

# **Intertwining people and forest in the Lower River Region (LRR) of the Gambia**

Ca 'Foscari University of Venice

Department of Environmental Sciences, Informatics and Statistics



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GRADUAND:

Sarata Darboe

SUPERVISOR:

Prof. Renata SOUKAND

ASSISTANT SUPERVISORS:

Giulia MATTALIA

Baiba PRUSE

## ABSTRACT

Biocultural diversity is fundamental in understanding the interactive pathways between people and the forest. The foundation of these various pathways is forest functions and values such as productive, cultural, social, and supportive which makes this relationship possible indicating the importance of forests in the lives of people living in its vicinity. The aim of this research is to examine the interrelationships between the people and forest in the Lower River Region of the Gambia by documenting individuals' life experiences and perceptions about various forest ecosystem services. To access these relationships, the study uses both qualitative approaches by interviewing community members and quantitative approaches using geographic information systems (GIS software) and remote sensing satellite imagery to establish facts about these complex connections. The findings reveal that people's perception of the forest is linked to their well-being and life experience that attributes to their activities of being in the forest. Those activities contribute to forest development and maintenance through integrated management systems, involving both state and communities in managing what belongs to them. However, the results indicate that the humans are the main drivers of deforestation of their community forest. Through their socio-economic and cultural activities like land use change for agriculture, commercial timber production, illegal timber logging, domestic firewood collection and charcoal production, bush fire, human settlement, and development. The analysis of land use and the land cover map indicates that from 1979 to 2021, there was a net decline of 17% of forest cover in the lower river region of the Gambia. Dense forest completely changes to mixed forest and grassland. Consequences of human activities in the forest in the region lead to the extinction of traditional knowledge about the forest and people's disconnection from the forest because the physical appearance of the forest is essential in keeping the human-forest relationship.



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## 1. INTRODUCTION

The direct interactions between individual people and non-human nature have attracted growing interest, particularly in human well-being (Soga and Gaston, 2020). Forest ecosystems are among the most important biodiversity hotspots on Earth (Bjorn et al, 2020). They play a fundamental role in the lives of rural people by providing provisioning, supporting, regulating, and cultural services (Bjorn et al, 2020). About 240 million people live in predominantly forested ecosystems (Chao, 2012). 350 million people live inside or close to dense forests, and they largely depend on these forests for subsistence and income, with an estimated 1 billion out of 1.2 billion extremely poor households depending on forest resources (Chao, 2012), (Wen Y, 2017). However, the growing urbanisation rate and development namely land use change for agriculture, and buildings for human settlements have altered this relationship, weakening the connection between the forest and the people (Nuissl and Siedentop, 2021). Such development creates a disturbance in ecosystems, leading to extinction and disconnection of the bond between humans and the ecosystem. However, traditional knowledge, customs, laws, and beliefs have been used by rural and indigenous communities with customary rights to their forests to manage and preserve the ecosystem for generations (Chao, 2012) (Bjorn et al, 2020) (Ritter and Dausksta, 2013). This strengthens the human-forest relationship (Bjorn et al, 2020) in such communities. Also, many people's identities and indigenous cultures are shaped by their interactions with the landscape (Russel et al, 2013) (Ryfield et al, 2019).

The diverse roles that forests have played in human societies and continue to play demonstrate the strong relationship between humans and forests (Ritter and Dausksta, 2013). However, the relationship between human culture and the forest is dynamic and dependent on the perceptions of different cultures and communities (Mai, H et al, 2022). In short, the non-material interactive pathways of human-forest relationships can be categorised into cultural, intellectual, and spiritual practices respectively (Mai, H et al., 2022). For instance, cultural practices are the ways that people connect with nature and get to exercise, express themselves, and take care of the environment (Ryfield et al., 2019). Whereas intellectual interaction with nature creates learning and gaining new knowledge (Ryfield et al, 2019), (Mai, H et al, 2022). On the other hand, cultural ecosystem services are because of the relational interaction between cultural activities and environmental settings that are dependent on the physical domain and provide



advantages in terms of experiences, identities, and capacities (Stålhammar and Eja, 2017). Spiritual practices give rise to the practice of spiritual and religious activities (Mai, H et al, 2022).

