DEFORESTATION IN SOUTH SUDAN

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JANUARY 2021

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CONTENTS

INTRODUCTION

Deforestation in South Sudan is one of the country's most under-researched and under-funded areas of policy and programming. The lack of knowledge on the scope of deforestation undermines the urgency that should be felt due to the impact that it is having on communities, as evidenced by increasing climate change and deforestation in the country. Due to the depletion of trees in the vicinity of settlements, women and girls are having to travel further to obtain firewood for cooking, which increases their vulnerability to gender-based violence. The destruction of forestry resources is also tied to worsening climate change, and in 2020 alone, more than half of the counties in South Sudan experienced flooding. However, the capacity for data collection on this issue is limited in the country. This is partly due to the exploitative nature of deforestation, and the lack of ability for authorities to hold perpetrators accountable. The limited legal and policy frameworks, as well as allocation of financial resources allocated in the national budget, also creates gaps in regulation of the extraction of forestry products.

Deforestation has a long history in South Sudan, with the earliest written documentation of it dating back to the colonial period. Even then, authorities struggled to regulate the trades of charcoal and logging, despite records indicating that the same colonial authorities were extracting and exploiting forestry resources for their own purposes. Colonial authorities also created seedling nurseries and forest reserves to nurture the growth of particular trees that they introduced to South Sudan. The National Archives of South Sudan contain a number of documents that outline forestry policies, practices and challenges during this period, particularly for the Greater Equatoria Region of South Sudan which constitutes the country's "green belt".

Today, the National Ministry of Environment and Forestry maintains responsibility for creating legislation and policies to oversee the country's forests. The government's initiatives in this area are supported by aid actors, such as UNEP, UNDP and FAO. Civil society organizations that focus on the environment, including deforestation, have also emerged. However, these stakeholders are currently limited in their capacity to both prevent and mitigate the impact of deforestation in South Sudan.

Understanding the current scope of deforestation, as well as the way forward in terms of mitigating its impact, requires an analysis of the broader contexts and dynamics

of South Sudan. This includes the socioeconomic trends, development status, conflict, natural disasters and climate change, as well as governance, gender dynamics and food insecurity observed in South Sudan. Furthermore, as this study will show, a multi-sectoral perspective to designing interventions is imperative for supporting sustainable practices that are accessible to all segments of the population.

To establish what is currently known about deforestation in South Sudan, and a feasible path forward to mitigate its impacts, the following topics are explored in this study:

- What is currently known about deforestation trends in South Sudan, and scope of its impact;
- Innovative ideas that can be implemented by aid actors to adopts sustainable practices;
- Other dynamics within South Sudan that need to be considered in relation to deforestation to ensure that sustainable practices are feasible and effective;
- Recommendations for different stakeholders to prevent deforestation, regulate its impact and mitigate its impact.

In exploring these topics, the study establishes the current literature that exists on deforestation in South Sudan, while also providing different stakeholders with tangible actions that can be taken to integrate deforestation initiatives into existing governance structures, policies and programs.

The dire state of poverty, natural hazards, conflict, and hindered governance in South Sudan paints a bleak picture for mitigation strategies to address deforestation. However, due to the youth of the country, which has only been independent for nine years, South Sudan has the ability to learn from the best practices of comparable countries, as well as learn from the impact that unmitigated deforestation has had across the globe.

BACKGROUNG

When South Sudan signed the Comprehensive Peace Agreement in 2005, the country began to chart a path towards nation building and development. This was solidified when the country became independent in 2011, and many refugees returned to the country to vote in the referendum. However, this trajectory was interrupted two and a half years later when civil war broke out, interrupting development initiatives and shifting the focus to humanitarian needs. At present, the country is facing multiple crises, making it difficult for communities to build resilience and local infrastructure, leverage resources for socioeconomic mobility, and to engage in sustainable long-term planning for their localities. These crises are compounded by a lack of government leadership, particularly as the formation of the new government has encountered significant delays, as well as the lack of distribution of financial resources from the national budget.

When civil war broke out in 2013, and again in 2016, many community members across the country were displaced from their homes. This led to those who had been forcibly displaced seeking out IDP sites, refugee camps or host communities to re-settle until it was safe to return home. This also led to the creation of Protection of Civilian sites adjacent to UNMISS bases in six locations. Initially, there was a lot of uncertainty over how long IDPs would be residing in IDP sites, whether the PoCs or ad hoc displacement sites that emerged across the country. As a result, the aid provided to IDPs were intended to meet emergency needs in the short term, and large-scale infrastructure that adequately met the needs of the forcibly displaced population was never planned for. Consequently, even the WASH and shelter materials that were distributed were meant to sustain IDPs for a short period of time. This was further compounded by the fact that permanent shelters could not be built in PoC sites. After the peace agreement was signed in 2018, the Government of South Sudan began to encourage IDPs and refugees to return to their homes. As a result, aid actors and the government have begun to strategize and implement programs to support returnees.

The relationship between deforestation and the current context in South Sudan primarily relates to different segments of the economy, including livelihoods, fuel sources and construction. As returnees relocate to urban areas or to their areas of origin, they will seek to obtain resources to meet their daily basic needs, build

new lives, establish means of generating income, as well as construct new homes, businesses and institutions. The National Biodiversity and Strategy and Action Plan (Ministry of Environment and Forestry, 2018) notes that returning refugees into the country are creating additional pressures on deforestation as the growing population has led to an increased demand for building materials in markets. Furthermore, as observed during the post-CPA period as well, when the government resettled many returnees in areas near forests, and land was cleared for agricultural and residential purposes (Doki, 2012). Tensions between host communities and IDPs or refugees have been documented in region, due to increased pressure on local natural resources such as water, land and forest products. It is anticipated that similar tensions may result from increasing population densities in areas where returnees will settle. Sustainable and innovative uses of forestry products can serve as a mitigating measure in reducing the potential for these tensions. Additionally, as outlined in this report, integrating sustainable practices into the extraction of forest products also protects populations from future risk factors, such as flooding and droughts resulting from climate change.

In 2020 alone, it was estimated that over half of the counties in the country experienced flooding. Instances of inter-communal violence have also spiked, particularly in Jonglei, Lakes State, and Unity State. Compared to previous periods, inter-communal violence has become more deadly and violent with the introduction of guns and cycles of revenge attacks between communities; these incidents involve the destruction of infrastructure including shelters, the burning of crops, theft of cattle, as well as gender-based violence and the abduction of women and children. The most recent IPC reports also estimates that within the next few months food insecurity levels will reach IPC Phase 3 or higher in 60% of counties (Food Security Cluster, 2020). The spread of the global pandemic to South Sudan, which led to the closure of schools, has also resulted in increased poverty across the country, as well as increased rates of gender-based violence, child marriage and teen pregnancies. Significant portions of funding that had been earmarked for humanitarian and development aid in 2020 were re-directed to COVID-10 related programming and services, leaving fewer resources to assist populations in meeting their basic needs and responding to crises.

Legislation, Policies and Guiding Frameworks

While forestry policies were created during the colonial period, and when the country was a part of Sudan, legislation and policies specifically for the Republic of South Sudan have been in progress since the Comprehensive Peace Agreement was signed in 2005, when the country began to create a national governance structure. This included efforts to create environmental policies (Ministry of Agriculture, Forestry Cooperatives and Rural Development, 2015). However, conflict and political instability since then has impeded progress in this branch of governance. As a result, many policies and legislation remain in draft phases, awaiting review and endorsement by the National Legislative Assembly. Combined with ongoing insecurity in the country and a lack of resources from the national budget, this gap in legal and policy frameworks has disempowered different stakeholders within the government, and prevents them effectively regulating natural resources such as forestry products. As result, these resources are frequently exploited in a manner that is unsustainable, and challenging to track.

In the pre-colonial era, the area currently known as South Sudan was constituted of indigenous groups that regulated societies and natural resources through communal practices. Following colonization, the British administrators created institutions and policies to facilitate their rule over the area, and in 1902, the Forest and Woodlands Service was established in Sudan (FAO, 2006) alongside the Forest Law and Ordinance of 1902 (Ministry of Agriculture, Forestry Cooperatives and Rural Development, 2015). The first forest policy was established in 1932, and later amended in 1986 to emphasize the involvement of communities. This was supported by Forest Law and Regulations of 1972, which also allowed southern Sudan to begin developing its framework in line with the Addis Ababa Peace Agreement signed the same year. Documents stored in the National Archive reveal that regulation of deforestation at the national level was in place during the colonial period. Ordinances were issued to regulate the circumstances under which trees could be cut down and which areas. Individuals that wanted to obtain wood and charcoal cut down trees, to request a permit to do so, which was issued by the Conservator of Forests for the respective province. The permits issued outlined the area in which the retrieve firewood and charcoal, and also clarified that "green living trees" could not be cut. Violation of this led to the "green living trees" being confiscated as government property, and the offender being prosecuted. Ordinances were also used to established which land are the forests they contained were to serve as forest reserves.

Following independence from the British in 1956, under the Khartoum government, forestry resources were extracted under government programs, and were used to support the national budget. Government regulation of the extraction of forestry products are also evident in the national archive. However, as has been noted in multiple historical analyses, the distribution of financial resources to southern Sudan was quite limited, which inhibited its overall development. This lack of investment following the colonial era is one of the underlying factors that has contributed to the multiple crises that the country experiences today.

Documents and policy frameworks were also published following the signing of the peace agreement, which still included the southern region under Sudan's purview. In 2006, the national government of Sudan, with support from FAO, published the "Sudan National Forestry Policy Statement", In the post-CPA period, a document titled "A Legal and Institutional Policy Framework for Sustainable Management of Forest Resources" was published in 2010.

In terms of broader legislation, the Transitional Constitution of 2011 established that the national and state governments would share concurrent powers over natural resources including forests. The revision of the national constitution was interrupted by the outbreak of conflict in 2013, and future legal provisions remain in limbo. The revitalized peace agreement provides guidance on approaching oil, land and water resources, but does not contain comprehensive information on environmental protections, and furthermore does not address forests at all (JMEC, 2018). The primary documents that guide the contemporary discourse on deforestation in South Sudan are the National Environmental Policy 2015-2025, as well as the Forestry Policy. Supporting legislation and frameworks are also discussed below. Despite the multitude of documents that have been created to mitigate deforestation in South Sudan, it continues to receive minimal funding and interventions compared to other sectors in South Sudan.

National Environmental Policy 2015-2025

endorsed by parliament in 2015, however it does not have an accompanying legislation to reinforce the framework. The document, which aims to frame environmental management for the country, outlines the

responsibilities of different levels of government, noting that the national government will provide policy and legislative frameworks, but will not directly implement programs.

In relation to forestry specifically, the policy acknowledges that without proper forest management the country risks "the gradual conversion of forest land to other land uses, the

introduction and spread of exotic invasive tree species, localized soil erosion,

accelerated loss of biodiversity, alterations in the hydrological and nutrient cycles" (Ministry of Environment, 2015, p.25). Risks to the country's environment and biodiversity are said to be mitigated through afforestation and reforestation. In order to do this, the policy outlines key actions that can be taken in South Sudan to support this, including: comprehensive laws and regulations, enforce reforestation policies for those responsible for cutting trees, encourage sustainable uses of forestry products for income generation, adopt participatory approaches, integrate pest-prevention and management approaches, increase capacity of staff and research relating to forestry, prevent burning of resources, encourage voluntary tree panting by citizens as well as participate in the UN REDD+ initiative.

