democratic Republic of Congo.

In the **forest sector**, development of CFM systems should be accompanied by support for **forest-based livelihood development**, particularly the identification and development of NTFP market potential, improved handling and processing, and marketing requirements. Development of **timber processing and value addition** is a longer-term concern, given the time required for reestablishment of the plantation sector. Similar activities here to improve the investment and operating environment are crucial, including through general and forestry-specific business climate diagnostics and interventions, and promoting the engagement of both domestic and foreign investors at all stages of the value chains.

Wildlife-based tourism development has the greatest long-term economic potential of any renewable resource industry in South Sudan. The current security environment and lack of suitable facilities and infrastructure pose major constraints, but the development of high-end, remote tented camps may already be possible; and improvements in national security could open much wider market

opportunities. A **tourism master plan** would help to identify tourism assets, market opportunities, and investment needs to develop different tourism segments in a phased manner, as well as to identify strategic measures to ensure tourism benefits both wildlife and communities. Such a plan could also help identify tourism assets and products and related markets, and put in place a rational strategy for developing this sector with the support of the private sector. **Tourism promotion and training** are usually best done by an entity that is institutionally close to the private sector, rather than by regular government agencies. It will be important for the Tourism Bill to clearly define roles and responsibilities.

South Sudan does not have a system in place to measure and **monetize carbon sequestration** in its natural habitats, though an initial REDD+ Strategy and Action Plan has been prepared. Nevertheless, the potential is significant, and should be pursued alongside other forms of revenue. Between 2001 and 2023, forests in South Sudan represented a net carbon sink of −36.9 $MtCO_2e$/year, which could be worth around $250 million per year on voluntary markets. If it were to follow a similar forest loss pathway as its neighbors, projected greenhouse gas emissions due could reach a range between 22.1 and 29.5 $MtCO_2e$/year. The dynamics of emissions from South Sudan's wetlands are not well understood, but it is possible that flood reduction measures could produce major methane emission reductions.

Report outline and methodology

The report comprises three chapters. **Chapter 1** provides an overview of the current importance and potential of renewable natural resources in South Sudan, drawing heavily on background reviews prepared for three focal sectors: fisheries, forestry, and wildlife and tourism. **Chapter 2** assesses some of the additional pressures on natural resources that might occur as South Sudan develops, reviewing potential spatial patterns of development in land use, water infrastructure, and oil and mineral exploration and extraction; and approaches to managing trade-offs to support balanced and sustainable development. **Chapter 3** outlines priority actions in each of the three focal sectors. Summary action plans for fisheries, forests, and wildlife and tourism are provided in tables ES.1, ES.2, and ES.3, respectively.

Much of the material in the report is based on background reviews that were prepared for each of the focal sectors. For **fisheries**, the sector review was prepared by the Food and Agriculture Organization of the United Nations (FAO), and involved visits to all 10 states to conduct a variety of key informant interviews. For **forestry**, the review was prepared by Indufor in close consultation with the Department of Forestry; it included limited field visits in the high-forest areas in the southwest of the country. For **wildlife and tourism**, the review was prepared by African Parks, and included collation of extensive wildlife survey data from recent years, as well as some limited additional field surveys. Unless otherwise referenced, data in the report are based on these three sector reviews. In addition to reviewing existing information on the locations of current and potential minerals and water infrastructure development, chapter 2 also includes new modeling on patterns of potential agricultural expansion in relation to population growth and improvements of the transport network.

Table ES.1 Summary action plan for fisheries sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	Strengthen local resource management and monitoring • Update Fisheries Bill and develop sector action plan focused on small-scale fisheries management • Enact legal framework for collaborative management • Establish participatory resource and ecosystem monitoring system • Build community and government capacity	$10–$20 million • Capacity-building and long-term operational costs for co-management would be main expenses • Technical assistance from partners with international expertise in small-scale fisheries co-management would be critical
Value addition	Reduce postharvest loss • Detailed value chain and market surveys • Key value chain infrastructure investments • Policy reforms to improve business environment and access to credit • Institutional capacity and vocational training for cooperatives and micro, small, and medium-size enterprises	$20–$30 million Core infrastructure and capacity building to facilitate further private sector investment would be main expenses
	Secure and expand export value[a] • Establish competent authority and laboratories to regulate sanitary and quality standards • Assess feasibility of new/improved border export markets • Bilateral and regional trade agreements to support reduced inspection times, closed container transshipments, etc.	$5 million Institutional establishment and capacity building would be main expenses
Longer term (5–20 years)		
Value addition	Capacity to ramp up production in high-flood years[a] • Multiuse cold storage and logistics capacity investments • Improvements to key transport links, including border crossings Access high-value export markets[a] • Transport, energy, and trade infrastructure • Policy and institutional reforms to remove trade barriers and promote access (e.g., trade fairs)	• Substantial, but most costs would be borne by the private sector and infrastructure sectors • Direct costs to fisheries management authorities to identify and lobby for priority investments and promote private sector investment could be modest

a. Predicated on strengthened resource management and monitoring to facilitate and permit sustainable catch increase.

Table ES.2 Summary action plan for forestry sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	National capacity building • Institutional and legal development (Forest Bill and policy) • Investments in ministry and local government technical capacity • Development of forest data collection (e.g., mapping) and monitoring system (technical assistance and investments)	$5 million Capacity-building, technical assistance, and operational costs would be main expenses
	CFM establishment • Technical assistance for CFM planning and system development • Developing guidelines • CFA establishment and management planning • Forest management operations	$10 million[a] • Technical assistance, operational costs, and community incentives would be main expenses • Community members would allocate time and in-kind community resources
Value addition	CFM activities • Forest management operations • Livelihood activities	$2 million • Operational costs and community incentives would be main expenses • Communities would provide labor and, depending on livelihood activities selected, other inputs
Longer term (5–20 years)[b]		
Resource governance	Plantation development • Institutional and legal development • Designing support systems • Developing guidelines	$1.25 million Capacity-building and technical assistance would be main expenses
	CFM activities • Ongoing support and monitoring	$1.5 million Operational costs, technical assistance, and community incentives would be main expenses
Restoration	Plantation development • Plantation establishment • Incentives to smallholders • Incentives to commercial plantations	$8.4 million • Operational costs, technical assistance, and producer incentives would be main expenses to facilitate private investments • Private beneficiaries would allocate both in-kind and financial contributions based on agreed cost-sharing formulas
Value addition	Plantation development • Incentives to smallholders • Incentives to commercial plantations	$7.15 million • Producer incentives would be main expenses facilitating private investments • Private beneficiaries would allocate both in-kind and financial contributions based on agreed cost-sharing formulas

a. CFM activities are scalable, and additional resources would allow faster expansion of the CFM model to larger areas.

b. Plantation technical assistance could start earlier if there is certainty of implementation finance.

Table ES.3 Summary action plan for wildlife and tourism sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	Strengthen framework for protected area management • Enact Wildlife Conservation and Protected Area Bill (2023), Tourism Bill (2023), and Environment Bill, and prepare instruments (regulations and guidelines) to guide implementation • Undertake a comprehensive survey of protected areas, including biodiversity survey, socioeconomic and threat assessment • Formalize the legal status of major protected areas, starting with priority areas for wildlife conservation and management (specifically Boma and Badangilo National Parks) • Reconvene the Natural Resources Management Group to enable interministerial consultation on development projects and to discuss potential environmental implications of sector development projects	$5–$10 million Field surveys, consultations, and boundary demarcation to formalize protected areas would be main expenses
	Strengthen wildlife management capacity • Rationalize the wildlife service and increase budget to establish a functional corps of staff • Develop standard operating procedures and training curricula, and deliver in-service training, including in working with communities and on social risk management • Renovate, equip, and provide operational costs for the wildlife service training center at Nimule National Park	$10–$20 million Not including regular budget allocations for staff salaries and operating costs, consistent delivery of capacity building to the wildlife service would be main additional expenses of the wildlife service
Restoration	BBJL landscape planning and management • Participatory strategic land use management plan for the BBJL covering anchor protected areas and conservancies • Establishment of a first batch (nominally, 10) of community conservancies	$40 million • Livelihoods and capacity support, and infrastructure and equipment would be main expenses • Community members would allocate time and in-kind community resources
Value addition	Wildlife tourism establishment • Preliminary assessment of tourism potential (products and markets) • Pilot high-end tented camps and initial marketing activities	Modest public cost, but around $5 million from private operators
Longer term (5–20 years)		
Resource governance	Consolidate and expand protected area management capacity • Expand partnership arrangements with conservation international NGOs to support management of major protected areas • Consider establishment of a protected area management agency with an independent governance structure and authority to retain and reinvest revenues and raise external financing • Establish a national conservation endowment trust fund to support reliable funding for major protected areas	Few million dollars to establish new agency
Resource restoration/ management	CFM activities • Bring remaining major protected areas under active management, in partnership with international NGOs where appropriate, including community engagement, patrolling and improving infrastructure and communications	$100–$200 million • Estimate largely depends on scale of infrastructure development and number of protected areas brought under active management • Community members would allocate time and in-kind community resources
Value addition	Wildlife tourism development • Prepare a tourism master plan with a strong focus on environmental and cultural sustainability • Consider establishing a tourism promotion agency • Expand and improve tourism infrastructure in and around major protected areas as security conditions allow, including in support of transboundary tourism offerings with Uganda • Develop programs for carbon financing to support conservation and habitat management	Substantial investment costs for tourism development, but should mainly be borne by private operators

1 Importance and potential of natural resources

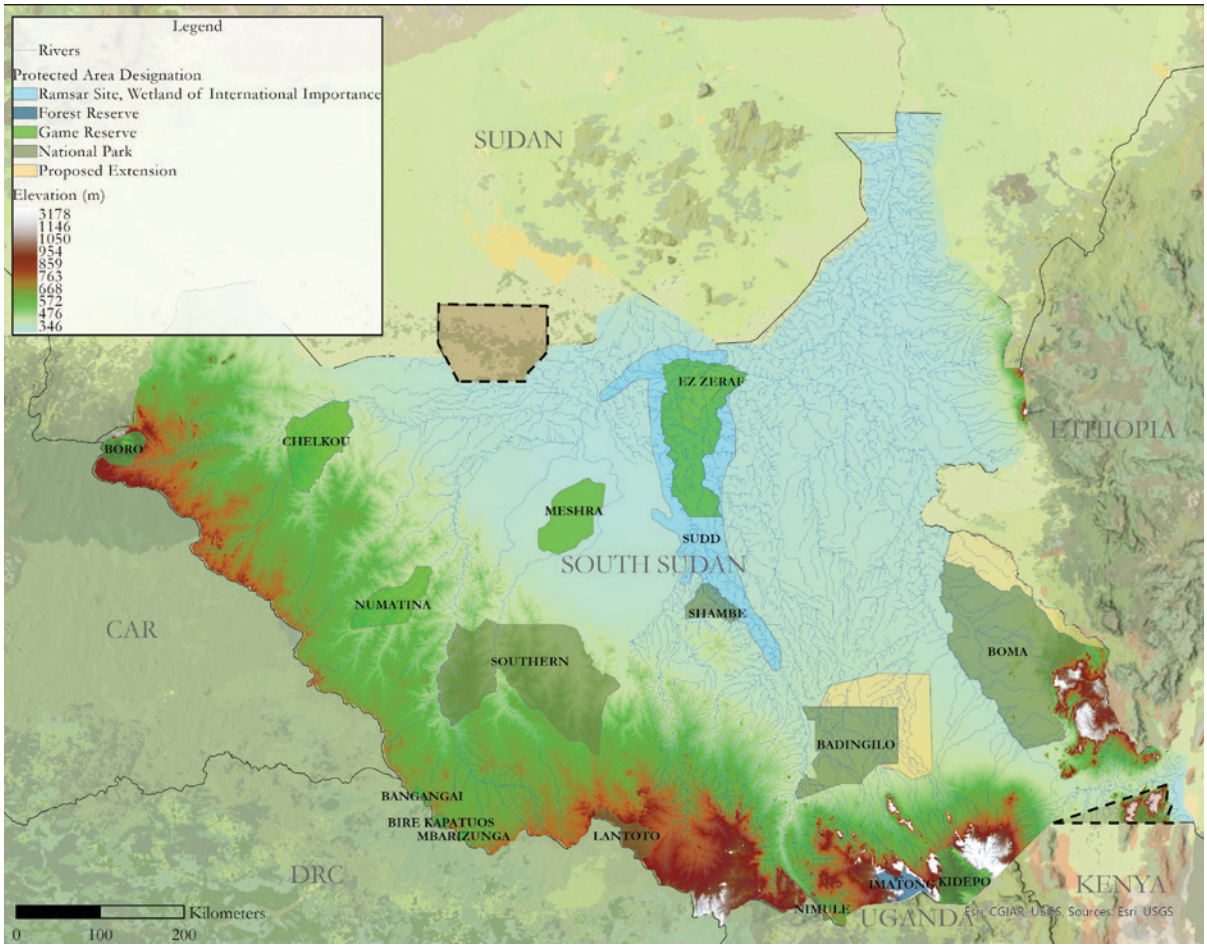
Overview of renewable natural resources

South Sudan's geography: resource abundance and dependence

The physical geography of South Sudan has given rise to a rich tapestry of ecosystems, encompassing vast wetlands, floodplain grasslands, savannas, and montane forests (map 1.1). South Sudan lies just south of the Sahel and spans an ecological gradient from subtropical Northern Congolian forests in the southwest to semiarid Sahelian savanna in the north. Almost all its land area (97.5 percent) falls within the White Nile Basin (South Sudan comprises 20 percent of the entire Nile Basin), and around half within the Nile floodplain at around 400–500 m altitude with the vast Sudd wetland at its heart. The Sudd is the world's second largest seasonal wetland, expanding from around 30,000 km^2 up to over 100,000 km^2 depending on the size of the annual flood pulse, making it larger than the Okavango Delta in Botswana and Cambodia's Tonle Sap combined. Beyond the Sudd, most of the floodplain consists of a mosaic of grasslands and savannas, grading to denser woodlands in the higher lands along the western and southern boundaries. The highest peaks reach over 3,000 m in the Imatong Mountain Range on the border with Uganda.

The country's human geography is equally diverse, and also dynamic. South Sudan is home to over 60 ethnic groups, with the largest being the Dinka, Nuer, and Shilluk. The history of settlement is marked by a

Map 1.1 Protected areas, major waterways, and topography of South Sudan

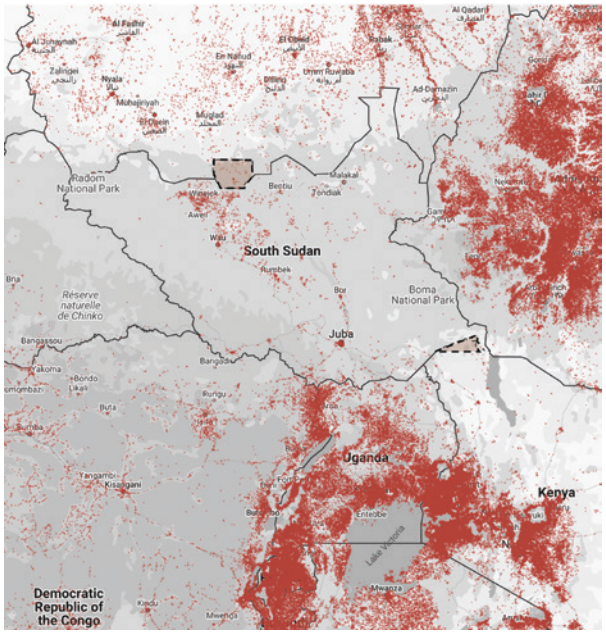


Source: African Parks 2024.

mixture of migration, displacement, and conflict. Many ethnic groups have long-standing ties to specific regions; while others have migrated over time in response to environmental changes, conflict, and economic opportunities. Until recent times, urban centers such as Juba, Wau, Bor, and Malakal were mainly trade and administrative hubs for the Anglo-Egyptian and then Sudanese authorities. However, following the Comprehensive Peace Agreement in 2005, which paved the way for independence in 2011, Juba and other towns have witnessed a remarkable growth in population. Widespread internal displacement, due to conflict and increasingly in recent years to flooding, has also accelerated movement to the towns. Moreover, the conflict in Sudan has created an influx of refugees and returnees. As of April 2024, 640,688 returnees, refugees, and asylum seekers have arrived in South Sudan, approximately 78 percent of whom are South Sudanese refugee returnees.[1]

A low human footprint has left vast tracks of habitat in generally good condition. Approximately 80 percent of the population of around 13 million is rural, but South Sudan's extensive land area (approximately 644,000 km^2) means the human footprint remains low, even by Sub-Saharan African standards (map 1.2 and map 1.3). Outside of the main towns and small settlements spread along major roads, much of the rural population and settled agriculture is concentrated in the western and southern edges of the lowlands, and in the extreme north of the country, where the Nile crosses into Sudan. This leaves vast areas of wetter floodplain grassland and savanna, and of forested hills, with very low population densities. Although most of the land is potentially arable, only around 5 percent is used for cropping; however, pastoral and agropastoral livelihood systems are extensively practiced. Most land in South Sudan remains de facto communal land, held and managed collectively by communities or traditional authorities. This encompasses land used for grazing, farming, and other communal activities vital to the livelihoods and cultural practices of local communities, while individuals within the community may have customary rights.[2]

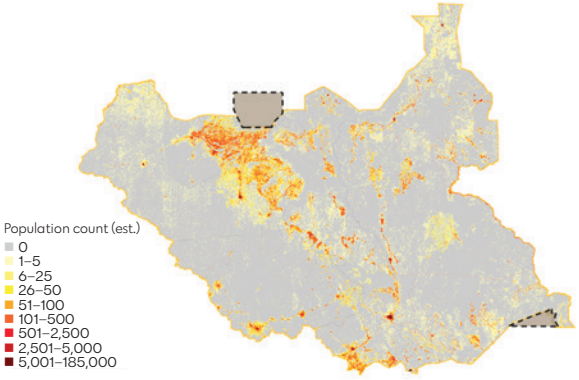
Map 1.2 Human footprint in West, Central, and East Africa



Source: R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

Note: The most extensive blocks of relatively undisturbed sub-Sahelian habitat are in South Sudan and the Central African Republic.

Map 1.3 Population density in South Sudan (number of people per km^2)



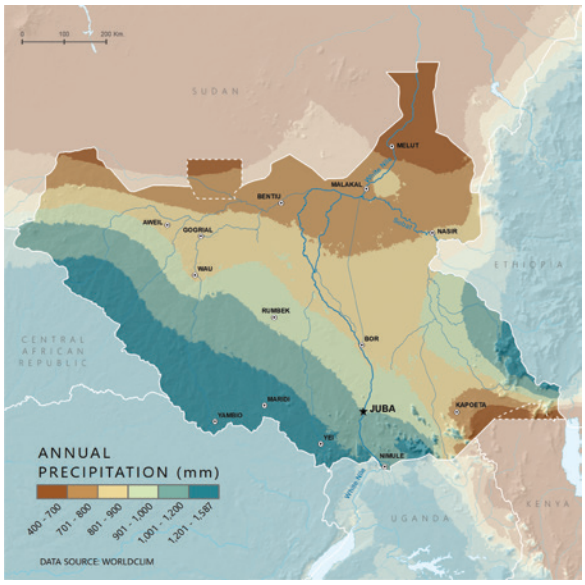
Source: R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

[1] Source: The World Bank in South Sudan: Overview web page, accessed September 2024.

[2] Source: Intergovernmental Authority on Development Land Governance Portal, South Sudan Land Governance Country Profile, accessed March 2024.

South Sudanese are highly exposed to variable climate cycles and disasters. Rainfall is concentrated over the highlands in the southwest (map 1.4), and the wet season lasts from May to October. With its vast floodplains and seasonal wetlands, extensive annual floods are a feature of large parts of central and eastern South Sudan. As with much of East Africa, fluctuating rainfall patterns have increased the magnitude and unpredictability of cycles of flood and drought in South Sudan. In recent years, vast floods have inundated large areas of the floodplain, leading to loss of life, massive displacement of people, and severe disruption to agricultural and pastoral livelihoods. Floodwaters inundated extensive areas from 2020 to 2023, with the submerged region probably around 200,000 km² in 2022, encompassing more than 30 percent of the country (map 1.5). The primary driver of the annual flood pulse (October through February) are the upstream flows in the White Nile, originating from the Lake Victoria Basin with additions from Uganda and the Albertine Great Lakes; although local rainfall over South Sudan and the borderlands of western Ethiopia and southwestern Sudan also contribute. It is possible that environmental changes in the Sudd, including spread of water hyacinth (*Pontederia crassipes*), could be contributing to increased flooding (Rebelo and El-Moghraby 2016). Notwithstanding the recent flooding, drought remains a hazard across much of the country, particularly in the northeast (map 1.6).

Map 1.4 Annual precipitation in South Sudan



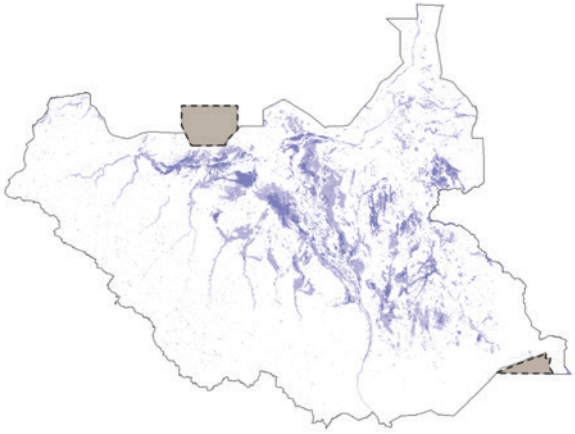
Source: Original calculations based on TerraClimate.

South Sudan has considerable mineral wealth, but has not been able to effectively capitalize on it to support broad-based national development. The oil sector accounts for 70 percent of gross domestic product (GDP), almost 90 percent of exports, and more than 90 percent of public revenues; but per capita GDP has fallen by over a third since independence in 2011, due to the war from 2013 to 2018 and a variety of oil price and climate shocks.[3] There is

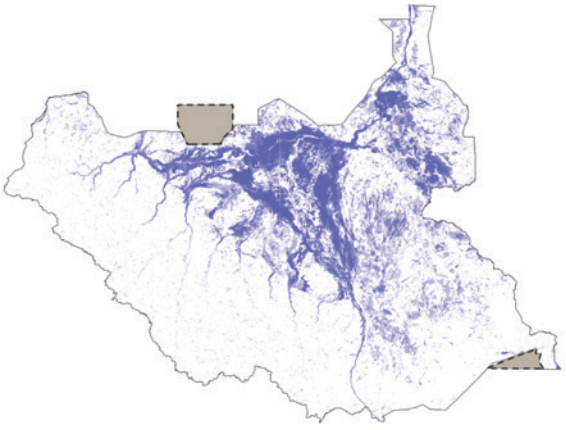
[3] Source: African Development Bank, South Sudan Economic Outlook web page, accessed March 2024.

Map 1.5 Extent of recent flooding in South Sudan

a. Flooding extent, 2019–20

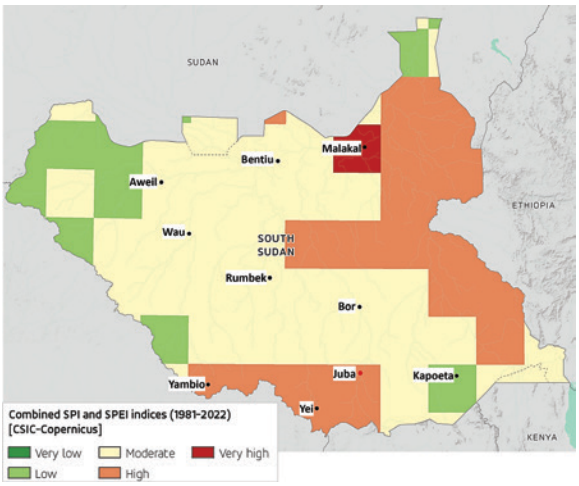


b. Flooding extent, 2021–23



Source: United Nations Satellite Center, Flood monitoring over South Sudan, accessed November 2024.

Map 1.6 Drought hazard map for South Sudan



Source: GMV, 2024.

little evidence that oil revenues are effectively channeled toward national development. Every auditor general report issued since 2006 has documented systematic corruption, and these reports have not been publicly released since 2008. South Sudan experienced a decrease in adjusted net savings of around 10 percent from 2015 to 2019 (World Bank 2021), largely because the ongoing exploitation of nonrenewable resources has not been used to build other forms of capital. Bringing transparency to the management of oil revenues is a key objective of the latest national peace agreement and a priority of many development partners, but progress has been limited. Since early 2024, oil exports have been disrupted because of challenges in maintaining the pipelines through Sudan, resulting in an acute fiscal crisis for government, and emphasizing the ongoing need for South Sudan to diversify its economy away from dependence on oil. Gold is one of the largest non-oil exports, but almost all of the exploitation is informal, and only a fraction of exports are likely to be captured in official figures.

Low rates of urbanization and access to the market economy leave the majority of the population directly dependent on renewable natural resources. Approximately 75 percent of the population relies directly on local ecosystems for essentials like food, clean water, and energy (Fedele et al. 2021). Natural resources like forests, livestock, fisheries, and wildlife all have been of crucial importance for the survival of people from all parts of South Sudan. During the civil war, communities in Boma, Nimule, and Western Equatoria turned to bushmeat for survival. Populations in Nimule, being close to the Uganda border, depend upon trade as well as fish from the Nile for their food security and livelihood needs. Populations in Western Equatoria have depended upon the rich agricultural and natural resource base to meet their livelihood and food needs. The agricultural growing season in Western Equatoria is 270 days, and an average household can grow between 10 and 15 field and tree crops on an annual basis. Large Nilotic tribes like the Dinka, Nuer, and Shilluk all depend on their livestock resources and access to vast areas for grazing,[4] as well as wild foods and medicinal plants (Grosskinsky and Gullick 2000).

Renewable natural resources could make a much larger contribution to lifting the South Sudanese out of poverty if better managed. Despite its wealth of land and resources, South Sudan has not achieved food self-sufficiency since 2009, largely because of conflict and climate shocks (Saidi et al. 2020). As of September 2024, 9 million people, representing 73 percent of the country's population, require humanitarian assistance (WFP 2024). Over 7 million people were severely food insecure in the April–July 2024 lean season (IPC 2023). Nearly 2 million people are internally displaced, and over 2 million live as refugees abroad. The poverty rate is very high, with 7 in 10 people living in extreme poverty (UNICEF 2023). South Sudan's human development index value for 2022 is 0.38, positioning it at 192 out of 193 countries and territories.[5] Women and girls are disproportionately affected in terms of poverty, lack of access to basic services, and overall constraints in becoming active participants and contributors to economic activities.[6] Only 7.7 percent of the population has

[4] Source: United Nations Operation Lifeline Sudan Southern Sector Food Security surveys, 1995–2005, available from the Sudan Open Archive, accessed September 2024.

[5] Source: United Nations Development Programme Human Development Index, accessed November 2024.

[6] Source: US Agency for International Development, South Sudan: Gender Equality and Women's Empowerment web page,

access to electricity (World Bank 2021), paying some of the highest tariffs in Sub-Saharan Africa at $0.4/kWh.

In addition to its agricultural potential, the country also has abundant fisheries, wildlife, and forest resources, which are largely unmanaged and in some cases could be readily developed. This report examines these potentials in detail.

Conflict and social history of natural resources

South Sudan has suffered from almost continual conflict since Sudan's independence in 1956, which has been tightly bound to its natural resources. During the period between Sudan's independence and the creation of South Sudan, Southern Sudanese were largely excluded from government and commerce, and resented the imposition of Arabic culture and Islam by the northern government. These were the main factors that motivated the Southern Sudanese Anyanya-1 movement to rebel against the central government in Khartoum, leading to the first civil war from 1956 to 1972 (Rolandsen 2005). By the time of the second civil war between the Sudan People's Liberation Movement/Sudan People's Liberation Army (SPLM/A) and the government of South Sudan (1983–2005), oil had been discovered, and the lack of revenue sharing added a major new source of resentment. The development of the Jonglei Canal, which was perceived to threaten the livelihoods of many South Sudanese for the benefit of downstream Sudanese and Egyptian farmers, was another.[7] The second civil war ended with the Comprehensive Peace Agreement in 2005, which mandated oil revenue sharing between Sudan and South Sudan, and provided the basis for a referendum and subsequent full independence in 2011.

The new ruling class emerging from the leadership of the SPLM/A was highly dependent on oil revenues and fractured along tribal lines. Long before the Comprehensive Peace Agreement, the SPLM/A had exercised effective control over large territories, and suffered intertribal rivalries and conflict, with fighting between Nuer- and Dinka-led factions breaking out in the early 1990s. Some tribal militia were also co-opted by the Sudanese government, such as Nuers engaged to protect oil fields in the north, and were only reconciled with the SPLM/A after the war. During the interim period from 2005 to 2011, attempts were made by development partners to strengthen governance structures and diversify the economy, but the main focus remained on implementing the peace agreement and preventing renewed conflict with Sudan. Governance remained weak and contestation for oil revenues acute, and the split in the SPLM/A ultimately led to a new civil war just two years after independence, in 2013.

The Revitalized Agreement on the Resolution of Conflict in South Sudan (R-ARCSS) in 2018 formally ended the civil war; but with economic and political power still based on a zero-sum contest for control of natural resources, the pattern of intertribal conflict persists. Greater transparency on the use of oil revenues was a key provision of the R-ARCSS, but has not been implemented, and major external shocks from COVID and flooding have not helped to build a more inclusive economy. New armed groups have continued to emerge, and no state has avoided local conflicts. Conflict between tribal groups is often related to the legacy of the wars and related displacement, but commonly precipitates around contestation for land and resources—and is often exploited by political leaders. The internal split within the SPLM/A in 1991 led to a large-scale displacement of the Bor Dinka (together with their cattle) to Central and Eastern Equatoria, which brought conflict between the Dinka herders and Equatorian farmers that continues to this day. Cattle rustling is a particularly common

accessed November 2024.

[7] The Nile Waters agreement of 1959 determined that any augmentation of the flow of the Nile was to be divided equally between the Arab Republic of Egypt and Sudan. The Jonglei Canal was designed to increase the flow of the Nile by about 6 billion m^3. John Garang, the leader of the SPLM/A during the second civil war, studied the implications of the planned Jonglei Canal diversion project during his PhD studies, and the SPLM/A brought an end to its construction by blowing up the machine excavating the canal early in the war.

form of intertribal conflict (EEAS 2022). With an end to the R-ARCSS coming in December 2024 and the probability of elections very low, prospects for reducing internal conflict remain uncertain.

Prolonged conflict has undoubtedly had negative impacts on natural assets, but has also restricted access to large areas and impeded land conversion. Conflict has weakened traditional authorities and customary management systems, caused a proliferation of weapons and lawlessness, and prevented investment in and establishment of modern management systems—leading to rapid depletion of high-value resources in many locations, including wildlife and teak. On the other hand, ongoing instability has also restricted access and land development in many parts of the country, allowing natural ecosystems to persist. This includes large buffer areas between tribal territories where activities such as cattle grazing are limited due to the risks of hostile action.

In the forest sector, the expansion of government teak plantations in the national forest reserves ceased in 1983 with the onset of the second civil war, and insecurity and resource scarcity hampered management efforts. Forest resources were used to fund the conflict, resulting in significant environmental degradation. The SPLM/A's capture of border areas in the southwest from the government of Sudan in 1997 led to an increase in illegal logging and export of teak logs through Uganda to international markets. The chaotic situation continues to impede management interventions and law enforcement. Under current conditions, significant private sector investment in forest plantations is unlikely. Even existing operations, such as Equatoria Teak Company (ETC), could be affected by newly formed militias like the Zande in Nzara, Western Equatoria. During the immediate postwar period (2005–11), some existing forest plantation concessions were given to individuals from Kenya and Uganda who had assisted the SPLM/A during the war; few of these were commercialized, and most have been abandoned.

