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Original Article

Assessment of the Causes and Effects of Deforestation in Lakes State of South Sudan

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Deforestation is a serious global challenge which adversely affects the environment, human well-being and climate stability, especially in fragile ecosystems and threatens environmental resilience worldwide. Trees are important for the provision of forest products such as food and medicines and the regulation of temperatures, as well as preventing soil erosion and water loss in Lakes State. The objective of this study is to assess the causes and effects of deforestation in Lakes State of South Sudan, as well as the effectiveness of existing laws and policies in the governance of forest resources. This study employed a descriptive research design and purposive sampling was used to select 80 key informants who included forest officers, local farmers and community leaders. Data was collected using semi-structured questionnaires and analysed using descriptive statistics and thematic analysis. Findings from the study reveal that the main causes of deforestation include cutting down trees for economic activities such as logging, expansion of subsistence agriculture, demand for fuel wood, urban expansion and recurrent wildfires. The effects include declining agricultural productivity, biodiversity loss, such as teak and mahogany, increased soil erosion and increased vulnerability of the community to the impacts of climate change. Even though there is the existence of forest laws and policies, their enforcement is weak due to inadequate public awareness and institutional capacity. Deforestation is occurring at an alarming rate and, if unaddressed, will adversely affect the environment and livelihoods. The study recommends that the government and relevant stakeholders implement alternative energy programs and stringent enforcement of forest conservation laws and policies. Promotion of the use of alternative energy, such as hydroelectric, solar and wind energy, could reduce reliance on wood-based energy sources, thus mitigating the effects of deforestation and climate change in Lakes State.

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INTRODUCTION

Deforestation remains a serious global challenge affecting the forest ecosystems, water resources, biodiversity and general resilience of natural ecosystems (FAO, 2022; UNEP, 2018). However, the global forest cover continues to decline due to a combination of anthropogenic drivers such as agricultural expansion, timber extraction, infrastructural development, and unsustainable energy practices (IPCC, 2023; Kalmar *et al.*, 2022). Global Shift from fossil fuel use to the use of renewable energy is globally recognised as a major strategy to combat deforestation and other interconnected challenges such as climate change, socio-economic problems, soil degradation, loss of biodiversity (UNFCCC, 2021; Tiitmamer, 2018).

Deforestation is occurring rapidly across the globe, especially in tropical countries. In the Amazon Forest Region, for example, widespread loss of forest has been linked to increased human suffering, social instability and deteriorating livelihoods, especially among communities that depend on forest resources for survival (FAO, 2022; Moraes *et al.*, 2013).

In Sub-Saharan Africa, deforestation is majorly caused by local subsistence activities such as small-scale agriculture, production of charcoal and collection of fuel wood, majorly done by rural communities that are heavily dependent on forest resources for their livelihoods (FAO, 2022; Kouassi *et al.*, 2021; Opara, 2012). The effects of deforestation on the environment, climate, water resources and socioeconomic systems have increased the vulnerability of the community in many rural areas in the Global South (Acheampong & Opoku, 2023; IPCC, 2023;

Alkali *et al.*, 2022; Njora & Yilmaz, 2022; Singh, 2019).

In South Sudan, deforestation is an under-researched yet critical environmental issue (IOM DTM, 2020). According to the United Nations Development Program (UNDP, 2012), the country loses approximately 277 630 of forest annually, mainly due to the clearing of lands for agriculture, production of charcoal, urban expansions and extraction of construction materials. In spite of the growing threat, forest conservation receives little attention in national policy frameworks and enforcement remains due to limited institutional capacity and resource constraints (UNDP, 2012).

Lakes State, which is one of the ten States of South Sudan, is facing severe environmental land degradation, including widespread soil erosion and biodiversity loss, as well as frequent droughts and floods. These challenges are exacerbated by unsustainable agricultural practices, rapid population growth, overdependence on wood fuel and poor land uses (Lok, 2013). The degradation of savannah vegetation in the Region threatens ecological stability and worsens climate change impacts on livelihoods and rural communities.

Notwithstanding these urgent issues, there is a paucity of empirical data and academic research on the drivers and impacts of deforestation in Lakes State. The inadequacy of reliable data, together with weak institutional frameworks, deters evidence-based policy formulation and forest management strategies. The lack of capacity to set up solar panels, windmills and geothermal equipment for clean energy generation is a key issue due to inadequate skills and training. Consequently, forest ecosystems in the region

continue to decline with little adaptation or mitigation measures put in place.