Forest Policy

The draft National Forest Policy was finalized in 2015 by the Ministry of Agriculture, Forestry Cooperatives and Rural Development, but the process to create it began in the post-CPA period. Since the policy was drafted, forestry resources now fall under the Ministry of Environment and Forestry. The policy acknowledges the relationship that forestry products have with food security and poverty, and "recognizes that forest and woodland resources of South Sudan are more than just trees; they including forest waters, soils, wildlife, biodiversity, and carbon, as well as their dependent communities, economies, and their collective productivity" (p.14).

Similar to the petroleum industry, the forestry policy suggests creating a "South Sudan National Forest Corporation (SSNFC) to operate as a semi-autonomous, self-supporting and income-generating institution operating under a Board of Directors" (p.8). The document also outlines approaches to regulating private investment in forestry resources, as well as encouraging collaborative forest managements agreements with communities in the country. A "National Forest Fund" to manage revenue obtained from forest resources is also recommended, which would support the equitable distribution of funds across all 10 states. The policy estimates that 45% of forest cover has been lost since the second civil war with Sudan began in 1983 (p.10), and expresses urgency in regulating extraction at all levels of government.

In terms of the role of community's in South Sudan, the policy makes two main points: 1) community members should pay taxes for the forestry products they extract; and 2) the government will draw from best practices globally to implement combined forestry management practices. Furthermore, in terms of ownership, the policy states, "Communities will delineate and gazette forests in their communal land to be managed as Community Forests (CFs) at the Boma and Payam levels of government."

Land Act

Also key to understanding the deforestation discourse in South Sudan is analyzing how components the Land Act of 2009, which guides the regulation, rights, ownership and usage of land in the country, also impacts forestry regulations. The legislation specifies, "Traditional Authority within a specific community may allocate customary land rights for residential, agricultural, forestry, and grazing purposes (p.15)." The act also mandates the establishment of Payam Land Councils, which include amongst their responsibilities the "protection of communal grazing land, forest, wetlands and water resources" (p.28).

One of the key dilemmas that legislative frameworks in South Sudan face is the dichotomy of recognizing both communal rights and government regulation of land, which is increasingly leading to tension, particularly in urban areas. With the signing of the CPA in 2005, government institutions were established which led to national regulation of land by a South Sudanese government for the first time. Land rights are closely connected to ownership and extraction of natural resources in the country; without a clear path forward on ownership and extraction rights, tension between communal rights and government oversight will impede progress in managing the country's natural resources.

National Adaptation Programmes of Action (NAPA) to Climate Change (2016)

The National Adaptation Plan of Action to Climate Change was published in 2016 by the Ministry of Environment, with support from UNEP and the Global Environment Facility (GEF) (Ministry of Environment, 2018). The plan attributes deforestation to growing populations in the country following independence, which has increased demand for fuel sources such as charcoal and firewood, as well as increased demand for cleared land to be used for agricultural and residential purposes. The outcomes of climate change, such as increased flooding, are also noted to be a causal factor in deforestation. Rural communities are identified as being particularly impacted, not only due to the loss of wood sources, but also other forestry products such as food, and diminished water sources. Forests are also said to provide rural communities with resources and survival mechanisms when food insecurity increases due to crop failures, natural disasters, etc.

To mitigate these impacts, the plan advocates for reforestation programs, the creation of forest reserves, encouragement of the use of alternative fuel sources, fire management plans, increased public awareness, as well as the establishment of seed banks. In doing so, it is anticipated that the threats of desertification, flooding and droughts will also be reduced.

National Biodiversity Strategy and Action Plan (2018-2027)

In 2018, the National Ministry of Environment and Forestry published the National Biodiversity Strategy and Action Plan, with support from UNEP. The document aims to serve as "the principle instrument for undertaking biodiversity management and conservation in the country, and as a framework for optimally integrating the management of the country's vast biodiversity resources into national economic prosperity and social welfare targets of the Vision 2040" (p.iii). One of the most comprehensive plans that addresses South Sudan's forest resources, the document outlines the current context in the country, organizations and stakeholders involved, the importance of biodiversity in the country, trends and threats to the country's biodiversity resources, and presents strategies to manage these natural resources while also mitigating threats.

The primary threats to the country's biodiversity include lack of coordination between government institutions, pollution of water sources, deforestation from fires, grazing and harvesting practices, bush fires, and dependency on forestry products for fuel sources. The plan also identifies the lack of development in the country as a contributing factor, along with a lack of clarity in land ownership policies, gender inequality, war which has led to illegal extraction of resources, lack of capacity in the sector, degradation of land by livestock and humans, poverty, increasing population growth, lack of public awareness and the introduction of foreign species.

Comprehensive Agricultural Development Master Plan (2015)

The Comprehensive Agricultural Development Plan was finalized in 2015, with support from JICA. The plan aims to guide agricultural development in the country by establishing the responsibilities of different stakeholders, establish the current trends and threats to this sector, and chart a sustainable path forward.

The primary causes of deforestation identified in the plan include use of fuel sources (charcoal and firewood), "mechanized agriculture, rain-fed and shifting agriculture, drought and climate change, overgrazing and fires, and conflict impacts" (p.3-16), and is concentrated in urban areas. Increasing populations since the CPA have also identified land degradation resulting from decreasing times between use of land for crops, as well as clearing the land in a manner that prevents regrowth. Livestock are contributed to land degradation in certain parts of the country where they play a key role in livelihoods. The document also notes the lack of governance and regulation over the country's biodiversity resources, making them vulnerable to exploitation.

In relation to forestry specifically, the report outlines the country's legal and policy framework, government capacities, forest reserves, concessions, private companies involved in logging, training capacities, activities of stakeholders, as well as the markets for forest products.

UN REDD+

South Sudan is also party to the global UN REDD program, which seeks to reduce emissions that result from deforestation, and is supported by the UN agencies FAO, UNDP and UNEP.

The UNREDD+ Country Needs Assessment was published in 2016, and sought to inform stakeholders in how to approach South Sudan's engagement in UNREDD+. The report acknowledges the close linkage between deforestation and climate change, and expresses urgency in mitigating these impacts, particularly through reduced emissions. The needs assessment identifies the different stakeholders in South Sudan that are critical for the successful implementation of REDD+ programming, including the government, civil society and development partners. It also seeks to establish whether South Sudan has the capacity to establish a National Forest Monitoring System and monitor Forest Reference Emission Levels.

An overview of South Sudan's forestry resources is provided, establishing the difference between indigenous forests and plantation forests which were primarily established during the colonial era. The types of trees found within each type of forest are listed. The indigenous forests extend along the Equatoria Region, as well as the western border of the country up to Northern Bahr el-Ghazal. These areas contribute significantly to the biodiversity of the country, particularly in Eastern Equatoria. Plantation forests, which primarily emerged during the colonial era, tend to be dominated with one tree type, particularly teak which has served as a profitable export for the country.

The country's forestry resources do not exist in isolation from other natural resources; in addition to having a critical role in the hydrological cycle, it also "South

Sudan's forests contribute significantly to the stability of the flow of the Nile River, with the Bahr el Ghazal, Sobat, Bahr el Arab and many other rivers joining the White Nile within South Sudan's geographical borders" (p.14).

METHODOLOGY

This study adopted two primary methods for data collection: 1) a review of existing literature and datasets, as well as 2) semi-structured key informant interviews with experts based in Juba.

While minimal data is available on deforestation in South Sudan, this study sought to establish the scope of the knowledge that does exist. For example, draft policy documents were analyzed, as well as existing literature that has been published by academics, practitioners and civil society. The study also looked at data and literature on dynamics that influences how and why people use forestry products in an unsustainable manner, and which factors need to be considered when designing sustainable interventions for the future. This includes examining what is known about historical, current and future displacement dynamics, market systems, as well as conflict and gender dynamics.

The semi-structured interview sought to establish the primary causes of deforestation in South Sudan, existing programs, policies and legislation, the different stakeholders in both causing deforestation as well as those that maintain responsibility for mitigating it, as well as the relationship that deforestation has with both humanitarian services and displacement.

A wide variety of key informants were recruited as participants, including those who are able to speak to the issue from the perspective of the national government, civil society, as well as academia. A select number of key informants were selected based on their existing role and work they have done on deforestation. Snowball sampling was then used to recruit additional participants for the study. A full list of participants included in this study is provided in the appendix section.

Participants were provided with an introduction letter which introduced the researcher and outlined the purpose of the study. The researcher also provided each participant with an overview of the purpose of the study and the intended use of the data collected. Each participant was asked to provide verbal informed consent for their participation in the interview, and also notified that their participation was voluntary, and therefore they could stop the interview at any time or decline to answer a specific question. Lastly, each participant was also asked for their permission to record the interview.

Due to the COVID-19 pandemic, the interviews were conducted either online or in person, depending on the preference of the participants. The interviews were recorded to ensure accuracy in data collection, and were later transcribed by the researcher. The recordings were stored securely, and belong to IOM – participants were assured that the recordings would not be shared publicly. The data was analyzed using grounded theory, which allowed for emergent themes to be identified, and subsequently shaped the key findings presented in this report.

KEY FINDINGS: DEFORESTATION IN SOUTH SUDAN

Insufficient data currently exists on the scope and extent of deforestation in South Sudan, however the data analyzed and collected in this study reveals that it is perceived to be an in issue that is rapidly increasing. As speculated by a government official interviewed in this study, until deforestation presents an urgent threat to people's lives, it cannot compete for resources and programming in the same manner as humanitarian needs such as food, security, shelter and water. However, as this study indicates, these humanitarian needs are not entirely disconnected from deforestation. Consequently, as stakeholders seek to stabilize the humanitarian situation in the country, it is important to consider some of the root causes of these needs, which include the increasing deforestation in the country.

Deforestation Histories

Deforestation in South Sudan is documented through the colonial period, as evidenced through documents maintained in the National Archive. Forest products were used to construct building, create furniture, fuel steamships, as household energy sources in the form of charcoal and fireword, and were also exported for revenue. The correspondence between colonial administrators notes the creation of saw mills across the country, including those set up by religious missions. Labour for these mills, recruited through local communities, was often in short supply. The saw mills provided wood for commercial purposes, for export, as well as the construction of office buildings by colonial administrators, schools, churches and residences. Interestingly, the need to transport timber to different areas in South Sudan or across borders necessitated the development and improvement of roads in the country, due to the weight of the loads and vehicles necessary to transport them. Similarly, within the contemporary context, one key informant that participated in this study

noted that if the road infrastructure in South Sudan were to improve, deforestation would worsen due to the increased ability to transport forestry products to markets, other towns and states, as well as across international borders.