Widespread conflict in rural areas has also disrupted wildlife migration patterns and tourism routes, threatening biodiversity and undermining tourism potential. The proliferation of guns and armed groups during the 2013–18 conflict is believed to have exacerbated wildlife poaching (UNEP 2018). Patterns of animal movement have been significantly constrained by conflict, including around the northern and western edges of the Boma–Badingilo–Jonglei landscape (BBJL). Ongoing insecurity, particularly along roads, hampers accessibility and safety, preventing pilot tourism activities from expanding beyond a 50 km radius from the capital. South Sudan's reputation of instability and fragility, with ongoing harassment by authorities against foreigners, further deters tourism and investment.

The fisheries sector has been less directly affected by conflict, but intercommunal violence in December 2013 severely reduced fisheries production in the Upper Nile, Unity, and Jonglei States and around the Sudd wetland. The Lakes and Warrap States experienced less severe impacts, highlighting the context-specific nature of conflict on fisheries activities. Local fisheries management has also been weakened.

The intersection of gender equality and conflict continues to constrain women's access to an economy dominated by natural resources. With millions of internally displaced persons and refugees, the impact on family structures and livelihoods is profound, disproportionately affecting women and children.[8] In many instances, women have been forced to adopt primary provider roles—including in subsistence agriculture and resource harvesting—yet are hindered by limited access to land and resources, restrictive cultural norms, and a legal system that often fails to protect their rights. Although women are entitled to own and inherit land according to the 2009 Land Act, enforcement of these rights is highly insecure in the face of armed groups and government reluctance—for example, to honor widows' claims to inherited leasehold rights. Gender-based violence is one of the most critical threats to the protection and well-being of women and children in South Sudan and is fueled by militarization and societal norms.

[8] Source: US Agency for International Development, South Sudan: Gender Equality and Women's Empowerment web page, accessed November 2024.

Almost 50 percent of married women ages 15–49 in South Sudan experience physical and/or sexual intimate partner violence (UNFPA 2023). Non–intimate partner cases of gender-based violence are mostly associated with attacks and raids, with one in four reported victims of conflict-related sexual violence being a child. In total, about 65 percent of women and girls have experienced physical and/or sexual violence in their lifetime, and the majority first experience sexual violence under the age of 18 (Gardsbane and Atem 2019).

In renewable natural resource sectors, women are often relegated to secondary roles, such as processing and marketing, while cultural norms and domestic responsibilities limit their direct involvement in more lucrative activities. In fisheries, women handle and market the catch, but face barriers to fishing itself because of cultural prohibitions and resource constraints. In forestry, women's rights to forest products are limited to less profitable goods, and they are often excluded from decision-making processes. The management of forest resources is influenced by broader socioeconomic and environmental factors, which further marginalize women. In wildlife and tourism, women's participation is minimal, with sustainable management practices offering some potential for increased involvement. However, gender norms and a lack of data on successful interventions pose significant challenges.

As South Sudan emerges from conflict and builds a modern state, the challenge is to institutionalize robust and inclusive natural resource management—building where possible on traditional systems—before increasing accessibility causes irreparable loss. Some steps toward a modern natural resource management framework have already been put in place. As early as 1999, John Garang, the leader of the SPLM/A, appointed a technical committee to develop an institutional framework for natural resource management (later called the Natural Resources Management Group [NRMG]), but a natural resource governance framework that promotes conflict resolution and inclusive benefits remains a critical need. The work of the NRMG led to the establishment of natural resource ministries covering minerals, agriculture, livestock, forestry, and fisheries, and the South Sudan Land Commission in 2005. As petroleum was controlled by the government of Sudan, it was not included at that time. Over the 2005–11 period, the NRMG functioned as an interministerial group. An institutional and legal framework was being developed to formalize the NRMG into law when the entire cabinet and the vice president were dismissed in July 2013, as the country descended into civil war. Although a number of broad sectoral laws have been passed more recently, there remains much to be done to institutionalize a coordinated governance framework for natural resource management that would formalize tenure rights, support conflict resolution, and institute transparency in the use of state revenues.

Status and value of renewable natural resources

As South Sudan emerges onto the global stage, a comprehensive understanding of its natural resource landscape becomes increasingly vital, serving as the foundation for informed decision-making and sustainable development initiatives in this dynamic and resource-rich nation. Determining the status of this report's three focal sectors—fisheries, forests, and wildlife and tourism—is challenging, as published literature and data are scarce and logistics for field visits and data collection timely, costly, and complex. As such, assumptions and estimates have been adopted using available data and supported by local stakeholder consultations held throughout December 2023 to May 2024 for each of the focal sector deep dives.

Fisheries

South Sudan is estimated to have one of the most productive freshwater fisheries in the world—although, as a predominantly tropical floodplain system, production is highly dependent on the extent of the annual flood pulse. Fishing is highly seasonal, with two-thirds of the

catch being caught during the rainy season from May to September. FishBase lists 101 fish species for South Sudan,[9] but less than two dozen comprise the main commercial species, many of which have high intrinsic growth rates (*K* value > 0.3). The species caught include Nile tilapia (*Oreochromis niloticus*) and Nile perch (*Lates niloticus*), but during the current high-flood period, air-breathing species that are well adapted to the floodplain habitat appear to be dominating the catch—for example, arowana (*Heterotis niloticus*) and catfish (*Clariidae* family). Based on general knowledge of tropical floodplain fisheries, a conservative estimate of a sustainable fisheries yield would be 100 kg/ha. Thus, in a flood year representative of the pre-2019 period, where close to 40,000 km^2 were inundated, a potential sustainable yield could be around 400,000 t. Considering the more extreme case of the recent floods, with a flooded area between 100,000 and 200,000 km^2, potential yield might be in the range of 1–2 million t, which would rival the most productive inland fisheries on the planet.[10]

Fisheries organization and infrastructure are extremely limited. Bomas (the lowest administrative level in South Sudan, corresponding to a cluster of villages or hamlets with a population of at least 1,500) have immediate control over local fishing territories and activities, although their management role is not well formalized in law. Local leadership and dispute resolution systems vary by location. Traditional or boma chiefs (who may or may not be the same) may exercise effective authority over local fishing grounds. In some locations, fishers themselves have selected leaders, who may be referred to as head or chief fishers, or as fisher group chair. Agreement at the local level on the delineation of which resources belong to each boma is needed, coupled with resource mapping. Across the Sudd, there are approximately 500 bomas controlling access to fishery resources. Fishers generally move between different fishing camps within the boma in which they reside, based on the presence of fish and floating vegetation. Fishing camps are mainly characterized by basic shelters lacking clean water supplies or health facilities; fishers' families typically remain in home villages where they can access schools. Although most fishers own mobile phones to facilitate communication with their customers, network connectivity remains limited in most fishing sites. There may be one or more initial landing sites in each boma, where the catch from individual fishing canoes (mostly dugouts with a few fiberglass canoes from previous fishery projects—photo 1.1) is aggregated for transport, often by motorboat, to the main landing sites on the Nile riverbank and in the Sudd, including Bor,[11] Malakal and Bentiu, Shambe in Lakes State, and Pariak and Malual-Agorbar in Jonglei. Facilities at the local level are rudimentary to nonexistent, with a few fish storage units in some locations to keep salt, fuel, and replacement fishing gear.[12] At the major landing and market sites, such as Bor and Juba, limited cold storage facilities are available.

Women's socioeconomic inclusion is limited in the fisheries sector. Women play an important role throughout the fisheries value chain, particularly in postharvest activities including sorting, processing, and retail marketing. However, key activities such as fishing, transport, and wholesale marketing are dominated by men; and few women hold a leadership or influential position. For instance, none of the 500 fishing camps in Bor County is headed by a woman. Of the 130 members of the Jonglei Fisheries and Traders Union and the 53 Ojekogoweh group members, no

[9] Source: FishBase (R. Froese and D. Pauly, eds.) "All fishes reported from Sudan (South) (landlocked)," accessed January 2024.

[10] Lake Victoria and the Lower Mekong Basin, both of which are multicountry fisheries with catchment populations numbering several tens of millions, have approximate annual fish production of around 1 and 2 million t, respectively.

[11] Bor takes in about half the catch from the swamps, representing almost one-third of total national production. Source: Food and Agriculture Organization of the United Nations, Fishery and Aquaculture Country Profiles: South Sudan web page, accessed November 2024.

[12] A USAID (2013, 9) fisheries project report notes that "It is not critical for fish storage buildings to be constructed for future programs. Storage can be rented in the major towns in the Sobat Corridor or in payam tukuls."

Photo 1.1 Fishing in the Nile River near Terekeka town, Central Equatoria State

Credit: © Albert Gonzalez Farran/FAO.

woman occupies a leadership position. As a result, women capture a much smaller fraction of fisheries revenues compared to men.

Assessments of fish catch remain ballpark estimates, but suggest South Sudan's fishery industry is perhaps under-exploited at the national level.[13] Combining earlier estimates of domestic fish consumption with estimates of exports based on the fieldwork for this study, the total annual catch is expected to be around 300,000 t (table 1.1); this is roughly in line with reported estimates of the catch of full-time fishers in each of South Sudan's 10 states (table 1.2). Although these are just indicative estimates, they suggest that rates of catch are likely to be broadly sustainable even in lower-flood years, and that biological production under current flood conditions may be considerably larger than the amounts fishers are able to exploit. Although there may be local impacts of stock depletion near urban centers or in areas where the security situation is more stable, observations from recent fieldwork and other studies suggest the fishery is not generally overexploited. These indicators of healthy fish stocks include good catch per unit effort, large net and body size, and no reports of declining trends (Benansio et al. 2021).

Fisheries are one of the most valuable renewable natural resources in South Sudan.[14] Assuming total annual landings of around 300,000 t and a typical first market price of fresh fish within South Sudan of around $1 per kg (£1,500 in mid-2023, when the majority of fieldwork was undertaken), the total local value of the catch may be estimated at at least $300 million. Although significant fish production occurs across much of the floodplain in high-flood years, the biggest single production area is the Sudd, accounting for perhaps two-thirds of the total catch. Major fish markets occur at the north (Malakal and Bentiu) and south (Bor) ends of the Sudd (map 1.7), from where fish is further transported

[13] There are no comprehensive catch assessment studies conducted in the country; existing fish yield estimates are largely based on data for the Sudan pre-independence.

[14] Value chain data presented here are based on estimates triangulated from key informant interviews, rather than systematic surveys or primary data collection. They should therefore be considered rough approximations.

Table 1.1 Estimates of South Sudan fish consumption and fish export

Consumption/export component	kt/year	Data source and comments
Consumption of fish in South Sudan	211.5	RSS 2016b: 17 kg/capita/year; population as per National Bureau of Statistics for 2023
Export of wet-salted/dried fish to Uganda/Democratic Republic of Congo from Jonglei State, Bor	25.3–67.5	Fresh fish equivalent; wet-salted and dried product; key informants: fish trader unions in Jonglei, Nimule border customs office
Export of fresh fish to Sudan from Upper Nile State[a]	0.8–8.4[a]	According to Upper Nile State Directorate of Fisheries: 200 t/quarter; key informants: 700 t/month
Export of sun-dried fish to Sudan from Unity State[a]	25[b]	Fresh fish equivalent; key informants: Munga port traders and port manager, Unity State
Export of fresh fish to Sudan by truck from Unity State[a]	2.34[b]	Key informants: Munga port traders and port manager, Unity State
Sum of consumption and export	265–315	Corresponds to 61–72 kg/ha/year in a normal flood year

Note: Fresh fish equivalent was calculated from wet-salted/sundried and sundried fish using a factor of 2.5. Some 4–10% of landed fish is lost to various causes of spoilage (FAO 2023). According to customs officials at Nimule, there is currently very little formal import of fish and fish products to South Sudan. It is estimated that informal imports and limited aquaculture contributes less than 2.5 kt.

a. Export volumes have been reduced due to conflict in Sudan.

b. Export paused due to conflict in Sudan.

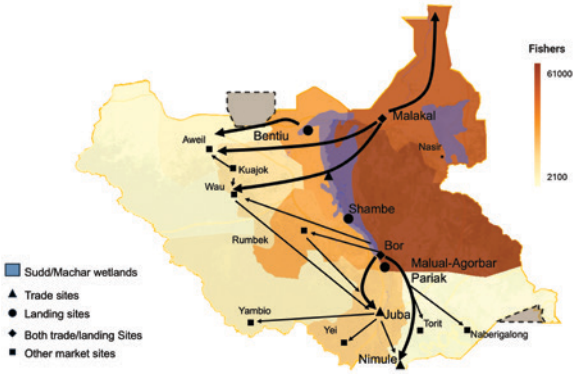
Table 1.2 Estimated total of fishers and primary fishers, and primary fishers' catch, by state

State	Population	% of fishers	Number of fishers	Number of primary fishers	Fish catch by primary fishers (t)
Central Equatorial	1,545,679	13	200,938	20,094	28,131
Eastern Equatorial	1,125,346	2	22,507	2,251	3,151
Jonglei	2,031,778	30	609,533	60,953	85,335
Lakes	1,209,754	24	290,341	29,034	40,648
Northern Bahr el Ghazal	935,156	7	65,461	6,546	9,165
Unity	1,123,634	28	314,618	31,462	44,047
Upper Nile	1,522,253	35	532,789	53,279	74,590
Warrap	1,248,033	12	149,764	14,976	20,967
Western Bahr el Ghazal	662,897	6	39,774	3,977	5,568
Western Equatorial	944,431	9	84,999	8,500	11,900
Total	12,348,961	18.7	2,310,723	231,072	323,501

Sources: FAO 2024; population as per National Bureau of Statistics for 2023; % of fishers as per Balli 2019.

Note: The number of primary (full-time) fishers is assumed to be 10% of the estimated number of total fishers, based on general estimates from key informant interviews.

Map 1.7 Estimated numbers of fishers by state and major fish trade flows



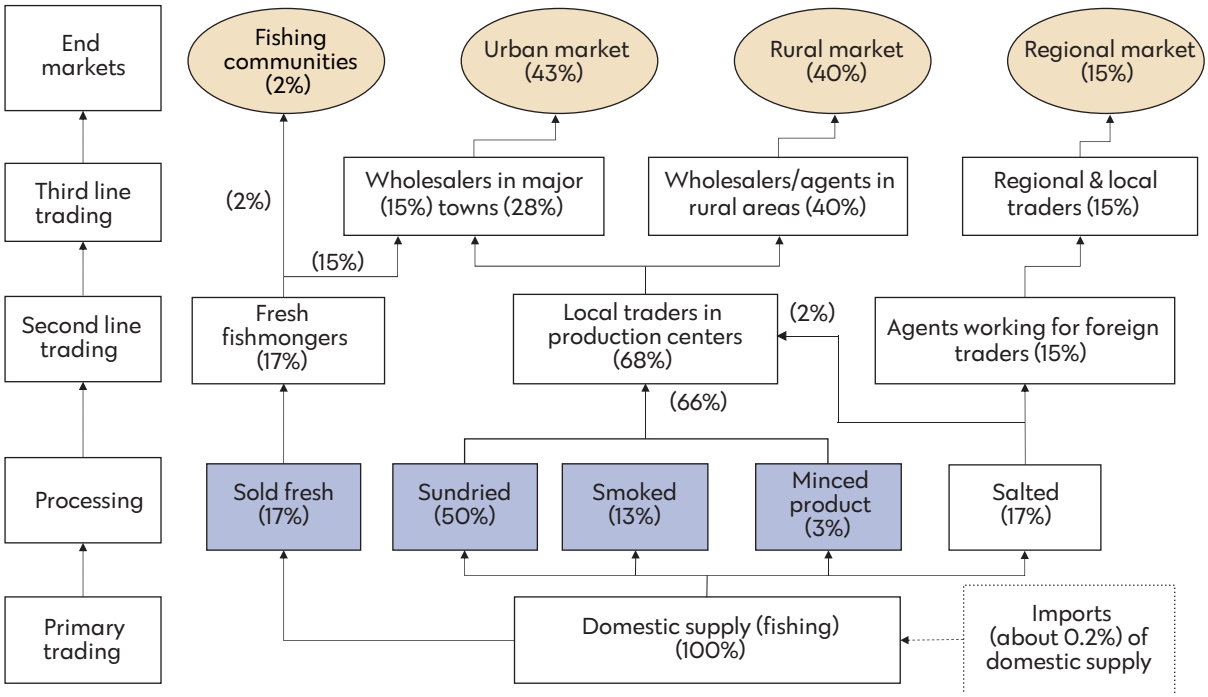
Source: FAO.

to the hinterlands, and north and south for export to Sudan and Uganda, respectively. Less than a fifth of the catch is consumed as fresh fish within fishing communities or urban centers with major fish markets (figure 1.2). A similar amount is exported as salted fish, of which the vast majority flows south from Bor and Juba to the Ugandan border at Nimule, from where it is transshipped to the Democratic Republic of Congo.[15] The largest portion of the catch (close to two-thirds) is sundried or smoked for sale in urban and rural markets within South Sudan.

Postharvest loss, including the opportunity cost of having to cure fish for preservation, reduces the overall value of the catch by over two-thirds. Physical losses (including discards) account for around 6 percent of the catch before first landing, and around 8 percent of the remainder at later stages of transport and processing (see table 1.3 for more detail). Around 24 percent of the landed value of the catch is also lost due to quality losses (i.e., having to sell products at a steep discount due to not being able to sell while in prime condition or damage during processing). Having to process fish by drying or curing represents a substantial opportunity cost to selling them fresh. Although the price per weight of processed fish is around 50 percent higher than fresh fish, around 60 percent of the fresh weight

[15] The balance of exports is likely to have changed considerably in recent years as the improved Juba–Bor road has facilitated southern trade, while the conflict in Sudan has restricted exports to the north.

Figure 1.1 Approximate physical transfers of products between actors, marketing networks and distribution channels



Source: FAO 2024.

Table 1.3 Physical and quality postharvest losses

	Cause of loss	% of catch[a]	Comments
Physical loss	Predators during fishing	4	Shallow fishing grounds characterized by large number of predators
	Spoiled during transport to land sites	2	Long soaking time and inefficiencies of nonmotorized canoes
	Rotten after failure to sell fish in its fresh condition	0.3	Fishers attempting to sell fish in fresh condition without ice
	Insect infestation particularly during storage	1.5	Use of insecticide as coping strategy (adulteration and toxicity)
	Theft during storage and marketing	0.8	Poor storage condition exacerbates fish loss problem
	Spoilage during distribution (e.g., breakdown or floods)—fresh fish	0.3	Short distances compared to markets for cured products
	Spoilage during distribution (e.g., breakdown or floods)—cured fish	1.5	Long distance exacerbated by poor and high cost of transport
	Spoilage due to prolonged storage	3.1	Lead time is unpredictable, forcing traders to stock large quantities
	Market malpractices including confiscation of fish	0.2	Includes confiscation of consignments of fish in export market
Quality loss	Quality loss of fresh fish at fishing-landing node, and when attempting to sell it in fresh condition without ice	20	% of landed value is lost due to underdeveloped cold chain storage
	Fragmentation and burnt (charring) during fish smoking process mainly due to using poorly constructed ovens	0.3	% of optimal value for smoked fishery product
	Fragmentation of smoked fish during distribution (transportation) mainly due to poor and high cost of transport	0.1	% of optimal value for smoked fishery product
	Spoilage due to inefficient sun drying process, especially during rainy season	3	% of optimal value for sun-dried product
	Spoilage occurring due to inefficient salting and drying process	0.3	% of optimal value for salted fishery product

Source: FAO 2024.

a. Based on equivalent fresh weight for physical loss and value of landed catch for quality loss.

is lost in the process, representing a net loss in value of around 40 percent; this translates to an overall cost of around 33 percent of the potential value of the landed fish. Hence, processing fish in South Sudan does not represent value addition, but rather a way of avoiding total loss of the roughly 83 percent of the landed catch that cannot be sold fresh due to the lack of cold chain infrastructure. The aggregate total postharvest loss, including this opportunity cost, comes to around 70 percent of the total potential value of the catch.

Fish is likely to be one of the largest non-oil exports from South Sudan, but much of the value is captured by foreign traders. Fish exports are not systematically reported, but are conservatively estimated at around 20,000 t per year (roughly 50,000 t fresh weight equivalent or one-sixth of total catch), based on reports of key informants from the Nimule crossing. The value of these exports at South Sudanese market prices would be in the order of $30 million; but in export markets, where prices for the equivalent cured fish products are typically at least double those in domestic

markets, that would rise to about $60 million. Little of this additional value is being captured by South Sudanese, however, as the export trade is dominated by Ugandan and Congolese traders.

Fishing is key to the livelihoods of more than one in six South Sudanese, makes a huge contribution to overall nutrition, and generates significant local government income. Roughly 17.3 percent of the total population (2.1 million people) are estimated to be members of households where at least one person is fishing (RSS 2016b), which implies around 300,000 fishers, assuming that the average household size in South Sudan is six to seven persons. This very roughly tallies with the indicative figures collected during the fieldwork that the total number of fishers is around 230,000, with some 10 percent of these full-time fishers (table 1.2). It is also a vital livelihood coping strategy for communities affected by flooding. In the states with the most productive fisheries (Upper Nile, Jonglei, and Unity), the proportion of the population engaged in the sector reaches 30 percent or more. The 2015 Comprehensive Agricultural Master Plan (CAMP) household surveys estimated mean per capita fish consumption at around 17 kg per year, or over 300 g per week (RSS 2016b). This is roughly equivalent to 60 g of pure protein per week, or 20 percent of average total protein and 46 percent of average animal protein consumption in South Sudan.[16] Micronutrients in fish play a key role in growth and cognitive development. The fisheries sector contributes 15–20 percent of government revenue at the state level (based on those states that provided estimates). The 18 percent general sales tax levied at the Nimule implies that this border post alone may generate the equivalent of several million dollars in federal government revenue.

Modest improvements in the management of the fisheries sector could potentially generate tens of millions of dollars in added value for South Sudan. The first priority is to reduce the extensive postharvest value loss, while improving understanding and management of fish resources at the local level. Postharvest loss currently accounts for around two-thirds of the annual local market value of the catch of roughly $300 million; reducing it by even just 20 percent—for example, through improved handling practices and cold chain storage facilities—could save tens of millions of dollars per year at current catch levels.

There is major long-term potential in expanding fish exports, predicated on improved fisheries resource science and management. If improved monitoring of fish stocks confirms that they are currently underexploited, then an increase in fish catch alongside reductions in postharvest loss could significantly increase the volume and value of overall production. Given the already high contribution of fisheries to domestic protein consumption, and the inaccessibility of large parts of the country, it is possible that (physically accessible) domestic demand for fish may not be able to expand much further in the near term, and therefore expansion of exports would be needed to accommodate increased production. In the short to medium term, expanding exports to regional markets (particularly the Democratic Republic of Congo, where demand is extensive) and capturing a greater share of export revenues are realistic goals. Improvements in handling and quality control are also needed to safeguard the export market, which fails to meet published but currently largely unenforced East African Community (EAC) standards. Doubling the volume of exports and capturing 50 percent of the value of export markups would grow the value of fish exports from perhaps around $30 million to something closer to $100 million per year. Longer term, there should also be opportunities to access higher-value intercontinental export markets that are already served by the Lake Victoria fishery, such as the Chinese market for swim bladders and the European market for frozen fish fillets. Ultimately, an ability to dramatically ramp up production and exports in high-flood years could generate much more substantial additional value in the sector, and enhance economic resilience to flooding at the national level. Achieving this sustainably would require significant investment in resource management and export value chain infrastructure—perhaps including multiuse cold storage facilities that

[16] Source: FAOSTAT, South Sudan—Food Security and Nutrition Indicators, accessed March 2024.

could switch between serving meat and fish exports as terrestrial and aquatic production fluctuate.

Forests

South Sudan has extensive forest cover, particularly in the western parts of the country, and the forests have globally unique ecosystem integrity and low deforestation. South Sudan's forest cover of some 30 percent of the national land area has been stable,[17] and forests are a carbon sink. However, deforestation hotspots exist locally.[18] Compared to some regional peers, natural forests in South Sudan are in comparatively good condition, largely thanks to low population pressure and inaccessibility. As a result, South Sudanese forests have exceptionally high ecosystem integrity and have been compared to some high-forest-cover tropical countries like Guyana, French Guiana, and Gabon in their forest quality (Grantham et al. 2020).[19] The national-level deforestation rate is estimated to be low and well below that of regional peers (table 1.4). There is anecdotal evidence that the natural forests still contain commercially valuable native species, which neighboring countries have largely lost.[20] Charcoal production is estimated to be the major driver of forest and tree cover loss and degradation, particularly around urban centers in Western Equatoria, Central Equatoria, and Eastern Equatoria States. Also, increased flooding has an impact on forests and woodlands. Dryland forests may die back if flooded frequently without time to recover. Improving the sustainable management and governance of South Sudan's forests could allow the country to avoid the same type of forest loss as neighboring countries have faced.

Table 1.4 Tree cover loss in South Sudan and neighboring countries, 2001–23

Country	% loss
South Sudan	1.2
Central African Republic	2.2
Congo, Democratic Republic	9.9
Ethiopia	4.2
Kenya	12.0
Sudan	1.7
Uganda	14.0

Source: Global Forest Watch website.

Note: Tree cover loss does not differentiate temporary loss of canopy cover from more permanent deforestation and does not fully capture forest regrowth.

Forest types and their threats differ from region to region, with the most dense and best-stocked forests found in the western parts of the country, particularly in the Northern Congolian forest-savanna mosaic, but also in the East Sudanian savanna ecoregions (map 1.8). The Northern Congolian forest-savanna mosaic covers vast areas of over 145,000 km^2 of the southwestern part of the country, which is the hilly land leading into the Democratic Republic of Congo and the Central African Republic. From a biodiversity conservation perspective, these forests are probably the most significant. Important tree species in these forests include African mahogany *Khaya senegalensis* and *Afzelia africana*—both listed as vulnerable in the International Union for Conservation of Nature's (IUCN's) Red List of Threatened Species.[21] These forests also support populations of a number of primate species, including the endangered eastern chimpanzee (*Pan troglodytes schweinfurthii*). Most of the natural hardwoods currently being used in

[17] Global Forest Watch reports South Sudan's forest cover to be as high as 59 percent, using a canopy cover threshold of 10 percent. South Sudan does not have a national forest definition and no national forest inventory has ever been done; further, overall data availability on its forests is poor. This report uses best available estimates, but notable uncertainty remains.

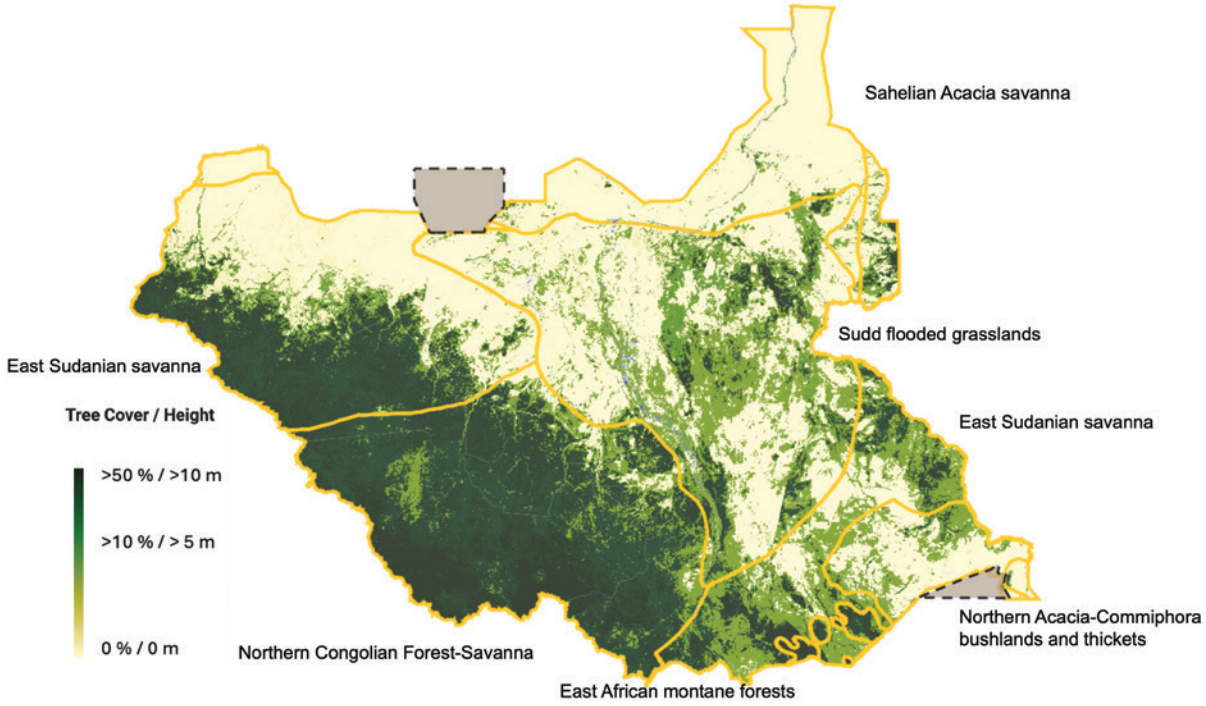
[18] Source: United Nations Environment Programme South Sudan Community Forestry web page, accessed February 2024.

[19] Forest integrity is the degree to which a system is free from anthropogenic modification of its structure, composition, and function.

[20] For example, White (2008) estimated the annual allowable cut for economically harvestable areas only in the Wau/Raja area of Western Bahr el Ghazal to be 449,725 m^3 (equivalent to 179,690 m^3 of sawn wood at a 40 percent sawn wood conversion rate), assuming a 60-year rotation or regeneration cycle.

[21] Source: IUCN Red List, accessed September 2024.

Map 1.8 Forest cover and tree height by ecoregion



Source: R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

South Sudan come from these unmanaged forests, and there is anecdotal evidence of considerable cross-border traffic in timber (Mimbugbe 2022). The East African montane forests are restricted to the Imatong Mountains and surrounding areas in the southeast of the country; they also extend their coverage to adjacent areas in northern Uganda. Very little information is available on the biodiversity supported by these forests, but at higher altitudes (above 1,500 m), they are thought to retain populations of mountain reedbuck (*Redunca fulvorufala*), listed as endangered in the IUCN Red List and known to be experiencing population declines across their range.[22] Other species of conservation interest include plum pine (*Podocarpus milanjianus*), the only source of coniferous timber in the country; and bamboo (*Bambusa vulgaris*). Bamboo trees are very large in size and can be good for commercial purposes (RSS 2018b). A survey of these forests by African Parks revealed that the only block that is intact is that of the Imatong, with about 40,000 ha of pristine forest—making it among the most intact large blocks of *Podocarpus* in Africa. The other forests to the east are highly degraded, except for one small patch of montane forest on the Boma Plateau that contains native or wild Arabica coffee; this is highly endangered, losing at least 20 percent of its area of just over 100 ha a year (Fay 2023; Krishnan et al. 2021).[23] An interesting subtype of forested landscapes is the savanna woodland recently derived from rainforests. It is a localized ecosystem found in higher-rainfall areas (>1,300 mm) along the Congo border and in some small patches of rainforest in other areas. These high-rainfall forests have experienced human-influenced degradation over the years (RSS 2018b).

Forests are largely natural, and they are mostly under community and other customary management (table 1.5). State-managed gazetted forest reserves constitute

[22] Source: IUCN Red List, Mountain Reedbuck, accessed September 2024.

[23] Krishnan et al. (2021) show that the Boma Plateau is part of a center of origin and natural distribution for Arabica coffee, as well as being genetically distinct from Ethiopian Arabica. This allows for the potential for crop improvement through selection and use in breeding programs.