This study seeks to fill this knowledge gap by assessing the causes and effects of deforestation in Lakes State, South Sudan. Through identification of the major causes of forest loss and evaluation of the environmental and socioeconomic effects, the study aims to inform the development of target specific policies and sustainable forest management practices.

LITERATURE REVIEW

Deforestation is defined as the abrupt transition from land with trees to land without trees with no subsequent regrowth (Alkali *et al.*, 2022; Ritchie, 2021; Bodo *et al.*, 2021). Cited in Intergovernmental Panel on Climate Change (IPCC) (2023), FAO defines “Deforestation as the conversion of forests to other land use of the long-term reduction of tree canopy cover below the minimum 10 percent threshold (FAO, 2001). Njora & Yilmaz (2022) define deforestation as the practice of permanently removing or uprooting trees from the ground to give rise to something other than forests. Hence, this study defines deforestation as the large-scale and unregulated clearance of forested land, involving the removal of trees without adequate reforestation efforts to enable activities such as agricultural expansion, urban development, biomass energy and infrastructure development.

Deforestation dates to the dawn of agriculture, industrial revolution and energy infrastructure, development of roads and railroads, as well as construction of houses and urban expansions (Ritchie, 2021; Butt *et al.*, 2023). This means that deforestation happened as a rapid process of cultivation, croplands, and industrial revolution that brought unprecedented demand for energy for fuelwood and fueling factories, and construction of roads, ships and houses (Ritchie, 2021; Miyamoto, 2020). The rapid causes and effects of deforestation are indisputable, given the current practices of modernised cultivation and industrial production. Forests are unlawfully removed and burned without taking proper precautions for replacement. As the earliest human beings around

6,000 BC transitioned to farming using the wielding hand axes to exploit the woodland and tropical bounty, vast swaths of forests were cleared for agriculture, fuel wood factories and construction purposes. Such intensification of developmental projects and programmes have altered the forest landscapes in many parts of the world (UNEP, 2020; Ritchie, 2021).

Globally, forests cover 31 per cent of the Earth’s land surface, an area of 4.3 billion hectares. Every year, the world loses 10 million hectares of the world’s forests to deforestation; some 80% of the tropical rainforests are destroyed for energy services and agriculture expansions by farmers and loggers (FAO, 2022). Njora & Yilmaz (2022) further argues that the deforestation in the countries globally is happening at an alarming rates as represented by the following countries percentages; Russia with 20%, Brazil with 12%, Canada with 9%, United States of America with 8%, China with 5%, Australia with 3%, Democratic Republic of Congo with 3%, Indonesia with 2%, Peru with 2%, India with 2% and the Rest of the World with 34%. The authors considered deforestation to be a significant problem in various parts of the world when it comes to preventing changes of climate change and variability, as well as conserving biodiversity (Njora & Yilmaz, 2022).

According to the Food and Agriculture Organization (FAO) (2022) report the world loses almost six million hectares of forests each year to deforestation. Nearly 80% of global deforestation is due to agricultural expansions, developmental infrastructure, wildfires and industrial revolution. Every day, approximately 50,000 acres of forested land are cleared by farmers and loggers globally. In a simulated model of the Amazon Basin alone, over 10,000 acres of land are destroyed daily for mechanised agriculture (Butt *et al.*, 2023). The authors show that deforestation of the Amazonian forest causes a significant increase in surface temperature and decreases in evapotranspiration and precipitation over Amazonia (Butt *et al.*, 2023).

Deforestation in Africa may be more severe than in other regions due to climate, soil formation, vegetation cover, and geological conditions (FAO, 2022). Much of African land consists of deserts and semi-deserts, with hot and dry weather, sandy soils, and sparse vegetation of long grasses and bushes. Therefore, these environmental structures and composition make Africa vulnerable to factors of deforestation and climate change impacts (IPCC, 2023). In Africa, deforestation occurs due to several factors including the search for agricultural lands, forest products, timber extraction, mineral mining, oil extraction, energy infrastructure development, urban expansion, and the collection of charcoal and wood fuel for energy services (FAO & UNEP, 2020; Njora & Yilmaz, 2022).

Climate change problems just increase the surface temperatures and albedo in the atmosphere, causing droughts and floods (IPCC, 2023). It is also a human rights problem because it makes the vulnerable groups suffer during its events and effects. The rural population, especially the children, women and elderly, are susceptible to diseases and hunger. Social problems increase the conflicts and violence in the communities during the search for pastures and water for both humans and animals (Njora & Yilmaz, 2022; FAO, 2022; UNEP, 2020).