It is believed that forest has a wide range of positive impacts, especially on human health and well-being (Häggström, 2019) (see table 6 of summarised CES in appendix). Indeed, the combination of physical activity, natural environment serenity, and a personal attachment to forests makes us feel good, which could have a positive effect on the mental health of people (Ritter and Dausksta, 2013). For instance, the productive function of forest resources relates to the economic and social utility of forest resources to national economies and forest-dependent local communities that reflect the wish to maintain a valuable supply of primary forest products (FAO, 2010). This can be done by maintaining diversity in the forest ecosystem to ensure the continuity and evolution of species diversity (M.E.A, 2005). This allows them to adapt to their habitat conditions under changing climate while maintaining species breeding ensuring a continuous supply of goods and services to humans (Leemans, R., & De Groot, R. S, 2003).

Moreover, there is increasing awareness of the protective functions and environmental services provided by forests, important for sustainable forest management (FAO, 2010) (see table 6 of summarised CES in appendix). Such a function strengthens human well-being in the outdoor environment. On the contrary, the awareness level is dynamic as the use of forests as an environmental resource and the function that forests perform in human society change with the invention of new technological facilities, needs, and perceptions of people (Ritter and Dauksta, 2006). Perceptions about places and belonging affect the potential for conflicting ecosystem uses and values (Norton and Hannon, 1997) (Ryfield et al, 2019). This can be seen in many communities due to modernization and improved technological facilities that change the need of using forest services (Tuan, Y. F, 1990) (Soga, M., & Gaston, K. J, 2016). For example, they used cooling appliances instead of depending on forests for temperature regulation.

Forests are one of Africa's most essential natural resources, both in terms of their ecological and economic benefits (FAO, 2020). Local communities in the humid and forested areas of the continent's western and central parts rely primarily on food and raw materials such as non-timber forest products combined with agriculture (Egoh et al., 2012). However, deforestation plays a great role in reducing the connection between the people and forest (FAO, 2020). According to FAO forest resource assessment, Africa had the highest annual rate of net forest



loss in 2010–2020, at 3.9 million ha (FAO, 2020). This creates forest-dependent communities vulnerable. Among the west African countries, Gambia is the smallest and forests occupy 51.3% of its total land area in 1975 (USGS, 2013) which provides fuel wood, food, construction material, tea/herbs, and medicinal plants for local communities (Nget. S et' al, 2012). The total forest area of the Gambia was reduced from 414.66(1000ha) to 242.67 (1000ha) from 1990 to 2020, respectively (FAO, 2020) with a net decrease of -5.73 (1000ha/year) (FAO, 2020). At present, widespread forest degradation and unsustainable land-use practices are reducing the generation of ecosystem goods and services that support both agricultural productivity and rural livelihoods in The Gambia (Nget. S et' al, 2012). Lower River Region is an area of the Gambia comprising degraded savannah woodland and mixed agriculture, with dense mangrove belts along the Gambia River (Nget. S et' al, 2012). The ongoing degradation of forest cover justifies the statement made by Gambia's former president in 1977 that the country has lost most of its larger wildlife species around the turn of the century:" it is a sobering reflection, that, in a relatively short period of our history, most of our larger wildlife species have disappeared together with much of the original forest cover" (Jawara, 1977). The degradation of forest cover can play a crucial role in reducing the use of forest goods and services because the materials that serve forest function and values are eventually fading away due to deforestation. (Miller, 2005). However, the government of the Gambia has been encouraging community forest management initiatives aimed at preventing deforestation, since the 1990s (Heß et al, 2018). Given that "sentimental connection to place can serve as a bridge between ecosystem functioning and stakeholders' engagement in environmental stewardship," as a management tool to engage local communities (Ryfield et al, 2019). Approximately 350 communities have established a community forest management system in the Gambia from 1995 to 2017 (Heß et al, 2018). This management initiative is called Participatory forestry, targeting local people for sustainable forest management to improve livelihoods through sustainable utilisation of forest products and services (Jammeh, 2008). Despite the introduction of Participatory Forest Management with the objective to transfer 80% of the forest to the community, the state remains the exclusive manager of the forest (Jammeh, 2008).