Table 1.5 Forest types by management system and indicative sizes

Type of forest	Total area (km^2)	Comments
Gazetted government-managed forests and woodlands	19,500[a]	
Community/customary forests and woodlands	207,000[a]	Forests on communal/customary land (i.e., not gazetted as forest reserves) without systematic management
Government plantations	200–300[b]	Largely unmanaged; 3 active concession or harvesting contracts with private sector covering < 40 km^2
Smallholder forest plantations	22–50[b]	Average size of woodlots is 1–2 ha

a. RSS 2016b. Different documents provide somewhat different forest areas. For example, RSS (2018b), the national communication to the United Nations Framework Convention on Climate Change, gives a total forest area of 207,422 km^2, of which 3% (6,220 km^2) would be gazetted; plantations would be 1,900 km^2.

b. Consultant estimates from the background report.

a relatively small part of the forests. However, irrespective of the formal arrangements, there is little or no systematic forest management on the ground.

Forest products are critical to the livelihoods of the rural population, and wood-based fuels provide for some 96 percent of household energy used for cooking—86 percent fuelwood and 10 percent charcoal (RSS 2016a). Wild foods from forests and woodlands—fruits, honey, vegetables, nuts, and bushmeat—make significant contributions to dietary diversity and nutrition, and provide a sustainable source of protein and vitamins in local diets. Hunting and gathering of wild products from forests and woodlands is also a key coping strategy during food insecurity, while the strategies differ somewhat between states. Many forest products are also important sources of cash income, including poles, timber, fuelwood, and thatching; and nontimber forest products (NTFPs) such as shea, gum arabic, honey, and bushmeat. Traditional medicine remains important in South Sudanese society, with plant species such as *Aloe vera* (Sabbar) used to treat dermatitis; *Sclerocarya birrea* (Anacardiaceae) for glycemia control; *Aristolochia bracteolate* (Dekery-timylo) used against malaria and fever; *Calotropis procera* (Uhsahr) for treating cholera, asthma, and wounds; and *Vernonia kotschyana* against gastric ulcers (Lako et al. 2020).

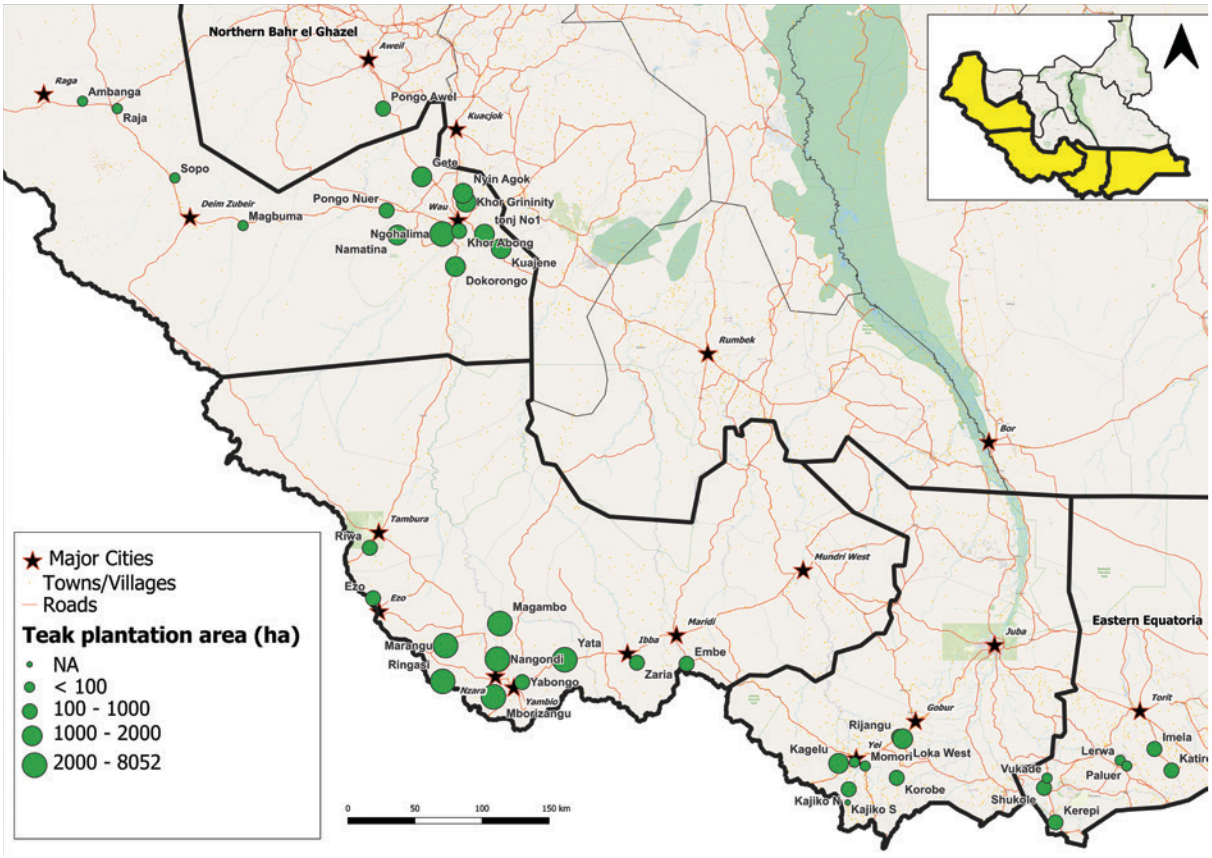
South Sudan had the oldest and most extensive teak (*Tectona grandis*) plantations in Africa, but after decades without proper management and of extensive uncontrolled harvesting, they are no longer a commercial resource. Most of the plantation sites can be found in the three Equatoria states and in Western Bahr el Ghazal. No comprehensive inventory has been carried out, and there is a general lack of reliable data on locations and conditions,[24] but it is estimated that there are only 20,000–30,000 ha of forest plantations remaining on government land. Map 1.9 presents an estimate of the location and size classification of the plantations as they were in 2008. Most government plantations are in a state of disrepair and are unmanaged, but unmanaged regrowth still provides some poor-quality teak that is used for local construction and small-scale domestic carpentry (photo 1.2).

There are 68 official forest reserves in South Sudan, although many of these reserves have never been actively managed for production or protection;[25] the long-term concession contract with the ETC is the sole exception in terms of plantation management. The Ministry of Environment and Forestry (MoEF) oversees three concession contracts with private entities, two of which are

[24] An attempt was made to do a satellite data-based assessment of the plantations, but differentiating plantations from natural forests without additional field data collection was not possible.

[25] This observation applies to the entire forest domain, except for ETC plantations in Western Equatoria.

Map 1.9 **Estimated location and size of teak plantations established (2008 data)**



Source: White 2008.

Photo 1.2 **Domestic trade in wood in Juba**

Credit: Indufor.

effectively harvesting concessions totaling less than 1,000 ha. The ETC concession is the only long-term, active plantation management enterprise. It covers around 3,000 ha of active plantation under a 20- to 25-year rotation, and harvesting in the oldest stands is scheduled for the early 2030s. The company has plans to double the plantation area to 5,000–6,000 ha. The total ETC concession area is close to 19,000 ha within four national forest reserves in Western Equatoria State. The contract includes both (1) forest management obligations for the active plantation areas, based on a management plan with reporting requirements to the MoEF; and (2) social obligations toward the surrounding communities. The ETC currently provides around 650 permanent jobs (30–40 percent held by women), which will increase when harvesting and processing starts. It also has corporate social responsibility investments including building schools, maintaining roads, and various other activities; and supporting local smallholder farmers with advice and teak and coffee seedlings. There are no specific management responsibilities for the natural forests found in the ETC's concession area outside the plantations themselves.

Smallholder private tree growers have established teak plantations, particularly in Western and Central Equatoria States and Western Bahr el Ghazal. Smallholder forestry covers all forest plantation management that involves private individuals and their families. The management may be on woodlots and/or plantations allocated on community land or leased on government land. A rough estimate of the area of smallholder forest plantations is 2,200–5,000 ha by 1,000 or more farmers.[26] Smallholder teak plantations are typically managed with a shorter rotation than traditional teak management. While the quality of plantation management varies and is generally low, smallholder plantations generally seem to be of better quality than unmanaged government forest plantations. The domestic use of wood from forest plantations is in the form of poles of various sizes for construction and small-scale logs for carpentry workshops. A rough estimate is that 2.5 million m^3 is harvested annually from forest plantations and natural forests for poles and timber; 75 percent of this could be estimated as illegal (box 1.1).

Statistics available from the MoEF and South Sudanese customs authority reveal discrepancies in trade volumes, and cross-checking the data suggests that all trade is not captured in the figures (Neumeister 2019). MoEF data are obtained from issuances of phytosanitary certificates and certificates of origin and include teak only. According to the data, the product is "logs or beams." Customs data include teak wood "in rough (customs code 4403)," which is mainly logs or beams. According to data from the MoEF, teak has been

Box 1.1 The challenge of assessing the level of illegal logging in South Sudan

Discussion of illegal logging in South Sudan is made problematic by the lack of any clear legal framework, and unclear roles and mandates between national and state authorities. This lack of a regulatory framework makes it difficult to distinguish between legal and illegal logging.

The formal custodian of the national forest reserves is the national government. Formally, only the national government has the right to allocate concessions and harvesting rights; in reality, state and local authorities also have been allocating these rights. This leads to legal ambiguity when loggers have a permit to harvest, even though the permit was issued by an institution that does not have a mandate to issue such permits.

Logging without any authorization (whether from national or state authorities) is clearly illegal. This is occurring at the moment—at least (as confirmed during study fieldwork) in Western Equatoria and Western Bahr el Ghazal—and is supplying poles and small, poor-quality logs to the domestic market.

[26] This estimate was made by the review team based on stakeholder expert opinions and should be treated with caution.

exported annually. In 2022–23, the trade balance in wood products was heavily negative, with sawn timber imports increasing tenfold, while the customs data did not record any exports. However, data from the Observatory of Economic Complexity indicate that sawn timber exports in South Sudan accounted for around $240,500 in 2022, with rough wood exports reaching $1.22 million.[27] The inconsistent and fluctuating trade data imply that the statistics are not presenting an accurate or complete picture. The Observatory of Economic Complexity also mentions reports that South Sudanese wood products have been—at least in the past—relabeled as coming from other countries in the region (e.g., Uganda) to avoid linking them to illegal and uncontrolled harvesting in the country.

Between 2001 and 2023, forests in South Sudan represented a net carbon sink of −36.9MtCO_2e/year.[28] If these credits were properly managed and verified, they could currently be worth around $250 million per year on voluntary markets.[29] However, South Sudan does not yet have a system in place to monetize these sinks through emission reduction transactions, though a National REDD+ Strategy and Action Plan have been prepared to facilitate future REDD+ implementation.[30] The country also lacks the necessary legal and regulatory framework and implementation capacity to engage in carbon trading under REDD+ schemes (Malok 2023).

In the long run, a restored teak plantation industry could generate close to $1 million per 1,000 ha, although significant shorter-term investment would be needed. Assuming a well-managed teak plantation estate, a rotation/cycle period of 25 years,[31] two commercial thinnings, a mean annual increment of 10 m^3 per ha, and average removals in the steady state of 200,000 m^3/year, the average annual cashflows in the steady state over five years would reach around $21 million from 25,000 ha of teak plantations. This implies that, if managed sustainably, government teak plantations could generate around $850,000 per 1,000 ha per year. They would also generate an average of around 150 jobs per 1,000 ha, based on the ETC's experience. Reaching this level of production would require notable investments to reestablish the plantation sector over a longer period of time. Restoring the old plantation sites would have no additional adverse environmental impact, as the sites have already been converted from natural vegetation.

Sustainable management of forest and woodland resources through community forestry could significantly contribute to rural development and community empowerment. It would offer wild food, construction materials, wood-based energy, and employment and income-generating opportunities to local communities including through exploitation of NTFPs. It could also provide significant carbon benefits by reducing the risk of forest degradation and deforestation. Were South Sudan to have a similar forest loss pathway as its neighbors, the projected greenhouse gas emissions due to deforestation and forest degradation between 2023 and 2030 could reach 22.0–29.5 MtCO_2e,[32] which could be avoided by introducing systematic natural forest management in South Sudan. Countries such as Tanzania,

[27] Source: Observatory of Economic Complexity, South Sudan: Sawn Timber Exports, accessed July 2024.

[28] South Sudan's Second Nationally Determined Contribution (NDC) strategies for a decarbonization pathway aim at increasing the country's sequestration potential by 2030 (MoEF 2021). As the NDC figures do not reflect the latest data, they are not displayed in the report.

[29] Assuming a price close to $7 per ton. Carbon prices have fluctuated considerably and are a small fraction of the social value of carbon.

[30] REDD+: Reducing emissions from deforestation and forest degradation in developing countries. See United Nations Climate Change, What is REDD+? web page.

[31] Teak has traditionally been managed in rotations of 80–100 years. However, the current rotation lengths have been shortened to 20 or 25 years for commercial wood production in most areas where teak is grown and managed.

[32] Estimated by comparing the currently low deforestation rate in South Sudan with regional peers. Under a business-as-usual scenario without improved forest management, South Sudan could well reach the forest and land use emission levels of neighboring Sudan, leading to emissions of between 22.1 and 29.5 MtCO2e. Authors' calculations based on data from Global Forest Watch, and Sudan's 2021 updated nationally determined contribution (Republic of the Sudan 2021).

Zambia, and Mozambique could offer good lessons, since the main objectives of community forestry in these countries are quite similar to those of South Sudan: enhancing community engagement in forest management, reducing rural poverty, and promoting forest resource conservation and sustainable management.

The potential for harvesting commercial timber from community forest vegetation on a sustainable basis exists in some locations, but cannot be quantified without inventory data. Previous studies indicate that some of the natural forests in South Sudan could be commercially harvested for timber—for example, mahogany (*Khaya* spp.). Different case studies have given varying information on the harvesting potential in natural forests.[33] An inventory to determine the commercial viability of timber from community forests is needed to assess the full economic potential of sustainable wood production.

The major commercial NTFPs have the potential to generate over $1 billion per year for community-managed forests. Important NTFPs include shea nut—locally known as "lulu"—fruits, fibers, grasses, honey, oils, resins and gums, along with sand, gravel, and forest soils. Key commercial NTFPs include the following:

- **Shea.** Shea (*Vitellaria paradoxa* ssp. *nilotica*) grows widely in South Sudan in an area referred to as the shea belt. Production potential is estimated at 500,000 t per year, with about 30,000 t consumed domestically. Average annual exports of 100,000 t could generate an average of between $460 and $720 million per year.
- **Gum arabic.** The three key gum arabic–producing states in South Sudan (Upper Nile, Northern Bahr el Ghazal, and Eastern Equatoria) have about 4,596,000 ha of gum acacia resources, with an estimated annual gum production potential of 25,700 MT. The potential export value could reach around $150 million.[34]
- **Honey value chain.** The annual production potential for honey in South Sudan is 100,000 t and 5,000 t of beeswax, which would be worth around $550 million.[35] If developed, the honey production in Western and Northern Bahr el Ghazal, Lakes, and Western Equatoria states could triple, from 9,611 to 28,833 t. This production capacity is half that of Ethiopia, a major producer of honey.
- **Bamboo value chain.** The potential annual production of bamboo in South Sudan could be $452,000, close to the one in Ethiopia (Indufor 2024).

Wildlife and tourism

South Sudan is extremely rich in biodiversity with a wide range of key habitats, species, and populations of conservation significance. Unfortunately, due to the long history of conflicts and security restrictions, there are significant gaps in the availability of robust and up-to-date biodiversity survey data. Much available information is now dated, and recent data are largely from aerial surveys which, by their nature, can only provide data on habitat quality and on larger, open-country inhabiting species that are visible from the air. Table 1.6 summarizes information on eight major protected areas that are believed to have significant biodiversity importance, and on which somewhat more information is available. The Key Biodiversity Areas (KBAs) partnership has identified around a dozen KBAs in South Sudan which largely occur within or around these major projected areas. These areas are recognized for their rich ecosystems, unique species, and critical habitats for endangered or threatened wildlife. They are primarily concentrated around wetlands, forests,

[33] For example, White (2008) and a 2012 MoEF survey in Torit County, Ifwoto Payam, under the Community Natural Forest Pilot Project funded by the United Nations Environment Programme.

[34] Source: World Integrated Trade Solution, Natural Gum Arabic exports by country in 2021, accessed July 2024.

[35] Authors' calculations based on prices for the main East African producers from IndexBox (2024a, 2024b), KNA (2022), and Koch and Appotive (2016).

Table 1.6 Overview of major protected areas in South Sudan

Characteristic	Boma NP/ BBJL East (KBA)	Southern NP (KBA)	Ez Zeraf Reserve/ Sudd Wetland (KBA)	Badingilo NP/BBJL West (KBA)	Lantoto NP	Imatong Forest Reserve (KBA)	Bangangai NP (KBA)	Nimule NP (KBA)
Approx. area	20,000 km^2	23,000 km^2	9,700 km^2	8,500 km^2	760 km^2	1,165 km^2	170 km^2	410 km^2
Establishment	1977 Sudanese govt	1939 Anglo-Egyptian Sudan	1939 Anglo-Egyptian Sudan	1986 Sudanese govt (pre-independence)	1986 Sudanese govt (pre-independence)	1952 Anglo-Egyptian Sudan	1939 Anglo-Egyptian Sudan	1954 Anglo-Egyptian Sudan
Purpose	Protects kob migration & significant wildlife populations	Protects savanna ecosystems & large mammals (elephant/ buffalo)	Protects Sudd wetlands & kob, elephant, hippopotamus, reptiles, birds, fish	Protects habitat of white-eared kob and other migratory species	Protects montane forests & endemic species	Protects montane podocarpus forest, endemic species	Protects forest species, particularly bongo antelope	Protects white rhinos & other wildlife species
States	Jonglei, Greater Pibor AA, Eastern Equatoria; borders Ethiopia's Gambella NP	Western Equatoria, Warrap, Lakes, Western Bahr el Ghazal	Jonglei, Upper Nile, Unity, Lakes	Central Equatoria, Eastern Equatoria (Greater Pibor AA & Jonglei), East of the Nile	Central Equatoria, Western Equatoria; borders Dem. Rep. of Congo	Eastern Equatoria; borders Uganda	Western Equatoria	Eastern Equatoria
Ecoregion	SFG, ESS, NAC VBFSM, EAMF	NCFSM	SFG	SFG, ESS	NCFSM	EAMF	NCFSM	NCFSM
Topography	West: floodplain; southeast: hills	Hills	Floodplain	Floodplain	Hills	Mountains	Hills/forest	Hills
Key wildlife species	Elephant, migratory antelopes, lion, hippopotamus, giraffe, wild dog, oryx, kudu, ostrich, cheetah, crocodile, vultures, etc.	Elephant, derby eland, roan, wild dog, buffalo, crocodile, hippopotamus, birds	Elephant, Nile lechwe, buffalo, sitatunga, hippopotamus, tiang, giraffe, shoebill, cranes, waterbirds, fish, reptiles	Elephant, migratory antelopes, buffalo, oryx, kudu, eland, cheetah, wild-dog, giraffe, ostrich, sitatunga, hippopotamus, tiang, birds, fish, reptiles	Forest elephant, chimpanzee, buffalo, Kodofan giraffe, primates, antelopes	Blue monkey, mountain reedbuck, giant bushbuck, black and white colobus, duikers, birdlife, reptiles	Bongo, buffalo, duiker, chimpanzee, monkeys	Elephant, buffalo, hippopotamus, migratory antelope, birds, reptiles
IUCN category	II park only, rest VI (official); VI (actual)	II (official & actual)	II (official); VI (actual)	II park only, rest VI (official); II park in part, rest VI (actual)	II (official & actual)	VI (official & actual)	II (official); VI (actual)	II (official & actual)
Conservation model	Conservation landscape with anchor PA	PA with protective buffer zones	Conservation landscape with anchor PA; Ramsar Site 2006	Conservation landscape with anchor PA	PA with protective buffer zones	PA with protective buffer zones	PA with protective buffer zones	PA with protective buffer zones

Note: AA = administrative area; EAMF = East African montane forest; ESS = East Sudanian savanna; NAC = Northern *Acacia-Commiphora*; NCFSM = North Congolian forest savanna mosaic; NP = national park; PA = protected area; SFG = Saharan flooded grasslands; VBFSM = Victoria Basin forest savanna mosaic. See table 1.7 for IUCN categories.

and national parks. Brief summaries of the KBAs not included in the table follow:

- **Ashana Wetlands**, located in Northern Bahr el Ghazal near the Sudan border, is a little-known wetland ecosystem that provides important habitat for bird species and supports local fisheries.
- **Juba** was designated an IUCN Category VI Game Reserve at the national level in 1939. It qualifies as a KBA of international significance for important bird and biodiversity areas and sits at the southwest corner of Badingilo National Park.
- **Kidepo Game Reserve** is located in southeastern South Sudan,adjacent to the border with Uganda and Kenya, and shares ecosystems with Kidepo Valley National Park in Uganda. Its wildlife populations have been hugely depleted, but there remains potential for restocking and recovery.
- **Lake Abiad** is 5,000 km², located in the northern part of Unity State, it qualifies as a KBA as it holds a significant proportion of the global population of the vulnerable black-crowned crane (*Balearica pavonina*) and shoebill (*Balaeniceps rex*), as well as other waterbirds.[36]

The establishment of South Sudan's protected areas during both colonial and post-independence eras aimed to conserve wildlife and habitats amid increasing human encroachment—and, more recently, to enhance community resilience and the sustainable use of natural resources. In all, South Sudan has 27 protected areas (table 1.7),[37] covering over 98,200 km²(15 percent) of total land area.[38]

[36] Source: Birdlife International Data Zone website, Important Bird Area factsheet: Lake Abiad (South Sudan).

[37] As per the 2003 Wildlife Conservation and National Parks Act.

[38] Source: World Database on Protected Areas, South Sudan Protected Area Profile, accessed September 2024. Some geographic locations have more than one designation—for example, as both a national park (a national designation) and a World Heritage site (an international designation). Such designations are counted as separate protected areas in the database, potentially inflating the total.

Table 1.7 South Sudan protected areas by IUCN category

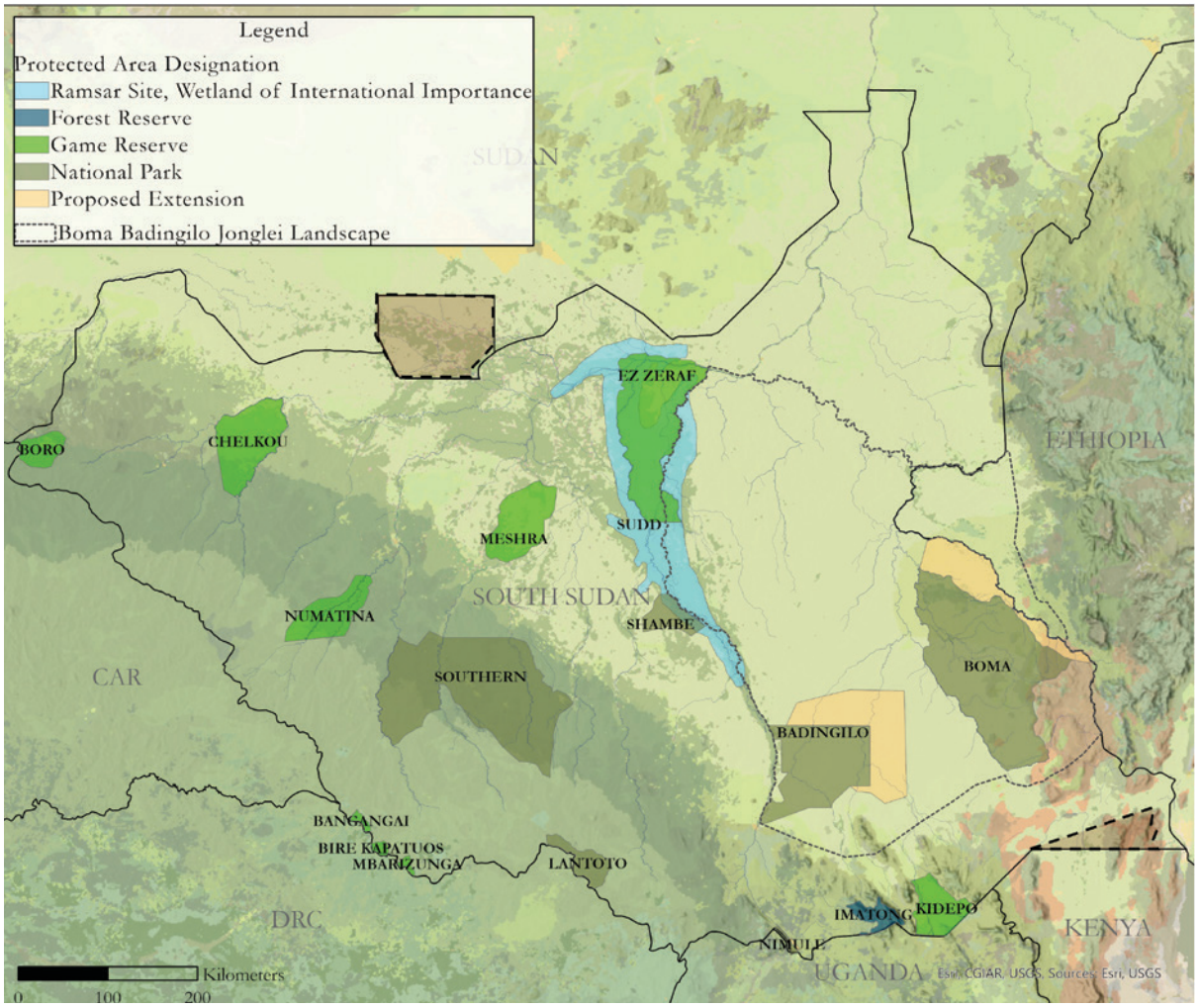
Category	No.	Description
VI	13	Protected area with sustainable use of natural resources
II	9	National park
IV	3	Habitat/species management
V	1	Protected landscape

Source: IUCN ESARO 2020.

However, most of these are typical "paper parks," with little active management on the ground, and without clearly defined boundaries (either legally described or physically demarcated) (IUCN ESARO 2020). Map 1.10 shows the major protected area network in South Sudan. During the colonial period, the purpose of creating protected areas was primarily to protect large mammals and maintain hunting grounds for colonial officials. The establishment of reserves like Ez Zeraf was part of broader efforts to manage and conserve wildlife resources, habitats, and biodiversity as well as to promote ecotourism in the Sudd wetland. After Sudan's independence in 1956 and South Sudan's independence in 2011, the focus shifted toward integrating conservation with sustainable development and local community involvement.

Most of the protected areas that exist in South Sudan, other than Southern and Nimule National Parks, were created with little regard to traditional land ownership or consultation. The 1939 National Parks, Sanctuaries and Reserves Regulations and 1965 amendment by the Anglo-Egyptian Sudan government set out the physical descriptions and boundaries for Southern National Park and Ez Zeraf Game Reserve, among others; and later, in 1952 and 1954, Imatong Forest Reserve and Nimule National Park, respectively. Between 1977 and 1986, as part of the National Game and Wildlife Protection Act of 1986, the Sudanese government gazetted Buma Reserve (which now forms two-thirds of the Boma National Park), Shambe National Park, and Badingeru National Park. Despite having physical descriptions validated in the early 1980s, no official documentation

Map 1.10 South Sudan's protected area network



Source: African Parks 2024.

Note: The protected areas shown are those with defined boundaries and conservation value, which account for about 60% of the country's total protected area system.

was found for the gazettement of Boma or Badingilo National Park.

Since independence, management and conservation efforts have been overseen by the Ministry of Wildlife Conservation and Tourism (MWCT), alongside international conservation organizations. Fauna and Flora International has been assisting the MWCT in managing Southern National Park and the Mbarizunga, Bire Kapatuos, and Bangangai Game Reserves in Western Equatoria; its total annual budget for these areas is around $1 million. Overall management on the ground would need to increase two- to three-fold for effective recovery of wildlife populations. The Enjojo Foundation has co-managed Kidepo Game Reserve and Lantoto National Park with the MWCT since 2022 and is finalizing a contract with the European Union to implement projects and a mentorship agreement with African Parks. The South Sudan Nature Conservation Organisation is an implementing partner in the Global Environment Facility project in the Badingilo National Park and is supported by the Swedish Cooperation. From 2007 to 2021, the Wildlife Conservation Society assisted the MWCT in managing the BBJL and eastern Southern National Park, spending over $70 million in combating illegal wildlife trade; supporting the MWCT in antipoaching efforts; conducting aerial surveys; and supporting park infrastructure development, personnel, and mission. Minimal engagement

between 2010 to 2021 led the MWCT to suspend the agreement. A 10-year memorandum of understanding was instead signed with African Parks in 2022 for the BBJL, including Boma and Badingilo National Parks. Operations began in 2023 with an investment of $5.5 million. African Parks has also signed an agreement for a cross-border activity between Gambella in Ethiopia and the BBJL in South Sudan; this is funded by the European Union for about $3 million. African Parks estimates that it would need a budget of over $50 million a year to implement a comprehensive conservation program and network of conservancies across the BBJL.

Overall, there has been around a 90 percent decline of large fauna across the country, despite vast remaining natural habitats and low human population densities. Evidence from national surveys and historical documentation indicates alarming declines in most large mammal species and populations as a result of unmanaged hunting (figure 1.2).[39] In Southern National Park, which has received international conservation assistance for over a decade, the majority of large mammals—if not already nationally extinct (like rhino)—have been reduced to around 1 percent of their 1980s levels (figure 1.2a). Large populations of over 60,000 buffalo (*Syncerus caffer aequinoctialis*) and 10,000 elephant (*Loxodonta africana*) (Boitani 1981) were locally extirpated by 2007. The proliferation of automatic weapons since the 1980s and the high prices of ivory and rhino horn have been the driving force behind significant declines in sedentary wildlife populations. Furthermore, the dependency on bushmeat as a key food source and decades of conflict have spurred the mismanagement of resources and illegal hunting activities. Throughout the protected area system, permanent waterholes, watercourses, and swamps are rare (the eastern boundary of the Sudd and the Jwom Swamp in the northern part of Boma National Park are the largest) and become dry-season refuges for many species. Yet throughout the landscape, wetlands and water sources are increasingly monopolized by humans, including permanent inhabitation by agropastoralists, squeezing wildlife into increasingly restricted safe zones with permanent water and little human disturbance. In recent times, four parts of western South Sudan saw an enormous influx of over 100,000 Mbororo cattle and Mbororo people who are becoming sedentary, burning land, killing wildlife, and degrading soils and rivers—as they have done in this ecoregion in the Central African Republic. These areas were not used by Nilotic herders in the past because of the prevalence of tsetse flies and trypanosomiasis, but habitation has become possible with the widespread use of ivermectin.[40] Various waves of, first Janjaweed in the 1980s and 1990s, next local commercial hunting, and now Mbororo, have not only eliminated the mega-herbivores, but well over 95 percent of the fauna since Watson's aerial surveys in the late 1970s. A similar influx of Mbororo is also occurring around the Machar marshes to the north of the BBJL.