Principally, trees capture the greenhouse gases (GHGs) such as carbon dioxide and moderate the climate, preventing their accumulation in the atmosphere and warming our mother planet but when trees are felled, they release carbon dioxide into the atmosphere, increasing global warming (Ahmed *et al.*, 2019). Understanding the links between deforestation and climate change requires us to know how humans use the forests on the Earth's surface. The anthropogenic activities, such as felling trees for agricultural extensions and urban expansions, illustrate the links between deforestation and climate change.

The legacy of these early farmers and traders is the environmental evidence of deforestation in the cultural landscapes we see today, which shaped the environment through countless generations of

forest management and energy exploitation (Yuan *et al.*, 2021). Therefore, this study asserted that despite the observations made by different technical specialists, researchers and government institutions, among others, on the global, international and national levels, the causes and effects of deforestation remain a continuous problem affecting human health, socio-economic, water resources and environment in the History of the World.

Theoretical Framework

This research study is grounded on the theory of economic growth. The theory of economic growth was presented by Adam Smith in his book titled "Wealth of the Nations" in the year 1776 where he considered elements of population growth, land ownership, market demands and labor forces as the aspects that determine the increasing returns of economic growth of the nations (Rudel, 2013). In regard to this study, the elements listed above by Adam Smith are the major causes of deforestation in the environment. The theory of economic growth has been an area of theoretical research since the early 1990s, when environmental deterioration and its economic effects intensified around the world (Ucak, 2015; Lopez, 2017).

This research was anchored on the theoretical framework that uses the theory of economic growth, which assesses the causes and effects of deforestation in Lakes State of South Sudan. The relationship between economic development and deforestation is complex, compounded by increasingly differentiated situations amongst developing countries like South Sudan in Africa and the World at large and within them. Moreover, the way and manner in which economic activities and deforestation are realised have negative effects on our environment, health, wealth, water resources, ecosystems and social relations (FAO & UNEP, 2020; MoEF, 2022). Hence, this research has its important issues currently preoccupying the realm of international environmental protection and conservation through assessing the causes and effects of deforestation in Lakes State. The use of fossil fuel energy has encouraged deforestation in South

Sudan, which is the main driver of environmental problems that alleviate the impacts of climate on human health, socio-economic, ecosystem and water resources (IPCC, 2014; Adkins, 2016).

Drawing upon the history of deforestation, and discussing the causes and effects of deforestation on the environment, this study questioned how much the dominant hardware and finances as well as policies and regulations are implemented to handle the environmental problems such as deforestation, drought and famine as well as climate change which have a lot of effects on the human environment, and community livelihoods (Adkins, 2015). Miah *et al.* (2011) introduced the Environmental Kuznets Curve (EKC) theory alongside the theory of economic growth that supported the generation of energy as one of the elements of boosting economic growth. Miah considered the economic growth with two factors: primary factors of economic growth that deal with the direct causes of agricultural production, and the other factors on the indirect causes of technological and innovation results, which increase the chances of using forest lands by the communities (Miah *et al.*, 2011).

According to Dissani *et al.* (2021) states that there is a correlation between economic growth and income inequality in an inverted U-curve. As these things occur on the grounds occupied by forests, the forests cease and on the other hand, when these activities are minimised or banned, the forests get to replenish and exist to provide ecological and ecosystem services in the environment. This agrees with what is happening in the area of Lakes State in South Sudan. The indigenous native are involved in the cutting of trees for fuel energy, agriculture lands, generation of incomes, further infrastructure development and urban expansions are among the main causes of deforestation (Dissani *et al.*, 2021).

In South Sudan, especially in Lakes State, the effects of deforestation on the environment are so widespread due to high prices for timber, infrastructure development, urban expansions, cattle ranching, bush burning and charcoal production. Fuelwood and charcoal production

account for over 80% percent of all wood used in Lakes State, with an annual deforestation rate estimated at between 1.5-2 % (FAO, 2022; IOM DTM, 2020). So, the forest areas in the four selected counties of Lakes State in South Sudan are under deforestation due to agricultural activities and the search for food products, settlement reasons, and for economic purposes, as well as infrastructure development and cattle ranching activities. These activities have resulted in the death of human beings through the flux of flooding and extreme heat waves, loss of habitat, displacement or extinction of animal and plant species, soil erosion and deterioration of ecosystem and ecology (Njora & Yilmaz, 2022).