This study focuses on people's relationship with the forest, a bond that goes beyond material connection. With this rationale in mind, the study considers economic gains from forests, but also cultural and people's cognitive beliefs about their natural environment. The objective is to examine the interconnection between people and forests in rural Gambia (Lower River





Region). Also, to further document their life experiences, identifying the role of forest in the livelihood of the people and their perception of various ecosystem services offered by the forest and some management practices in the maintenance of forest resources from generation to generation. Specifically, this thesis aims to:

- To examine the intrinsic and instrumental value of forest between people and forest in the Lower River Region of the Gambia.
- To identify the role of forests in the livelihood of the people and local communities
- To document the perception of the local communities about various ecosystem services offered by the forest.
- Unravel the contribution and influences of the people in maintaining the forest for the future generation.

## 2. ECOSYSTEM

Globally, forests account for 4.06 billion hectares of land, which is about 31% of the total land area on earth (FAO, 2020). Forest ecosystems worldwide are known to be important hotspots in terms of the biological diversity they contain and in terms of the ecological functions they serve (Pearce, D.W and Corin G.T, 2001). Significant effort has been directed at understanding the wide range of benefits that ecosystems provide to people to facilitate sound decision-making accounting for the connections between ecosystems and people (Russel et al, 2013). Multiple interacting pathways exist between how humans affect ecosystems and how they are affected by them (M.E.A, 2005). These pathways are linked to well-being, good health, and human satisfaction. Humanity has always depended on the services provided by the biosphere and its ecosystems (Leemans, R., & De Groot, R. S, 2003). An ecosystem is a dynamic system made up of populations of plants, animals, and microorganisms in their non-living surroundings interacting as a whole unit (EU Economic Commission, 2007).

Ecosystem function is explicitly defined as the potential of natural processes and systems to deliver commodities and services that directly or indirectly meet human needs and values (Groot, 1992). This definition is considered because ecosystems are part of ecological processes. Each function is the outcome of the overall ecological subsystem's natural processes, which are the consequence of intricate interactions between biotic and abiotic elements of ecosystems via the fundamental forces of matter and energy (Rudolf S. de Groot<sup>1</sup>, Matthew A. Wilson and Roelof M. J. Boumans, 2002). Millennium Ecosystem Assessment defined ecosystem services as “the benefits people get from ecosystems” (M.E.A, 2005). While Costanza et al. (1997) defined ecosystem services as the processes and outputs provided to us during the transformation of natural resources. Recently, ecosystem services have been defined as the contributions of ecosystem structure and function, along with a combination of other inputs, to human well-being (Kalam, 2022). Services such as provisioning (food, water), regulating (wastewater treatment, pollution control), shelter, and cultural services (recreation and tourism) are provided by biodiversity (Kalam, 2022). These services provided by the ecosystem lead to human well-being. Nonetheless, many ecosystem services are largely underappreciated in terms of their global significance and the critical role they play in meeting the needs of people (M.E.A, 2005). The relationship between ecosystem conditions and the flow of services to the well-being of groups of people as well as individuals is diverse and

complex and can change over time (M.E.A, 2005). A fundamental characteristic of final ecosystem services is that they retain a connection to the underlying ecosystem functions, processes, and structures (Young and Potschin, 2018). On the 'supply side' of the cascade, the idea of 'function' is used to highlight those characteristics of the living system that come together to make something a service. (Young and Potschin, 2018). There is a widespread, profound understanding that our non-material relationships with ecosystems provide numerous benefits through various channels of experience and contribute to various aspects of well-being (Russel et al., 2013). Moreover, individuals view the forest as a sense of place that symbolizes all aspects of how people perceive and interpret their surroundings on an emotional, spiritual, and cognitive level (Tuan, Y. F, 1990) and (Jorgensen, B. S., & Stedman, R. C, 2006). People develop a sense of place because of biological, and sociocultural processes that occur during their lives (namely by interacting, knowing, perceiving, or living) (Russel et al., 2013).