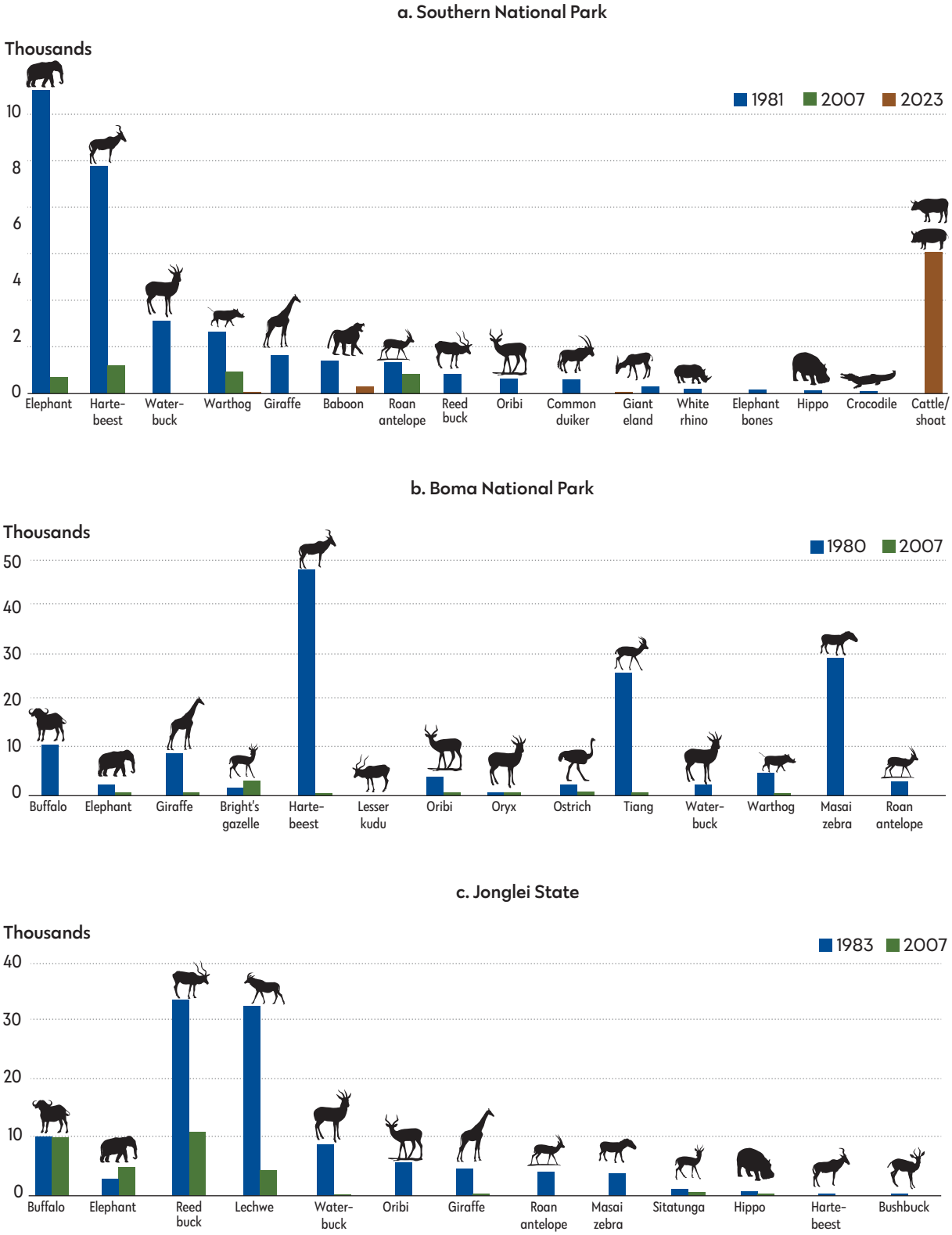
The one large-scale exception to the national picture of dramatic wildlife decline is the BBJL in the southeast of South Sudan. It borders the largest wetland in Africa and covers vast, ecologically pristine floodplains of over 150,000 km^2 in South Sudan, as well as a smaller area in Ethiopia, including Gambella National Park. The BBJL is an asset of global importance in terms of carbon sequestration, ecosystem services, water conservation, and biodiversity. Systematic aerial wildlife surveys completed in 2023—the first since that by Grossman et al. (2010)—revealed that the BBJL is home to the world's largest ungulate migration, with at least twice the population in the Serengeti, including the following species (figure 1.3):

- **Approximately 5 million white-eared kob (*Kobus kob leucotis*).** This places the white-eared kob (photo 1.3) as the most populous species of large ungulate on Earth. Kob cover an enormous area of ground from east of the Sudd in a circular pattern centered on the Pibor area, where they

[39] There has been no comprehensive survey of wildlife in South Sudan since that conducted by Murray Watson in 1975–76 (referenced in World Bank 1979). Several partial surveys were conducted in important areas in the 1980s and then in 2007–10; other surveys were done between 2010 and 2015.

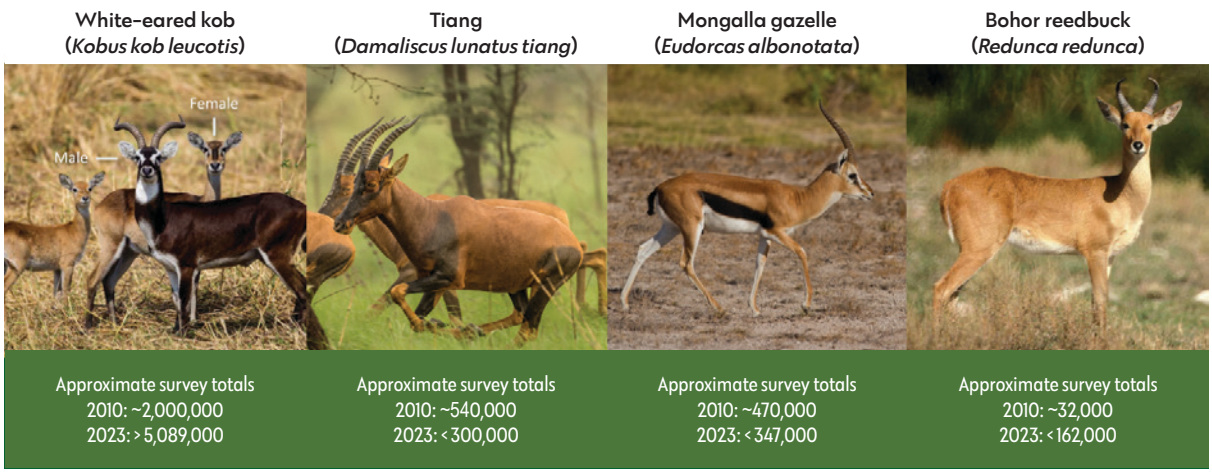
[40] Source: African Parks, field observation.

Figure 1.2 **Indicative declines of wildlife in select areas across South Sudan**



Source: African Parks 2024; from aerial surveys conducted of Southern National Park (Boitani 1981; Fay et al. 2007; and by Fauna and Flora International in 2023), Boma National Park (Fryxell 1980a, 1980b: and Fay et al. 2007), and Jonglei State (Cobb and Mefit-Babtie 1983; Fay et al. 2007). Note that the 2023 survey was not a complete systematic reconnaissance flight, but covered only the west and southern end of the east of the park.

Figure 1.3 Migratory antelope



Source: African Parks 2024.

Photo 1.3 Kob migration in southeast Badingilo National Park and adjacent areas

Credit: Katherine Alvarez, African Parks, 2024.

are absent, with a major concentration to the northeast, north of Akobo and up to the Sobat River. The major pocket of white-eared kob found between Waat–Akobo and to the Sobat River was previously unknown.

- **Approximately 350,000 mongalla gazelle (*Eudorcas albonotata*).** There are major concentrations from east of Badingilo National Park to the area west of Marawa and Kassangor in Boma National Park. The northeastern sector of the survey areas was more or less empty of mongalla gazelle as they prefer the drier habitats.
- **Approximately 300,000 tiang (*Damaliscus lunatus tiang*).** The tiang is predominantly concentrated

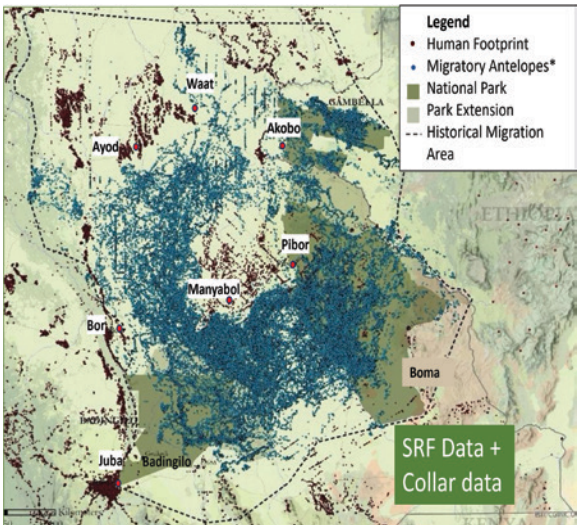
in areas with green grass in the plains north of the Bor–Pibor road. Only a single sighting was made in the northern area; there were sporadic small groups in Boma National Park, mostly in the south. There were no tiang within the major concentration of kob between Waat–Akobo and the Sobat River.

- **Approximately 160,000 bohor reedbuck (*Redunca redunca*).** The reedbuck is mainly concentrated in southeast Badingilo National Park and adjacent areas outside the park. In addition, there are pockets in the southeast of Boma National Park and lower numbers along the east side of the Sudd flood areas. The northeast of the BBJL was void of reedbuck.

Even in the BBJL, however, wildlife populations have not been immune from human impacts. Comparisons between Fay et al. (2007) and Grossman et al. (2010) indicate that the white-eared kob population has significantly increased since those studies, while other species have either stayed relatively stable or declined. A comparison with surveys done by Fryxell (1980a, 1980b) and Cobb and Mefit-Babtie (1983) show that despite the huge numbers of main species of migratory antelope, there have also been catastrophic declines of most sedentary species (see figure 1.2b and 1.2c).

Ungulate migrations in the BBJL follow general annual patterns, but also adapt to changing patterns of water availability and human activity. Collaring helped depict the movements of the main antelope species, elephants, and predators in the landscape. The antelope species migrate in different seasonal patterns, while adapting to local conditions and avoiding human activity—forming an overall donut-shaped distribution around the Pibor–Manyabol population center, and including Boma, Badingilo, and Jonglei, with a small portion also going into Gambella National Park in Ethiopia (map 1.11 and map 1.12). Of the 58 collared white-eared kob, 21 (36 percent) traveled more than 2,000 km in 12 months. The 10 most-traveled kob ranged from 2,188 to 2,742 km. Dry season activity is noticeably more concentrated around perennial waterways. Data from reconnaissance flights done

Map 1.11 Antelope migration, human settlements



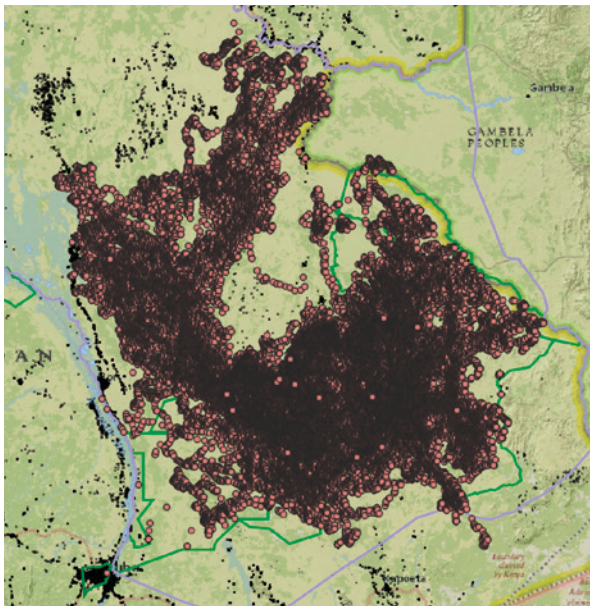
Source: African Parks 2024.

between October 2022 to September 2023 showed basically the same spatial distribution of white-eared kob, tiang, reedbuck, and gazelle except that there were higher concentrations of tiang along the Lotilla River at the height of the dry season, with the major concentrations in the central north; there were more reedbuck at the western side of Badingilo National Park in the wet season; and there were concentrations of mongalla gazelle along the eastern side of the Marawa Hills in Boma National Park in the wet season.

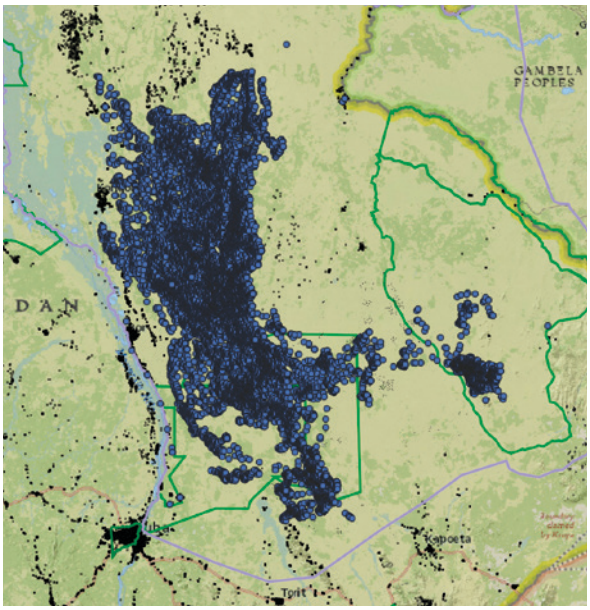
The BBJL migration also supports important predator populations (map 1.13). Current data for lions (*Panthera leo*) and cheetahs (*Acinonyx jubatus*) in the BBJL are limited. Between October 2022 and March 2024, lions were observed over 40 times and cheetahs 10 times on flights covering less than 5 percent of the landscape. These observations suggest several hundred lions and over 100 cheetahs remain in the landscape. Targeted hunting for ceremonial purposes and cases of lion snaring have been reported, but overall lions pose a low threat to livestock and are rarely poisoned. The highest remaining populations of elephant, buffalo, and giraffe (*Giraffa camelopardalis camelopardalis*) remaining in the BBJL were found during the dry season in and south of Gambella National Park—confirming the need for transboundary planning and management.

Map 1.12 Migration patterns of antelope species observed in 2023–24

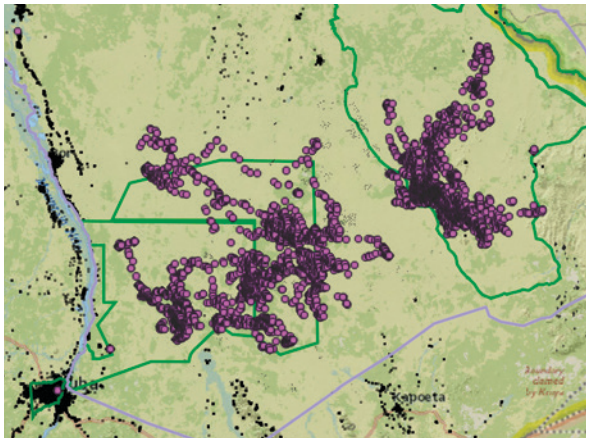
a. White-eared kob: north in dry season, south in wet



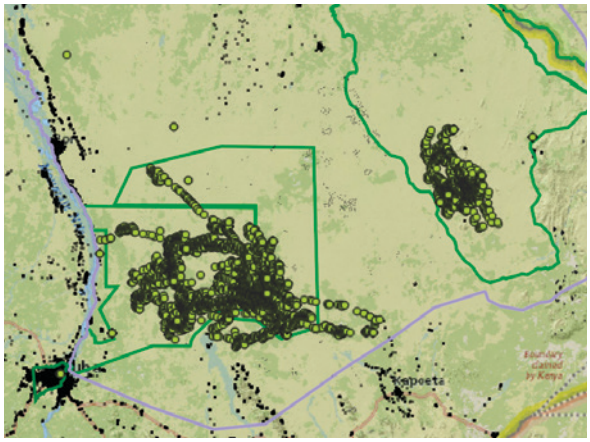
b. Tiang: north in dry season, south in wet



c. Mongalla gazelle: northwest and northeast in dry season, southeast and south in wet



d. Reedbuck: northwest and north in dry season; southeast and south in wet



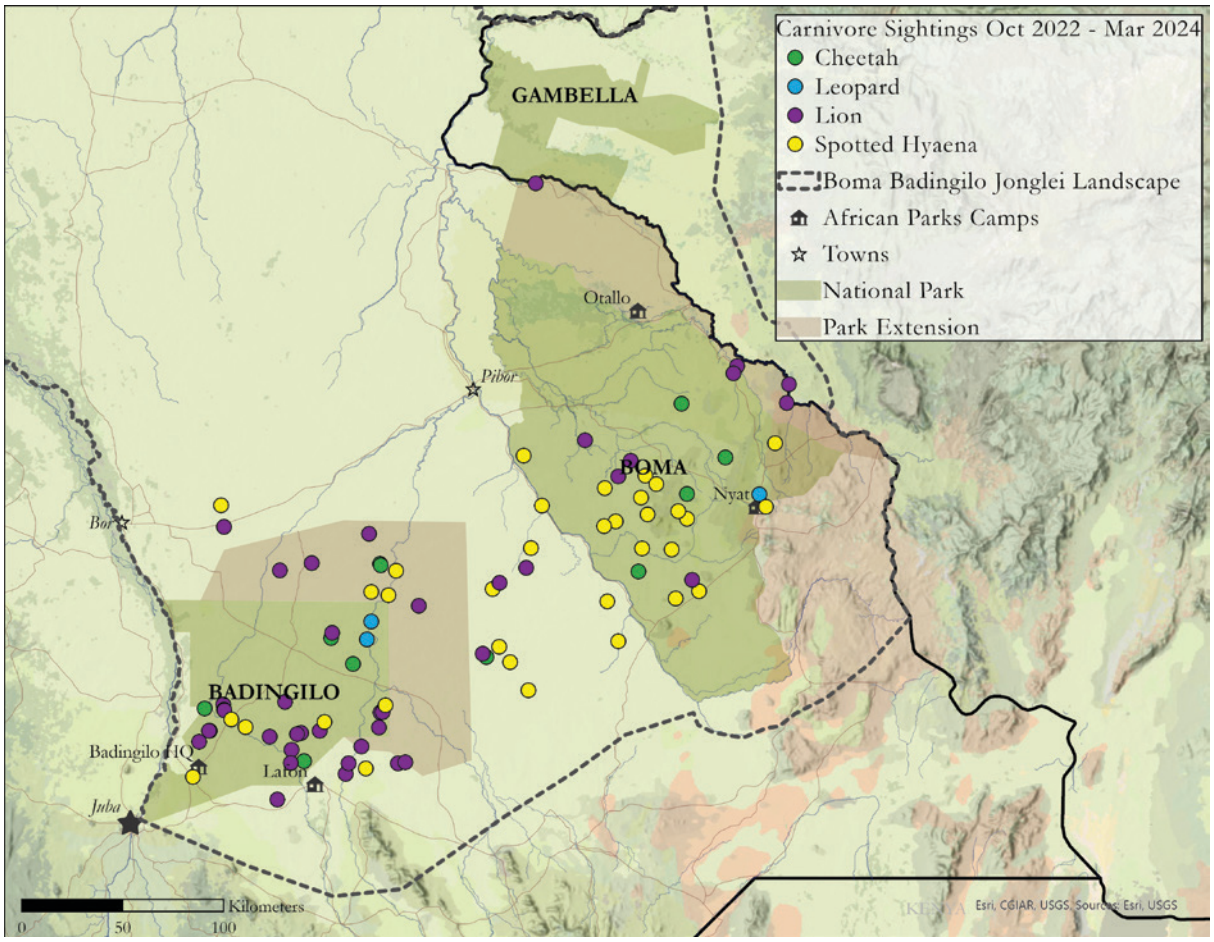
Source: African Parks 2024; based on collaring data.

The BBJL and the Sudd form an extremely important landscape for large birds. Although not systematically surveyed, observations reveal some of most abundant populations of large birds in Africa, including massive populations of several storks, cranes, herons, and vultures, with large nesting colonies of Ruppell's vulture (*Gyps rueppellii*). The Sudd supports the world's largest population of shoebill—a vulnerable species at risk of extinction[41]—estimated at least 3,800, compared to the previous global population estimate of only between 3,300 and 5,300 mature individuals left in the wild, with populations on the decline (Fay et al. 2007; Grossman et al. 2010; Stuart, Adams, and Jenkins 1990). It is also an important zone for many Palearctic migrants.

Human population remains sparse in the BBJL, at around six to seven persons per km², but is dynamic and has been strongly influenced by conflict. Around 1 million people inhabit the BBJL, with a slightly larger population on its periphery within South Sudan. Human occupancy is concentrated around larger towns such as Juba, Bor, between Manyabol and Pibor, Akobo, and between Ayod and Waat; and has historically been

[41] Source: Birdlife International Shoebills web page, accessed November 2024.

Map 1.13 Large predators observed during the 2023 systematic reconnaissance and Recce flights



Source: African Parks 2024.

divided in tribal homelands. The Murle, Dinka, Nuer, Anyuak, Jie, Kachipo, Toposa, Mundari, Pari Lopit, Bari, and Mundari peoples are the principal inhabitants of the landscape, each with their own lands. Over time, the boundaries of these tribal lands shift because of competition between the tribes and the impacts of civil war. This competition is manifested in raids that are often justified as counterattacks for previous raids and revolve around the acquisition of cattle and sometimes people; they occasionally result in an actual shift of human settlement with one tribe replacing another (2023 and 2024 have seen many of these raids). Major shifts in tribal distribution have occurred in the past 40 years, with massive movement of both fighters into the bush and displacement of civilians to other areas of the country or outside the country. Most of the people in the BBJL are agropastoralists with traditional grazing sites and movements. Virtually the whole landscape is actively burned by humans, sometimes more than once in the year. All the tribes depend on the natural vegetation and fauna for a large percentage of their subsistence, and tribes hunt and consume wildlife meat as a main source of animal protein using traditional methods and, more recently, automated weapons.

The wildlife abundance in the BBJL appears to be the exception that proves the rule. Although the overall human presence in the landscape appears to be very low, it is clear from the dramatic decreases in the abundance of many sedentary species that the region is not exempt from the hunting pressures that have affected the rest of the country. It is the high mobility of the migratory ungulate species, along with the predators that track both them and large bird populations, that allows them to continue to thrive by avoiding concentrated hunting pressure.

Specifically, the ability of these species to move long distances between water points has allowed them to avoid being trapped and easily located around limited dry season water points. This dependence on mobility, however, does make them vulnerable to future landscape-level changes. In particular, the recent construction of the Juba–Bor highway has cut herds off from the east bank of the Nile, shifting the western edge of their area of occupancy to around 40 km east of the road. Without robust management of hunting pressure, future road development within the landscape would likely be devastating for the remaining large mammal populations.

Millions of South Sudanese depend on South Sudan's natural habitats for their livelihoods, but direct financial revenues are very small. Agropastoralists rely on the natural vegetation to feed their flocks and on the consumption of wildlife as a main source of meat. More broadly, the hydrological and climate systems on which all agropastoral livelihoods depend are regulated by the country's vast natural habitats, with the Sudd at their center. Although there is no systematic valuation of South Sudan's ecosystems, some initial estimates have valued the Sudd's ecosystem services at around $2.3 billion per year, mostly from regulatory services (table 1.8). Direct financial flows from biodiversity and wildlife are very small, however. Although significant profits were undoubtedly made from commercial poaching of wildlife in the past—including high-value products like ivory and rhino horn—this rapidly depleted populations on which tribal communities depend without returning value to them. Tourism within South Sudan remains nascent, with a handful of local companies running a total of 200 short tours per year. Most of these involve short excursions to visit tribes close to Juba, but visits to Boma, Badingilo, the Nile River/Sudd, the Imatong Mountains, or Boya hills are also possible. In the absence of suitable infrastructure, wildlife viewing opportunities are very limited, other than a few ultra-high-end helicopter tours run by African Parks, largely as a demonstration activity with its donors.

The potential for sustainable extractive use is considerable. In the BBJL alone, well-managed harvesting of the current migratory antelope populations could provide for a sustainable offtake amounting to around $61 million, assuming a 12 percent annual growth rate. If additional sedentary species such as elephant, giraffe, buffalo, zebra, hartebeest, roan, or others could be recovered to the levels of the 1980s, the overall offtake could potentially increase by between 10 and 20 percent. Much of this production would be consumed primarily locally, but opportunities to market sustainable bushmeat are also available.

Any longer-term potential for nature-based tourism is vast if security conditions were to improve. South Sudan has some of the most outstanding potential tourism assets in the world—vast and beautiful landscapes supporting traditional tribal lifestyles and the largest mammal migration on the planet, with ample opportunities to further enrich wildlife populations; and one of the world's largest wetlands supporting globally outstanding bird populations. Connectivity to regional transport hubs and tourist destinations is good, and there are also opportunities for transboundary tourism from Uganda. There may already be opportunities to develop high-end fly-in tented camps in remote locations where security can be managed. If security improves, South Sudan's long-term potential could compare to Kenya, Tanzania, and Uganda, where the tourism sector has in recent years contributed between 6.9 and 11.1 percent of GDP in recent years. For example, in 2024, tourism in Tanzania has recovered from the negative impacts of the COVID-19 pandemic, contributing an estimated $8.15 billion, or 10 percent of the economy, and is projected to grow to about $12.4 billion over the next decade (WTTC 2024c). Furthermore, in 2023, the sector employed over 4 percent (Uganda), 5.7 percent (Tanzania), and 7.8 percent (Kenya) of the total workforce, showing almost a full recovery to pre-pandemic levels (WTTC 2024d, 2024b, 2024a). Table 1.9 shows the actual tourism numbers for 2024 versus the growth potential in just two years.

Table 1.8 Annual economic value of the direct and indirect uses of the Sudd wetland

Ecosystem service	Indicator	Size (ha) or pop.	Unit value	Income adjustment	Total value ($)
Direct use					**209,835,721**
Crop	Value of crop produced per year	131,112	347	1	45,445,471
Fish	Value of fish harvested per year	89,352	116	1.21[a]	12,541,562
Papyrus	Value of papyrus harvested from the wetland	480,965	21	0.58[b]	6,016,239
Papyrus crafts	Value of mats and crafts made of papyrus	480,965	53	0.58	14,793,777
Domestic water supply	Value of water supplied to households	160,000	39	0.58	3,623,028
Livestock watering	Value of water consumed by livestock	1,786,336	32[c]	0.58	33,459,772
Livestock grazing	Value of livestock grazing	1,786,336	80.4	0.58	83,649,431
Fuelwood	Value of fuelwood collected from the wetland	264,168	3	0.23[d]	191,970
Natural medicine	Value of natural medicine from the wetland	2,985,750	1	1	2,627,460
Charcoal	Value of charcoal from the wetland	5,000	904.2[e]	1	4,521,074
Vegetation	Value of vegetation (reeds, bamboo)	1,141,263	1	1.21	1,153,032
Mulch	Value of grass for mulching from the wetland	16,920	154	0.58	1,519,516
Transportation services	Value of transportation using the open water of the wetland	89,352	3	1.21	293,389
Indirect use					**2,130,433,924**
Microclimate regulation	Value of microclimate regulation service of the wetland	3,075,102	292	0.58	522,735,961
Flood control	Value of flood-controlling service of the wetland	3,075,102	798	0.58	682,553,940
Water regulation	Value of water regulation service of the wetland	3,075,102	33	0.58	59,177,656
Habitat/refugia	Value of habitat/refugia service of the wetland	3,075,102	484	0.58	865,966,366
Direct and indirect use					**2,340,269,645**

Sources: Adapted from Kakuru, Turyahabwe, and Mugisha 2013; Mulatu and Tadesse 2020; and Mulatu et al. 2022.

a. GDP per capita adjustment with Malawi (2015).

b. GDP per capita adjustment with Uganda (2015).

c. Unit value: 2 20 l jerrican used per livestock per day (i.e., 730 per year) and $0.04 per jerrican.

d. GDP per capita adjustment with Nigeria (2015).

e. Unit value: kg of charcoal sack. Each household can process 0.27 50 kg sack of charcoal per week.

Table 1.9 Approximate tourism numbers versus estimated near-term growth potential in major protected areas

Tourism	Badingilo NP/BBJL West	Ez Zeraf Game Reserve/Sudd Wetland	Nimule NP	Imatong Forest Reserve	Boma NP/BBJL East	Lantoto NP	Bangangai NP	Southern NP
Actual (2024)	500	500	200	100	50	0	0	0
Possible (2026)	1,500	1,000	1,500	1,000	1,000	0	0	0

Source: Information from tour operators and African Parks.

Note: NP = national park.

Barriers to realizing potentials

The central issue in all three sectors is a lack of active and legally institutionalized natural resource management systems, leaving a high degree of open access to resources. Traditional resource management systems—based on tribal claims to exclusive territories, customary laws, and cultural practices—influence which species are hunted, and in some cases also limit seasonal and spatial patterns of resource use (NRC 2012). The maintenance of tribal territories, and low levels of human activity in the buffer zones between them, may well have played a key role in maintaining the wildlife populations of the BBJL. However, large-scale armed conflict, widespread displacement and urbanization driven by both conflict and climate shocks, and wider societal and technological change have weakened traditional authorities. Tribal claims to land and resources may be overridden or contested, becoming a source of further conflict and instability. Customary systems also tend to struggle to effectively manage resources that are highly mobile (i.e., that are not contained within the area of one community or tribal group) or that are exploited commercially rather than for subsistence. As a result, high-value resources—including teak plantations and much wildlife—have been severely depleted, and other resources whose abundance currently outstrips local demand are inefficiently exploited. As South Sudan completes its transition from a largely tribal society to a modern state, the role of traditional authorities and the rights of individuals need to be formalized to provide for secure tenure and investment in natural resource management.

Governance frameworks

Framework laws exist in some areas, but often lack detailed implementing legislation and contain inconsistencies. There is no definitive national environmental legislation, but draft documents exist including the 2015–25 National Environment Policy and the 2014 Environmental Protection and Management Bill, which outline a framework for managing environmental risks, but await budget allocation and implementation.

The Land Act of 2009 governs all land types in South Sudan. Communities can register their land in the community's name; or under a traditional leader acting as trustee; or under a clan, family, or community association. Once registered, individual community members may claim individual land rights within the community land area (SSLC 2011). Private land ownership is more common in urban centers like Juba, Malakal, Wau, and Bor where land is demarcated and registered under statutory law. Land for commercial farming and commercial and industrial zones may be privately owned (e.g., specialized economic zones in Juba and Terekeka, Central Equatoria State and Renk, and Upper Nile State); however, private investment remains extremely limited (US Department of State 2021). Protected areas are designated as state or public land, but ethnic groups may still inhabit them. Government

may also designate public land for infrastructure or other projects, including private concession agreements on public land (e.g., the ETC).

Establishing formal land tenure and completing land transactions remains challenging, and communities lack formal recognition of land and resource rights, especially for women. These challenges are exacerbated by overlapping claims, lack of documentation, inadequate land registration systems, and weak legal frameworks and enforcement. These conditions lead to minimal incentives for long-term management, heightened political and ethnic conflicts over land disputes, and risks of appropriation and land grabs. Inconsistencies exist between land laws and customary land tenure systems. For example, the 2009 Land Act allows land leases of up to 99 years, while the 2009 Investment Promotion Act restricts leases to 30–60 years (Water Journalists Africa 2019). The Draft National Land Policy of 2023 proposes new measures to strengthen land administration, including developing a Community Land Act, harmonization with environmental and forest sector laws, and inclusion of cross-cutting priorities such as gender equality. There remains a need to clarify the roles of government and customary institutions when rights overlap.

The 2015 CAMP outlines a 25-year investment framework with 110 projects for South Sudan's crop, livestock, forestry, and fisheries subsectors, but it remains largely unimplemented. The CAMP lays out putative investments to improve rangeland and livestock management, land tenure, conflict resolution, water infrastructure, and crop production (RSS 2016b). It also envisages new quality standards for fish and increased value addition for timber products. Meeting CAMP production targets would require $200 million of public investment to catalyze an estimated total $1.15 billion investment (African Development Bank Group 2023). But private sector investment in agribusiness and natural resources is hindered by a poor enabling environment and a lack of investment finance.

A fisheries policy is being finalized, but will need to be complemented by additional steps. The current white paper provides for the adoption and implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (FAO 2015). A centralized regulatory framework cannot capture the diversity in small-scale fishers across the country, requiring local fisheries regulations that respond to fishers' needs and build on traditional tenure systems. Fisheries exports are threatened by the lack of any quality control systems or competent authority to certify exports—making it difficult for local traders to comply with EAC regulations and increasing the risk of loads being confiscated or trade entirely shut down.