All this environmental destruction needs the interventions from the forest sectors and institutions with proper laws and policies in place to conserve and preserve forest resources from deforestation, which is the major driver of climate change in the State and the country at large. Following the main objective of UNFCCC and IPCC, the world's countries are encouraging the transition from the global use of non-renewable energy to renewable energy use (UNFCCC, 2021). This principle agrees with this research, which says "assessing the causes and effects of deforestation in Lakes State will curb or reduce these global issues such as climate change, deforestation and environmental degradation.

MATERIALS AND METHODS

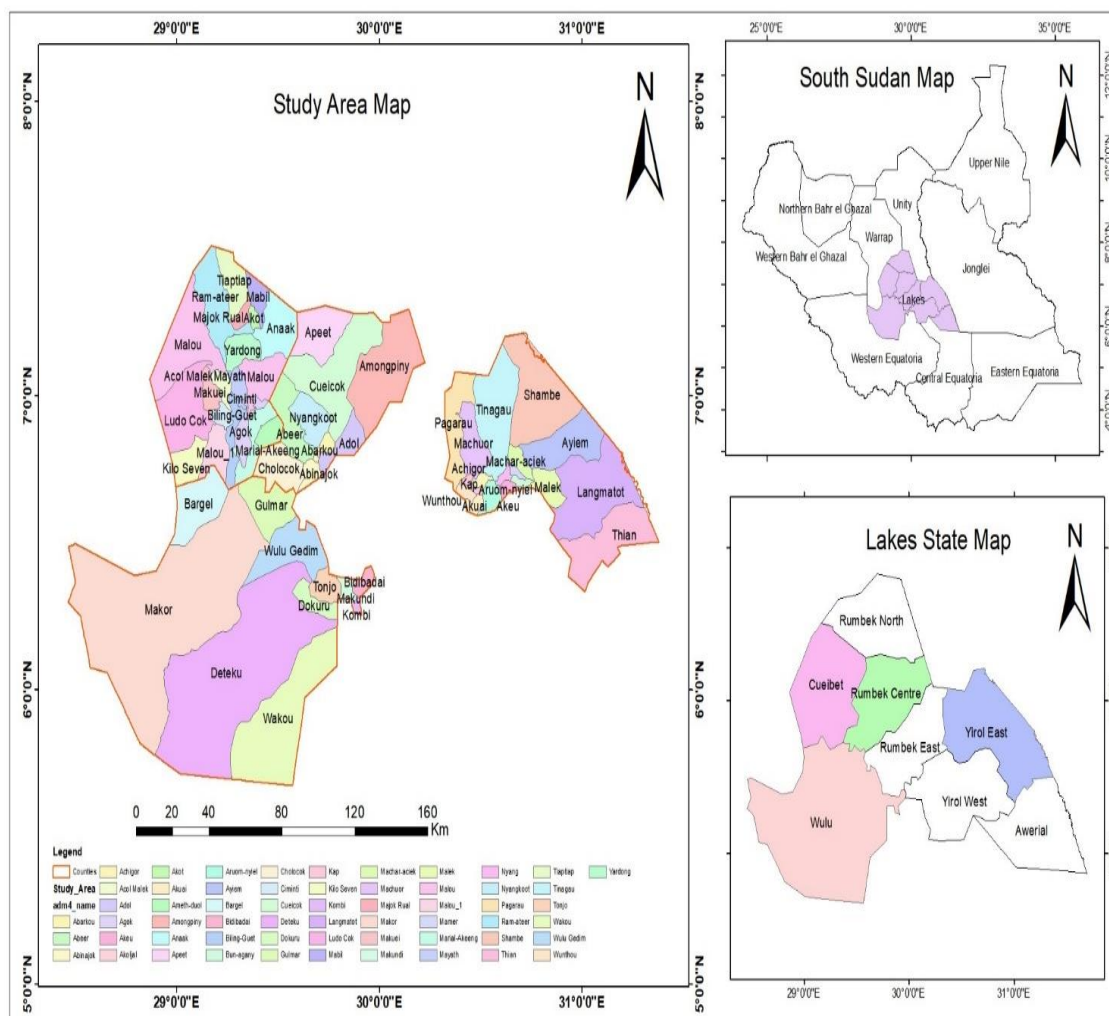
Study Area Selection

This study was conducted in South Sudan, with Lakes State purposefully selected as the study site out of the ten states of South Sudan and three administrative areas due to its relative peace and stability. The region's sociopolitical calm made it particularly suitable for a descriptive case study, which seeks to explore complex social issues in real-life settings. The research was delimited to four counties in Lakes State: Wulu, Rumbek Centre, Chueibet, and Yirol East. According to UNDP (2012), the population sizes of these counties are as follows: The research was delimited to four counties in Lakes State: Wulu, Rumbek Centre, Chueibet, and Yirol East.