Current Forest Resources

The existing policy documents for South Sudan do not provide a clear definition of what constitutes a "forest" in the country. According to Global Forest Watch's approach to data collection, which draws from FAO's work in this area, the definition,

> *"adopted by the FAO in 2000 [is used], which takes into account biophysical and land use criteria. The biophysical criterion establishes minimum thresholds for the height, canopy cover and extent of trees. The land use criterion requires that land be officially or legally designated for a "forest use," such as conservation or harvest. Land that contains trees but is designated for agricultural or urban uses – for example, an oil palm plantation or a city park – would not be considered a forest. On the other hand, land that is temporarily devoid of trees – for example, recently logged or burned areas – would still be classified as forest if the official land use stipulates that trees will be allowed to regenerate in the future" (Harris et al., 2016)*

According to the National Biodiversity Strategy and Action Plan, the country's forestry and woodland reserves are primarily located along the country's western border. Western Bahr el-Ghazal and Western Equatoria States combined contain more than half of the country's forest and woodland areas, according to FAO estimates from 2011, as indicated in the table below:

State	FAO/Government of South Sudan (2011)[1]		Global Forest Watch[2]	
	Hectares	% National Total	Hectares	% National Total
Central Equatoria	1,579,929	7.41%	1,790,000	13.50%
Eastern Equatoria	1,02,624	5.07%	663,000	5.00%
Jonglei	1,554,901	7.29%	536,000	4.04%
Lakes	1,564,445	7.33%	1,000,000	7.54%
Northern Bahr el Ghazal	1,577,372	7.39%	9,200	0.07%
Unity	196,030	0.92%	89,900	0.68%
Upper Nile	998,466	4.68%	104,000	0.78%
Warrap	764,630	3.58%	149,000	1.12%
Western Bahr el Ghazal	7,643,670	35.83%	2,360,000	17.80%
Western Equatoria	4,373,605	20.50%	6,560,000	49.47%
Total	**21,335,672**		**13,261,100**	

Estimates by Global Forest Watch for 2010, which exclusively focuses on forest cover only, present a different picture however, in which Western Equatoria hosts the greatest proportion of the country's forest resources.

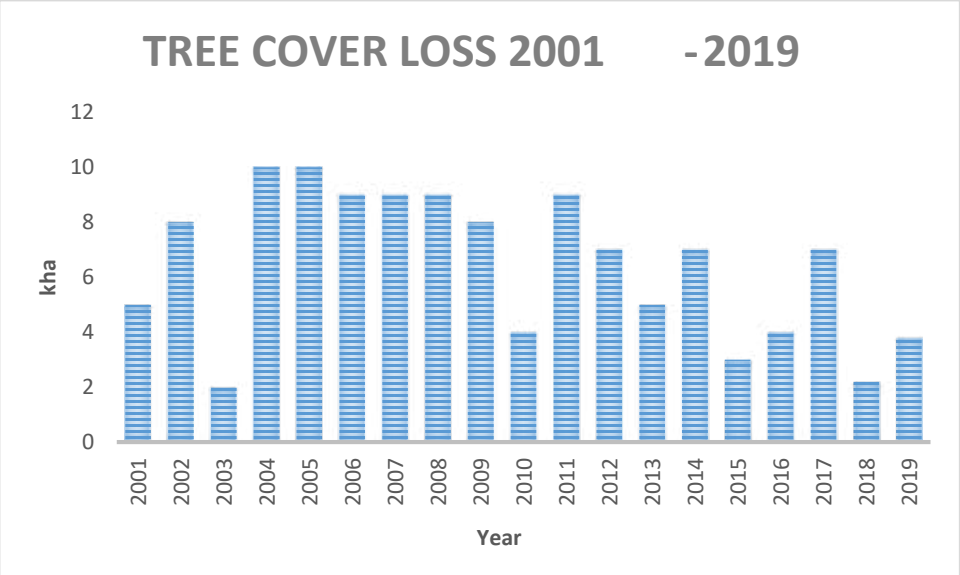
When compared to other types of land cover, forests and woodlands constitute the second most common type of land cover in terms of hectares, constituting more than 32% of land in South Sudan (Global Forest Watch, 2021). This includes plantations with different species of teak and mahogany (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015). As indicated below, bushlands are the most frequent type of land cover in the country (39.52%) (Global Forest Watch, 2021).

Table # Types of Land Cover in South Sudan[3]		
Type of Land Cover	**Hectares**	**% of Total**
Agricultural lands	2,777,226	4.22%
Forest and woodlands	21,335,672	32.38%
Bush lands	26,039,167	39.52%
Grasslands	15,067,996	22.87%
Urban areas	34,190	0.05%
Bare lands	179,429	0.27%
Water bodies	463,641	0.70%
Total	**65,887,321**	

[1] *These estimates are for forests and woodlands.*
[2] *These estimates are for forest cover.*
[3] *Data drawn from Global Forest Watch (2021)*

The data presented in these tables draw from FAO data from 2011, and it is not known how types of land coverage have changed in the last nine years. New urban areas have been created with the introduction of PoC sites and ad hoc IDP sites. Additionally, many IDPs have resettled amongst host communities, expanding existing urban areas. Increased flooding in recent years, as well as desertification along the northern border of the country, may also have changed the topography of water bodies and bare lands. It is also unclear how conflict may have impacted land coverage in the country, as land is cleared at times to increase visibility, or allowed to overgrow to provide coverage. As returnees begin to resettle in the country, this will also have an impact on the proportion of land coverage types in South Sudan. FAO is currently in the process of producing a new land coverage assessment for South Sudan.

Global Forest Watch (2021) provides the most recent information available on deforestation rates in South Sudan. The organization estimates that in 2000, the country had 18% tree cover[4] and in 2015, 11% of the country's land was forest[5],. The organization's data indicates that Western Equatoria and Central Equatoria accounted for two-thirds of deforestation observed between 2001 and 2019, a total loss of over 123 kilohectares (1.1% of total tree cover). As of 2016, the organization noted that 0% of the country's forests were considered "intact forest" – defined by Global Forest Watch as "unbroken expanses of natural ecosystems within the zone of forest extent that show no signs of significant human activity and are large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained."



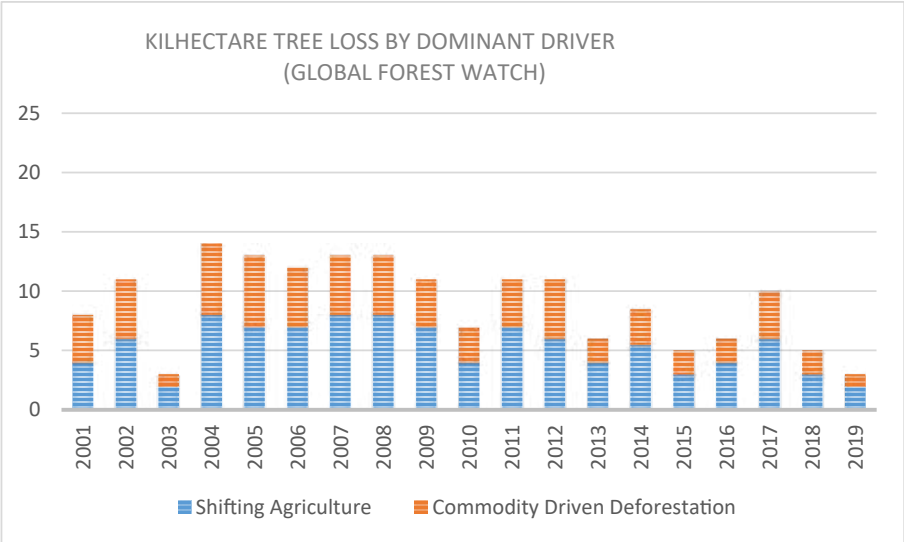
As indicated above, tree cover loss actually peaked in 2005, the same year that the Comprehensive Peace Agreement was signed. Spikes in tree cover lost were observed again in 2011, the year of the referendum and independence, as well as in 2017. The National Forest Policy estimates that if deforestation is not mitigated in South Sudan, there will be a total loss of forest cover in 50 years (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015).

The implications for the environment are significant, as Global Forest Watch states "the land-use change and forestry sector is…emitting an average of 216tCO_2e per year from 1990 to 2017. This represents 79% of South Sudan's total greenhouse gas emissions over the same period".

[4] *Tree cover is defined by GFW as "all vegetation taller than 5 meters in height as of 2010…[and] is the biophysical presence of trees and may take the form of natural forests or plantations existing over a range of canopy densities."*

[5] *Forest cover is defined by GFW as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use."*

While the exact proportion of causes of deforestation are not known, Global Forest Watch has tracked data from 2001-2019 that examines tree loss according two causes: 1) shifting agriculture and 2) commodity driven deforestation.



Global Forest Watch attributes the causes of both drivers to different scales of agricultural expansion, and does not break down data by other causes such as commercial logging or trees cut for charcoal production.

Desertification

In addition to the consumption and extraction of forestry products, desertification is also considered to be a key threat to forests in South Sudan. In particular, desertification threatens the country from its northern border, as it extends southward from Sudan (GEF, 2016). Desertification trends have also been observed in the South-East of the country, along the border with Kenya. The National Environmental Policy (Ministry of Environment, 2015) notes that 50-200km along the northern border has shifted from semi-arid deserts to deserts (p.43). The consequences of desertification include a loss of wind barriers, a loss of water sources in streams and rivers, as well as a loss of land degradation. Counties and states located along the northern border, which already have lower forest coverage compared to other regions in the country, are most vulnerable to desertification.

Unfortunately, the data and research that exists on desertification in that region tends to focus on trends identified on the Sudanese side of the border. As a result, the full extent of desertification, and the rate of which it is occurring in South Sudan, is currently unknown. However, the country's National Environmental Policy (Ministry of Environment, 2015) advocates for the planting of trees along the border areas to act as wind breakers, and mitigate the rate of desertification.

Types of extraction of forestry products

Unfortunately, data does not currently exist on the proportion that each type of extraction of deforestation constitutes of the total rate of deforestation. While key informants identified the charcoal and firewood being the main causes, followed by logging, it us unclear if this is the primary means as a result of the number of people in the country that rely on charcoal and firewood, or if it actually accounts for the greatest proportion. The Forest Policy also acknowledges the dependency that rural populations and settlements have on forestry products, including for shelter, medicine, food and income (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015).

Key informants also noted that while the use of charcoal and firewood, as well as the exporting of trees, have been evident historically, the mechanization of cutting trees for commercial purposes at high rates has contributed to deforestation practices. While previously trees were cut manually in a manner that allowed them to regrow, the introduction of chainsaws and other machines does not allow regrowth. As a key informant recounted, "In

most cases the rural communities go to the forest to get things like firewood. And the way they harvest they look for branches that are already drying up and the like. And even those burning charcoal, the way they harvest the forest was not very harmful like at the moment. However, currently, the deforestation attributed to massive and indiscriminate felling of trees. And this is for commercial purposes." As noted, such practices are usually engaged in on the commercial side of extracting forestry products, among those who can afford to import the tools needed, which local communities do not have control over.

Charcoal and firewood

The use of charcoal and firewood were consistently identified by key informants as the primary cause of deforestation. It is estimated that between 90-99% of the population in the country rely on these products for daily consumption (Ministry of Environment, 2018). These products are primarily used to cook food for households, as well as to heat water. Firewood is also noted to be used as the primary source of lighting in the country, accounting for 35% of households (Ministry of Environment, 2018). Due to inflation, supply of natural resources and variances in trade supplies, the price of charcoal in November 2020 varied from 29-276 SSP/kg, and prices of firewood varied from 50 – 3,000 SSP/bundle. Access to the two sources of fuel also varies – firewood can be found in natural environments, however charcoal needs to be produced and is often found in markets.