## **2.1 Forest Values and Function**

The major factor that links forests and humans is forest values and functions that have an impact on societies. The concept of forest values is based on the principle of human preference and satisfaction or welfare (Leemans, R., & De Groot, R. S, 2003). There are existing non-use values that are never used by humans directly, but they deeply held historical, national, ethical, religious, and spiritual values (Leemans, R., & De Groot, R. S, 2003). For example, the bequest value of forest resources is being preserved for future generations (Leemans, R., & De Groot, R. S, 2003). Millennium ecosystem assessment refers to this as cultural ecosystems that have intrinsic value (M.E.A, 2005) and can be passed on to the future generation. Research has shown that biodiversity (including taxonomic, functional, and phylogenetic diversity) promotes the functionality of ecosystems (e.g., primary production, decomposition, nutrient cycling, trophic interactions and so on) (Mori.S A et al, 2016). And this supports a broad range of ecosystem services (e.g., food production, climate regulation, pest control, pollination, and numerous others) (Mori.S A et al, 2016), (M.E.A, 2005). The forest ecosystem is directly related to species diversity that supports interacting units including trees, soil, insects, animals, and man (Nix, 2018). The forest regulates local and global climate, mitigates weather events, stabilizes the hydrological cycle, protects watersheds and their vegetation, water flows, and soils, and serves as a vast repository of genetic information (Pearce. D.W and Corin G.T, 2001).

While forest value can be instrumental value where, economic value relates to the goal of maximising human well-being (Pearce. D.W and Corin G.T, 2001)

### **2.1.1 Provisioning Services**

The Provisioning services of the forest are more directed to the economic values of forest resources. Food, raw materials, medicines, ornamental resources, genetic resources, freshwater, and fuelwood are examples of productive functions (M.E.A, 2005), (Tiemann et al, 2022). The provision of natural resources through the transformation of solar energy into biomass for human construction, and various medical applications of natural biota are ecosystem processes and elements of productive function. (Rudolf S. de Groot<sup>1</sup>, Matthew A. Wilson and Roelof M. J. Boumans, 2002). Since a specific flow may or may not be sustained over the long term, provisioning service flows do not truly reflect their reality (Leemans, R., & De Groot, R. S, 2003). For example, agricultural production can be maintained through the addition of fertilizers and through new crop varieties even though the productive potential of the ecosystem is degraded through soil erosion (M.E.A, 2005).

### **2.1.2 Regulating and Maintenance services**

Forest regulation and maintenance services deal with climate regulation, CO<sub>2</sub> sequestration, accumulation by organisms, flood and disease control, and water purification responsible for local air pollution reduction (Tiemann et al, 2022). The regulation of ecological processes involves maintaining air quality, regulating the climate and water, controlling erosion, treating waste, preventing storms, and controlling disease (Leemans, R., & De Groot, R. S, 2003). The forest is crucial in absorbing and reducing atmospheric CO<sub>2</sub> levels, which controls the chemical composition of the oceans and the atmosphere (Tiemann et al, 2022).

### **2.1.3 Cultural and spiritual services**

The interaction with forests and their use for recreation have sparked a growing interest in forests. Cultural services are non-material gains that ecosystems provide through aesthetic value, rumination, and cognitive growth (Leemans, R., & De Groot, R. S, 2003). People's spiritual views are influenced by their cultural heritage, which is intimately tied to how humans view forests. (Russel et al, 2013). MEA defines cultural services in terms of the "nonmaterial benefits people obtain from ecosystems," and specifically list "cultural diversity as spiritual and religious values" as forms of knowledge, educational values, aesthetic qualities,



interpersonal interactions, sense of place, historical values, recreation, and ecotourism. (M.E.A, 2005). Comparatively to provisions and regulating ecosystem services respectively, cultural ecosystem services are the most difficult to evaluate due to their primarily non-material and qualitative nature (Daniel et al, 2012). For instance, spiritual and symbolic values derived from recreational activities sometimes include aesthetic values (Stålhammar and Eja, 2017).