The 2015 Forest Policy recognizes the importance of sustainable management and community participation, but has not been approved by the legislature and remains largely unimplemented. State governments have been given a mandate by the Forest Policy to provide technical support, supervise community forestry, and enforce community forestry laws and regulations. The policy provides for delineating community forests on community land at the boma and payam government levels and encourages the improvement of forestry extension services at the local level. Staffing at all levels of government is low, and many states and counties do not have vehicles and equipment to facilitate mobility for supervision and monitoring. The policy supports private sector participation, but does not cover biodiversity protection and climate change (i.e., potential mitigation and carbon trade, and adaptation measures). According to the policy, afforestation efforts on public land are to be promoted through "replacing low-production natural wood vegetation with well-managed and highly productive plantations efforts." Although the need for environmental impact assessment and ensuring biodiversity conservation is recognized, the policy presents a risk of promoting forest conversion with adverse biodiversity impact.

The Forest Bill (2023) is in an advanced draft, but has not been enacted. The bill establishes the South Sudan Forest Authority (SSFA) to manage government forest reserves, including plantations. It also defines the powers and functions of the MoEF and the SSFA, but some mandates are overlapping and remain

unclear. The SSFA is to be responsible for the "protection, conservation and sustainable management of all forests and woodlands in South Sudan." However, the Forest Policy grants local governments the power to establish county forest reserves.[42] The bill implies that such reserves may also be under the management of the SSFA ("other forest reserves"); however, according to the Local Government Act, they would be managed by local government. The authority of the SSFA over forests on nonpublic land—including private plantations—needs clarification. There are no current regulations on private sector engagement in managing government forest plantations. The first draft guidelines for forest concessions were developed in 2011, but lack sufficient detail for planning and implementation.[43] While the draft Forest Bill states that the SSFA may enter into management agreements with an agency, it does not include sufficient detail to regulate private sector engagement in the management of government plantations (table 1.10) or stipulate that such regulations shall be developed in subsidiary legislation. The bill also provides for community forest management (CFM), but does not clearly define it. It promotes three forms of CFM—community-based, participatory, and collaborative—but does not provide definitions for these or explain their differences. It also introduces community forestry associations, but does not define their structure, objectives, or functions. In principle, the SSFA would aim to reach an agreement with the community forestry associations on co-management of forest resources at the local level. The bill promotes benefit sharing with communities as crucial for CFM, but provides no guidance. Neither the Forest Bill nor policy articulate the rights and responsibilities that should be devolved to communities in community forestry. Experiences in other countries show the importance of having these rights and responsibilities clearly defined in relevant legislation (box 1.2).

The Wildlife Conservation and Protected Areas Bill (2023) is before parliament, but does not define boundaries for protected areas, or a clear process for their legal establishment. It provides for landscape planning for migratory species and creating community conservancies outside of protected areas, but does not allow people—including indigenous communities—to use or reside in national parks or game reserves, despite their long-standing presence in some protected areas (e.g., Boma, Kidepo, Ez Zeraf, and Shambe). Furthermore, there is a lack of clear statutes on hunting: it states that conservancies can only hunt Appendix III species, yet most targeted wildlife species are in Appendix II.[44] Adjustments to the listed protected species and penalties for infractions should be made. Preserving large mammal populations outside protected areas, particularly in the BBJL, would require comprehensive management and legal frameworks, including the legal and institutional basis for community conservancies.

The Tourism Bill (2024) and policy were recently passed by parliament and are awaiting being signed into law. The bill provides the legal basis for developing tourism and establishing a directorate of tourism responsible for preparing and implementing a national tourism strategy. The directorate's main powers and functions include formulating guidelines for tourism development, setting standards, issuing licenses, developing criteria for classifying tourism facilities, formulating national plans, conducting surveys, researching for tourism potential, conducting

[42] These would be new forest reserves. According to information received during the mission in South Sudan (November–December 2023), such reserves have not yet been established.

[43] The guidelines were developed in 2011 by the Land Resources Survey and Information Centre under the Southern Sudan Forest Sector Programme funded by Norway. The guidelines outline the process for inventory of the forest assigned for concessioning as well as the process for bidding, but do not include any information on the process after the selection of the concessionaire—that is, the duration of a concession, standards for a concession contract and for a management plan, or monitoring and reporting procedures.

[44] The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. Appendix III contains species that are protected in at least one country, which has asked other CITES parties for assistance in controlling the trade.

Table 1.10 Requirements on forest concessions in South Sudan

Good governance requirement	Provisions in existing and draft South Sudan forestry regulations
Regulation on types of concession arrangements applicable (duration, dimension[a])	• Draft Forest Bill defines concession "for a given time period"; Forest Policy mentions long-term concessions • No framework is provided regarding dimensions of forest concessions
Standards for awarding of concessions, including information to tenders and procedures for tendering and selection procedures	• No requirements in policy or legislation on procedures for information to tenderers.; draft guidelines define procedures for forest inventory • Draft guidelines[b] define procedures for tendering and selection; draft Forest Bill refers to the Procurement and Disposal Act
Standards for contents in the forest concession contract	No standard is available. The draft Forest Bill requires: • The agreement to specify terms and conditions; and • The SSFA determine the terms and conditions of the concession.
Standard operating procedures for monitoring and enforcement	No requirements

a. "Forest concession contracts can have two dimensions: (1) utilization referring to harvesting and/or use rights; and (2) management referring to management obligations" (Tegegne et al. 2018).

b. Guidelines developed in 2011 in the Land Resources Survey and Information Centre under the Southern Sudan Forest Sector Programme funded by Norway.

Box 1.2 Rights and responsibilities devolved to communities in Zambia

Rights

- Recognition of the rights of households and communities living close to or deriving their livelihood from or having strong traditional ties to forests to be allowed to join a community forest management group
- Secure forest user rights that will enable the community forest management group the right to issue community permits and collect revenue for forest products and uses provided for in the CFM plan and community forestry agreement
- Economic rights for forest use and products as set out in the community forestry agreement
- Rights to develop and enforce local rules, regulations, and sanctions in conformity with customary laws to facilitate effective management of forests.

Responsibilities

Interested communities should:

- Identify a noncontested area in consultation with all local forest users and other rights-holders of the proposed community forest area and with the consent of the local traditional leaders
- Democratically elect representatives and ensure the operation of the community forest management group's management of funds, sharing of benefits, and selection of leaders shall be based on transparency, fairness, impartiality, and nondiscrimination
- Adhere to sustainable forest management principles under the community forestry agreement and management plan, consistent with traditional forest use rights and following principles of sustainable forest management.

feasibility studies for national tourism projects, monitoring and evaluation, and formulating rules and guidelines for licensing and training plans. There is also a provision to create a technical advisory committee with members from the MWCT, the MoEF, the Ministry of Livestock and Fisheries (MLF), the Ministry of Finance and Planning, etc. However, the draft legislation lacks provisions for (1) coordination with the Ministry of Investment Promotion, (2) due diligence processes for registering tourism enterprises, and (3) promotion of community livelihoods and benefits from tourism activities.

Lack of capacity at government, private sector, community, and individual levels

Even where policies exist, government institutions in South Sudan are critically weak, lacking the financial and operational resources necessary for effective management and transparent processes. Institutional capacity is insufficient to address resource management challenges, with a severe shortage of qualified staff, especially at subnational levels. Issues like delayed salary payments lead to a lack of motivation and retention. Key agencies may be entirely missing at field levels, with some states lacking operational county land authorities (payam land councils). Operational resources are minimal, often lacking basic office essentials, contributing to poor data collection, compromised governance decisions, and a heavy reliance on external support. Additionally, low transparency fosters corruption, with informal fees and bribes disrupting market accessibility. Despite significant international investment during the 2005–11 Comprehensive Peace Agreement period, the focus was primarily on the government in Juba, neglecting state-level issues and land management. Very few routine functions such as the monitoring of natural resources take place, except where supported by external projects.

Although the MWCT employs a large staff, this remains a potential, rather than an effective, workforce. The MWCT has over 10,000 staff, mostly field-deployed, with less than 100 administrative staff. However, these are mostly ex-combatants who are poorly trained and vastly underresourced to fulfill their responsibilities. Field locations are often far from conservation areas; and staff are typically left without transport, operational budget, or even a salary. Protected areas are chronically underfunded. The 2023/24 government budget to conserve South Sudan's protected areas was less than $10 per km^2, compared to $211 in Kenya. Although this figure is augmented by a number of international nongovernmental organization projects, total support is still a fraction of the estimated amount needed for robust protected area management.

The MLF's Directorate of Fisheries and Aquaculture Development manages fisheries sector development, but has few resources to support activities on the ground. Fourteen directorate staff were reallocated to other directorates, where they would work on behalf of fisheries and aquaculture. The MLF's reformed structure resulted in the loss of direct control and management by the Directorate of Fisheries and Aquaculture Development of its reallocated staff, affecting the development and management of capture fisheries and aquaculture. Interdirectorate collaboration and cooperation within MLF is considered weak, compromising delivery. The weak fisheries enforcement capability may render the legal framework obsolete. South Sudan lacks a dedicated fisheries research institute and in-country funding for fisheries research, with limited training courses available. The changing business environment, influenced by marketing and technological dynamics, has rendered traditional apprenticeship training among fishers less effective. An incubation center in Lakes State serves as an example of addressing gaps in extension services. More incubation centers are needed to train community-based trainers to compensate for the weak and costly extension service system.

Forestry staffing is inadequate for forest management and monitoring. Government forestry institutions at the central, state, and local government levels have outlined staffing structures for their roles, but not all positions are filled because of financial resource

constraints. For example, Western Bahr el Ghazal and Western Equatoria State have a total of 8 and 15 foresters, respectively, employed for the whole state.[45] In addition, salary payments are frequently delayed. The Department of Agroforestry and Forest Extension Services in the MoEF at the national level is responsible for community forestry; it has 30 staff at the national level and 15 at the state level. Staffing at the ministerial level is also a challenge, with most Department of Forestry staff beyond retirement age. Support for mapping natural resources on community land is limited, and formal delineation and gazettement of community forests is almost nonexistent. Key government institutions—in particular, the MoEF and decentralized units at the state level—could play critical roles in community forestry, but increased capacity and resources in these institutions are critical and require increased financial support and political goodwill. The Kagelu Forestry Training Center, which is the main training center for forestry offering certificate courses, was vandalized in 2013 during the conflict and remains inoperable despite revitalization attempts.[46] The lack of training facilities has led to a shortage of technical staff in the forest sector.

Poor coordination between communities and government institutions at all levels results in fragmented resource management, with collaborative plans often excluding key stakeholders, particularly at the local community level. For example, in the fisheries value chain, despite the existence of traditional and recent institutional structures (e.g., head fishers, women's trading groups, fisher unions), there is a considerable need to develop capacity for cooperation and linking value chain institutions. In the wildlife sector, preserving large mammal populations, particularly in migratory landscapes like the BBJL, demands comprehensive management frameworks inclusive of diverse stakeholders. Trust between communities and government authorities is often lacking, making collaboration and the adoption of new practices challenging. These barriers can be overcome, however. For instance, the Murle initially opposed African Park's involvement in the BBJL, but trust was built through close engagement and raining awareness of conservation objectives—leading to increased support from the tribe.

Community leaders and chiefs, traditional custodians of natural resources, are not technically or organizationally equipped to manage complex systems. Chiefs generally lack the necessary organizational and technical skills for reducing conflicts, and institutions of chieftainship are not uniform throughout the country as they vary by culture. Prolonged periods of conflict and violence have negatively affected chiefs' mandates and authority, making them less effective in resolving local conflicts. Communities have limited awareness of the benefits of scientific sustainable management practices in fisheries, forestry, and wildlife or experience of effective external support, leading to limited confidence and participation in natural resource management programs.

There is a critical lack of private and individual capacity to manage resources and identify and exploit related market opportunities. Knowledge and skills shortages and inadequate training impede effective evaluation efforts. There is a general lack of expertise in natural resource management concepts and systems beyond a small cadre of academics. For the fisheries sector, there is a lack of technical skills to achieve hygienic handling of fish or high-quality processing and preservation of products. In forestry, knowledge of NTFP harvesting, processing, and markets is limited to traditional practices; and high-quality management of plantations is dependent on foreign managers. Education opportunities exist for all sectors, but attractive job opportunities and ongoing professional development to stay current with global best practices are scant; technical/vocational training is lacking. The University of Juba has several departments focused on producing graduates for natural resource, wildlife, and protected area management. Experience

[45] Consolidated information across all states is not available.

[46] Staff training and equipment were provided through an African Development Bank grant, Support to Good Governance and Capacity Building in Natural Resources Management, in 2016–18.

has shown that graduates are often eager to learn, but need extensive additional training.

Beyond specific knowledge of natural resource industries, the still-emerging private sector faces severe capacity challenges in general:

- **Poor enabling environment.** The private sector needs encouragement and removal of operational and investment impediments. Government action is required to create conditions attractive to the private sector, such as strengthening the legal framework, land reform, and addressing major cross-cutting issues. Monitoring and control of private sector activities is also necessary to curtail excesses and dubious practices (RSS 2016b).
- **Lack of access to finance.** Unstable lending practices and currency controls hamper even high-demand industries from offering competitive services. For example, actors in the fisheries value chain largely lack financial resources to manufacture quality fish products. Across all sectors, credit facilities are lacking (microfinancing schemes) for stakeholders, especially women. Funding for community forestry is particularly lacking, with few institutions involved in forest management as humanitarian needs override environmental concerns. Daily financial transactions are hindered by the absence of automated teller machines dispensing local currency and the limited availability of those dealing in US dollars, which is a challenge for the tourism sector. Fish export is dominated by foreign traders, partly because of a lack of access to foreign exchange for South Sudanese businessmen.
- **Lack of entrepreneurial skills and management expertise.** Many potential private sector participants lack the entrepreneurial skills needed to establish and run businesses in fisheries, forestry, and tourism. There is also a shortage of experienced professionals to manage enterprises effectively. For example, private tour operators lack essential resources, training, and financing.
- **Limited marketing efforts and promotional/branding challenges.** Inadequate marketing and promotional efforts hinder attraction of international tourists and investors because of a lack of skills, resources, and expertise. The country's image, marred by past conflicts, affects its attractiveness as a tourist destination and investment opportunity. African Parks has started promoting its conservation efforts in Juba on billboards.

Women in South Sudan's natural resource sectors are markedly underrepresented in decision-making roles at the state and community levels. There is a significant gender gap in leadership, exemplified by the gender disparity at both ministry and boma levels. Women's access to essential assets such as land is constrained, affecting their capacity to obtain loans—and often resulting in unfavorable credit terms due to unregulated credit facilities and a lack of business support. Despite possessing specialized knowledge in biodiversity, sustainable management, and conservation (particularly of many NTFPs), women's significant contributions to natural resource value chains are poorly recognized and supported by policy and extension services. To overcome these challenges, it is vital to create supportive market spaces, offer business and leadership training, encourage cooperative formation, and facilitate access to information, empowering women to improve their economic standing and decision-making authority.

Investment

Investment needs in the renewable resource sectors are substantial and would entail a mix of state and private funding. Government is directly responsible for establishing core management systems for public assets—including protected areas, forests, and fish populations—and for facilitating community involvement in management and private investment in developing supply chains and products in a risky and unstable business environment. South Sudan's current business environment is very weak. In 2019, the year for which the most recent ranking is available, South Sudan placed 185th of 190 countries and economies rated by the World Bank for ease of doing business.[47]

[47] Source: World Bank Group, Doing Business Archive: Ease of Doing Business in South Sudan web page.

In the wildlife and tourism sector, substantial investments from external donors are required for management facilities, infrastructure, staff training, and tourism infrastructure development. New parks generally require more capital expenditure in the early years to establish systems and infrastructure. This is especially true for South Sudan, which has minimal existing investment in protected area infrastructure; further, local conditions (taxes, logistics, and insecurity) demand a premium over typical protected area management costs. The estimated cost for rehabilitation and effective management of South Sudan's protected areas depends in part on their size, as there are significant economies of scale. Average annual rehabilitation and management costs for various protected areas are as follows:

- Nimule and Bangangai (< 1,000 km²): $807/km²
- Lantoto and Imatong Forest Reserve (1,000–2,000 km²): $2,969/km²
- Sudd and Badingilo National Park (2,000–10,000 km²): $1,090/km²
- Southern and Boma National Parks (> 10,000 km²: $281/km.

The total estimated requirements to manage South Sudan's protected area network comes to around $50 million per year; a comprehensive management program in the BBJL, based on a network of conservancies, would add a similar amount.

In the fisheries sector, in addition to participatory resource management and monitoring systems, there are substantial investment needs in value chain facilities, including functional landing sites, feeder roads, cold chain storage, and market structures. Approximately $40 million is estimated to provide core investments to upgrade infrastructure at key trade sites and build management capacity, in order to facilitate a wider range of private investment to improve handling, processing, and marketing to retain more value in the sector. In addition, significant investment is required in institutions to support training and capacity development, as well as quality control and certification of fish products.

Forest sector investments would need to cover both building the national institutional and regulatory framework, and institutional capacity. These would need to be followed by investments in improving the management of exiting forest resources—particularly in natural forests—and reestablishing the productive capacity of the plantation forests. For natural and community forests, developing and implementing CFM systems in priority areas, and building capacity and information, would require around $13 million—facilitating 10 percent of community forest lands and national government reserves under sustainable CFM. The government needs $17 million to establish and support plantations (10,000 ha of smallholder plantations and 15,000 ha of commercial plantations).

Domestic processing and value addition of the wood produced by smallholder woodlots, plantations, and natural forests by CFM groups would create more employment and economic benefits than exporting roundwood. This approach would, however, require notable investments (largely from the private sector) and a supporting business environment. Sawmill investment costs depend on the quality of production and available labor skill level. Teak and natural tropical hardwoods are valuable raw materials, so low-level technology (i.e., mobile bush sawmills) should not be used to ensure high-quality products. For every 25,000 m³ of roundwood, investment costs would be roughly as follows, depending on the level of technology and product quality desired:[48]

- **Low/midrange professional sawmill:** 6–7 units, $1.1 million (each $140,000–$180,000), employing about 90 people (full-time equivalent); each unit could be located close to the raw material supply.
- **Industrial sawmill:** 1 unit, $1.4 million, employing about 35 people (full-time equivalent); producing higher-grade products, but requiring centralized supply.

Poorly developed general infrastructure is a major hindrance to the development of all sectors, particularly fisheries and wood processing, given the rapid spoilage

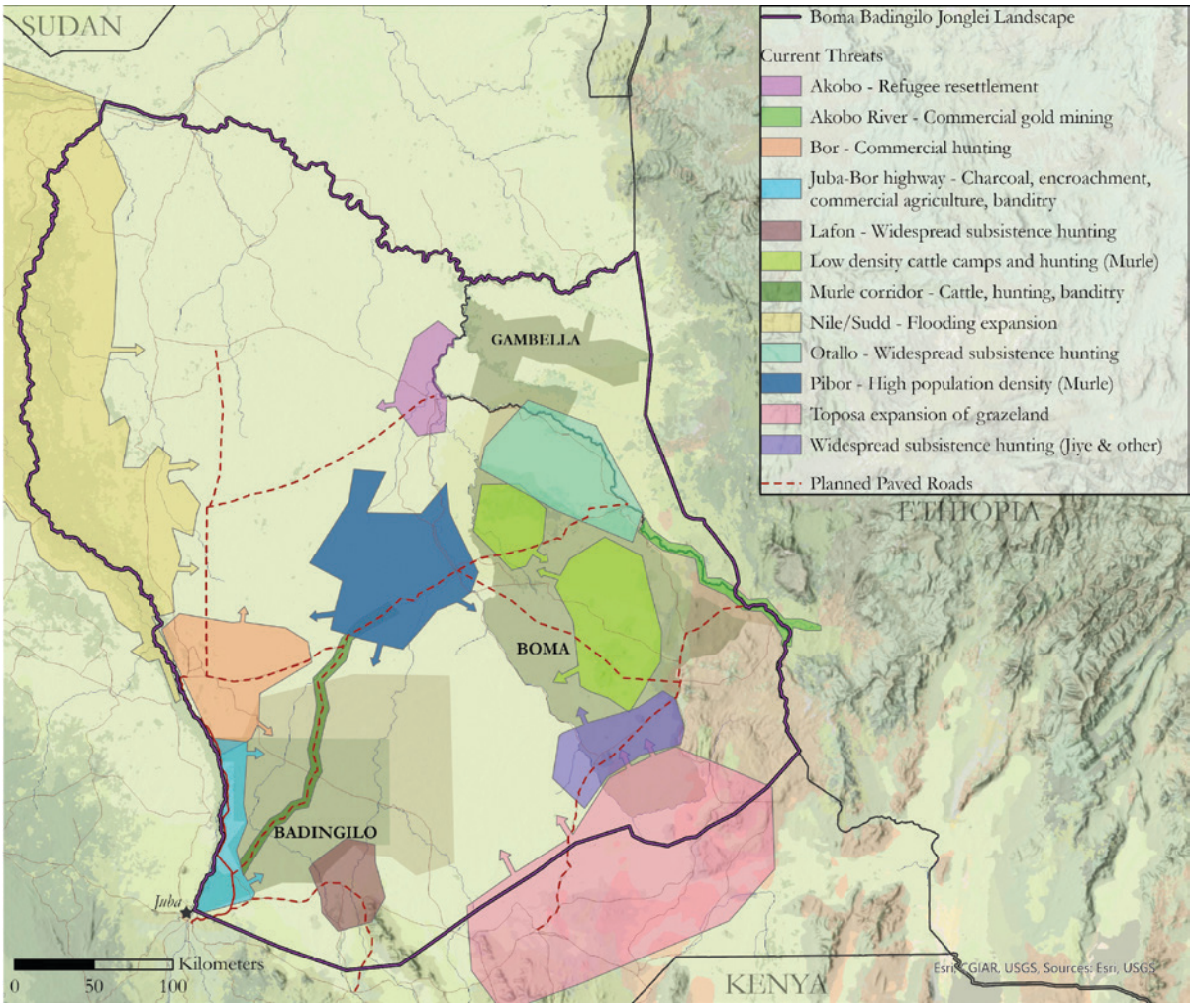
[48] Based on confidential reference cases in Uganda. Both options have estimated recovery of 35 percent.

in the absence of hygienic cold chains and the need for electricity to power sawmills, respectively. Transport costs and delays are a major barrier to export and accessing hinterland domestic markets for fish traders, exacerbated by informal taxation at roadblocks. A lack of clean water is another cause of concern and quality loss. Additionally, effective wildlife monitoring nodes and a tourism industry cannot exist without functioning electricity and clean water. There is a need to diversify the country's energy mix to include solar, wind, and geothermal energy (Mozersky and Kammen 2018).

External threats

External threats to renewable natural resources (those that come from outside the immediate sector) are likely to grow rapidly with economic development and diversification. At present, the main threat,—at least to wildlife and forestry resources—comes from poaching by external actors who have no stake in the sustainability of the resource base. However, pressures from competing land use, pollution, and increasing access and disturbance are growing and will continue to accelerate as South Sudan stabilizes and develops. Map 1.14 illustrates the mosaic of growing threats to the BBJL, which requires landscape-level management approaches, despite its vast and relatively pristine natural habitats. Aquatic habitats and fisheries are particularly vulnerable to pollution, introduction of invasive species, and cumulative impacts to natural hydrological patterns. For example, water hyacinth is spreading within South Sudan's wetlands and may be linked to a broader set of environmental changes. While these threats are undoubtedly lower in South

Map 1.14 Current threats to the BBJL



Source: African Parks 2024.

Sudan than in most countries, given low population densities and levels of economic activity, there are very little data and no routine monitoring to actually assess them. The next chapter reviews future threats from the development of a number of key potential growth sectors in South Sudan, and how future trade-offs can potentially be managed.

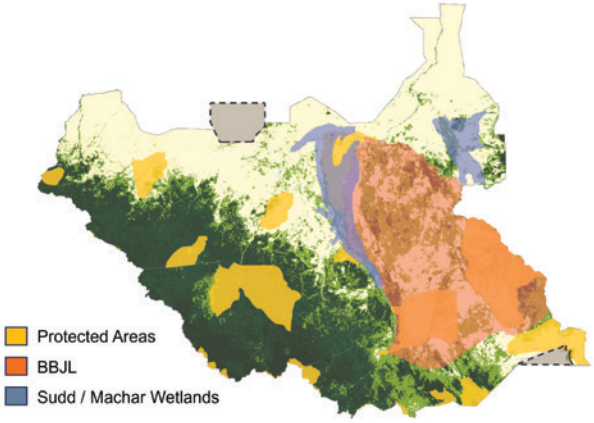
Climate change is also an accelerating external threat to South Sudan's renewable natural resources, with increased annual flooding being the most obvious and impactful manifestation. Unprecedented (in recent times) flooding has boosted fish production, but more variable and unpredictable fish production will be harder to manage efficiently and sustainably in the longer run. Increasing water temperatures will certainly have some impacts on fisheries, but it is unclear whether this would have significant effects on overall productivity, or just in terms of the relative abundance of species already adapted to less-oxygenated waters. Flooding has also destroyed vast areas of other wildlife habitats, such as acacia savanna, and restricted the ability of wildlife to move within deeper wetlands. The physical and economic displacement of around 600,000 people due to flooding has put additional pressure on natural resources, and could exacerbate natural resource conflict. The influx of displaced populations into new areas can lead to overexploitation of resources such as water, firewood, and grazing land; and disruption of normal agricultural activities may lead to unsustainable pressure on natural resources. Drought risks remain significant and unpredictable in South Sudan alongside flooding. These may lead eventually to the dying of forests and spread of forest fire,[49] but also pose a direct threat to wildlife populations—especially migratory species, which depend on predictable patterns of water availability, and will become increasingly vulnerable to heat stress if also water stressed. Drought will put pressure on the livelihoods and protein sources (including fish) for local human populations, encouraging more exploitation of wildlife. Tourism development will be more challenging in less-predictable wildlife landscapes. It is also certain that climate change will lead to more dynamic landscapes including increased variability in water availability, as well as the spread of disease and invasive species—all of which could shift human activities. This reinforces the need to conserve and adaptively manage extensive blocks of natural habitat.

[49] Fire does not appear to be a significant cause of forest loss at present in South Sudan. Savanna forests are regularly burned by pastoralists, but are fire adapted. The extent to which climate change may put denser forests at risk of fire damage is not well understood.

2 Trade-offs and complementarities with other development sectors

This chapter examines likely spatial patterns of development in three major sectors that may affect or compete with key renewable natural resource assets (map 2.1): **land use** (primarily driven by transport development and population growth), **major water infrastructure**, and **extractive industries** (i.e., oil and minerals). These sectors will be critical to the development and economic diversification of South Sudan. The imperative is therefore not to constrain them, but rather to avoid critical and unnecessary impacts, to reduce potential conflicts, and capture potential synergies between sectors. The chapter also suggests mitigation measures to address potential trade-offs and maximize overall development benefits through the mitigation hierarchy: avoiding, minimizing, mitigating, and compensating for impacts, in that order.

Map 2.1 Major natural assets in South Sudan: forests, wetlands, protected areas, and the BBJL



Sources: Dinerstein et al. 2017; Protected Planet protected areas database, accessed March 2024; R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

Patterns of development and potential impacts

Land use

Most of South Sudan's land area is (semi) natural habitat, although subject to pastoralism. More than 75 percent of total land area is potentially suitable for agriculture (USAID and MANAGE, n.d.), but only 5 percent is currently cultivated, the vast majority of which is rainfed. South Sudan is home to around 38 million head of livestock (USAID 2016), but livestock production only reaches about 20 percent of its potential; this low productivity is primarily due to the breeds of cattle and the extensive, low-input production systems used (WFP 2011). Around 74 percent of South Sudanese households depend on subsistence agriculture and pastoralism for their primary income, and expanding the productivity agriculture and livestock systems is therefore a major priority for poverty alleviation (RSS 2015). With improving security in rural areas and greater linkage to regional markets, it is likely that South Sudan's land will become a target for agribusiness development.

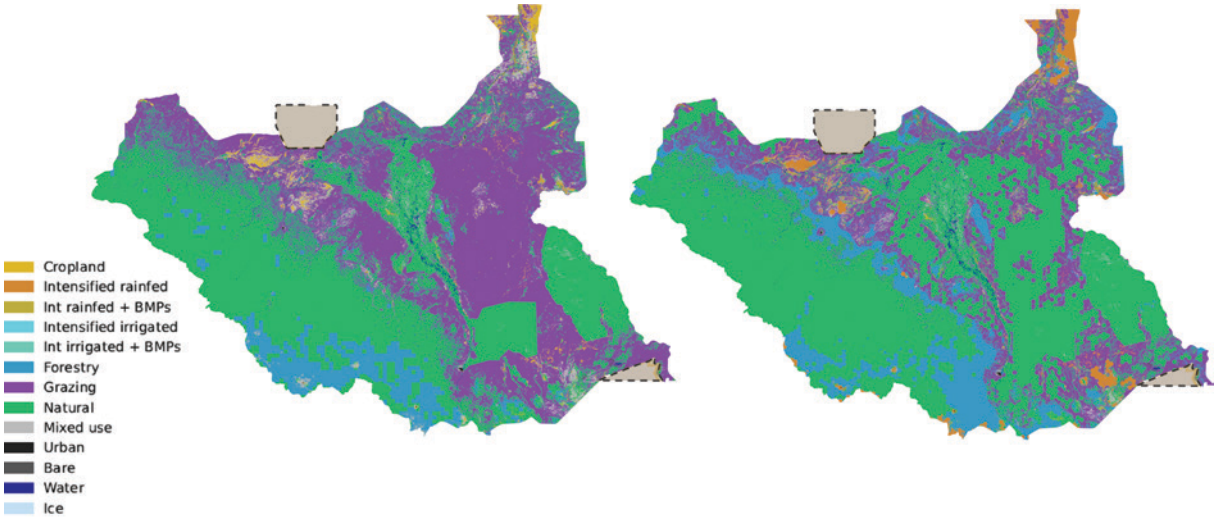
A recent study on global natural resource use efficiency found that there is theoretical potential in significantly increasing rural production in South Sudan's land without significantly affecting ecosystem services (World Bank 2023). Models of current and potential land use patterns in South Sudan found that aggregate financial returns from agriculture, livestock, and forestry could almost double without any reduction in greenhouse gas sequestration—a good proxy for biodiversity and ecosystem services more generally—through more efficient patterns of land use. This would primarily involve intensifying the use of existing cropland and replacing low-productivity pastoralism with more natural habitat (map 2.2).

For the present natural resources review, this earlier modeling was extended to predict future patterns of land use if productive values were maximized subject to constraints on population (labor) and transport. Changes in future land use were predicted based on (1) a 50 percent increase in the rural labor force; and (2) systemic improvements across the current road transport network, resulting in substantially reduced transport cost (map 2.3).

Map 2.2 Land use in South Sudan

a. Modeled current land use

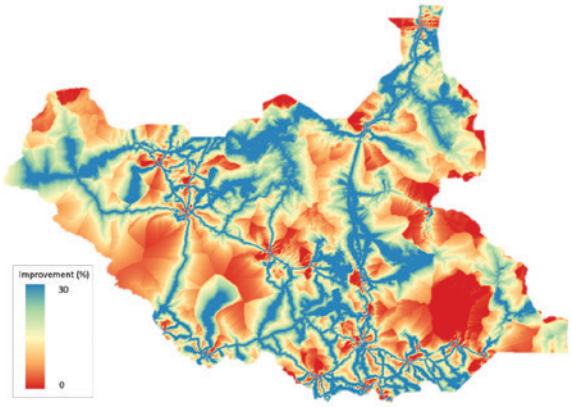
b. Modeled land use for Pareto maximum production[a]



Source: Modeling data used by World Bank 2023a.

a. Pareto maximum production refers to a land use pattern in which aggregate economic production is maximized for no net loss in ecosystem services (greenhouse gas sequestration).

Map 2.3 Impact of road quality improvements in South Sudan on net travel time to markets



Road type	Travel time reduction (%)
Primary	30
Secondary	40
Tertiary	45
Track	25

Source: Original modeling for this report.