According to UNDP (2012), the population sizes of these counties are as follows: Wulu: 40,550 people, Rumbek Centre: 157,882 people, Chueibet: 117,755 people and Yirol East: 67,410 people. These counties were selected to capture

diverse perspectives across different geographic and demographic contexts within Lakes State. The study area falls in the coordinates of 29° E – 31° E and 06° and 46° N, and its position falls in the central part of South Sudan (Figure 1).

Figure 1: Shows Lakes State on the Map of South Sudan



Source: Author, 2024

Methods and Procedures

Research Design and Sampling

To capture diverse perspectives, the study employed a cross-sectional design. This design allowed for the collection of data at a single point in time from different categories of stakeholders. The objective was to gather insights into the causes and effects of deforestation, as perceived by those directly and indirectly affected.

Data Collection

Data was collected from a total of 80 participants using purposive sampling. This included: 22 local government officials, 16 traders, 32 academicians, and 10 representatives from NGOs. These respondents were selected using purposive sampling; the criteria for their selection was based on their knowledge, experiences, and relevance to the study topic. Data was collected using semi-structured interviews, direct observations, and documentary analysis. This combination allowed for a rich, triangulated dataset that reflects the

complexity of the deforestation issue in Lakes State. Key informant interviews were used to administer the research tool and this encouraged active participation and cooperation from

respondents. Observations provided context-specific insights that complemented verbal data. The target population and final sample size by county are presented in Table 1.

Table 1: Target Population and Sample Size in the Selected Counties of Lakes State

County	Target Population	Sample Size	Percentage
Rumbek Center	35	32	43%
Yirol East	15	15	20%
Chueibet	15	13	17%
Wulu	15	15	20%
Total	80	75	100%

Source: *Author's Fieldwork, 2024*

Data Analysis

The data collected were analysed using thematic analysis, a method suitable for identifying, analysing, and reporting patterns (themes) within qualitative data. The following steps were followed: Coding of interview transcripts and observation notes, grouping of codes into broader themes, and interpretation of themes using narrative and explanatory techniques. Although primarily qualitative, SPSS was used to organise some of the data into tables and graphs for visual presentation. This applied particularly to frequency-based responses derived from coded qualitative inputs. However, structural thematic analysis remained the primary analytical lens, ensuring that contextual meaning was preserved.

Ethical Considerations

All the necessary ethical protocols were observed. A research authorisation letter was obtained from the University of Nairobi, together with a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). These documents were presented to the relevant state and

local authorities in Lakes State, including officials at the State Headquarters, County, and Payam levels. Informed consent was obtained from all participants prior to data collection. According to Mugenda and Mugenda (2019), informed consent involves voluntarily agreeing to participate in research after being adequately informed about its purpose and process. In this study, participants were assured of confidentiality and their right to withdraw at any stage without penalty.

RESULTS AND DISCUSSION

The Causes of Deforestation in Lakes State of South Sudan

In Lakes State, deforestation is due to the State's reliance on biomass (wood and charcoal) as the primary energy source for cooking and heating. With limited access to alternative energy sources like electricity or cleaner fuels, many households depend on wood fuel and charcoal. This leads to over-exploitation of forests and exacerbates deforestation, as more trees are cut to meet the growing energy and economic needs of the population.

Table 2: Shows the Analysis of the Causes of Deforestation in Lakes State of South Sudan

	Urban User	Rural User	Total
Poor Agricultural Practices	84.0%	16.0%	100%
Economic Development	94.7%	5.3%	100%
Conflicts and Migrations	74.7%	25.3%	100%
Bush Burning and Wildfires	80.0%	20.0%	100%
Illegal Urban Expansions	88.0%	12.0%	100%
Overgrazing	62.7%	37.3%	100%
Infrastructural Development	46.7%	53.3%	100%
Climate change	4.0%	96.0%	100%
Other Fuel Used	48.0%	52.0%	100%

Source: *Author, 2024*

Interpretation

From the results of the data analysis of causes of deforestation, it was observed that highest percentage in urban users' responses is economic development with (94.7%) which is a major cause of deforestation and climate change with 96.0% as a major cause of deforestation in the rural responses while the least percentage under the urban users is climate change with 4.0% and economic development which is 5.3% under lease causes of deforestation in rural. This means that economic development, as one of the anthropogenic factors and climate change, as one of the natural factors, are the main causes of deforestation in Lakes State. The results are in agreement with (Njora & Yilmaz, 2022), who pointed out climate change as a natural cause of deforestation. The natural causes of deforestation include wildfires, climate change, droughts and flooding, while anthropogenic causes are economic development, mining, and infrastructure development (Alkali *et al.*, 2022; Opara, 2012; Singh, 2019; Bodo *et al.*, 2021; Njora & Yilmaz, 2022).