The market for charcoal also extends beyond South Sudan. Key informants described growing road trade routes from Juba to Nimule, at the border with Uganda, to export these resources. The Sudd Institute is currently researching these trade routes further. An additional example was provided of charcoal being sent to the United Arab Emirates by air in significant quantities, which became public knowledge when a shipment was intercepted by authorities at Juba International Airport. While most of the interviews focused on the role of South Sudanese citizens in the charcoal trade, foreign traders were also noted to play a role in both the charcoal and logging traders.

In 2015, the Government of South Sudan banned the exportation of charcoal and timber. However, it was done through a public order issued by the Ministry of Environment, rather than an act of legislation which would be passed by the National Legislative Assembly. What further complicates the regulation of the charcoal trade in South Sudan was the involvement of soldiers, which was observed by a number of key informants that participated in this study. This aligns with previous research conducted in the country (Leonardi et al., 2020).

Logging

South Sudan is said to "boasts the world's largest and Africa's oldest teak plantations" (Nasulea et al., 2016, p.110), and originate from teak plantations that were planted during the colonial era. Due to the legal precarity of logging practices in South Sudan, accurate public data does not exist regarding the number of trees that are cut each year. However, UNEP estimates that $100 million dollars in revenue could be retrieved with proper management in forestry resources. However, estimated indicate that at present the country is only receiving $1-2 million per years in revenue from teak exports (Akile, 2019). As South Sudan is a land-locked country with limited transportation infrastructure, it relies on neighboring countries, particularly Uganda, to facilitate the exporting of timber (C4ADS, 2019; Fleischner, 2015). Current teak resources are primarily found in the country's Greater Equatoria Region (C4ADS, 2019).

In recent years, the logging and the export of timber has been closely correlated with the conflict, as armed groups have been accused of using the trade to fund their movements. This relationship was also acknowledged in the country's Forest Policy (Ministry of Agriculture, Forestry, Cooperatives and Rural Development , 2015). The integration of logging into the war economy has been particularly evident in the Greater Equatoria Region, especially beginning in 2015. As armed groups in the region do not have access to other natural resources to exploit, such as oil, they rely on such tree products to raise revenue. They are also raising funds by forcing individuals and companies operating in the area to pay for protect and access to trade routes (C4ADS, 2019). While the civil war was primarily relegated to the Greater Upper Nile Region after the outbreak of conflict in 2013, where the country's oil resources are located, leading up to the second outbreak in 2016 areas of the Equatoria Region also began to experience insecurity,

and were eventually embroiled in the civil war in an unprecedented manner. The changes in the geographic parameters in the conflict also opened up the Equatoria Region to exploitation in natural resources, particularly of the region's forests. The participation in armed groups in this exploitation, and the extensive insecurity in the region, means that much of it has not been documented as public record. A report by the UN Panel of Experts, which was presented to the United Nations Security Council in 2019, detailed the different armed groups that have been involved in illegal logging, and notes the economic impacts of such practices, particularly in a context

In 2020, the Governor of Central Equatoria banned logging in the state, which followed a previous ban of exporting of teak in the country in 2015. A previous study indicated that private companies engaged in logging are not engaging in sustainable practices or reforestation programs (Adkins, 2015).

Similar to petroleum companies, those that receive permission for logging in South Sudan are meant to provide support to local communities from which they extract these resources. However, across the board, there has been little evidence of private companies honoring these conditions of agreements.

Teak is a highly valuable commodity, and is one of South Sudan's key exports aside from crude oil. Increasing regulation and ban of exports in Asian countries has led to an increased in demand for teak from other areas such as South Sudan. From 2018-2019, India was cited as the top destination of teak from South Sudan exported through Uganda, where the raw materials are processed into items such as furniture, and subsequently exported to markets in other locations such as Europe. This occurs despite the fact that India is said to possess the largest "planted teak forests in the world" (C4ADS, 2019). The final products that are sold on the market have much higher prices than the raw materials that are originally extracted (Adkins, 2015), meaning that small-holder loggers within communities are selling their teak to middle-men for lower prices than their actual value.

Burning of Land

In South Sudan, land is purposely burned for two primary reasons: 1) clearing land for agricultural purposes and 2) hunting. Burning is land is unregulated, and often uncontrolled, which may lead to trees being destroyed unnecessarily. Additionally, when forests are burned by hunters seeking to push wildlife into open spaces, it also forces wildlife to move their habitats and grazing grounds to other areas, potentially depleting these resources as well.

The National Forest Policy notes that forest and bush fires are a significant threat to the maintenance of forests in South Sudan. Whether burning for agriculture, hunting, grazing, or wild fires, these practices make it difficult for forests to regenerate their resources. The document also encourages greater government regulation and response to fires in the country. The National Environmental Policy (Ministry of Environment, 2015) advocates for the banning of all burning in order to preserve the land and forests in South Sudan. However, it is unclear what alternatives community members will turn to if a ban is implemented and enforced, as burning of land is closely to tied to the majority of livelihoods in the country, particularly those practiced in rural areas. Global Forest Watch (2021) reported over 48,000 fire alerts in South Sudan during a one year period from 2020-2021.

Petroleum Pollution

Although less is known about the connection between the extraction of crude oil and deforestation, one key informant pointed out that when land and water sources are contaminated in South Sudan, this also has an impact of forests in the area. Oil fields are primarily located in the northern states in South Sudan, particularly in the Greater Upper Nile Region. Previous research conducted on oil pollution in the country indicates that community members in oil-producing areas are experiencing higher rates of diseases and birth defects. Cattle, which constitute a primary livelihood in the area, are also reported to be experiencing greater illnesses as a result of contaminated water sources and grazing land. To date, however, the existing research has not directly established causation. between the contamination and the impact of communities and the environment; rather, research has relied on community accounts of the impact of pollution to establish a correlation. Additional resources and government involvement is required to conduct environmental impact assessments in this area, particularly as communities residing in these areas rely heavily on their surrounding environment to meet their basic needs and support their livelihoods.

Construction: Shelters and Furniture

Increasing urbanization, particularly in Juba, has been driving the demand for wood products to be used for construction, and "primarily this is coming from economic pressure to produce timber and poles or urban centres within South Sudan" (Adkins, 2015, p.21). It is currently unknown exactly what proportion of deforestation can be attributed to construction needs. However, most homes in South Sudan use wooden poles to reinforce structures made from local materials, and as a result the demand arises both in stable contexts as well as emergency situations. In humanitarian responses, wooden pools are distributed to households to build shelters. However the materials provided are meant to erect temporary shelters, which means that due to a lack of durability, shelters will have to be re-built on a more frequent basis compared to permanent shelters. With increasing hazards in South Sudan which lead to the destruction of local infrastructure including residences, such as flooding and inter-communal violence, both permanent and temporary structures are threatened and need to be rebuilt on a regular basis.

Increasing prices of shelter materials due to inflation as well as limited supplies due to hazards, may create a barrier for returnees to access the materials they require to construct and repair shelters where they re-settle.

The Cash Working Group in South Sudan reported in November 2020 that in the span of a month, the average prices of plastic sheets had increased by 35% and poles by 54% (p.6). Prices for these items vary widely across the country; in Akobo plastic sheets cost 11,000 SSP, where as in Nimule they cost 3,500 SSP. Similarly, in Magwi wooden poles are sold for 250 SSP whereas in other markets consumers are paying 1,000 SSP (p.11).

The humanitarian sector that serves IDPs may also be creating a demand for logging, however this is largely under-researched. A study by USAID indicated that "several major

humanitarian NGOs are also relying heavily on mahogany and other timber from

natural forests for their operations, exacerbating forest degradation in the rural

areas, reportedly because the cost is low" (Adkins, 2015, p.16).

In addition to the national demand in the market for construction materials, South Sudan's forest products are also exported to other countries to meet their supply needs for construction. This is detailed further in the logging section.

Gender dynamics in extraction of forestry products

The Forest Policy acknowledges that gender considerations need to be made for the sector (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015). This includes land rights, which are often not enforced in favor of women, and as a result ownership of forestry resources tend to be in the hands of men. A key informant in this study stated, "The benefit goes to men. The men own the bush, the men own the land…and the women are often victims when deforestation happens." Additionally, women carry the primary burden of providing food for households, and therefore ensuring that they have acquired the fuel necessary for cooking. Formal and informal employment in the forestry sector also tends to be dominated by men in the country.

The gender dynamics of the extraction of forestry products tends to vary by location and circumstances. In areas where there is a high concentration of IDPs and female-headed households, women and girls often take on the responsibility of collecting firewood for their households. Numerous reports from the humanitarian sector identify this as a risk factor for gender-based violence, as women and girls are forced to travel longer distances in insecure areas in order to collect firewood in depleting forests.

In other areas, where trees are cut for charcoal production, which is then later sold in local markets, men are primarily reported to conduct the extraction. A number of key informants noted that due to insecurity in the rural areas surrounding Juba, it is often armed soldiers who are able to obtain the resources for charcoal production.

The vulnerability of women and girls who retrieve charcoal and firewood for household use is noted in a recent report by the Rift Valley Institute (Leonardi, et al., 2020). The research findings state, "The challenges that women face to cook food for their families are not just an indication of general poverty and the lack of development of the energy infrastructure in South Sudan. These challenges need to be understood as a consequence of conflicts in the

country that have driven displacement, contributed to urbanization, eroded customary

rights, limited access to energy sources and created a militarized economy of unprecedented natural resource exploitation" (p.5). In terms of logging, Open Global Rights recently reported that the breakdown of markets in areas such as Magwi had made women and girls more vulnerable to gender-based violence (Kiarie-Kimondo, 2021). The article states: "Deterioration of the markets for agricultural produce led the women, who were the majority farmers, to seek employment in the forest as casual workers for the loggers. Within the forests, women face untold discrimination and abuse." The author also notes that aimilar to increased vulnerability to GBV when traveling long distances to collect firewood, women working at logging sites are also extremely vulnerable while having to walk distances of approximately 20 kilometers.

A FAO study on energy needs in humanitarian settings revealed that adult women were primarily responsible for collection of firewood, and that almost half of respondents reported spending up to five hours for this task due to the long distances they needed travel to find these resources (Wani, 2015). The nature of firewood collection in South Sudan, particularly as deforestation occurs around IDP sites, means that women are increasingly vulnerable to gender-based violence.