Results suggest significant expansions of agriculture and forestry activity with increased population, and major threats to the integrity of the Boma-Badingilo-Jonglei landscape (BBJL) from expansion of activities along the Bor-Pibor and Kongor-Akobo corridors (table 2.1, map 2.4, map 2.5). Most of the likely expansion in agricultural activity and land habitat conversion would occur in those areas that already have relatively high population density and are therefore of lower value in terms of natural assets—although encroachment on both the northern and southern boundaries of the BBJL is a risk. Upgrading the road network does not have as much of an impact as population growth on overall expansion of land use. However, in the higher-population scenario, the upgraded road network does allow for an expanded agricultural footprint along key roads, particularly the transport corridors passing through the center of the BBJL (i.e., the Bor–Pibor and Kongor–Akobo roads). This would pose a major threat to the integrity of the BBJL and its ability to support large-scale ungulate migrations.

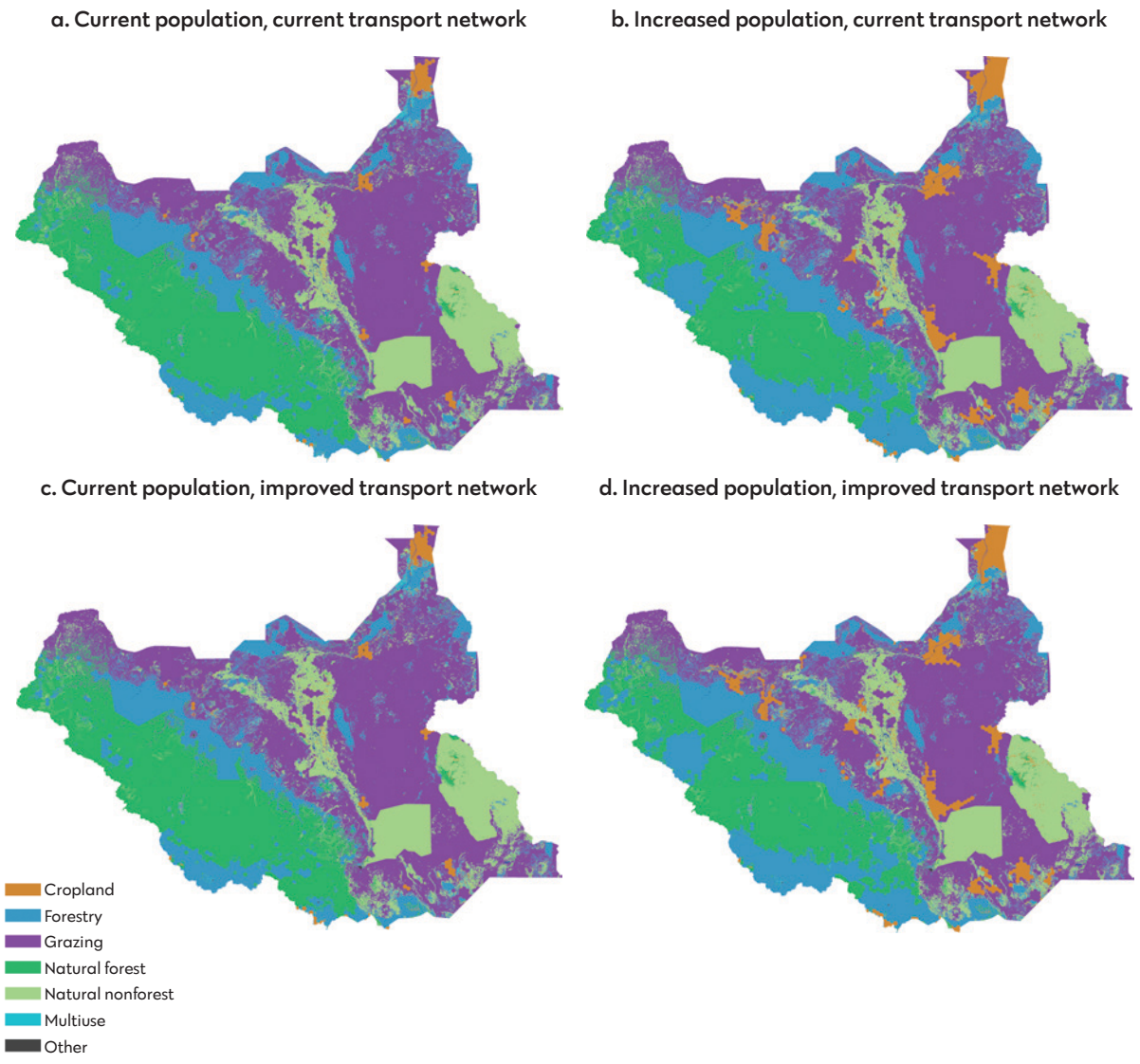
Road and agricultural development are often intertwined; both can have extensive direct and indirect impacts on natural ecosystems. Expansion of agricultural activities has a direct and severe, but localized impact

Table 2.1 Area for land use by category, as modeled under different national land use objectives, km²

Land use scenario	Land use category			
	Cropland	Grazing	Forestry	Natural
Modeled current land use	15,295	267,125	43,327	298,903
Pareto maximum production	24,001	145,702	83,918	371,029
Max production, population limited	9,666	261,869	99,458	253,657
Max production, 1.5x population	30,298	245,115	135,092	214,146
Max production, improved roads	10,055	260,712	96,478	257,406
Max production, 1.5x pop + improved roads	31,336	241,313	132,304	219,697

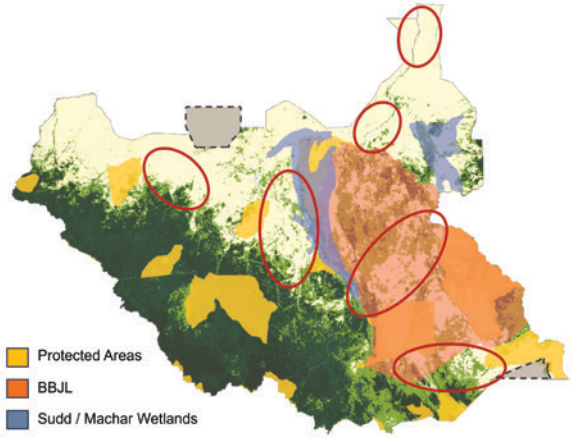
Source: Original modeling for this report.

Map 2.4 Potential changes in land use for 50 percent increase in population and improved transport network



Source: Original modeling for this report.

Map 2.5 Approximate locations of main areas at threat of agricultural expansion



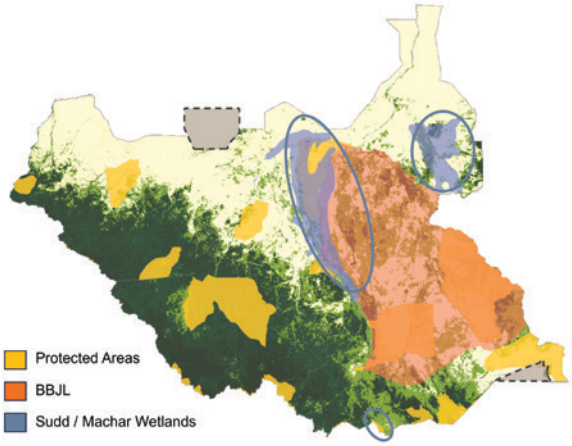
Sources: Dinerstein et al. 2017; Protected Planet protected areas database, accessed March 2024; R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

on biodiversity and natural assets due to the direct conversion of natural habitats into agricultural, or at least highly modified and simplified, ecosystems. Agriculture also can greatly increase rates of erosion and thus degrade water quality, and introduce pollutants from agrochemicals—with significant impacts on aquatic ecosystems, including the spread of invasive species such as the water hyacinth. Extensive forms of agriculture or pastoralism can have major impacts on the ecologies of large areas by changing grazing and fire regimes, including promoting (or even directly introducing) invasive species, introducing diseases, and increasing human access and activity—all of which can have major impacts on wildlife. As illustrated by the modeling here, development of rural roads and agriculture are often tightly intertwined. Road construction has direct impacts through habitat conversion in the immediate footprint, and potential changes in surface water flow and therefore erosion and sedimentation. Within areas of mostly natural habitat, however, road construction typically has much wider impacts associated with increasing access for human activities (both agriculture and overexploitation of natural resources), as well the introduction of associated barriers to wildlife movement and fragmentation of available habitat. These issues are far more acute where robust natural resource management systems are not in place and high-value natural resources are present. Wildlife conservation experts have suggested that the completion of the Juba–Bor highway has resulted in the exclusion of wild ungulates from a 40 km-wide corridor to the east of the highway (and consequently from access to the Nile), due to their sensitivity to hunting.

Large water infrastructure

There is limited large-scale water infrastructure in South Sudan, but the country has significant hydropower and irrigation potential. It also has acute flood protection needs, which could potentially threaten the major wetlands, as well as the mainstream of the Nile at Nimule (map 2.6). Many water facilities were damaged or destroyed during the civil wars, and existing flood protection structures are poorly maintained. There also is a lack of information on the location and technical details of existing structures. South Sudan's hydrometric monitoring network is extremely weak. The country lacks capabilities for surface water quality monitoring, sediment sampling, and groundwater quantity and quality measurement. The potential for solar-based irrigation is estimated at up to 6–10 million ha for groundwater, and 1–3 million ha for surface water (Borgomeo et

Map 2.6 Approximate locations of main areas at threat of large-scale water infrastructure



Sources: Dinerstein et al. 2017; Protected Planet protected areas database, accessed March 2024; R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024.

al. 2023). Polders have been constructed to protect several large settlements from flooding in South Sudan—most famously, the Bor dikes—but there are no large dams as yet in the country. The roughly two-thirds of the 360 km Jonglei Canal that were completed before the excavating machinery was destroyed in 1983 represents by far the largest water infrastructure development in South Sudan; it was never finished. Completion of the project would have major hydrological impacts on the Sudd, which would need to be carefully assessed and weighed against potential benefits. South Sudan has considerable potential for hydropower, and a number of potential dam projects have been identified, mostly in the more hilly borderlands where the Nile and other rivers enter the country. There are two potential designs for a hydropower project at the Fula Rapids where the Nile enters South Sudan close to Nimule. The much larger of the two would have major impacts on the river as well as the surrounding habitats in Nimule National Park. Smaller-scale dam developments on the border with Ethiopia could also have an impact on the hydrology of the Machar marshes. With flooding a critical problem, large-scale engineering solutions for flood control will remain of interest, although options are limited.

Large water infrastructure projects can have a much larger footprint than their physical works, significantly affecting hydrology and water resources critical for fisheries and wildlife. Impoundment by dams and river channel modifications disrupts natural water cycles, affecting fish habitats, breeding, foraging patterns, and seasonal migration. Even small-scale water infrastructure and extraction, such as from farmer-led irrigation, can have significant cumulative impacts on hydrology and water quality if they become widespread. The Jonglei Canal was originally identified as a means of significantly increasing water availability for irrigated agriculture in Sudan and the Arab Republic of Egypt by diverting flow around the Sudd and therefore reducing evaporative losses. Since work was halted during the war, the canal has remained deeply controversial, but is now being promoted by interested parties as a flood control investment for South Sudan. While a carefully managed diversion scheme could indeed assist in regulating the annual flood pulse, completion of the Jonglei Canal could also potentially do huge harm to the Sudd. The loss of wetlands and functional floodplains would not only affect local fisheries and biodiversity, but would also disrupt regional climate and groundwater recharge systems. Conversely, forests and vegetation play a critical role in maintaining watershed functions, supporting hydropower and flood risk management. Hence, synergies are possible between protection of natural habitats and well-managed water infrastructure development.

Extractive industries

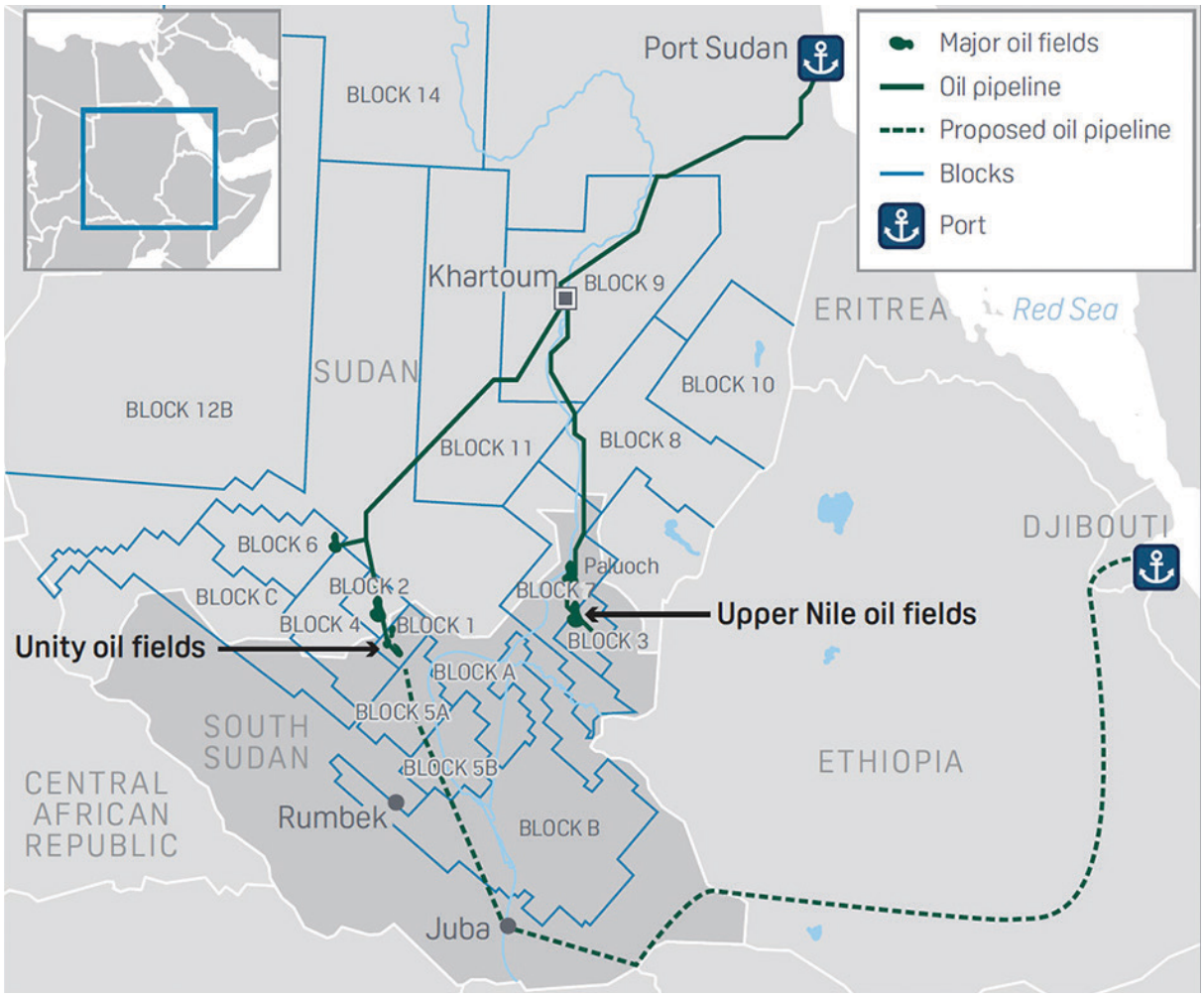
South Sudan's economy is heavily reliant on its oil industry, but the sector faces significant challenges, including political instability, environmental risks, and declining productivity. The oil industry in South Sudan has been the foundation of its economy, contributing billions of dollars annually in export sales. The industry accounted for 90 percent of the government's revenues until the conflict in Sudan brought oil export to a virtual standstill in early 2024, as damage to pipelines can no longer be fixed. The primary oil reserves are concentrated in the Mughlad Basin (Unity State) and the Melut Basin (Upper Nile State), as shown in map 2.7. Since the discovery of oil in South Sudan in the 1970s, these basins have been central to exploration and development, with significant activities in the 1990s and early 2000s. Currently, there are 64 operational oil fields[1] with a total of 1,352 wells. Crude oil from these fields was transported via pipelines to Port Sudan, the sole export point.[2]

Even before the recent halt in exports, the oil sector faced multiple challenges. Shortly after independence, the government halted production for political reasons. Then, just as production was ramping up again, the

[1] This number is stated in a stock market update by Savannah Energy (Parker 2024).

[2] Oil wells are sunk to optimize the extraction of oil from an underground reservoir. South Sudan's large number of wells is typical of oil fields exploiting petroleum basins consisting of multiple discrete reservoirs. Some wells are in operation; others temporarily idle; and many abandoned, in which case they would be plugged and sealed if regulations are followed.

Map 2.7 South Sudan's key oil infrastructure

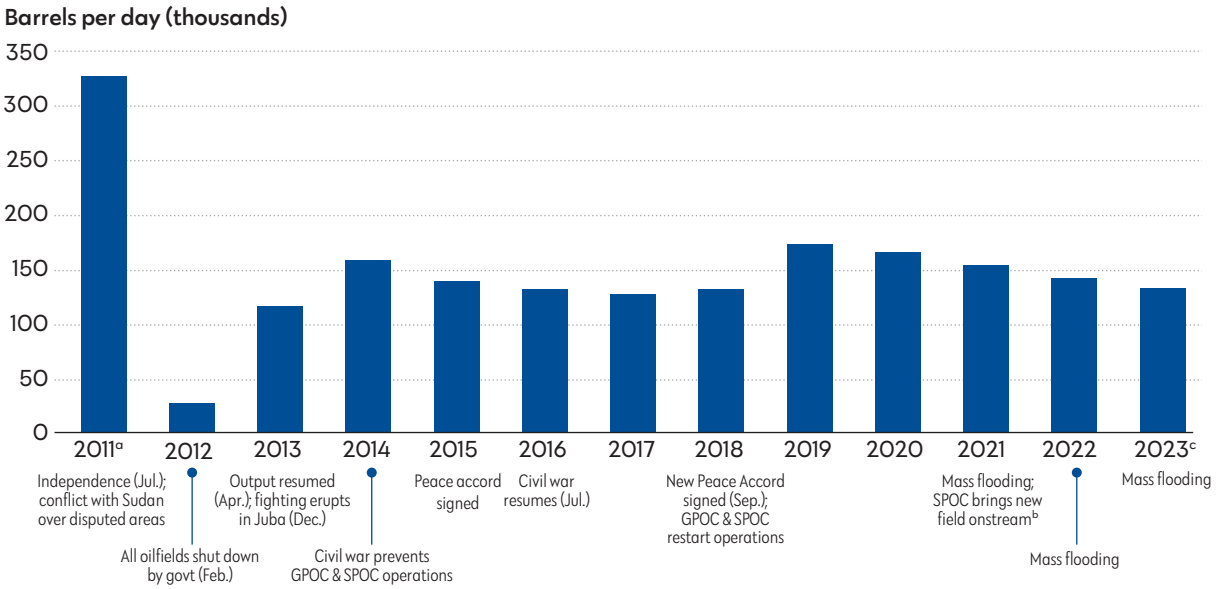


Source: Nduru 2019.

civil war broke out, causing major disruption. Since the peace agreement in 2018, a variety of climate, local conflict, and economic shocks—particularly flooding and COVID—have continued to hamper production, and there has been a steady decline in output (figure 2.1). For example, in Unity State, flooding in 2022 rendered 533 wells inoperable, although some may have already been out of operation as a result of other issues. In addition to these intermittent disturbances, the downward trend in output may be related to the natural decline in oil field productivity, as exploited fields in the Mughlad Basin mature and reservoir pressures fall. Enhanced oil recovery techniques could potentially improve recovery rates, but substantial investment would be needed. Similarly, a large investment would be needed to confirm commercial reserves and open new wellheads in additional concession areas. The current political climate mitigates against such investments; consequently, the future of the oil industry in South Sudan remains shrouded in uncertainty—even if the current export routes to Port Sudan can be reestablished.

The minerals sector, although currently informal and underdeveloped, holds significant potential for growth (map 2.8). Gold is the only mineral currently mined and extraction is purely artisanal, although the cumulative scale of artisanal mining activities is thought to be substantial. South Sudan may potentially have significant deposits of other metals and rare earth elements. Formalizing operations and enhancing regulatory frameworks are essential to unlock this potential. Balancing resource extraction with environmental conservation is critical for sustainable

Figure 2.1 Average daily output of crude oil (barrels per day)



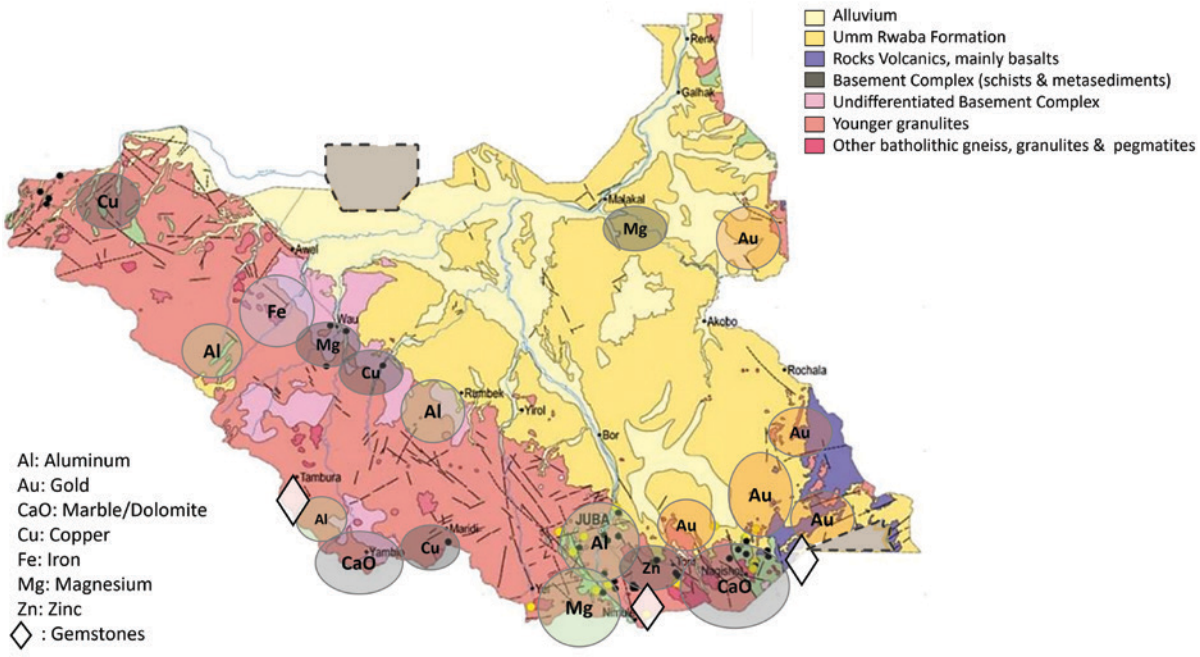
Sources: Ministry of Petroleum (2011–18); *Statistical Review of World Energy*, BP and Energy Institute (2019–22); Ministry of Finance (2023).

Note: GPOC = Greater Pioneer Operating Company; SPOC = Sudd Petroleum Operating Co.

a. This number (325,233 barrels per day) is thought to include output north and south of the new border.

b. SPOC announced that output would reach over 10,000 barrels per day in 2022 at the new field.

Map 2.8 Greenfield opportunities for mineral exploration



Source: Ministry of Mining website, accessed March 2024.

Note: Additional industrial mineral occurrences include brick clay, road construction gravel, sand, kaolin, and talc. Other minerals include rare earth minerals, tin and tungsten, nickel, niobium, uranium, and iron ore.

development. Strengthening governance, implementing sustainable practices, and investing in infrastructure are necessary steps to mitigate conflicts and ensure the long-term prosperity of South Sudan's economy and natural resources. For instance, a single mine producing 10 tonnes of gold annually, and two others producing 5 tonnes each, could generate an export value of approximately $1.3 billion per year.[3] By 2050, further extraction of minerals like copper and nickel could be operational, adding significant value to the economy.

Gold is the largest non-oil export in South Sudan, according to mirror trade statistics; but much of the production is probably smuggled out of the country without any formal records or state revenue collection. Gold is primarily mined in Equatoria and adjacent areas, and estimates suggest around 60,000 miners work in Kapoeta alone, at 80 different locations such as Nanaknak, Lauro, and Napotpot (de Zeeuw 2016). Despite these challenges, the government has shown interest in formalizing the sector. The Mining Act of 2012 and associated regulations provide a framework for operations, although enforcement remains weak. In 2015, the government began issuing new exploration licenses, aiming to attract investment and diversify the sector beyond gold to include minerals like copper and nickel. The Ministry of Mines's cadastral map shows numerous exploration licenses in force, indicating a potential for future growth (map 2.9).

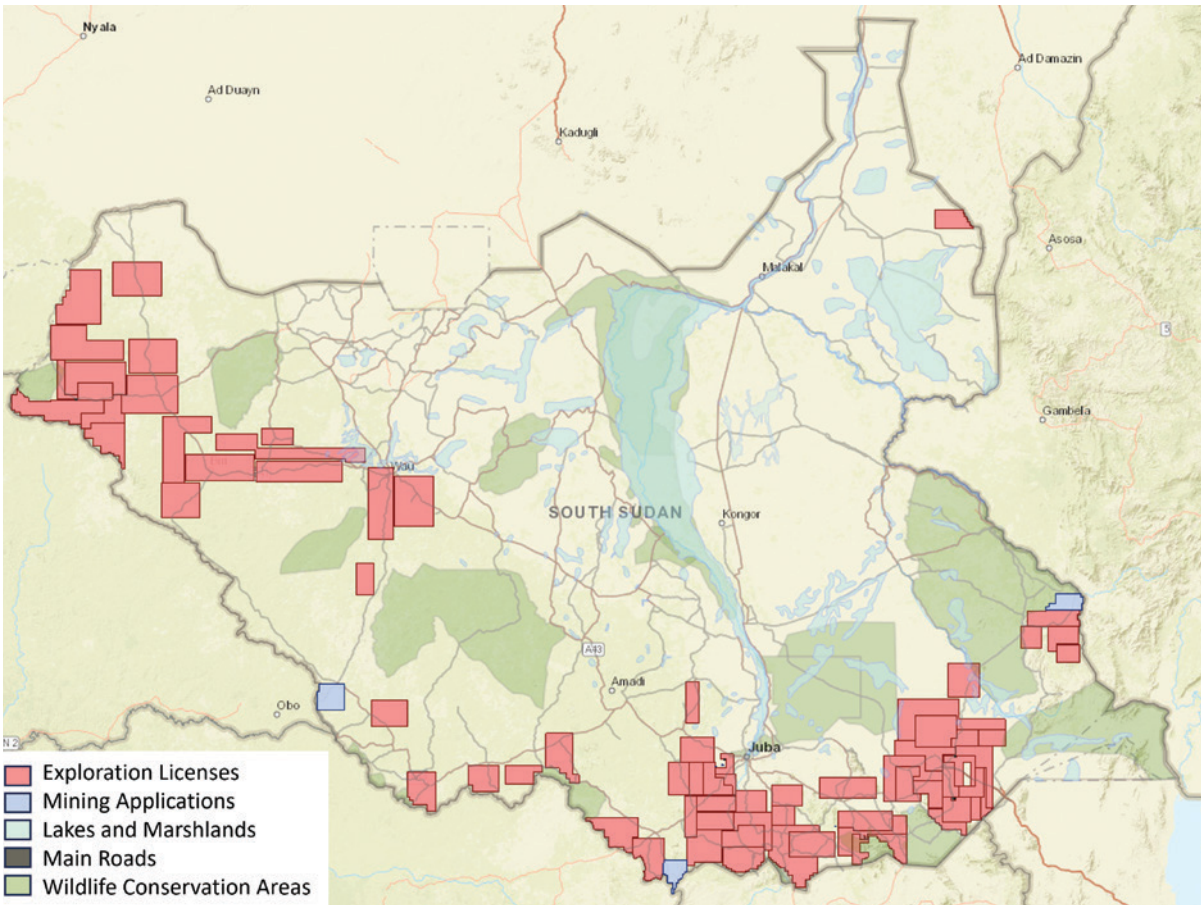
Current oil and gold mining activities pose local risks to wetlands and the southern part of the BBJL; an expansion of extractive industries in South Sudan could increase these impacts massively (map 2.10). Oil infrastructure is currently located in limited areas, but these are close to major wetlands, have been associated with several instances of local pollution, and have also been affected by extensive flooding in recent years. If oil production were to be significantly expanded in the future, expansion of existing fields would bring them closer to the core areas of the Sudd and Machar wetlands. Development, or even significant exploration activities, could have major impacts in many parts of the country, including the rest of the Sudd and most of the BBJL. Artisanal gold production already affects protected areas in the south. If the extensive exploration licenses lead to a large expansion of artisanal or the establishment of large-scale mining, then there is a potential for major impacts on land and rivers in the northwest and south, including the southern part of the BBJL.

Extractive industries in South Sudan present several environmental risks. Oil extraction activities often lead to significant habitat destruction, affecting forests, wetlands, and aquatic ecosystems. The extraction process can contaminate surface and groundwater with harmful chemicals, adversely affecting fisheries, aquatic life, and terrestrial wildlife. Land use conflicts arise as areas designated for natural resource sectors are repurposed for oil extraction, affecting local communities and ecosystems. Artisanal mining activities in Equatoria and adjacent areas risk encroaching on important wildlife habitats. Artisanal and commercial mining can lead to deforestation, habitat destruction, and water pollution, affecting both biodiversity and local communities reliant on these natural resources. The use of hazardous chemicals in unregulated operations contaminates water sources, affecting fisheries and local communities. For example, the Akobo (Pibor) River, which is the biggest river on the east is heavily affected by the massive illegal exploitation of gold from Ethiopia on the river and other smaller projects further to the west, with high levels of mercury recently having been detected.[4] Moreover, Russian prospectors are currently looking for gold in the area. Formalizing the sector and implementing sustainable practices are crucial to mitigate these impacts and ensure the long-term viability of both the mining and fisheries sectors. But large-scale mining also often leads to deforestation, habitat fragmentation, and loss; this has substantial impacts on biodiversity, including wildlife and fisheries. Land subsidence from mining creates depressions that alter habitats and disrupt surface water flow, affecting aquatic ecosystems and fisheries. Mining

[3] Assuming a gold price of $2,000/troy ounce.

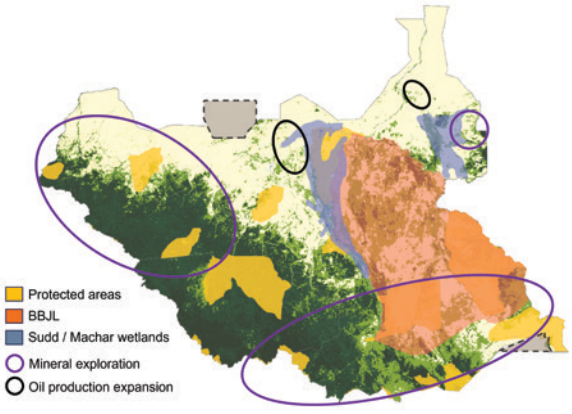
[4] Source: African Parks, 2024.

Map 2.9 Mineral exploration licenses



Source: South Sudan Mining Cadastre Portal, accessed January 2024.

Map 2.10 Approximate locations of main areas at threat of expansion of oil production and mineral exploration



Sources: Dinerstein et al. 2017; Protected Planet protected areas database, accessed March 2024; R. Samapriya, T. Swetnam, and A. Saah, Community Dataset, accessed November 2024. Note: Exploration blocks for potential further oil production cover most of the Nile floodplain down to the southern boundary of the BBJL.

operations require substantial water use, leading to water contamination with pollutants such as acid mine drainage and heavy metals. The influx of labor for mining operations exacerbates land acquisition and deforestation, affecting local communities and biodiversity hotspots.

Managing trade-offs and mitigating impacts

Environmental risk management is critical to maximizing aggregate development potential across sectors. South Sudan has a critical need to sustainably diversify its economy. The objective therefore is not to hinder sectors that could potentially affect renewable natural resources, but to develop them in a way that avoids unnecessarily reducing the benefits

and potential from renewable natural resources; and to carefully weigh, reduce, and mitigate those trade-offs that remain. Given the vast land resources available in South Sudan, avoiding and minimizing impacts will be readily achievable in many cases, but it does require a robust knowledge of the presence, vulnerabilities, and values of natural assets.