However, James (2015) argues that Ecosystem services that are believed to be directly inferred from ecosystem attributes cannot account for the cultural benefits that individual derives from places. Instead, there is no apparent boundary between the forest as a sense of identity or place and the function it gives as a cultural value, after all, individuals are dependent on a specific place because of its benefits (Bjorn et al, 2020), (James, 2015), (Häggström, 2019). It can be regarded as a sense of place that harbours cultural connotations and spiritual values. But in addition, some cultural values have no connection with the forest ecosystem. The fulfilment of human desires and needs as specified in the physiological, psychological, and cultural settings must be shown to have a meaningful relationship between ecosystem functions and structures as stated in the biophysical domain and cultural services, just as in every other ecosystem (Daniel et al, 2012). Cultural services can better satisfy both physical and emotional human requirements and are frequently dependent upon supplying services (Bjorn et al, 2020). For instance, communities view the energy services that the forest provides as subsistence services that meet human needs, but they can also be regarded as cultural services of "having" that induce recreation (Bjorn et al, 2020) and performances of spiritual functions.

In a changing cultural environment, fundamental beliefs about forests have indeed been passed down from generation to generation (Ritter and Dauksta, 2013). Forests and trees are seen as symbolic representations of fertility, sustenance, and knowledge in many cultures (Ritter and Dauksta, 2013). The value of the product and service the forest provides, as well as the cultural and spiritual value it transmits from one generation to the next, are all part of the symbiotic relationship between humans and forests (Ritter and Dauksta, 2006).

The social and cultural dimension is used in this study because it represents attributes of living systems that enable education and training, promoting health, restoration, or enjoyment through observational interactions, hereby referred to as recreation mainly linked to a conscious experience of nature (Tiemann et al, 2022).

## **2.2 Summary of ecosystem services**

The Common International Classification of Ecosystem Services (CICES 5.1) framework has been used to summarize each component of ecosystem function in recent studies for forest ecosystem services such as provisioning, regulating, maintenance, and cultural services. Various ecosystem services as possible indicators of how well forests function in human-forest interaction were envisioned in it (see Table 6 in the appendix).

## **2.3 Relationship Between Forest Ecosystem Services Diversity, And Human Well-Being**

The frequency and magnitude of interactions between people and forests vary over several geographical dimensions, from local to regional to global (Soga and Gaston, 2020). They are greatly influenced by the accessibility and availability of more natural settings or forests (Soga and Gaston, 2020) and trade-off of ecosystem service utilisation that exist in a form of preferences (Kim et al, 2021). Trade-offs and synergies, which have proven to be crucial subjects in the assessment of ecosystem services at the global and regional scales, can be used to analyse and comprehend interactions between different ecosystem services in a forest. (Ray et al, 2015), (Kim et al, 2021). Understanding trade-offs is useful for managing ecosystems (Tilman, 2000) because they are susceptible to change over time, once the usage of one ecological service is reduced due to the growing consumption of another (Rodriguez JP et al, 2006). Human wants are seen as being interconnected and dynamic, with complicated relationships and trade-offs in the process of achieving those needs (Bjorn et al, 2020).

There are numerous relationships between the forests and people's well-being (Bratman et al, 2019). Numerous aspects of human well-being, such as fundamental material necessities, personal health, security, positive social relationships, and freedom of choice and action, have been mentioned in the context of ecosystem services (M.E.A, 2005). There is strong evidence that exposure to nature improves people's physical and psychological well-being by reducing stress, nervousness, and depression while boosting the immune system, joy, cognition, and social behaviours (Bratman et al, 2019), (Keniger et al, 2013). The human cognitive theory contends that all our conceptual, intellectual, or culturally distinctive beliefs are creative of the bodily connections individuals establish with their surroundings,

and awareness of these connections affects how people feel about their well-being (Gallagher., 2005) (Russel et al, 2013). Variables such as local environment, societies, and ecological factors have an impact on people's perspectives and experiences of well-being (M.E.A, 2005).