Types of Trees in South Sudan

There is currently no up-to-date list of trees indigenous to South Sudan. The available resources, which are based on data collection conducted during the colonial era, are listed below:

	Sources
1	The Plants of Sudan and South Sudan: An Annotated Checklist. Retrieved from https://shop.kew.org/the-plants-of-sudan-and-south-sudan-an-annotated-checklist
2	National Biodiversity Strategy and Action Plan
3	Robinson, J. (2007). Useful wild tree resources of southern Sudan. Plant Genetic Resources 4(3) p.188-197.
4	Tree Foods for Healthy Diets In South Sudan: Practical Ways of Growing Local Foods Plants and Doing It Well. Retrieved from https://www.wvi.org/sites/default/files/South%20Sudan%20Tree%20food%20plants%20for%20healthy%20diets.pdf
5	Indigenous Solutions to Food Insecurity: Wild Food Plants of South Sudan. Retrieved from https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620360/rr-south-sudan-indigenous-solutions-food-insecurity-301017-en.pdf?sequence=2&isAllowed=y
6	UNREDD+ Country Needs Assessment. (2016).
7	Adkins, B. (2015). Forestry and Prospects for Stability, Livelihoods and Peace-building in the Equatorial States of South Sudan.

Instructors teaching at Juba University's College of Natural Resources also maintain their own personal records of trees present in the country as a part of their lessons, however these lists have not been shared publicly.

What is considered indigenous can also be contested, as several species of trees were either introduced or cultivated through nurseries during the colonial era. This includes both fruit trees and those used for timber. The trees planted during this era are estimated to be among the country's top forestry resources – teak could bring in revenues of $100 million per year, and in 2008 South Sudan was said to be the world's fourth largest producer of gum acacia (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015).

During the Second World War, the British Empire also sought out sources of gum rubber for manufacturing purposes. Correspondence between colonial administrators indicated they were under immense pressure to utilize the trees in South Sudan to extract gum rubber for exportation. This pressure from abroad led to administrators forbidding the purchase of forestry products from other industries, such as honey and chilies, to encourage the growth of rubber production. However, despite their efforts, South Sudan never became a large source of the extract, and administrators noted that the extraction process in the area was not efficient enough for it to become a viable industry.

Climate Change

In 2020, the increasing severity of floods in the country has led to heightened interest in the impact of climate change in South Sudan. The Forestry Policy for South Sudan acknowledges the relationship between deforestation and climate change, stating that forests "provide critical environmental services, particularly in water catchment and mitigating climate change" (p. 26). With the advent of the COVID-19 pandemic, combined with other crises such as global warming, global stakeholders have expressed increasing urgency over addressing the key driving factors of climate change. This discourse was sparked in 2020 with UNDP's release of the latest Human Development Index, noting that no country in the world had managed to achieve high levels of development in a sustainable manner (Rowling, 2020). Addressing deforestation was listed as a key strategy in addressing this gap.

Global research indicates that forest management can play a key role in mitigating floods. Floods in South Sudan have multiple effects on communities – infrastructure is destroyed, crops are damaged, and significant populations are displaced indefinitely. In addition to this, the ability of communities to meet their basic needs is further impeded as trade routes become inaccessible, and water sources become contaminated. According to USAID (2016), South Sudan has experienced a decline in rainfall by 10-20% over the last 50 years, as well as warming of 0.4 degrees centigrade/decade (p.2). USAID also notes that the impact of climate change are primarily observed in three critical areas: 1) agriculture and pastoralism, 2) water sources, and 3) ecosystems. This not only makes communities increasingly vulnerable to natural hazards such as drought and floods, but also puts at stake the livelihoods of the majority of the population, and hinders the natural resources that many rural communities rely on for shelter, food and medicine (Adkins, 2015).

A climate model study that examined the relationship between climate change and deforestation in South Sudan determined that land degradation and changes in land use correlate with changes in precipitation and increases in average temperature throughout the year (Salih et al., 2013). Not only will the changes impact communities in South Sudan, but neighboring countries within the region will also experience climate change as a result.

INNOVATIVE CASE STUDIES

Due to the ongoing humanitarian crises in South Sudan, there has been minimal room to fund and explore innovative ideas that can mitigate deforestation. However, some organizations have recognized this growing issue and have begun to integrate ideas into their programs. Furthermore, ideas for future programs and services can be drawn from case studies identified in other comparable settings. Due to the unique and challenging context of South Sudan, combined with increasing poverty levels and the ongoing humanitarian crises, additional considerations need to be made when designing policies, programs and services for the country – these factors are outlined in the next section.

Replanting Programs and Seedling Nurseries

Programs that encourage reforestation of degraded areas, afforestation in new areas, and the development of seedling nurseries can also be used as a mitigating measure to address the impacts of deforestation. As one key informant observed, "I think also people understand the importance of re-planting trees, but actually to invest time in it, or energy, when households have so many other challenges that they're trying to deal with, that's definitely not given priority." As a result, working with communities and supporting both replanting efforts and developing plant nurseries will be key in addressing deforestation.

A nation-wide program for planting new forest resources has yet to be implemented, however the UN's Food and Agricultural Organization (FAO) has partnered with the Ministry of Environment to plant 100 million trees in South Sudan.

The UN's World Food Program (WFP) had integrated afforestation and reforestation efforts into its existing livelihoods and resilience programming in South Sudan, which seeks to mitigate the impact of deforestation

caused by agricultural expansion and fuel needs, also address climate change. This includes supporting local communities to establish seedling nurseries for both fruit and forest trees, and each person is responsible for planting between 1,000 – 1,600 trees. When the plants start to mature they are transplanted to communal spaces such as clinics and schools, or they can be planted in their residences or even sold in the market. The organization has an annual target to have 3 million seedlings planted and raised, and is seeking to explore options for locally procuring seeds and other materials needed to support the program. The programming approach used by WFP since 2012, scaled up in 2017, and was reaching 100,000 people over 9 out of the 10 states.

In both Uganda and Sudan, UNHCR has introduced nurseries in communities hosting refugee populations, as one mechanism to address inter-communal tensions between refugees and the host community over dwindling local natural resources (Robinson, 2018). In addition to fuel needs by host communities and refugee, trees have also been cleared in many areas to create space for refugee settlements, as was observed in Adjumani. As natural resources dwindle in areas experiencing rapid increases in population densities, such programs can facilitate ongoing relationships between the displaced and local communities.

In some countries, hydroponics have been used as a strategy for growing plants, and can be used to develop seedlings for forests. In Sudan, WFP has implemented a program for female IDPs and refugees that allows them to grow plants without resources that may be scarce such as rich soil and water (Popovska, 2019). In addition to providing communities with crops and seedlings, the growth of these plants also reduces the pressure on women to travel long distances to manage farms and obtain water. This may also be a viable strategy to be used in areas of South Sudan that are experiencing desertification, primarily along the northern border and in the south-east.

Satellite Imagery

Researchers in Africa have begun to use satellite imagery to track environmental concerns, particularly in areas where infrastructure is limited and access is low. For example, in one program supported by researchers in the United States, satellite imagery is used to issue free alerts whenever trees are cut down (Elks, 2021). In the nine African countries that the program has been implemented in so far, deforestation has estimated to have dropped by approximately 18%. Images are taken eight days apart, and artificial intelligence is used to compare images and identify areas where trees have been cut.

Similarly, Dr. Nakalembe at the University of Maryland who also works for NASA, has used satellite data to document weather patterns and agricultural practices (BBC News, 2020). The data collected is able to identify different types of land cover, such as forests, agricultural land used for crops, water sources, etc. Her work includes building a base of researchers and farmers on the ground who are able to fill in gaps in the data to better inform decision-making practices. While the methods used have been implemented previously to assist large-scale mechanized farms, in Uganda the primary target are small-scale farmers using manual tools. The information is communicated through text messages, radio programs and also community workers who can deliver the information in person.

Adopting practices, such as those introduced in the two examples provided, are useful in designing programs that combine large-scale data with small-scale community involvement and investment. With East African countries increasingly facing unpredictable patterns that contradict what indigenous knowledge has taught about planting and harvesting seasons, obtaining this information allows small-scale farmers and community to leverage the small amount of resources they have in their best interest. In the context of South Sudan, where many areas remain out of reach for regular assessments for the government, civil society and aid actors, using satellite imagery to identify where forest resources are disappearing, and how afforestation programs can leverage data on weather patterns, will allow stakeholders to leverage minimal resources for a higher level of effectiveness.

Shelter Designs and Materials

Due to South Sudan being in a humanitarian crisis for several years now, the space for innovative approaches to addressing deforestation, including the use and design of shelter materials, is perceived to be quite limited. However, as the country and its humanitarian partners plan for the return of refugees and IDPs, who will require long-term housing options, there is now room to integrate sustainable designs for permanent shelters. To date, both PoC sites which are protected by UNMISS forces, as well as ad hoc displacement sites, were not allowed to build permanent structures on land allocated for them. This was done with the perception that their displacement was temporary, and IDPs would eventually return home. However, as IDPs leave these sites, there is now the potential to consider a wider variety of shelter designs that are more sustainable and are able to integrate other designs that are considerate of environmental impacts.

Any innovative design proposed for future shelters will have to take into consideration some of the unique environmental contexts and threats present in South Sudan. For example, many structures used in South Sudan today are not able to withstand the severe flooding experienced by many communities on an annual basis, leading to the extraction of local materials and rebuilding of shelters on a more frequent basis. Additionally, due to the heat in South Sudan, structures will also have to provide sufficient ventilation and cooling in order to be livable. Furthermore, as key infrastructure is lacking in South Sudan, such as electricity, water and sewage systems, future shelter designs will have to take into consideration how to meet these needs. While some materials such as bricks have been identified as a potential source for shelters to be made from local materials as well as generate income for community members, the process of baking bricks requires additional firewood for the process, and could end up contributing to deforestation. While this has been researched in Sudan, less is known about the impact of brick making in South Sudan in the few communities where it is practiced.

In other countries, case studies are available of shelter designs that accommodate for the different needs of those who have been forcibly displaced. In Turkey, refugees from the Syrian war have been allocated with housing options that are made from containers (McClelland, 2014). The Ikea Foundation (2017) has also released a refugee shelter design that is easily transportable in boxes, does not require advanced skills or machinery to set up, and includes built-in solar panels. These options require adequate funding, reliable

supplies and trade routes, investment from governments, regular maintenance as well as the ability to build more permanent structure (depending on government policy and host community perceptions). They also require the development of local infrastructure including power sources and sanitation lines.

While adapting shelter materials and designs may not be sufficient for protecting shelters from floods in South Sudan, sustainable and durable designs can be integrated with other protective interventions in the community. For example, the immense flooding observed this year has pushed communities to request assistance with building dikes that can withstand the high levels of water from overflowing rivers. Additionally, in northern Europe "terps" have been built, essentially an artificial mound upon which houses are built, to raise the level of homes above potential flood waters. Similarly, in several Asian countries houses along waterways are built upon stilts to increase their heights. While relocation of communities to locations at higher elevations can be considered, such initiatives would need to consider other risk factors such as: loss of access to abundant water sources, impact on livelihoods that rely on water sources, distance women and girls will have to travel to retrieve water for their households and the GBV risks that arise, as well as

Reforestation and afforestation for watersheds

In recent years, many communities along the Nile have faced unprecedented levels of flooding. Because hazards, both natural disasters and conflict are occurring so frequently, communities do not have the time and resources to build back better and protect themselves from future hazards. In the past, planting of trees along the Nile has been used as one mechanism for creating watersheds to mitigate flooding. Case studies of this method illustrate how it has also been used in a variety of contexts and countries to protect communities. The Forest Policy for South Sudan also notes the importance of forests in creating watersheds to protect communities living along the Nile (Ministry of Agriculture, Forestry, Cooperatives and Rural Development, 2015). It is unclear if these forest resources have been destroyed over time due to conflict and the settlement of populations along the river, and further assessment is needed to see if this is a viable solution for mitigating floods, as well as which locations in particular would be suitable for such interventions. The Nile Basin Initiatives aims to promote policy, investment and interventions in the region, however it does not list South Sudan as a targeted location for watershed creation (Nile Basin Initiative, 2021). The two primary existing watershed appearing in existing literature are the Nile Congo Watershed along the country's southern border, as well as the Kinyeti Watershed in Eastern Equatoria's Imatong Mountains region. A new project that WFP will be implementing also seeks to explore options for water-shed redevelopment in the near future through afforestation approaches.