However, the results were supported by the probing questions, such as; first, I asked the respondents *Is Deforestation Linked to Energy Poverty?* Most of the respondents responded Yes, deforestation is closely linked to energy poverty. In areas where modern energy sources are either unavailable or unaffordable, people are forced to rely on forests for their energy needs. The harvesting of firewood and charcoal production contributes significantly to deforestation. This creates a vicious cycle: deforestation leads to environmental degradation, which worsens poverty and limits access to resources, further increasing energy poverty.

Secondly, I asked, *Is Economic growth related to deforestation?* Most respondents answered Yes, it is related to deforestation in several ways; People cleared many hectares of land for agriculture, raising cattle, construction and settlement activities, as well as for timber and charcoal selling. Additionally, agroforestry can improve food security and provide economic benefits

through the sale of timber and other forest products.

Thirdly, I asked, *Would You Participate in Environmental Conservation Activities (e.g. Tree Planting, Agroforestry)?* The majority of respondents responded Yes, we would be willing to participate in environmental conservation activities like tree planting and agroforestry, especially in Lakes State. These activities are critical for restoring ecosystems, combating deforestation, and mitigating climate change impacts. Participation fosters a sense of responsibility for the environment and contributes to the well-being of the community by ensuring sustainable use of natural resources.

Initiatives to Reduce Deforestation in Lakes State:

While specific programs in Lakes State may vary, common initiatives aimed at reducing deforestation in regions like South Sudan include:
Agroforestry Programs: These integrate trees with crops and livestock farming to enhance biodiversity, reduce deforestation, and provide sustainable wood resources.

Reforestation Projects: Community-led tree planting campaigns that restore degraded lands and provide alternative sources of wood.

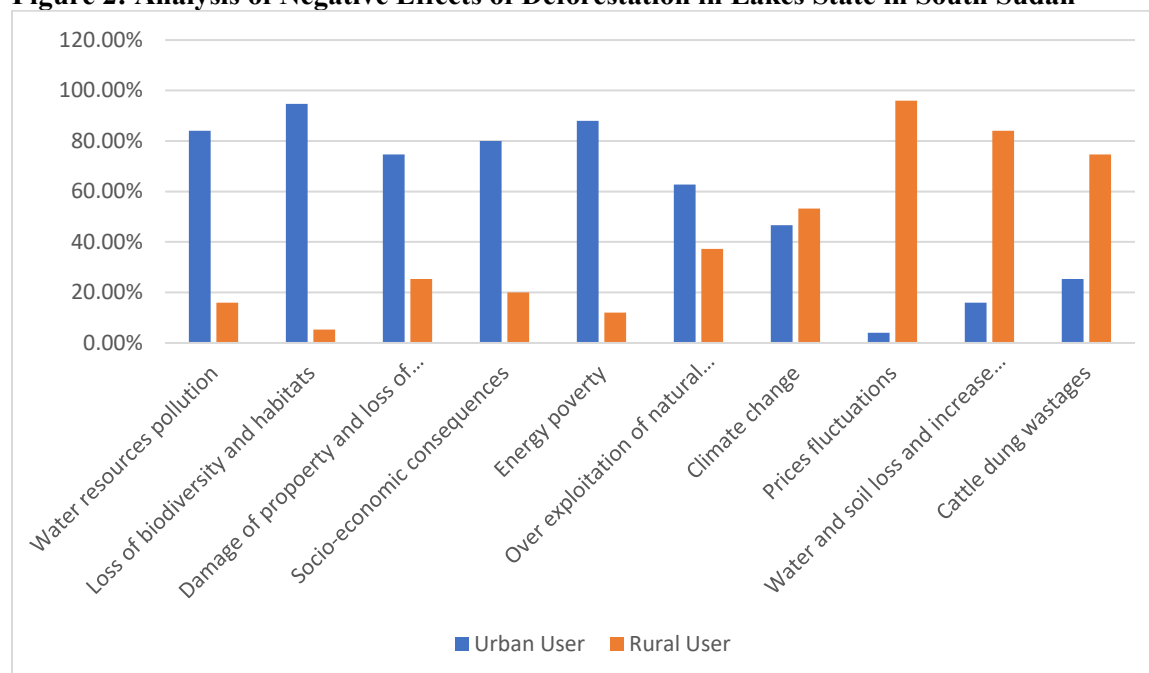
Promotion of Alternative Energy Solutions: NGOs and government programs often promote the use of improved cook stoves that reduce wood fuel consumption or advocate for solar and biogas energy to reduce pressure on forests. *Community Forest Management:* Involves local communities in the sustainable management of forests to balance energy needs and forest conservation. These programs often operate through partnerships between local communities, NGOs, and government agencies. They focus on raising awareness, providing technical support, and offering incentives like seedlings or improved cook stoves to encourage sustainable practices.