The natural resources of communities are a significant factor in determining their well-being (Leemans, R., & De Groot, R. S, 2003). The value of forests should be established in human cultural consciousness in addition to the factors that are productive, regulatory, and socioeconomic to create a symbiotic relationship. Considering back in time, the value that forests provide to mankind and their contribution to cultural evolution is directly correlated to the existence of forests (Ritter and Dausksta, 2013). The forest's interconnectedness with societies—in both past and modern times—is what makes it so great, For instance, in the olden days, Venice may be the best example of how society developed through the use of forests because forests were so important from an economical perspective that the Venetian senate had to pass legislation in order to guarantee a constant supply of wood from "terraferma" to Venice's arsenal between 1471 and 1476 (Appuhn, 2009). Positive relationships exist between well-being and forest, as later is seen as a sense of belonging to a secure resource to societies. (Russel et al, 2013).

Moreover, in the present generation due to industrialisation and modernization, there is an increasing sense of disconnection between forest and people, instead, indirect relation is more profound in productive functions of forest resources through industrial finished goods. Bratman (2019), argues that the growing concentration of people in urban areas and development has decreased people's regular interaction with outside nature, and there is evidence of a global decline in people-forest interactions. When an individual is present in the forest or lives close by, interactions are more instantaneous (Soga and Gaston, 2020). An ever-shrinking range of nature encounters is produced as direct environmental experiences become gradually inaccessible to younger generations (Miller, 2005) since modern generations engage in increasingly sedentary activities (Soga, M., & Gaston, K. J, 2016). This resulted in the "extinction of expertise" and "environmental multi-generational amnesia" (Soga, M., & Gaston, K. J, 2016). The main cause of disconnection is a lack of opportunity and a positive attitude toward interacting with nature, which decreases emotional resonance with the forest (Soga, M., & Gaston, K. J, 2016). Losing contact with forest has the effect of eliminating the

advantages that come with it, including health and well-being, emotional stability, and alterations in behaviour. (Soga, M., & Gaston, K. J, 2016).

## **2.4 Drivers of Changes in an Ecosystem**

It is worth understanding the major factors that lead to changes in the ecosystem. Any element that directly or indirectly alters an aspect of an ecosystem is a driver. (Leemans, R., & De Groot, R. S, 2003). Since an indirect driver function more irregularly and often by modifying one or more direct drivers, a direct driver functions with a clear-cut effect on ecosystem processes and can easily be characterized and quantified (Leemans, R., & De Groot, R. S, 2003). The choices people make on what they esteem and how much they eat from the forest can be influenced by cultural and religious beliefs, which might be considered indirect drivers of change (Leemans, R., & De Groot, R. S, 2003). Assessing the multiple relationships between people and forests reveals that many interactions have changed throughout time, while others seem to have remained consistent (Ritter and Dausksta, 2013). There are several factors that contribute to the modification of natural forests, such as increased demand for ecosystem services driven by economic development, population shifts, the decision to exploit forests, personal preferences, and climate change (Leemans, R., & De Groot, R. S, 2003).

Demographic drivers, which include variables such as growth and spatial distribution of population, migration patterns, market development, urbanisation, and level of literacy, influence directly and indirectly the changes in forest communities. According to demographic projections from the United Nations Population Division, by 2050, 86% of the world's population is anticipated to reside in developing nations. In addition, the population of 49 low-income countries including The Gambia has been projected to triple by 2050 (UN Population Division, 2001). However, despite the complex relationship between population growth and changes in forest ecosystems, they projected a significant increase in the population of certain regions in the world most especially in the tropics (Sub-Saharan Africa) in the coming decades which will immensely place her forest under pressure. Different approaches to forest conservation may be necessary to accommodate demographic changes, including population expansion, land use changes, population ageing, and growing ethnic diversity (Dockry et al, 2020)



One of the main causes of changes in forest components, climate change, is anticipated to have an impact on the forest during the next 20 years (Dockry et al, 2020). Through unexpected changes in climatic variables, climate change can alter forest productivity, distribution, composition, and structure (Dockry et al, 2020). It is impossible to ignore how human influences on population expansion and climate change are affecting forests, which has a domino effect on our local surroundings and contributes to forest degradation (Leemans, R., & De Groot, R. S, 2003).