The ability to manage trade-offs rationally and effectively will depend on the development and practice of South Sudan's environmental and social risk management systems. The foremost tools involved are environmental impact assessment (EIA) of individual investments, and strategic environmental assessment of sector policies and plans. For landscapes of outstanding importance, such as the BBJL and the Sudd, upstream spatial planning will also be critical. As mentioned in chapter 1 in the Governance frameworks section (page 33), there are significant legislative, institutional, and technical capacity gaps in environmental risk management. The country's 2013 Environmental Protection Management Bill—which introduces the requirement for an EIA—has not been ratified. Further, it does not specify the detailed requirements for an EIA, including the technical scope of assessments, standards for risk mitigation, or the types of projects for which assessment is required. The Ministry of Environment and Forestry is the institution tasked with environmental risk management, but there is no dedicated EIA oversight agency—and, without detailed EIA regulations, its mandate remains imprecise. Although some ministries have established structures and protocols for managing specific risks, there is a scarcity of qualified and experienced environment risk management specialists; and capacity for risk assessment, management, and monitoring is typically weak or nonexistent. Environmental and social risks in development projects are not being addressed systematically, but rely on differing standards of donors.

Location is key to the impact of land-related investments, including in agriculture and roads; upstream strategic and spatial risk assessment is thus critical, as well as analysis of alternatives for individual investments. Risk management strategies include avoiding sensitive habitats, maintaining natural wildlife movement patterns (including through management of associated human activities), minimizing vegetation removal, and managing invasive species. Implementing biodiversity management plans and protecting wetlands by maintaining water flow, reducing pollution, and preserving vegetation are crucial for sustainable land and water management. In the agricultural sector, projects with significant water consumption must adopt strategies to reduce or mitigate water use to prevent negative impacts on local communities and the environment. By integrating these practices, land use and agriculture investments can achieve a balance that protects natural resources and supports sustainable development. Biodiversity or environmental offsets can compensate for significant residual impacts on biodiversity. These offsets involve conservation outcomes like protecting or allocating land or aquatic zones for conservation, improving habitat management, and other specific actions. Offsets can establish or buffer existing reserves, rehabilitate habitats, and conserve species of concern (box 2.1). Additional advice and established best practices for handling environmental, health, and safety hazards in road and agriculture industries can be found in the World Bank's Environmental, Health, and Safety Guidelines for Agribusiness and Food Production[5] and Water and Sanitation (IFC 2007b).

To ensure sustainable large water infrastructure, it is crucial to integrate conservation practices that minimize environmental trade-offs. Infrastructure should be strategically located to avoid areas of biodiversity significance and critical wildlife habitats. Protecting fishery habitats and preserving floodplains and native vegetation are essential measures. Planting indigenous trees and providing wildlife access can prevent habitat fragmentation. For aquatic habitats, it is important to minimize modifications in key fish breeding sites and restore habitats around flood structures. Controlled flooding can rejuvenate wetlands and aquatic habitats, while proper

[5] These guidelines are available from the International Finance Corporation's EHS Guidelines: Agribusiness and Food Production web page.

Box 2.1 Good practice example: Biodiversity offset in South Africa's road sector

The Shaw's Pass road-widening project undertaken by the Western Cape Department of Transport and Public Works involved the expansion of a dangerous section of road between Hermanus and Caledon in South Africa. The regional roads department was obligated to offset for the environmental impact on a 1 ha area of critical habitat, which housed significant endemic plant species. The 30 ha offsite conservation area has been established and safeguarded, effectively preserving a section of habitat identical to that affected. The land remains in the possession of the original owner, who has legally agreed to manage it as a nature reserve within a stewardship program. Shaw's Pass has been acclaimed as a success by conservationists. The achievement is largely credited to the collaborative efforts of all stakeholders involved, such as CapeNature, the landowner, and various government departments, who reached a consensus on the details of the offset implementation and its financing. Additional factors contributing to the project's success include the limited number of participants, the straightforward nature of the offset requirements, the relatively small size of the offset area, the establishment of clear and enforceable conditions in the environmental authorization, and the presence of a cooperative landowner with suitable habitat on his property.

Source: Jenner and Balmforth 2015.

Box 2.2 Good practice example: Biodiversity offset in Sierra Leone hydroelectric dam

The Bumbuna Hydroelectric Power Station is designed to supply Sierra Leone with affordable and clean energy. Situated on the Seli River within the Tonkolili District, the project has undergone extensive environmental impact assessments and additional studies on biodiversity. These studies have raised concerns about the potential loss of critical species near the dam. In response, efforts were made in the early 2000s to find an appropriate location to offset the ecological impact. The Loma Mountains Forest Reserve was selected for its similar ecosystems and even greater species diversity. Consequently, the Loma Mountains Non-hunting Forest Reserve, a crucial component of the national protected areas network, was designated as a national park in 2012 to offset the environmental impact of the Bumbuna Dam. This World Bank–supported initiative not only facilitated the construction of the dam but also played a pivotal role in establishing the Loma Mountains National Park as the project's environmental offset. The project allocated funds for the initial establishment of the national park, which included the development of transportation infrastructure, provision of essential equipment, and enhancement of facilities at the park's headquarters and outposts, as well as the demarcation of park boundaries and the improvement of access routes.

Source: Mathur 2019.

assessment and disposal of dredging waste prevents harm to ecosystems. Biodiversity offsets may be designed and implemented to compensate for residual loss of biodiversity at the project development site (box 2.2).

Maintaining environmental flows in wetlands and floodplains, regular monitoring, and consideration of downstream user needs are critical. Water efficiency should be prioritized, with efforts made to reduce losses and maintain infrastructure. Structures facilitating aquatic organism movement, like fish ladders, and minimizing land clearing in sensitive

areas support ecological balance. Proper irrigation methods maximize water use efficiency and prevent waterlogging and salinization; monitoring drainage quality helps manage contaminants. Buffer zones between irrigation areas and sensitive habitats contain contaminant spread, and minimal use of agrochemicals reduces ecological impact. By implementing these practices, a balanced approach can be achieved, preserving natural resources and supporting sustainable development. Further guidance and good industry practices for managing environmental, health, and safety risks in the water sector are available in the World Bank's Environmental, Health, and Safety Guidelines for Water and Sanitation (IFC 2007b). The Hydropower Sustainability Standard provides global guidelines for hydropower and large dam investments (Hydropower Sustainability Secretariat 2021).

Terrestrial habitat loss from mining activities can be minimized by strategically locating mining facilities away from sensitive areas, establishing buffer zones, reducing disturbances and deforestation, avoiding barriers to wildlife movement, and implementing appropriate mitigation measures. Effective water management practices are crucial to minimize the impact on natural drainage systems and water users in mining areas. To ensure sustainable development, conservation of natural resources must be integrated into mining activities. Prospecting and exploration should consider the presence of protected areas, critical habitats, endangered species, and key biodiversity areas. The ecosystem services derived from mining areas—including fisheries, forestry, and wildlife tourism—should be considered. The impact on aquatic habitats and fisheries can be mitigated by minimizing or avoiding the clearing of riparian vegetation, preserving surface water flow patterns, and preventing the discharge of untreated mining tailwater into natural watercourses. Discharges into surface waters should not increase contaminant concentrations beyond ambient water quality levels.

Biodiversity or environmental offsets may be employed to mitigate any significant residual impacts, compensating for biodiversity or habitat losses due to mining activities. Biodiversity offsets, such as those in the examples provided in box 2.3 and box 2.4, aim to achieve a net positive outcome by compensating for significant residual impacts, following the principle of

Box 2.3 Good practice example: Oil project in Chad–Cameroon

The Chad–Cameroon petroleum development and pipeline project established approximately 690,000 ha of new protected areas, vastly exceeding the 10,000 ha affected by the project. This measure ensured long-term conservation and protection of biodiversity in the region. Biodiversity offsets were designed to compensate for the project's ecological footprint by enhancing conservation efforts in other areas, creating a net positive impact on biodiversity. Comprehensive environmental management plans were developed and implemented, focusing on minimizing deforestation, protecting water resources, and reducing habitat fragmentation during the construction and operation phases. The project also engaged local communities in the planning and implementation of conservation efforts, ensuring that the measures were culturally appropriate and supported by those directly affected. Benefits to local communities included improved livelihoods through sustainable resource management and conservation-related employment opportunities. Ongoing monitoring of environmental impacts and the effectiveness of mitigation measures was established. Adaptive management strategies allowed for adjustments to be made in response to new information or changing conditions, ensuring continuous improvement in environmental performance. Finally, the project invested in building the capacity of local institutions and stakeholders to manage and protect the newly established protected areas, ensuring sustainability beyond the project's life span.

Source: BBOP 2009.

Box 2.4 Good practice examples: Natural gas and minerals in Norway-Germany and Ghana

Statoil's 1994 Europipe natural gas pipeline project originates from the North Sea near Norway and reaches the mainland within the confines of Germany's Lower Saxony Waddensea National Park. Identifying a suitable point of entry for the pipeline within the park posed a significant challenge. Following an extensive planning phase and the evaluation of 10 potential entry points, a decision was made to adopt a route that incorporated a tunnel beneath the tidal flats to traverse the park. This route was anticipated to cause temporary, but still significant, environmental disturbances. To offset these effects, Statoil established a 17 ha biotope featuring ponds and sand dunes adjacent to the pipeline's metering station, on what was once a heavily utilized agricultural field with limited biodiversity. This newly created area—which has since been granted official protection—now serves as a sanctuary for various endangered and uncommon species.

Ghana's Newmont Akyem gold mine project implemented robust environmental mitigation measures by creating a comprehensive reclamation plan, including reforestation and habitat restoration efforts to offset mining impacts. Established community development programs provided compensation and alternative livelihoods for displaced residents, and set up continuous environmental monitoring to ensure compliance with ecological standards and mitigate long-term environmental damage.

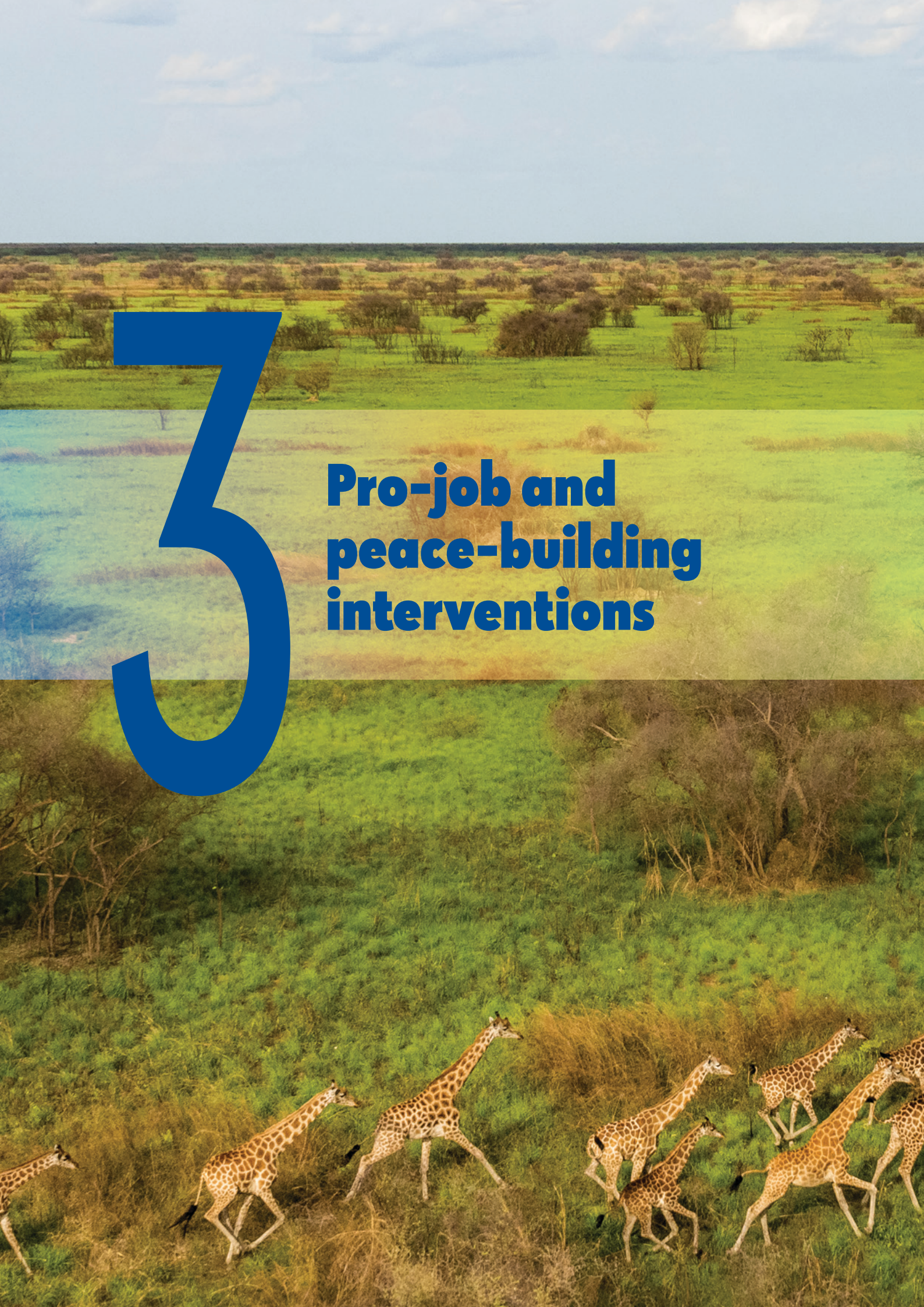
Sources: EBI 2003; Newmont Golden Ridge Limited 2009.

"like-for-like or better." In cases where impacts on unique and irreplaceable biodiversity cannot be mitigated, it may be necessary to redesign or relocate mining operations to prevent the need for offsetting measures in critical habitats. Additional guidance and international best practices for management of environmental, health, and safety risks in the mining sector can be found in the World Bank's Environmental, Health, and Safety Guidelines for Mining (IFC 2007a).

General measures to reduce and mitigate losses to ecosystems and renewable natural resources applicable to a range of large-scale investments are summarized in table 2.2.

Table 2.2 Potential environmental trade-offs in the productive sectors and indicative mitigation measures

Potential environmental impact	Key mitigation measure
Terrestrial habitat, alteration degradation, and fragmentation	• Identify strategic facility locations • Restore affected habitats • Establish buffer zones • Undertake proportional actions to preserve wildlife corridors • Establish biodiversity offsets to achieve net positive outcomes • Provide alternative passages for wildlife • Minimize vegetation removal • Manage invasive species • Preserve natural water flow in wetlands • Avoid sensitive habitats (not disrupting natural wildlife patterns)
Aquatic ecosystem impact (mainly from investments in the water sector)	• Follow effective water management practices • Prevent discharge of untreated water into natural watercourses • Minimize clearing of riparian vegetation • Preserve surface water flow patterns • Prevent contamination and mitigate pollution of aquatic ecosystems • Restore and protect aquatic habitats • Monitor and manage phytoplankton and aquatic plant health • Monitor irrigation drainage quality • Avoid overextraction of irrigation water • Create buffer zones between irrigation and sensitive habitats • Use minimal agrochemicals • Develop and sustain comprehensive water balance • Develop water balance for catchment area • Monitor and adjust water withdrawal rates • Ensure downstream water user needs are considered • Avoid modifications in key fish-breeding sites • Assess dredging waste before removal • Dispose of waste in nonharmful locations
Other biodiversity and natural resource loss	• Engage in community planning to identify natural resource values and manage access • Avoid areas of high biodiversity value (i.e., sensitive areas) • Prepare and implement biodiversity management plans • Rehabilitate degraded habitats • Employ biodiversity offsets following "like-for-like or better" principle



3 Pro-job and peace-building interventions

South Sudan remains blessed with a wealth of renewable natural resources and has the opportunity to follow a development path that avoids mistakes made elsewhere, and makes full use of the productive potential of its ecosystems in a sustainable way. It is, however, critical to invest in renewable natural resource sectors in a way that is not only sensitive to the security context, but actively supports and enhances efforts to promote stability and peace. This includes building representative local institutions and trust between communities and with government, and enhancing productive employment in rural areas, including for young men. All natural resource management interventions should thus adhere to a set of common cross-cutting principles:

- **Ground up.** Natural resource management must be based around the active participation of communities in planning and implementation, and ultimately focused on delivering benefits to them—particularly in the form of expanded, improved, and reliable livelihoods.
- **Inclusive.** Management systems must be inclusive of all ethnic groups with customary rights to resources, and promote the inclusion and benefit of marginalized groups including women and youth. Natural resource value chains should be managed to enhance inclusive jobs, enterprise development, and value generation within South Sudan. Applying a gender lens to interventions enables data collection and interventions that are more inclusive and effective at improving decision-making, reducing gender-based violence, and boosting equitable benefits and access to resources. Strengthening women's land rights will be key to ensuring women are enabled to own and inherit land.
- **Pro-peace.** Management systems should actively contribute to peace and stabilization in rural areas through (1) establishing the credibility of government as a service provider, (2) formalizing tenure rights through consultative systems that support conflict resolution, (3) supporting the development of effective and responsive community-level institutions, and (4) enhancing employment opportunities for young men.
- **Integrated and balanced.** Development of natural resources cannot come at the expense of vital growth sectors including transport, energy, and agriculture. Trade-offs must be managed to maximize sustainable benefits across sectors. South Sudan is in desperate need of basic infrastructure, and infrastructure development can either support or harm the renewable natural resource sectors depending on how it is implemented. Coordination across sectors is a key element of this (1) at the national level through the reestablishment of interministerial coordination structures, and the development of investment-based and strategic environmental impact and risk management systems; (2) at the regional/landscape/watershed level through the use of integrated land use and development planning instruments; and (3) at the community level through the establishment and capacitation of integrated resource user/management groups that can support management across different local resources.
- **Resilient.** Resource planning and management systems should be climate-informed and responsive, and robust to a range of external natural, social, and market shocks. Diversifying resource management and livelihood systems will be important in this regard.

Fisheries

Priority actions in the fisheries sector fall under the following categories: strengthening resource management, value retention and addition, access to export markets, and enhancing inclusion. These actions are detailed below and summarized in table 3.1.

Strengthening resource management

Although South Sudan's fish stocks are considered to be healthy and probably underexploited, the knowledge

base from which this assessment is derived remains thin. Any efforts to enhance fisheries production—either directly or indirectly (i.e., improving sector performance or conditions in a manner that would encourage additional private investment)—must be predicated on core monitoring and management systems for fisheries resources and the aquatic ecosystems on which they depend.

- **Policy framework.** Update and implement the 2015 Fisheries Bill, along with guidance on a new sector strategic action plan. The bill and plan should formalize local resource tenure and dispute resolution systems, and reinforce them through local government recognition and support. The decentralized management framework would need to be sufficiently flexible to accommodate the diverse local arrangements that currently exist, involving traditional chiefs and/or elected chief fishers, while encouraging inclusive governance strategies that involve existing and potential stakeholders.
- **Collaborative management models.** Develop a number of Boma fisheries management models—including enacting simple area-specific bylaws on the use of fisheries and wetland habitats—that are in harmony with the regulatory framework, and developed in collaboration with and the broad consent of local users. This effort should include strengthening organizational capacity of existing local governance structures, and mapping and agreement on Boma management boundaries. Robust co-management of small-scale fisheries can bring significant impacts to fishing communities over time periods of only a few years (box 3.1).
- **Training and capacity building.** Train local leaders (including in dispute resolution), government, academic, nongovernmental organization (NGO), and value chain actors in the ecosystem approach to fisheries to ensure continuity of healthy aquatic ecosystem services.[1] The effectiveness of capacity building for government staff is likely to be limited without sufficient staff retention and motivation. Thus, core civil service management challenges need to be addressed, including ensuring timely payment of adequate salaries and providing necessary operational resources—although this is beyond the scope of the fisheries sector alone.
- **Data collection and monitoring.** Develop a simple and affordable community-based fisheries and aquatic environmental data collection system which would include basic indicators of fishing effort, catch (including major species and size distribution), and ecosystem health. This should be combined with modest national-level value chain and wetland health monitoring systems to detect environmental and market-driven challenges to the sustainability of fisheries.

Value retention and addition

A set of coordinated interventions are necessary to reduce postharvest loss and capture additional value in the fisheries sector.

- **Key value chain infrastructure.** Upgrade landing sites and trading structures at key nodes (e.g., Bor, Malakal, and Munga ports) to include potable water and proper storage facilities. Invest in and support cold chain systems, including solar-powered chest freezers and small ice plants, to link fishing grounds with main landing sites and export markets. Because the private sector should invest in value chain and business development, the role of public investment ultimately is to provide a minimal base of critical

[1] The ecosystem approach to fisheries is defined as "the integrated process of information gathering, analysis, planning, decision-making, allocation of resources and formulation and enforcement of fishery regulations by which the fisheries management authority controls the present and future behaviours of the interested parties in the fishery, in order to ensure the continued productivity of the living resources" (FAO 1995). It was developed to implement the principles of the Convention on Biological Diversity, the Food and Agriculture Organization of the United Nations' Code of Conduct for Responsible Fisheries, and sustainable development as set out by the Brundtland Commission.

Box 3.1 Successful co-management of the Mexican Pacific lobster fishery

Along the Pacific coast of Baja California, community fishing cooperatives are granted 20-year exclusive and renewable concessions to harvest the California lobster *Panulirus interruptus* within clearly defined territories. This is an artisanal fisheries using 5–7 m-long fiberglass boats and traps. Cooperative members work with government to jointly establish regulations; they are also empowered to carry out surveillance, and detain illegal fishers and turn them over to authorities. Cooperatives provide other benefits and services including jobs; financing for fishing equipment; and local investments in education, roads, and electricity.

Over time, effective co-management has generated a shift from a short-term production mindset to a long-term value mindset among fishers. Despite large-scale climate fluctuations caused by El Niño, the lobster catch has remained within recommended catch limits over the past few decades. Several of the cooperatives have joined the Regional Federation of Cooperative Societies of Baja California, which handles marketing responsibilities and has also invested in staff biologists that collect and analyze data, conduct stock assessments, and liaise with fisheries science agencies. As a result, these lobster fishers are among the most financially successful small-scale fishers in Mexico.

In 2004, the Baja California red rock lobster fishery became the first small-scale developing world fishery to achieve Marine Stewardship Council certification, which it holds to this day. Several factors contribute to the success of this fishery:

- A strong and effective organizational structure focused on the long-term economic interest of cooperative members
- Strong and exclusive tenure rights
- Strong coordination and communication with regulatory agencies that facilitates adaptive co-management
- Strongly enforced community-driven fishing rules.

Sources: Coastal Resources Center 2014; McCay et al. 2014.

infrastructure to catalyze business engagement and investment.

- **Favorable business environment.** A favorable business environment will crowd in private sector investment in value chains, including cold chain infrastructure. This includes general policy frameworks to support business, as well as assessment of the sector-specific regulatory framework—including high tax rates such as the 18 percent tax fish exports, and exposure to uncertain and informal tax regimes. For a sector dependent on rapid and reliable transportation of a perishable product, delays and unpredictable charges at road blocks can be a serious constraint.
- **Institutional and vocational training for collectives and small enterprises.** Help fishers, particularly women, establish organizations, like the Post-Harvest Fish Technology Platform model in West Africa, to collectively deal with challenges and to develop basic business skills. Provide vocational training to actors in the value chain to minimize postharvest losses and maximize value addition.
- **Credit and insurance services.** Offer credit, microcredit, and insurance services tailored to the needs of women, youth, and others with limited access to collateral. Create village savings and loan associations to support entry into business ventures. Regulate credit facility schemes and empower women through business coaching.
- **Incubation centers.** Establish local business and technical skills training centers to support commercialization of small-scale fisheries

through providing training for community-based trainers as well as a networking hub.

- **Promoting fish to address food security.** Explore the potential to expand domestic demand for fish, and fisheries' contribution to meeting national food security needs, through promoting increased use of locally sourced fish in humanitarian food assistance—particularly supplying displacement camps.

Access to export markets

Fish exports are limited, vulnerable to the enforcement of existing regulations in East African Community countries; commerce is mostly captured by foreign traders. Key measures to enhance exports include the following:

- **Quality assurance and export regulation.** Establish a competent authority to promote and regulate fishery product quality, safety, and trade, including setting up accredited laboratories.
- **Critical transport infrastructure.** Improving river and all-weather road transport infrastructure in key locations would facilitate timely and dependable transport of perishable fish.
- **Border markets.** Assess the feasibility of establishing secondary fish markets in strategic border towns, such as Nimule. These could encourage easier access and competitiveness within the export trade through increased number of customers from and opportunities to sell more products under free-on-board conditions (transferring risks to traders from importing countries).[2]
- **Bilateral and regional trade agreements.** Address trade barriers through bilateral and regional trade agreements, including securing access to existing trade arrangements, notably the African Continental Free Trade Area (AfCFTA); and arranging provision for sealed container transshipment of fish through Uganda to the Democratic Republic of Congo.

Enhancing inclusion

Ensuring women are included in decision-making and leadership roles within the fisheries value chain is essential to realizing the sector's full economic and social potential, and should be mainstreamed across all activities.

- **Gender-transformative approaches.** Gender-transformative approaches are needed to challenge harmful gender norms, roles, and relations—including awareness about human rights and gender-based violence, deliberate engagement of women for meaningful participation in fisheries groups and enterprises, and setting quotas for women in group leadership positions (for decision-making).
- **Tailored trainings and formal education.** Provide women with tailored trainings and education to enhance their skills and enable their access to finance, thus ensuring the sustainability and profitability of their businesses.
- **Sector gender strategy.** Assist the Department of Fisheries in developing an integrated, budgeted fisheries sector gender strategy, bringing women and men into a position where they participate as equals in fisheries management and marketing. Helping policy makers better understand the constraints that females (and youths) face is a critical first step in the development of an enabling policy environment that ensures equal access for women and youth to land (especially as collateral), finance, and inputs. The strategy should be designed to strengthen governance that ensures women and men benefit equally from any fishery project and any financial and technical support.

[2] "Free-on-board" (FoB) is a term used to indicate when the ownership of goods transfers from buyer to seller and who is liable for goods damaged or destroyed during shipping. "FoB origin" means the buyer assumes all risk once the seller ships the product.

Table 3.1 Summary action plan for fisheries sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	Strengthen local resource management and monitoring • Update Fisheries Bill and develop sector action plan focused on small-scale fisheries management • Enact legal framework for collaborative management • Establish participatory resource and ecosystem monitoring system • Build community and government capacity	$10–$20 million • Capacity-building and long-term operational costs for co-management would be main expenses • Technical assistance from partners with international expertise in small-scale fisheries co-management would be critical
Value addition	Reduce postharvest loss • Detailed value chain and market surveys • Key value chain infrastructure investments • Policy reforms to improve business environment and access to credit • Institutional capacity and vocational training for cooperatives and micro, small, and medium-size enterprises	$20–$30 million Core infrastructure and capacity building to facilitate further private sector investment would be main expenses
	Secure and expand export value[a] • Establish competent authority and laboratories to regulate sanitary and quality standards • Assess feasibility of new/improved border export markets • Bilateral and regional trade agreements to support reduced inspection times, closed container transshipments, etc.	$5 million Institutional establishment and capacity building would be main expenses
Longer term (5–20 years)		
Value addition	Capacity to ramp up production in high-flood years[a] • Multiuse cold storage and logistics capacity investments • Improvements to key transport links, including border crossings Access high-value export markets[a] • Transport, energy, and trade infrastructure • Policy and institutional reforms to remove trade barriers and promote access (e.g., trade fairs)	• Substantial, but most costs would be borne by the private sector and infrastructure sectors • Direct costs to fisheries management authorities to identify and lobby for priority investments and promote private sector investment could be modest

a. Predicated on strengthened resource management and monitoring to facilitate and permit sustainable catch increase.

Forests

Priority actions in the forestry sector fall under the following categories: building forest governance systems and government capacity, restoring and protecting natural forests through community forestry, restoring forest plantations and building a basis for sustainable value addition. These actions are detailed below and summarized in table 3.2.

Building forest governance systems and government capacity

Strengthening legislation, governance framework and institutions is a crucial element in the development of both plantation sector and community forest management (CFM) of natural forests. Updated national policies, comprehensive forest law, and clear institutional mandates will allow technical work in various forest subsectors to proceed by creating regulatory clarity. There is also a need to ensure that agencies and institutions responsible for the forest sector have adequate resources—human, material, information/data, etc.—to operate effectively. Capacities need to be available at both the national and subnational levels. The key elements in building forest sector regulatory certainty and capacity include the following:

- **Clarifying and updating policy and legal framework and issuing subsidiary legislation.** The draft Forest Bill (2023) needs a technical update to include some missing elements (climate change and forest carbon, clearer definition of key concepts, etc.); it also needs to be enacted by the legislature. The Forest Policy of 2015 could also be revised to ensure alignment. Once enacted, the Forest Bill needs to be complemented with subsidiary regulations and technical guidelines for forest management of both plantations and natural forests. This includes preparing implementing regulations with clear definitions, rules, and operating practices.
- **Strengthening capacity for Forest Policy implementation.** Establish and operationalize capacity for improved implementation capacity and coordination between key institutions at the national, state, and local levels to strengthen government capacity for forest management and improve security in insecure national forest reserves. Building capacity at all levels is needed. Carrying out capacity needs assessments at selected sites could help in developing a capacity-building plan. Investments in capacity building are needed on all fronts, including human resources and skills, facilities, information technology, and mobility.
- **Improving availability of forest information.** Improve data and knowledge on forests and their use by establishing a forest information management system, demarcate and map national forest reserves, carry out forest management planning, and map and assess woodlots and plantations under farm forestry. These efforts should include establishing national standards and guidelines for data collection to ensure consistency of all data collected from field operations. A national forest inventory would provide the baseline data needed in sector planning.

Restoring and protecting natural forests through community forestry

Introducing systematic, participatory, and science-based management of South Sudan's natural forests is a precondition to the protection and sustainable use of forests for local socioeconomic benefits. The natural forests are almost all situated on community land; consequently, CFM would provide a number of benefits. People living in and around forests would be in charge of their management and would benefit from them. The national government and local administrations would be largely indirectly involved and would only need to invest in support and extension services and higher-level monitoring, but not in field implementation. While there is no current national guidance on how CFM could be organized in the country, two

types of arrangements could be used, based on experience from other African countries:

- On **community land**, institutional arrangements would involve forest management by community groups and decentralized government entities with land management regulation oversight responsibilities (specifically the payam land council and county land authorities)
- On **government forest reserves**, community forestry would be implemented through co-management agreements between the government and community forestry associations (CFAs).

The 2015 Forest Policy and the latest Forest Bill allow for CFM, but they do not define the systems in detail. CFM establishment processes and division of rights, responsibilities, and benefits thus remain undefined. Introducing community forestry in South Sudan would require interventions through three phases: (1) defining the CFM approach and systems, (2) building governance and key institutions, and (3) practical implementation in high-priority areas.

Defining the CFM approach and systems

While existing policy documents introduce various CFM-related concepts and terms, these are not defined. Therefore, there is an explicit need to design and define a South Sudanese CFM model. This would include agreeing on a process as to how to identify legitimate stakeholders and communities entitled to a given forest area; decision-making processes (including participatory processes within communities and the role of traditional leaders); and processes to delineate forests and agree on management plans. The role and responsibilities of forest authorities need to be clear and dispute resolution processes agreed upon. While all countries are different, and the systems need to be based in South Sudanese realities, models and lessons from other countries in Africa should be studied to obtain guidance (box 3.2).

This phase would result in clearly defined, consulted, and officially endorsed guidelines for CFM, explaining how areas and communities are to be selected, and how sustainable management and good governance are to be ensured. The general guidelines would be national, but should be localized as needed to account for differences in forest structures and community dynamics and traditions by state. While the majority of natural forests are on community land, there would also need to be a separate system for forest reserves where communities could co-manage the reserves with local or national government.