Fuel efficient stoves

One of the main interventions introduced by the aid sector to address the risks that women and girls face when collecting firewood is fuel-efficient stoves. As the Rift Valley Institute report noted, some of the food such as beans which are included in food distributions in humanitarian response, take more fuel and time to cook (Leonardi et al., 2020). A key informant also shared research findings in which "the women themselves were trying to construct clay and brick stoves, that conserve heat better, and enables the charcoal to last longer", and could be one area of programming where aid organizations can support community initiatives. Some aid organizations have provided fuel-efficient stoves, or provided training on how to build them using local materials, however it has not been made available widely. The benefits of fuel efficient stoves were highlighted by a key informant who noted that the traditional open three-stone fires used in rural areas leads to higher energy loss, and therefore requires more firewood. However, fuel-efficient stoves also reduce the need for women and girls to collect firewood frequently, as "instead of women going every day, with [fuel efficient stoves] they will only go one day in a week." Different models of fuel-efficient stoves exist in the market, and other designs include the use of local materials. The key informant also observed that these models were being increasingly used in Juba to reduce consumption of fuel sources.

AREAS OF CONSERVATION FOR SUSTAINABLE INNOVATION

Displacement

Displacement trends need to be considered in the context of deforestation, as it leads to rapid urbanization, which subsequently increases demands for fuel in a particular location (Leonardi et al., 2020). As early as the 1960's, archival documents reveal that displacement was seen as being tied to unregulated deforestation. Specifically, government documents from the period indicated that Congolese refugees that had re-settled in Rejaf, near Juba, were relying on the charcoal trade to support themselves financially. The letters between colonial administrators reveal that vehicles transporting charcoal to Juba were stopped and found to be lacking the necessary permits to cut down trees in the area. After the signing of the CPA in 2005, returnee programs were facilitated by the government, community leaders and aid actors, to support refugees to return home in preparation for the referendum for independence. Refugees returned to help rebuild their country and vote for independence. During this time, development initiatives were initiated to support the creation of government institutions, infrastructure, as well as to help returnees build their lives. Just two and a half years after independence, civil war broke out in South Sudan, leading to significant displacement, both internally and across international borders. During this time, much of the foreign aid to the country was re-oriented from development programming to humanitarian aid. Similarly, government funding for institutions and projects significantly decreased, particularly in opposition held areas.

At present, South Sudan has over 1.6 million IDPs (IOM DTM, 2020), as well as 2.19 million refugees that are residing in neighboring countries (UNHCR, 2021). Although the civil war ended with the signing of the peace agreement in 2018, displacement continues to occur due to inter-communal violence and natural disasters. At a time when the country would ideally be

preparing to support returnees, it continues to grapple with multiple humanitarian crises that make population movements dynamics. While a large number of IDPs are residing in PoC sites where they are supported by UNMISS and humanitarian actors, many also reside in ad hoc displacement sites and host communities, which leads to further reliance on the natural environment to meet their basic needs. A key informant stated, "They are scattered somewhere in the rural areas. So how are they living? They are using the forest for firewood, for fuel, they are using the bushes or the trees to build their houses. Also, they are using these trees, which also leads to deforestation, for their livelihoods." This was echoed by another participant who noted that IDPs that are forced to migrate to a different area have limited options for livelihoods and meeting their own basic needs: "It is not intentional, but it comes as a result of shock. When people move, like the people are displaced from Upper Nile and from Jonglei State, and they come here, definitely they have no choice for livelihoods except to gather from the nearest forests around Juba. Wherever there is a concentration of the population, deforestation will always be pronounced."

One of the key points raised by experts interviewed in this study, is there is a likelihood that refugees and IDPs may not opt to return to their areas of origin – instead, they will seek out urban centers that provide increased access to health, education and government services, as well as more opportunities to engage in different livelihoods due to proximity to markets. As a result, major towns and communities that host large IDP sites may experience increased deforestation practices in the near future. This predicament is also acknowledged in the National Environmental Policy (Ministry of Environment, 2015), which advocates for increased capacities to support settlements, enforced zoning of land for different uses, environmental impact assessments, and increased public awareness.

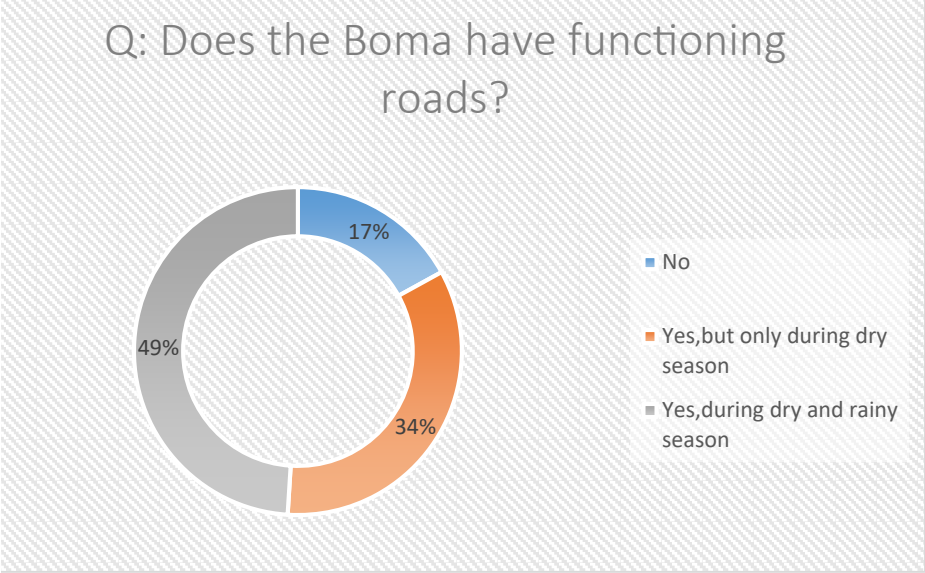
Markets

Markets in South Sudan, whether in urban or rural areas, are vulnerable to multiple shocks. Natural disasters such as flooding restrict access to markets for both consumers and producers. Merchants that rely on trade routes to import goods to their areas often face a reduction in access to supplies during floods. Conflict, whether civil or inter-communal violence, has led to similar impacts on markets in the country. These challenges often increase transportation costs, leading to an inflation in the prices of basic goods. As South Sudan heavily relies on imports for both foods items and other basic goods due to its limited infrastructure and manufacturing capacity, prices are already unaffordable for much of the population.

At present, South Sudan is grappling with an enduring financial crisis as well as hyper-inflation. As a result, poverty has increased, and households are finding it increasingly difficult to have sufficient cash to purchase goods in the market. The economic conditions have also made it difficult for traders to obtain an adequate supply of goods, and maintain prices that are affordable for their customers. Reports from REACH consistently highlight that communities turn to forestry products, such as wild foods, during crises. This includes when food insecurity is heightened, and either households do not have cash to purchase goods in the market, or the supplies in local markets have dwindled. As food insecurity levels are predicted to be at IPC Phase 3 or higher in the coming year, increased pressure on wild foods and other forestry products may increase.

The status of markets has also been direly impacted by adverse events this year, including but not limited to, inter-communal violence, flooding, the closure of international borders for a period of time, as well as the closure of small business in major towns across the country. During natural disasters and conflict, markets become inaccessible for indefinite periods of time, which impact both consumers and producers.

In a IOM DTM's analysis of 192 bomas from 2019-2020, more than one-third of bomas reported that roads to their area were only accessible during the dry season:



A further 17% of bomas reported that they did not have functioning roads, regardless of season. In a country that is highly dependent on imports and inter-state trade for food items and other basic goods, functioning roads process access to market systems that are critical for transporting and regulating forestry products, as well as purchasing materials for more sustainable options that may not be available in their localities.

Shelter and WASH Needs for IDPs and Returnees

The current and anticipated returnees, both IDPs and refugees, will require wooden poles and other forestry products to construct permanent shelters, latrines and furnish their new homes. While intention surveys have been limited, and it is difficult to anticipate exactly where returnees will re-settle, the key informants in this study indicated that most will attempt to re-settle in areas where there is a high concentration of services (education, healthcare, WASH, etc.) as well as access to employment opportunities.

IOM's Round 9 of Mobility Tracking indicates that the following counties have the highest number of returnees at present:

Returnee Households	
Wau	38,229
Renk	16,681
Magwi	15,184
Juba	10,786
Ulang	8,847
Bor South	8,544
Jur River	8,444
Kajo-keji	8,161
Aweil East	6,890
Aweil North	6,510

Returnee Individuals	
Wau	166,419
Renk	85,656
Magwi	70,730
Juba	63,990
Ulang	51,194
Bor South	48,941
Jur River	42,219
Kajo-keji	38,338
Aweil East	38,037
Aweil North	36,921

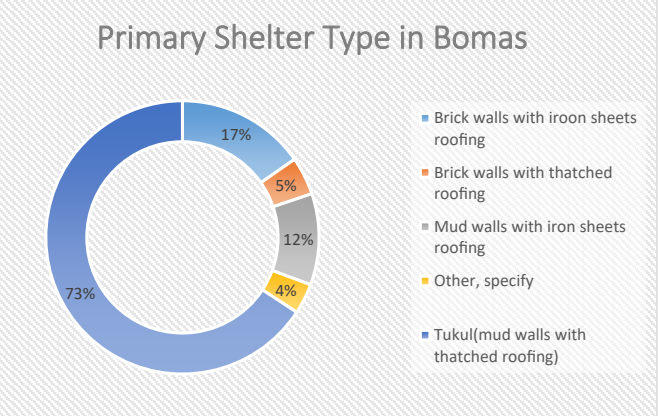
The data also indicates that the following counties have the highest number of people that have yet to return to their areas of origin:

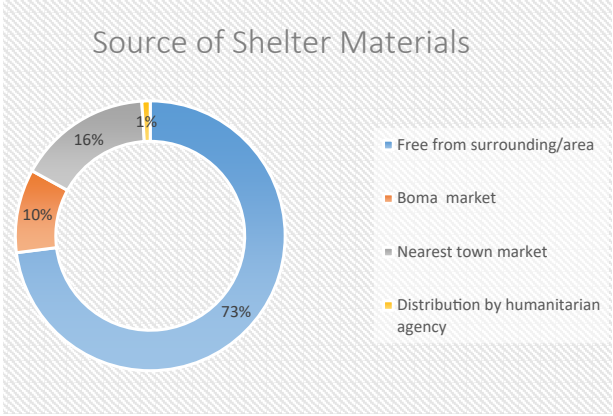
Households Yet to Return	
Morobo	37,455
Yei	8,255
Kajo-Keji	4,590
Panyikang	4,412
Malakal	4,296
Magwi	4,062
Juba	3,608
Aweil east	3,317
Wau	2,914
Raja	2,853