The Effects of Deforestation in Lakes State of South Sudan

Figure 2 below indicates the frequencies and percentages of the respondents based on their

responses on the negative effects of deforestation in Lakes State of South Sudan.

Figure 2: Analysis of Negative Effects of Deforestation in Lakes State in South Sudan



Source: Author, 2024

Interpretation

From the results of the data analysis of negative effects of deforestation, it was observed that highest percentage in urban users' responses is loss of biodiversity and habitats loss (94.7%) which is the main negative effects of deforestation and prices fluctuations with 96.0% is known as a main negative effects of deforestation in the rural responses while the least percentage under the urban users is prices fluctuation 4.0% and loss of biodiversity and habitat loss 5.3% as the lease negative effects of deforestation in rural settings. This means that loss of biodiversity and habitat loss are the main negative effects of deforestation in Lakes State. The results are in agreement with (Bodo *et al.*, 2021), who found that loss of biodiversity and habitats are the major negative effects of deforestation.

A critical examination of the concurrent scores for each of the statements in Figure 2 above indicates that all of the statements were considered to reflect the effects of deforestation in Lakes State. Therefore, the study found that *Urban areas receive effects*; based on this study on the provided

data, the overwhelming majority of respondents' views indicate that most of the negative effects of deforestation in Lakes State of South Sudan are faced differently in urban and rural areas. Urban areas' effects include loss of biodiversity and habitat loss (94.7%), energy poverty (88.0%), water resources pollution (84.0%), socio-economic consequences (80.0%) and damages to property and loss of lives (74.7%) respectively. *Rural areas receive effects*; the survey results indicate that the following negative effects of deforestation affect rural lives, price fluctuation (96.0%), other fuel use (86.7%), water and soil losses and increase flooding (84.0%) and cattle dung wastages (74.7%) respectively in the rural areas. Generally, this result implies that respondents' level of agreement with the above statements was equally shared by urban and rural users on the negative effects of deforestation in Lakes State of South Sudan. The results reaffirmed the studies done on the effects of deforestation (Kalmar *et al.*, 2022; Opara, 2012; Singh, 2019; Alkali *et al.*, 2022).

Energy poverty is the condition where households lack access to affordable, sustainable, and reliable energy services (Day *et al.*, 2024; Nguyen & Su, 2021). In Lakes State, this means the inability to access electricity or modern fuels, pushing people to rely on traditional biomass (firewood, charcoal) for energy needs, which refers to the lack of access to modern, affordable, and reliable energy services, and in Lakes State, this is strongly linked to deforestation. Due to limited electricity infrastructure, many households depend on firewood and charcoal for cooking and heating, leading to extensive deforestation as people harvest trees to meet their energy and socio-economic needs. In Lakes State, electricity access is limited. Many rural households either lack access entirely or rely on small solar systems. Even in areas where there is some grid access, like Rumbek Centre, electricity is often only available for a few hours a day, if at all. The main power distribution unit (PDU) established in Rumbek is not functioning to provide electricity services to the people of Rumbek Town in Lakes State. This needs allocation of funds and finances to complete it, setting up of grids, training workers and employing the youths and women in the State.

Distance to Access Firewood: Many households in rural areas may travel several kilometres to collect firewood. As deforestation worsens, the distance tends to increase, putting more strain on households. *Main Source of Household Income and Energy Expenditure:* Agriculture and livestock rearing are the main sources of income for many families in Lakes State. A significant portion of household income is spent on energy, especially on charcoal or kerosene, and for those with access to solar energy, initial investments in panels and batteries can be costly. *Effects of Using Charcoal for Cooking:* Using charcoal for cooking contributes to respiratory health problems due to indoor air pollution. It also requires time and labour to gather, depletes forests, and contributes to climate change to the environment through land degradation and soil erosion.