The guidelines and standard operating procedures would need to be codified at a sufficiently high level (e.g., legislation or government degree) to ensure that they are not changed too often or interpreted differently by different authorities. There should also be alignment with relevant regulations on community-based wildlife management and conservancies; see further discussion under Strengthening governance frameworks and capacity (page 73).

Building governance and key institutions

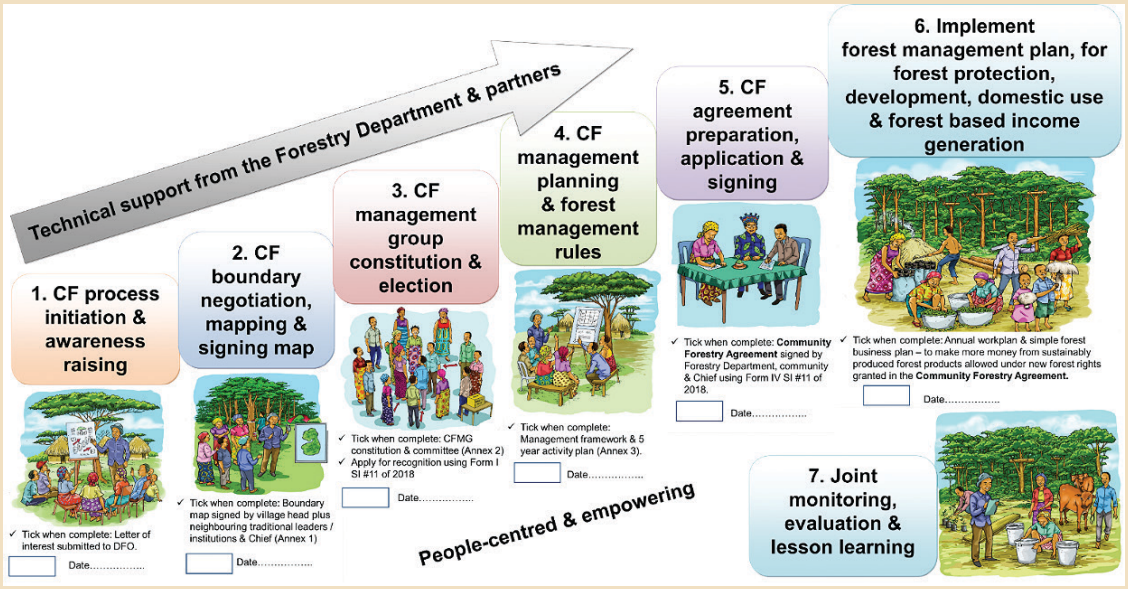
This phase will develop the institutional capacity of public institutions and local communities to implement CFM. Implementation of community forestry will require the creation of new institutional arrangements and incentives; and capacity building at the ministry, state, and county government levels. The expected outcome of this phase is increased capacity (institutional, human, and capital resources) to manage, supervise, and monitor community forestry. This will be achieved through three distinct steps.

- **Develop capacity-building plan.** A human, capital, and institutional reforms capacity needs assessment at the national, state, and county levels should be undertaken to inform this plan. This needs assessment—focusing on key institutions with a mandate for community forestry at the national, state, and county levels—will result in more effective capacity building in the long term. It should be followed up with prioritization of needs and matching of needs with requisite

Box 3.2 Good practice example: Seven phases of CFM in Zambia

Zambia follows a seven-step approach to CFM (figure B3.2.1), defined and delineated in national guidelines issued by the Ministry of Lands and Natural Resources. The guidelines, which also include checklists and supportive materials, are aimed at strengthening stewardship of forests on customary land through communal control, use, and management while—balancing responsibilities with attractive legal rights to end uncontrolled forest loss and incentivize community-driven sustainable forest management. Total costs of implementing the seven steps (excluding centralized training, provision of equipment, and implementation of the plans) are under $10,000.

Figure B3.2.1 Overview of Zambia's seven-phase CFM process



Source: Zambia Ministry of Lands and Natural Resources, Community Forestry website.

This approach has led to a notable increase in improved and participatory forest management in Zambia. It has been estimated that a total area of 3 million ha in over 300 CFM areas, accounting for 7 percent of all forests in Zambia, or 10 percent of all forests outside protected areas. The CFM approach was established in the Forest Law of 2015; its long-term impact on actual forest condition and local socioeconomic development is still being analyzed.

Sources: Zambia Ministry of Lands and Natural Resources, Community Forestry website, and Zambian practitioner interviews.

capacity. The assessment will indicate human and capacity resource, institutional reform, training, and accountability needs. It will also identify coordination and governance needs, skills development capacities, and gender mainstreaming issues. The assessment will lead to a capacity-building plan targeting institutions involved in community forestry at the national, state, and county levels. The plan should be developed and costed.

- **Strengthen capacity of public institutions.** A lack of data and information on community land makes demarcation and management of community forests challenging. Therefore, there is a need

to increase public institutions' capacity to map and assess resources within community forests and government forest reserves. The increased capacity would enable the Ministry of Environment and Forestry (MoEF) to understand the resources available in community forests and government forest reserves that could be harnessed to support community forestry.

Given South Sudan's vast areas of community forests and woodlands, prioritization of identified potential areas should be carried out to determine the most-critical community forests.[3] Boundaries could be defined by already existing land use. This could then be followed up with initial assessments through meetings, participatory rural appraisal, field reconnaissance, and surveys; land use and forest mapping; boundary delineation; and natural resource/forest inventories.

- **Strengthen capacity of CFM practitioners and facilitators.** Implementation of the CFM framework will require awareness creation and development of institutional capacity. Community forestry manuals, guidance, and protocols will be fundamental in the development of institutional capacities at the local level. These tools should be used by facilitators, coordinators, and participants in the community forestry process as well as serve as reference material for government agencies, NGOs, and other institutions that play a supporting role or have an interest in community forestry. The tools should capture the rationale and principles of CFM and an overview of its steps and requirements.

Practical implementation in high-priority areas

This phase would start actual implementation of CFM in high-priority areas. Its startup should overlap the tool development discussed above to ensure that lessons learned from practical implementation are taken into account. The key steps in implementation follow.

- **Build local-level support for CFM institutions.** Currently, there are no institutions that can be used to roll out community forestry at the grassroots level. Implementation of community forestry will thus require creating awareness of community forestry among local communities to establish CFAs in selected areas to represent the interests of people living around forests. Building these associations would entail the following:
  - Raising awareness on community forestry with all key decision-makers at state, county, payam, and boma levels, including traditional authorities
  - Identifying and working with practitioners (e.g., community forestry facilitator teams) who should fully understand community forestry processes and approaches
  - Publicizing and creating awareness through various platforms at the community level to elicit interest
  - Identifying incentives and tangible benefits that would encourage communities to engage in community forestry.

  The 2023 Forest Bill recognizes a forest community as one living in or around a forest and with a traditional association to the forest for purposes of livelihood, culture, or religion. The bill acknowledges a CFA as a community entity with which relevant national government/MoEF bodies may enter into an agreement for management of any natural forests and woodlands and the establishment of CFM committees.[4]

[3] Prioritization criteria need to be developed through a consultative process, but could include areas with high-value forests (in terms of both biodiversity and commercial species); increased pressure from infrastructure, extractive industries, and agricultural development; and protected area buffer zones, largely in the green belt in the western parts of the country.

[4] The draft Forest Bill also proposes the establishment of the South Sudan Forest Authority. This authority is not yet operational, but could play a role in the establishment of CFAs. The contracting party could also be the local authority, depending on the relevant legislation and whether CFM is conducted on traditional land or gazetted reserves.

The process of establishing CFAs should be rolled out in priority CFM areas. This process could be facilitated by NGOs or other institutions that play a supporting role or have an interest in community forestry. The CFA formation process will require the establishment of bylaws or constitutions and governance structures based on templates established in the CFM guidelines. CFA obligations should be clearly defined. These could be to (1) protect, conserve, and manage the forest or part of the forest following an approved forest management agreement entered into with the MoEF; (2) formulate and implement sustainable forest programs consistent with traditional forest user rights of the community; and (3) assist the MoEF in enforcing relevant legislation, including with regard to illegal harvesting of forest products and encroachment.

- **Develop CFM forest management plans.** The Forest Bill requires that all forests be managed through management plans; therefore, also community forestry should be directed by forest management plans as well. The MoEF, NGOs, or other entities facilitating the process should initiate the development of forest management plans in selected sites with the CFM area. A clear procedure for bringing in all interested parties should be adopted, and this could provide good lessons during the development of the community forestry manuals and guidelines.
- **Implement CFM forest management plans.** Once the forest management plans have been developed and approved, their implementation needs to begin. Co-management agreements should be formulated and implemented in the forest reserves. For community forestry on community land, CFAs and local authorities could establish co-management agreements defining respective rights and responsibilities. One of the functions of the payam land councils is to assist traditional authorities and leaders in the management of community lands. They also have a mandate to ensure the protection of communal grazing land, forests, wetlands, and water resources under the Land Act of 2009. For CFMs in forest reserves, the CFA and initially the MoEF have co-management responsibilities.
- **Support livelihood and economic opportunities in CFM communities.** It is essential that targeted communities be allowed to benefit from their forests and improve their livelihoods. Structures and systems that improve the well-being of communities in the forest sector are likely to enhance community participation in forest management in South Sudan. Emphasis should be placed on innovative and impactful actions that will transform the lives of the local community residents and enhance forest management.

Restoring forest plantations and building a basis for sustainable value addition

Plantation development and revitalization of sustainable production forestry in South Sudan will require interventions in both types of production plantations: smallholder plantations/woodlots and commercial plantations. While investing in commercial plantations ultimately is a private sector task and responsibility, certain government actions (including investment subsidies) are needed to create a conducive operating environment for private operators.

Forest plantation sector revitalization through facilitating community/smallholder commercial tree growers would include a stepwise process approach, preferably in areas with an existing smallholder plantation subsector like the Western Equatoria State. This revitalization would involve the following:

- **Strengthening service delivery to farm forestry and commercial tree growers**, including by building systems for service delivery to tree growers through project-type interventions and engaging formal private sector operators in service delivery to tree growers.
- **Building capacity of commercial smallholder tree growers for plantation management on community and government land**, which would call for organizing

interested tree growers and strengthening their understanding of contractual obligations and knowledge and skills in tree growing and plantation management. Local-level (county, boma, payam) authorities would also need sensitization on the opportunities of production forestry in building local economic resilience.

- **Rehabilitating government forest plantations** in target counties by preparing contracts between government and commercial tree growers, allocating management rights to entrepreneurial smallholders and businesses.
- **Increasing areas of on-farm forestry** and improving their management by promoting the establishment of on-farm plantations and woodlots and promoting agroforestry practices.
- **Engaging tree growers in plantation revitalization** and incentivizing private smallholder forestry on tree growers' own land. This may also include outgrower schemes with commercial plantation operators.

Promoting plantation development through private sector investment in industrial forestry takes more time and involves much larger individual transactions than for smallholder plantations (box 3.3). It is likely that public enabling actions would need to be more tailored to individual investors' needs. Key steps would include the following:

- **Increasing awareness** through preparing and disseminating information linking investors to opportunities. This would also require preparing national government standard operating practices for soliciting proposals and answering to unsolicited proposals.
- **De-risking investments** through implementing interventions to reduce physical and economic risks associated with forest plantation investments. This would require both improving physical safety and improving the business climate. For the latter, collaboration with international financial institutions and development partners would be needed.
- **Promoting partnerships** with private investors by engaging both domestic and foreign investors at different stages of the plantation wood value chains.

For all commercial production forestry activities, an enabling investment and operating environment is crucial. While some challenges can be addressed through forest sector–specific interventions, improvements to the general business climate are crucial.

Box 3.3 Financing needed to establish sustainable forest management systems in South Sudan

South Sudan has over 200,000 km^2 of natural forests, and current institutional capacity for its management is vastly insufficient. Building forest management systems in the country will require a stepwise approach focusing first on (1) building a key institutional framework, (2) protecting the existing resource base, and (3) building community engagement in priority areas.

Table B3.3.1 presents three options in the order of urgency: (1) national capacity development, building CFM infrastructure, and its implementation in high-priority areas ($16.5 million); (2) launching plantation revitalization and smallholder plantations ($6.6 million) and (3) enhanced support to CFM, smallholder plantation and launching support to industrial plantations ($10.2 million). This forest sector reform program would put roughly 20,000 km^2 (10 percent of the forest area) under improved and systematic forest management and empower and support the livelihoods of some 350,000 people in rural South Sudan.[1] Once initial investments in CFM architecture have been made, the area covered can be expanded if and when the government and development partners allocate additional resources to the sector. Building sustainable forest management and improving forest governance would also have climate benefits; if CFM introduction prevents tree cover loss from increasing to 2.4 percent over the next 20 years, it would prevent some 40 $MtCO_2$ emissions.[2]

Table B3.3.1 Projected budget for priority and enhanced development options (million $)

Activity	Theme	Short term	High option	Total
Priority development options				
1. National capacity (TA and investments)	Governance	5.0	0.0	5.0
2. CFM establishment				
TA	Governance/ restoration	3.5	1.5	5.0
CFA establishment	Governance	4.0	0.0	4.0
Forest management & livelihood activities	Restoration/ value addition	4.0	0.0	4.0
Subtotal		**16.5**	**1.5**	**18.0**
Enhanced development options				
3. Plantation sector development[a]				
TA	Restoration/ value addition	2.5	0.0	2.5
Smallholder plantations		4.1	4.1	8.2
Industrial plantations		0.0	6.1	6.1
Subtotal		**6.6**	**10.2**	**16.8**
Total		**23.1**	**11.7**	**34.8**

Note: TA = technical assistance.

a. 50% (smallholder) or 25% (industrial) subsidy to plantation establishment. Private investments in plantations or downstream processing not included.

[1] The target levels are based on reference data from other countries and need to be validated in more detailed planning.

[2] Assuming that a lack of systematic forest management would double the past tree cover loss in the next 20 years.

Table 3.2 Summary action plan for forestry sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	National capacity building • Institutional and legal development (Forest Bill and policy) • Investments in ministry and local government technical capacity • Development of forest data collection (e.g., mapping) and monitoring system (technical assistance and investments)	$5 million Capacity-building, technical assistance, and operational costs would be main expenses
	CFM establishment • Technical assistance for CFM planning and system development • Developing guidelines • CFA establishment and management planning • Forest management operations	$10 million[a] • Technical assistance, operational costs, and community incentives would be main expenses • Community members would allocate time and in-kind community resources
Value addition	CFM activities • Forest management operations • Livelihood activities	$2 million • Operational costs and community incentives would be main expenses • Communities would provide labor and, depending on livelihood activities selected, other inputs
Longer term (5–20 years)[b]		
Resource governance	Plantation development • Institutional and legal development • Designing support systems • Developing guidelines	$1.25 million Capacity-building and technical assistance would be main expenses
	CFM activities • Ongoing support and monitoring	$1.5 million Operational costs, technical assistance, and community incentives would be main expenses
Restoration	Plantation development • Plantation establishment • Incentives to smallholders • Incentives to commercial plantations	$8.4 million • Operational costs, technical assistance, and producer incentives would be main expenses to facilitate private investments • Private beneficiaries would allocate both in-kind and financial contributions based on agreed cost-sharing formulas
Value addition	Plantation development • Incentives to smallholders • Incentives to commercial plantations	$7.15 million • Producer incentives would be main expenses facilitating private investments • Private beneficiaries would allocate both in-kind and financial contributions based on agreed cost-sharing formulas

a. CFM activities are scalable, and additional resources would allow faster expansion of the CFM model to larger areas.

b. Plantation technical assistance could start earlier if there is certainty of implementation finance.

Wildlife and tourism

Given the abundance of habitats in good condition, many of South Sudan's protected areas can be brought to a high level of management if proper systems and investments are put in place. In certain cases, such as Southern National Park, the severe depletion of wildlife will mean that recovery will take several decades (Blower 1977). An initial step in supporting any rehabilitation strategy for protected areas and wildlife will be to undertake a comprehensive survey of the national protected areas system. There are eight protected areas—Boma and Badingilo National Parks (which are part of the BBJL), the Sudd, Nimule National Park, Southern National Park, Imatong Forest Reserve, Lantoto National Park, Kidepo Game Reserve, and Shambe National Park—and their surrounding lands which can be classified as priority candidates in a process toward well-managed protected areas that contribute to sustainable development and the national economy.

Restoration for the Sudd would be particularly complex, given high population density, high levels of depletion of wildlife resources, and large-scale and poorly understood processes of change. One such change is the clogging of water flows that has contributed to seasonal and permanent flooding, perhaps exacerbated by an accumulation of invasive waterweeds (especially water hyacinth washed downstream from the Lake Victoria Basin) and the extirpation of large herbivore populations (especially hippopotamus and elephant) that would have helped open up vegetation when populations of these species were healthy. Restoration efforts would need to be undertaken in coordination with efforts to introduce and expand community fisheries development. More research on whether existing environmental changes are affecting hydrological flows in the Sudd is needed.

Priority actions in the wildlife and tourism sector fall under the general categories of strengthening overall governance systems and capacity, and investing in the rehabilitation of specific protected areas and wildlife landscapes. These actions are detailed below and summarized in table 3.3.

Strengthening governance frameworks and capacity

Strengthening and implementing the policy framework

Enactment, clarification, and subsequent implementing regulations on the specific institutional roles, responsibilities, and measures of pivotal bills are needed. These bills include the Wildlife Conservation and Protected Area Bill (2023), the Tourism Bill (2023), and the Environment Bill (currently in draft) is needed. For wildlife conservation and protected areas, it will be important that this legislation provides clarity between policy/regulation roles and implementation functions and on financing arrangements. As one specific example, experience in Africa has shown that protected area agencies that can focus on implementation perform better than those in countries where the ministry itself holds responsibility for implementation. Institutional measures that allow protected area authorities to retain and then reinvest revenues from protected area management also tend to perform better; Uganda and South Africa provide good examples in this regard. Under these systems, revenues generated from tourism entry and stay fees, concession revenues, licenses and permits—together with external financing—can help create budget certainty, increase incentives for developing revenue generation measures, and ultimately help place protected area financing on a more sustainable footing.

Finalization and enactment of the Environment Bill will also introduce appropriate environmental and social impact assessment into the development planning process. This will provide a measure of safeguards that could encourage more wildlife-friendly planning and development approaches. Further, the bill will introduce a more comprehensive legal framework for broader environmental protection.

To ensure effective land use management and conservation, consultative processes will be needed with local communities and land authorities to respect customary rights in land ownership and to come to an agreement on how to officially designate (gazette) protected areas—including potentially developing some kind of formal status for the Boma-Badingilo-Jonglei landscape (BBJL).

Building collaborative partnerships

As government resources are likely to remain constrained in the near term (at least until significant tourism revenues begin to flow), government could build on the successful partnership that has been established with African Parks to assist in conservation management and wildlife-based tourism development of the BBJL. Strengthening partnerships and collaborative efforts with development partners as well as specialized NGOs will help garner support for natural resource management, providing indigenous land rights are respected. NGOs and perhaps private sector partners could help strengthen the wildlife service to manage protected areas and wildlife more effectively and to develop wildlife-based tourism that could contribute to economic development as well as financial sustainability of protected areas. A short-term measure could be to reconvene the Natural Resources Management Group to enable interministerial consultation on development projects and discuss potential environmental implications of sector development projects.

Training the wildlife service

There is a pressing need to improve capacity for law enforcement through training. Given the high dependence of local communities—many of which comprise indigenous groups—on natural resources and long-established traditional land resource use claims, it will be extremely important for training goes beyond traditional enforcement. It should also cover measures to address social risks, human rights, gender-based violence, and grievance redress. The objective, in addition to building capacity for day-to-day ranger work, should be to ensure the wildlife service adheres to and upholds high standards of social risk management with respect to communities within and around protected areas. The Ministry of Wildlife Conservation and Tourism could also learn from neighboring Uganda—where the Uganda Wildlife Authority has adopted standard operating procedures that cover all aspects of ranger service delivery, including compliance with international standards for social risk management.

Developing wildlife-based tourism

The current peace and security environment in South Sudan—combined with a lack of suitable facilities and infrastructure—places a major constraint on the development of wildlife-based tourism, and hence the ability to capitalize on the enormous economic potential that could otherwise be derived from South Sudan's extraordinary wildlife resources.

Currently, wildlife-based tourism is extremely limited in volume and largely "niche-focused"—affordable only to small numbers of extremely wealthy tourists who travel in helicopters and stay in tented camps in the BBJL. The economic contribution of wildlife-based tourism is therefore minimal at present. Looking ahead, and assuming progress is made in reducing conflicts, there is considerable potential for tourism development in general, and wildlife-based tourism in particular.

Preparation of a tourism master plan could help develop different tourism segments in a phased manner that could help avoid cultural and environmental impacts, bring economic benefits to local communities, and generate funds that could be reinvested in conservation management. Such a plan could also help identify tourism assets and products and related markets, and put in place a rational strategy for developing this sector with the support of the private sector. For wildlife-based tourism, the plan would need to cover the following:

- Basic infrastructure and management investments, including developing access roads and grading of tracks and trails in protected areas; and consideration of the strategic positioning and cost implications of airstrips in selected areas

- Consideration of how best to improve water and electricity availability and accessibility through boreholes and solar installations,
- Consideration of how to improve the number and quality of tourist and administrative facilities
- Sustainability considerations that ensure that investments do not undermine sustainable natural resource management efforts—for example, careful consideration of the implications of increasing access and thereby exposing local communities and wildlife populations to human exploitation.

Promoting tourism

The Tourism Bill needs to clearly define the roles and responsibilities of (1) tourism policy and regulatory development—typically functions retained by the relevant ministry—in this case, the Ministry of Wildlife Conservation and Tourism; and (2) tourism promotion and tourism training development—which is usually better done by an entity that can work closely with private sector entities. In some cases, tourism promotion entities are funded by subscription contributions from the private sector.

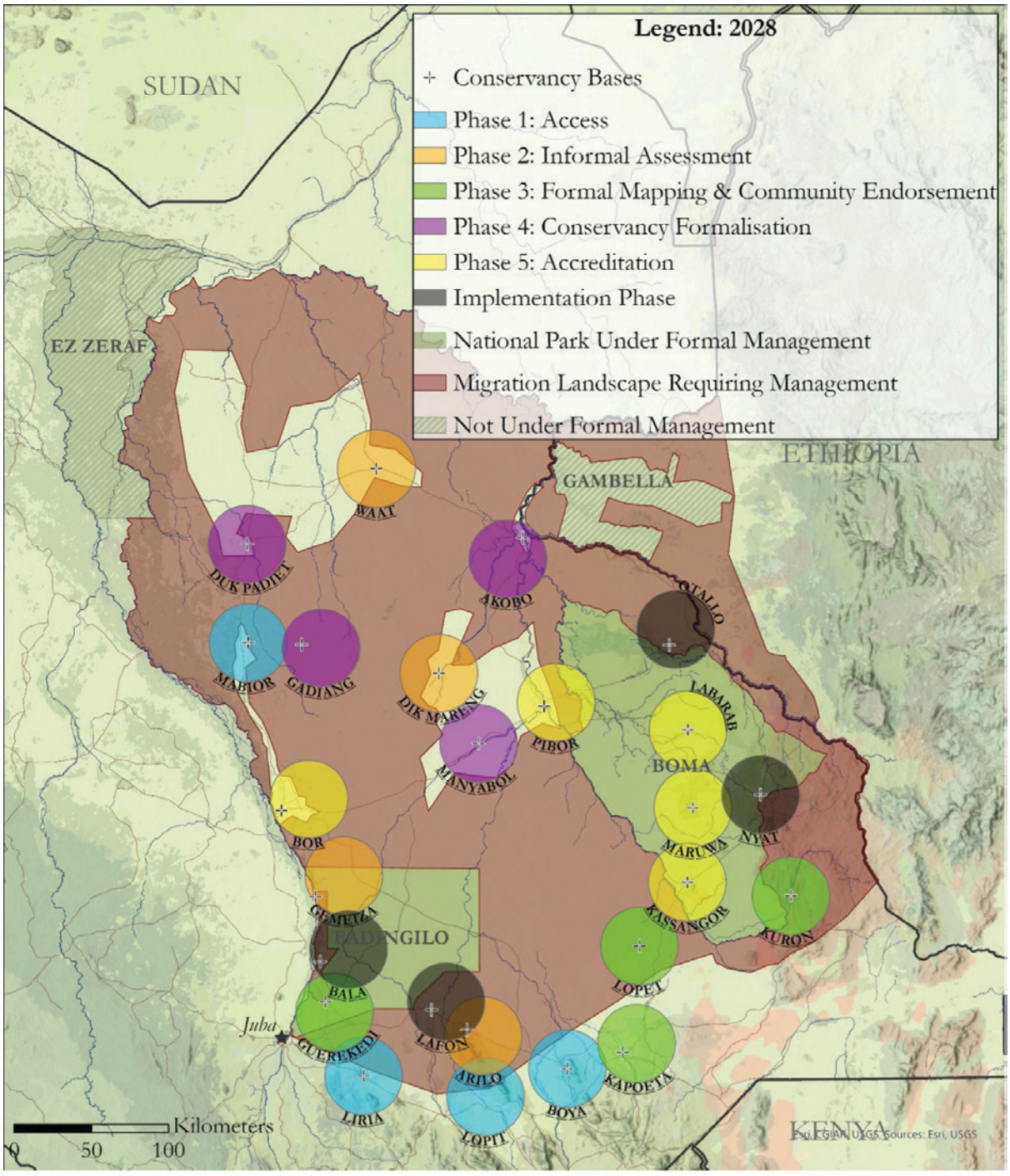
Interventions on the ground

Given the value of current wildlife resources and their vulnerability to future development, top priority should be given to identifying the substantial financing and investments that will be needed to secure the BBJL and associated antelope migrations. A starting point could be development of a landscape plan that can provide a multistakeholder framework for future investments and activities. Early development of this plan is under way and would involve the development of a network of community conservancies anchored by well-managed protected areas (including Ez Zeraf Game Reserve in the Sudd). The initial step would involve establishing a community conservancy and CFM model that enhances community organization, capacity, and tenure to effectively map and manage wildlife and forest resources while developing related livelihood opportunities.

An ongoing initiative proposed by African Parks aims to establish up to 21 community conservancies with business and livelihood planning and start-up support; as well as up to 19 conservation service nodes equipped with offices, basic equipment, airstrips, communications, and trained community conservancy liaison staff (map 3.1). Additionally, there would be institutional capacity support for the wildlife service to fulfill core community support functions. There would also be a focus on strengthening community resource tenure, promoting wildlife-based tourism, and the development of sustainable finance strategies—perhaps including efforts to secure financing from the voluntary carbon markets and from debt-for-nature swaps.

The primary objective will be to ensure the continued functionality and productivity of the migration in harmony with local cultural norms and practices and managing wildlife resources for both consumptive and nonconsumptive purposes to contribute long-term and sustainable benefits for local communities. For this to work in the context of the migratory patterns of the wildlife populations will require the protection and maintenance of breeding, grazing, and movement spaces and the introduction of regulated sustainable offtake agreements at the conservancy level. Reintroduction of key species—in particular of sedentary species that have largely been extirpated from the landscape, such as buffalo and elephant—and habitat restoration will also be key for enhancing wildlife populations and thereby increasing sustainable offtake opportunities. This approach broadly follows tried-and-tested approaches developed by the Northern Rangeland Trust for conservancies in Kenya and Namibia (box 3.4).

Map 3.1 Planning for community conservancies to link formal protected areas in the BBJL (proposed stage of development by 2028)



Source: African Parks 2024.

Box 3.4 Experience with community conservancies: resilient communities and ecosystems

The Northern Rangelands Trust (NRT) supports 45 community conservancies covering an area of 15 million ha in northern Kenya and Uganda. The community conservancy approach has attracted substantial private sector ecotourism investments that directly benefit these communities. Revenues generated by the conservancies come from wildlife tourism, livestock investments, and women-owned craft enterprises. Revenues and investment are used to support livelihood programs and to expand infrastructure development within conservancies such as airstrips, roads, schools, hospitals, and water points. The NRT also supports the Northern Kenya Rangelands Carbon Project which generates sustainable income for NRT conservancies.[1]

Elsewhere in Kenya, the Maasai Mara Wildlife Conservancies Association (MMWCA) creates a platform for pastoral communities and tourism partners to strengthen conservancy management, raise issues, and create large-scale impact. The MMWCA currently supports 24 conservancies with over 16,500 landowners with a vision to create a "vibrant and unified Mara ecosystem where the community and wildlife coexist sustainably for the prosperity of all."[2] As in the BBJL, most wildlife at any one time in the Maasai Mara tend to be found outside national parks and game reserves (over 83 percent of wildlife in the Maasai Mara are typically found in community conservancies) (MMWCA 2023).

Namibia also has an impressive and well-established network of community conservation areas empowering rural people, improving livelihoods, and conserving wildlife and the environment. Initiated in the 1990s, community conservation areas now cover over 20 percent of Namibia's land. As of 2022, there were 86 registered communal conservancies in total, including 46 registered community forests and 20 community fisheries reserves in 7 of the conservancies (MEFT and NACSO 2023).

[1] Source: NRT website, Who We Are; accessed September 2024.

[2] Source: MMWCA website, Who We Are; accessed September 2024.

Table 3.3 Summary action plan for wildlife and tourism sector

Theme	Action	Indicative public cost
Short-medium term (1–5 years)		
Resource governance	Strengthen framework for protected area management • Enact Wildlife Conservation and Protected Area Bill (2023), Tourism Bill (2023), and Environment Bill, and prepare instruments (regulations and guidelines) to guide implementation • Undertake a comprehensive survey of protected areas, including biodiversity survey, socioeconomic and threat assessment • Formalize the legal status of major protected areas, starting with priority areas for wildlife conservation and management (specifically Boma and Badangilo National Parks) • Reconvene the Natural Resources Management Group to enable interministerial consultation on development projects and to discuss potential environmental implications of sector development projects	$5–$10 million Field surveys, consultations, and boundary demarcation to formalize protected areas would be main expenses
	Strengthen wildlife management capacity • Rationalize the wildlife service and increase budget to establish a functional corps of staff • Develop standard operating procedures and training curricula, and deliver in-service training, including in working with communities and on social risk management • Renovate, equip, and provide operational costs for the wildlife service training center at Nimule National Park	$10–$20 million Not including regular budget allocations for staff salaries and operating costs, consistent delivery of capacity building to the wildlife service would be main additional expenses of the wildlife service
Restoration	BBJL landscape planning and management • Participatory strategic land use management plan for the BBJL covering anchor protected areas and conservancies • Establishment of a first batch (nominally, 10) of community conservancies	$40 million • Livelihoods and capacity support, and infrastructure and equipment would be main expenses • Community members would allocate time and in-kind community resources
Value addition	Wildlife tourism establishment • Preliminary assessment of tourism potential (products and markets) • Pilot high-end tented camps and initial marketing activities	Modest public cost, but around $5 million from private operators
Longer term (5–20 years)		
Resource governance	Consolidate and expand protected area management capacity • Expand partnership arrangements with conservation international NGOs to support management of major protected areas • Consider establishment of a protected area management agency with an independent governance structure and authority to retain and reinvest revenues and raise external financing • Establish a national conservation endowment trust fund to support reliable funding for major protected areas	Few million dollars to establish new agency
Resource restoration/ management	CFM activities • Bring remaining major protected areas under active management, in partnership with international NGOs where appropriate, including community engagement, patrolling and improving infrastructure and communications	$100–$200 million • Estimate largely depends on scale of infrastructure development and number of protected areas brought under active management • Community members would allocate time and in-kind community resources
Value addition	Wildlife tourism development • Prepare a tourism master plan with a strong focus on environmental and cultural sustainability • Consider establishing a tourism promotion agency • Expand and improve tourism infrastructure in and around major protected areas as security conditions allow, including in support of transboundary tourism offerings with Uganda • Develop programs for carbon financing to support conservation and habitat management	Substantial investment costs for tourism development, but should mainly be borne by private operators

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