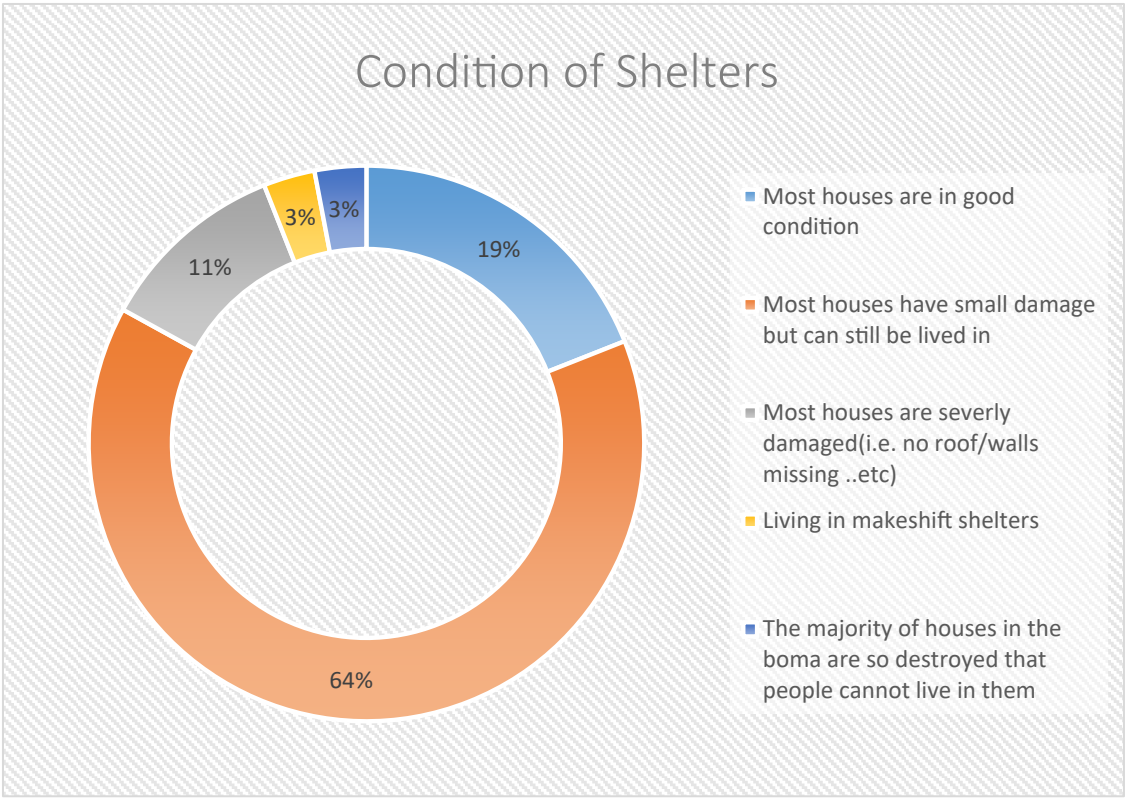
Individuals Yet to Return	
Morobo	187,283
Yei	45,457
Kajo-Keji	24,847
Panyikang	22,913
Malakal	23,426
Magwi	21,242
Juba	20,672
Aweil east	16,759
Wau	14,307
Raja	14,155

Among those yet to return, it is possible that they will choose to re-settle in locations that are not their areas of origin. The data on counties with households and individuals yet to return also reflects the ongoing insecurity found in Central Equatoria (Morobo, Yei, and Kajo-Keji), where armed actors continue to be active, preventing the return of many who have been forcibly displaced. As it is unknown exactly when the security situation will stabilize and people will feel safe enough to return, the timeframe for planning for returnees in these areas is challenging to ascertain.

IOM's village assessment survey of 192 bomas in 2020 indicated that the primary type of shelter in assessed areas are tukuls, which are made from mud walls and thatched roofing. Households primarily rely on their surrounding environment to obtain these materials.







Poverty

One of the key lessons learned in this study is that challenges of poverty and urgency of basic needs are not going to be reduced in the near future. As a result, rather than eliminating entire practices altogether – such as the production of charcoal – it is perhaps more viable and responsive to address the impact of deforestation rather than attempt to prevent its use.

Women and girls in particular work in the informal economy which is not regulated, and makes them more vulnerable to economic shocks. In 2020, with the advent of the COVID-19 pandemic, their ability to generate a stable income has been further impacted (UN Women et al., 2020). This has also increased their exposure to gender-based violence, child marriage and teen pregnancy. Combined with displacement caused by inter-communal violence and flooding across the country, women and girls are increasingly vulnerable due to their financial status. As income support and social services are fairly limited in South Sudan.

Regulation of Land

As land rights are correlated with the management of natural resources, understanding and addressing how these rights have implications for mitigating deforestation in the future is critical. The tension between communal ownership and increasing government regulation of land in South Sudan presents the possibility of legal contradictions that have yet to be resolved through legal frameworks. A previous study also established that ownership over forestry resources was contested even among stakeholders involved in the regulation of these resources (Adkins, 2015).

Land ownership is also a contentious issue due to the takeover of homes and land, and the sale of land, that occurred while many people in the country were displaced. Establishing ownership is difficult at times as not everyone has the required documentation, and may have lost proof of ownership in the course of being displaced during conflict. In urban areas this is particularly contentious, as land may have been resettled by soldiers or other ethnic groups, as reported in Juba and Malakal, and the current revitalized peace agreement does not provide a path to resolving these issues. The lack of legal mechanisms to resolve this issues also has the potential to dissuade IDPs and refugees from returning to their areas of origin.

RECOMMENDATION

Addressing deforestation in South Sudan will require prioritizing this sector, which has been a challenge in recent years due to the ongoing and multiple humanitarian crises. As one key informant in the government pointed out, "When we are looking at the humanitarian [crisis], we look at the needs. And the needs are [focused on] life-saving in most cases…Prioritizes impose themselves. Until deforestation becomes a threat in this country, now it would be a priority." However, as the country seeks to support those who are returning, whether IDPs or refugees, the needs have to be met will not exclusively be humanitarian in nature.

Comprehensive legislative and policy frameworks

At present, South Sudan does not have legislation that applies specifically to the regulation and rights of forests. As a result, the government has minimal leverage to hold people accountable for exploiting forestry products and other resources. Advocacy is needed to provide accompanying legislation for both the country's environmental and forestry policies. These frameworks also need to consider the existing context in South Sudan where infrastructure and access is limited, and local authorities will have to play an active role in regulating forestry resources. Additionally, these frameworks will need to address the growing tension between communal and government regulation and ownership over land.

Regulation and accountability mechanisms

Once legislation and policy are put in place, mechanisms are needed to enact them across the country. Currently, the presence of the government varies, and is sparse in rural areas. Creating a cadre of forestry experts and officials will be critical in ensuring that any laws and policies can be implemented thoroughly. Additionally, sufficient resources needs to be allocated through the national budget, and subsequently dispersed, to allow government officials responsible for regulating forestry to carry out their responsibilities. This is needed from the national to the local level.

Attribution of Funding for Development Initiatives

At present, the prioritization of humanitarian needs has meant that neither the government or the aid sector have attributed sufficient funding to support environmental programming more broadly, and deforestation programming specifically. As South Sudan transitions to a development phase, adequate resources for relevant long-term programs and policies will be essential. Forestry and environmental programs require long-term investments and support that are currently not available.

Reforestation programs

One of the key characteristics that makes deforestation unsustainable in South Sudan is the lack of reforestation programs. Such interventions have been implemented successfully in neighboring countries, and would assist in mitigating the impacts of deforestation in South Sudan – particularly as charcoal usage and logging are unlikely to decrease in the foreseeable future. Replenishing resources can also assist in preventing inter-communal tensions over depleting natural resources.

Multisectoral programming to address poverty

The unsustainable use of forestry products is closely tied to growing poverty in South Sudan, and the urgency of needs faced by those who are displaced. As a result, to decrease pressure on these natural resources, addressing other factors such as poverty through multi-sectoral programming is a key factor is charting a sustainable path forward.

Gender-sensitive programming

Due to extensive conflict, many households are now headed by women in the country, amongst all population groups, including IDPs, returnees and host community members. As noted in this study, women also maintain responsibility for obtaining and using fuel sources for cooking and heating water. They may also constitute the majority of returnee households who will have to seek out the financial resources to rebuild their lives. Gender-sensitive programming will be essential in reaching households that are both the most impacted and have the most leverage in addressing deforestation at the household level.

Preparation for returnees

The findings of this study indicate that there is still a lot of uncertainty over where returning IDPs and refugees will re-settle. While there is a possibility that many will return to their homes in rural areas, due to issues of a lack of resources as well as land ownership, key informants in this study indicated there is a strong likelihood many will opt to re-settle in urban areas where they can readily access basic services (such as healthcare, education, employment and humanitarian support). Returnees will need extensive support to rebuild their homes and communities in a sustainable manner that keep long-term development goals in sight.

Sustainable shelter designs

Shelter materials provided to IDPs are intended to provide temporary shelter, with the anticipation that displacement is temporary. These materials are also provided as a part of an emergency response, which requires immediate implementation, will minimal long-term planning and decision-making. As a result, they are not optimal for current and upcoming needs, particularly those of returnees and those facing natural disasters (particularly flooding). As returnees re-settle in different areas, support for shelter design and building can now integrate practices that are both sustainable and durable, and consider the dignity of those who have been forcibly displaced.

Integration of environmental assessments into rapid humanitarian assessments

Multiple key informants highlighted that humanitarian assessments tend to focus on areas such as food, shelter and WASH needs, and do not include environmental factors. The research that does exist relating to the exploitation of natural resources and its impact on communities is primarily conducted in the petroleum sector. The RVI report also noted that such assessments do not attempt to document daily fuel needs of displaced populations. Creating tools for both rapid assessments and long-term planning will be critical in provide humanitarian organizations with information needed for both short-term and long-term planning, while also identifying areas for mitigating the environmental impact of services provided. A key informant that works in the shelter area of programming explained, "We need to include in our shelter activities environmental impact assessments, and how we mitigate those impacts even as we support IDPs wherever they are displaced. And this is critical, not only for the environment itself, but also for the IDPs to have a good environment to settle in." Consequently, these types of assessments can benefit stakeholders and IDPs alike.

Affordable fuel options

Charcoal and firewood are primarily used as fuel sources by households in South Sudan, due to the fact that they are both affordable and accessible. Other options such as gas, solar panels and even generators are unaffordable for the majority of the population (Leonardi et al., 2020), particularly given the current economic crisis. Key informants interviewed for this study shared skepticism that this trend will change in the near future, particularly due to high rates of poverty in the country. If, and when, other fuel sources are introduced into markets in the country, they need to be provided in such a manner that they are affordable to the average citizen. One option is developing local manufacturing capacities, as the need to import most items at the moment increases the costs of other options (such as solar panels).