Laws and Policies on Forest Control in Lakes State of South Sudan

Laws and Policies on Forest Resource Management: South Sudan's forest policies focus on conservation, sustainable management, and combating illegal logging. However, enforcement is weak, especially in rural areas like Lakes State. *Effectiveness of Laws and Policies on Forest Resources Management:* These laws are not highly effective due to a lack of enforcement capacity, corruption, and limited resources for monitoring and management.

“As a person in charge of the department, my work is to make sure that all traders, business personnel’s and guides in the forests work together, and understand the importance of all different tree species in the forest on how they moderate the local climate, provide food and support other socio-economic activities. We have to learnt a lot about this concept about how we can conserve the Mahogany and Teak species, which are mainly targeted by loggers, timber producers and charcoal making persons. The forest guides should not look only at the money given to them privately but go beyond what other tasks the forest would do for them and their children. All laws and policies are there but the people to implement them in the action areas are what we doubt. One of the forest department heads who was involved in the interviews said.

As doubt among the people is high and given the fact of economic crisis in the country, not only in the States but within the people implementing laws and policies, the act is facing the people and offices in the State. The laws and policies are well-spelt out in the South Sudan Constitution of 2011, the Forest Act of 2011, among other documents, but implementation is hard because of hunger and poverty that increase brief in the implementation of laws and policies of protecting indigenous tree species. *Challenges in Forest Management Implementation:* Include weak enforcement mechanisms, lack of community awareness and participation, and a lack of alternative energy sources to reduce reliance on forests. Community

Involvement in Forest Management: The community can be involved through awareness programs, reforestation initiatives, and participation in forest monitoring. Local leadership and education are crucial for effective community engagement. **Reforestation and Afforestation Programs:** Some small-scale reforestation programs exist, often initiated by NGOs. However, the government lacks a comprehensive, large-scale effort to restore forests.

CONCLUSION

This study aims to assess the causes and effects of deforestation in the Lakes of South Sudan. A total of eighty (80) participants were interviewed, with the researcher focusing on several semi-structured questionnaires given to traders, local government officials, and academicians present in Lakes State. The results and discussion of the data collected show that the causes and effects of deforestation are known. It also acknowledges that deforestation has positive links with climate change through the use of forest resources as a source of biomass fuel energy, and these sources increase the rate of greenhouse gas emissions when burned. The local population uses forest resources to generate economic income and boost their development. Based on the findings and results of this study; The assessment of causes and effects of Deforestation in Lakes State include; The local population is heavily relying on biomass, mainly wood and charcoal, as their primary source of energy due to a lack of access to affordable and sustainable alternatives energy sources like electricity and clean cooking solutions. This has accelerated the rate of deforestation in the region due to depleting forest resources and exacerbating climate change impacts on the environment to degradation and biodiversity loss. *Causes of deforestation:* The primary causes of deforestation in Lakes State are the reliance on traditional biomass, such as wood fuel and charcoal. Due to high poverty levels, limited infrastructure, and a lack of access to modern energy, the local population continues to use unsustainable energy sources, further increasing the strain on forest resources. Settlement in forest areas, urban and agricultural

expansions, logging, and burning of forest and grasslands for the regeneration of green pastures and economic needs as the main causes of deforestation in Lakes State. *Effects of deforestation:* The effects of deforestation in Lakes State include desertification, loss of biodiversity and habitat loss, climate change, energy poverty, socio-economic consequences, conflicts and soil degradation. *Forest Policies and Laws:* Although national laws and policies exist to promote sustainable forestry management and energy efficiency, implementation is weak in Lakes State. There is a gap between national forest policies and their actual enforcement at the local level, contributing to ongoing deforestation and energy poverty. Policies meant to alleviate energy poverty, like subsidies for cleaner energy or forest conservation programs, have not been effectively adopted in the State of Lakes.

RECOMMENDATIONS

From the results of the study, I recommend that the forest and energy sectors and any other influential stakeholders;

- **Promote Alternative Energy Sources:** The government and developmental partners should invest in providing affordable and sustainable energy alternatives, such as solar energy, biogas, and improved cooking stoves, to minimise deforestation.
- **Strengthen Policy Implementation:** There needs to be stronger enforcement of existing laws on forest conservation and management.
- **Community-Based Forest Management:** Engage local communities in managing forests and promoting sustainable practices.

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