Strengthened market systems

The integration of sustainable practices within communities will rely on strengthened market systems. In order to maintain long-term practices that are not dependent on humanitarian actors for resources, being able to afford to independently purchase materials, and have these materials in supply in local markets, are essential conditions that need to be met. At present, threats to market systems include inflation, natural disasters and conflict. Introducing multi-sectoral programming as noted above will allow communities to be resilient in the face of such hazards and shocks, and thereby strengthen the local market systems that they engage in. Supporting local manufacturing capacities, and lessening dependency on imports, will also contribute to this.

Education programs that draw from indigenous knowledge systems

RVI's research report (Leonardi et al., 2020), as well as the key informants interviewed for this study, shared their beliefs that individuals residing in rural areas had greater knowledge of sustainable practices compared to their urban counterparts. As one key informant narrated the connection between deforestation and drought, "Even traditionally they know, that if the trees are cut off, the rain will disappear", even if this is not taught through formal curriculum. This knowledge has been passed down through multiple generations, and is based on histories and experiences in engaging with local environments. The current national curriculum does not include comprehensive environmental units, which would be critical particularly in providing civic education that trains citizens to engage in sustainable practices. Knowledge of climate change and sustainable practices has been passed down through multiple generations in South Sudan, and can be formalized to be integrated into the national curriculum as well – thereby, reaching both urban and rural communities.

CONCLUSION

As this study illustrates, both understanding and addressing deforestation in South Sudan requires a multi-sectoral approach. At the household and communal level, deforestation is often tied to charcoal demand and materials used for construction. Demands for forestry products for these uses is heightened during times of conflict and natural disaster, when displacement exacerbates these needs and also creates ad hoc sites with high population density. While historically most South Sudanese have lived in rural areas, increasing urbanization in select locations due to displacement as well as growth of towns is anticipated to increase needs for forestry products in areas that are unable to sustainably address them. With the anticipation of IDPs and returnees re-settling in urban areas now that the security situation is stabilizing in South Sudan, this issue is going to be compounded even further.

There are several stakeholders in South Sudan that maintain responsibility in either causing deforestation, or in mitigating its impact. However, these stakeholders have limited leverage for the time being to adopt sustainable practices. The average citizen in South Sudan, who is grappling with poverty and food insecurity, relies on affordable and accessible fuel sources. As it will require significant interventions over a long period of time for the socioeconomic status of these citizens to change, they will continue to rely on charcoal and firewood for the foreseeable future. In terms of those responsible for providing programs and policies that protect the environment, there are limited resources and power to comprehensively regulate the extraction and use of forestry products. As a result, the primary method of mitigating the impact of deforestation that is most feasible in the near future would be through reforestation and afforestation programs, such as those being proposed by WFP, FAO and the National Ministry of Environment.

South Sudan is rich in natural resources, however the current state of the economy, governance, and security context, prevent stakeholders from leveraging these

resources in a manner that would be both sustainable and in a way that would benefit all citizens. As a result, those who control deforestation on a macro level receive an inequitable share of profits and benefits from these detrimental practices, and community members with the lowest socioeconomic strata will continue to be impacted by the indirect impacts of deforestation – namely, climate change and depleting resources in their natural environment to meet their basic needs.

As the country transitions from humanitarian programming to development initiatives, there is great potential to protect the country from levels of deforestation that are difficult to recover from, as observed in other countries. Taking preventative measures to mitigate the issue will require fewer resources and minimize harm on the most vulnerable groups in South Sudan; waiting to address deforestation when a significant resources have been destroyed permanently will come at great costs to the country's citizens, and lead to other consequences such as worsening climate change.

The recommendations proposed in this study draw from the literature review, as well as the findings obtained from key informants. They seek to provide a path forward for different stakeholders, from the community to the international level, that will not only address deforestation directly, but also provide relief for the indirect driving factors that are making community members dependent on forestry products and extract them in an unsustainable manner.

Addressing deforestation, as well as protecting future generations of the country from the devastating effects of climate change that arise from the mass destruction of natural resources, will take considerable effort on the part of all stakeholders. If South Sudan and its partners begin interventions now, it is possible that communities will be protected against the direst impacts of deforestation and the climate change hazards.

REFERENCES

Adkins, B. (2015). Forestry and Prospects for Stability, Livelihoods and Peace-building in the Equatorial States of South Sudan.

Akile, E. (2019). Parliament summons Ministers, governor over illegal logging.

BBC News. (2020). How Ugandan Nasa scientist Catherine Nakalembe uses satellites to boost farming. Retrieved from https://www.bbc.com/news/world-africa-55333624

C4ADS. (2019). Money Tree: Teak and Conflict in South Sudan. Retrieved from https://c4ads.org/money-tree
Doki, C. (2012). Forests Dying in South Sudan Violence.

Elks, S. (2021). Satellite alerts seen helping fight deforestation in Africa. Retrieved from https://news.trust.org/item/20210104172452-nqi9w/

FAO. (2006). Sudan National Forestry Policy Statement. Retrieved from http://www.fao.org/forestry/15154-0f1a279a68972549c8f10e5aeeb9fc22.pdf

Fleischner, J. (2015). Deadly Enterprise: Dismantling South Sudan's War Economy and Countering Potential Spoilers.

Food Security Cluster. (2020). South Sudan Combined IPC Results – October 2020 to July 2021. Retrieved from https://fscluster.org/south-sudan-rep/document/south-sudan-combined-ipc-results-october

GEF. (2016). South Sudan: The newest member of the GEF family. Retrieved from https://www.thegef.org/news/south-sudan-newest-member-gef-family

Global Forest Watch. (2021). South Sudan. Retrieved from https://www.globalforestwatch.org/dashboards/country/SSD

Harris, N., Petersen, R., Davis, C. and Payne, P. (2016). Insider: Global Forest Watch and the Forest Resources Assessment, Explained in 5 Graphics. Retrieved from https://www.wri.org/blog/2016/08/insider-global-forest-watch-and-forest-resources-assessment-explained-5-graphics

Ikea Foundation. (2017). Flat-pack refugee shelter wins Design of the Year 2016. Retrieved from https://ikeafoundation.org/story/flat-pack-refugee-shelter-wins-design-of-the-year-2016/

IOM DTM. (2020). South Sudan. Retrieved from https://dtm.iom.int/south-sudan

JICA. (2015). Comprehensive Agricultural Development Master Plan.

JMEC. (2018). Summary of the Revitalized Agreement on the Resolution of the Conflict in the Republic of South Sudan (R-ARCSS).

Kiarie-Kimondo, C. (2021). Illegal logging fuels conflict and violence against women in South Sudan.

McClelland, M. (2014). How to Build a Perfect Refugee Camp. Retrieved from https://www.nytimes.com/2014/02/16/magazine/how-to-build-a-perfect-refugee-camp.html

Ministry of Agriculture, Forestry, Cooperatives and Rural Development. (2015). Forest Policy.

Ministry of Environment and Forestry. (2018). National Biodiversity Strategy and action Plan (2018-2027).

Ministry of Environment. (2018). Initial National Communication to the United Nations Framework Convention for Climate Change.

Nasulea, C., Cretu, B.N. and Moroianu, M. (2016). All Roads Lead to Juba: An Inquiry into the Economic Viability of South Sudan. Retrieved from http://economice.ulbsibiu.ro/revista.economica/archive/68609nasulea&cretu&moroianu.pdf

Nile Basin Initiative. (2021). Our Investments. Retrieved from https://nilebasin.org/what-we-do/our-investments#

Popovska, B. (2019). Growing plants without soil in Sudan. Retrieved from https://www.wfp.org/stories/growing-plants-without-soil-sudan

Republic of South Sudan. (2015). Comprehensive Agricultural Development Master Plan.

Robinson, C. (2018). Uprooted refugees plant trees to rebuild Uganda's forests. Retrieved from https://www.unhcr.org/news/latest/2018/2/5a8e89b94/uprooted-refugees-plant-trees-rebuild-ugandas-forests.html

Rowling, M. (2020). Africa: Code Red – UN Calls for Urgent Shift to Planet Friendly Development.

Salih, A.A.M., Kornich, H. and Tjernstrom, M. (2013). Climate impact of deforestation over South Sudan in a regional climate model. International Journal of Climatology 33 p.2362-2375.

South Sudan Cash Working Group. (2020). South Sudan: Joint Market Monitoring Initiative. Retrieved from https://www.impact-repository.org/document/reach/e9c5d8a6/reach_ssd_factsheet_joint_market_monitoring_initiative_jmmi_november_2020.pdf

UNHCR. (2021). Refugee and Asylum Seekers from South Sudan – Total. Retrieved from https://data2.unhcr.org/en/situations/southsudan

UNSC. (2019). Letter dated 9 April 2019 from the Panel of Experts on South Sudan addressed to the President of the Security Council. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/S_2019_301_E.pdf

USAID. (2016). Climate Change Risk Profile: South Sudan.

UN Women, Ministry of Gender, Ministry of Humanitarian Affairs, CEPO and RWDSS. (2020). A rapid gender analysis on COVID-19. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/rapid_gender_analysis_on_covid-19-south_sudan.pdf

Wani, J. (2015). Energy Needs in a Humanitarian Setting: The South Sudan Experience.

Appendix A: Workplan

Appendix A: Work Plan															
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Work-plan and research design															
Secondary Lit Review															
Best practices cases studies															
Activity	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Interviews															
Report writing															

Appendix B: KII Questionnaire Semi-Structured Interview with experts

1. What is the state of deforestation in South Sudan, and what have been the key drivers of it? Have the reasons changed over time?
2. Do you think there is a relationship between the humanitarian services provided in the country and deforestation?
3. Do you think there is a relationship between displacement and deforestation? How are IDPs and returnees using natural resources, including forestry products?
4. Who are the key actors working on deforestation in South Sudan? Are there any actors who should be a part of the process but have been left out?
5. Do you know of any programs and policies implemented by the government or aid workers that are seeking to address deforestation in the country?
6. Are there any community initiatives or coping strategies that you know of that are attempting to address deforestation in South Sudan?
7. In looking to the future, what are some key programs, policies and services that could be useful in addressing deforestation in South Sudan?
8. What responsibility does the government (at all levels have) in addressing deforestation? What are some areas in which they could contribute more?
9. What are some locally relevant and feasible actions that community members and civil society organizations can take to address deforestation at the local level?
10. What is the role of aid actors in addressing deforestation? What actions would your recommend for the future?
11. Are you aware of any other datasets, reports, programs or policies relating to deforestation that we didn't discuss today?

Appendix C: List of Participants

	Name	Title/Organization	Contact Information
1	Dr. Cherry Leonardi	Durham University	
2	Dr. Zuheir Sule	Juba University	
3	Nhial Tittamamer	Sudd Institute	
4	Charles Judo	Civil Society Coalition for National Resources	
5	Otti Julious	Save Trees	
6	Hon. Majok	Parliament, Land Committee	
7	DG David Batali Oliver	Ministry of Environment	
8	Dr. Massimo	Juba University	
9	Anna Soper	WFP	
10	Martin	UNEP	
11	Jamus	IOM/SNFI Cluster	
12	DG Banak	Min. of Humanitarian Affairs	

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