Economic drivers such as intercontinental commerce such as commercial timber production and other economic forces like capital movements have an influence on ecosystems in their own ways. To determine their consequences on deforestation, changes in land use, resource overuse, and pollution of all types, it is crucial to understand the linkages between an economy's development rate, international trade and money flow, and the variability in the tenure of land and natural resources. Nevertheless, forest ecology is impacted by government subsidies and levies on agricultural products in developing nations (Leemans, R., & De Groot, R. S, 2003).

Millennium Assessment of ecosystem explicitly recognises how persons in positions of authority can have an impact on ecosystems, ecological services, and human well-being (M.E.A, 2005). For example, land use change, the kind of technology to be used, and what can be harvested from the forest are influenced by our decisions. Some of the decisions can create a long-lasting impact on the forest and its regenerative capacity, leaving a permanent scar on the ecosystem. In the case of the Gambia, the cutting down of woodland forest for charcoal and timber production as raw material for furniture has led to current deforestation in the Gambia. Another factor influencing the changes in the Gambia's forest environment is the conversion of rangeland to farmland (LDN, 2018). Bush fires are another significant natural factor influencing ecosystem change in the Gambia; they caused secondary ecological succession and the extinction of native species. This undermines the forest's cultural and spiritual function because materials in the forest that are representative of cultures are normally consumed during bushfires.

## **2.5 Consequence of Human-Forest Relation**

The effects of human activity on forests have been unpredictable and unanticipated, and some of these effects have harmed the forest and further harmed the already vulnerable (Leemans,



R., & De Groot, R. S, 2003). Due to environmental damage or the introduction of foreign species, many of these activities are drastically altering the biotic structure and variety of the forest's biological ecosystems (Hooper et al, 2005). Such modifications can be a threat to functional units in any ecosystem. Concerns regarding the effects of forest degradation on human well-being are triggered by evidence of increasing human influences on forests in recent decades and vulnerable populations are often the most sensitive to negative changes in forest conditions (Leemans, R., & De Groot, R. S, 2003). The benefits of the forest environment are traded off. For instance, a country may increase its food supply by turning a forest into agricultural lands but doing so would deplete the ecosystem's supply of other services that could be more crucial, including the ability to manage floods and droughts or provide clean water and timber (M.E.A, 2005).

According to the M.A. ecosystem assessment, there is a strong demand for ecosystem services and that need will increase for forest ecosystem services in the upcoming decades (Leemans, R., & De Groot, R. S, 2003) due to population growth (Chao, 2012), (UN Population Division, 2001). The problem brought about by the strong demand for forest services is exacerbated more severely by the ecosystems' deteriorating ability to provide these services (M.E.A, 2005). For environmental maintenance and regulation, the forest function of carbon-dioxide sequestration is undermined by deforestation occurring in many parts of the world resulting in extreme climate variables issues. To protect the environment's sustainable use, this human-induced influence on forests may be related to the loss of local populations' knowledge and experience, which aggravates the decline in forest function (Leemans, R., & De Groot, R. S, 2003). Expertise is needed in understanding human influences on the forest. The potential for sustainable expansion is severely constrained by the interaction of rising demands and more diminishing forest ecological conditions (Leemans, R., & De Groot, R. S, 2003). Variations in supply and demand for forest resources have an influence on human well-being, but so do people, communities, and countries' growing vulnerabilities (Leemans, R., & De Groot, R. S, 2003). The human-forest relationship that leads to forest degradation impacts rural people more than urban ones, with the poor bearing the brunt of the repercussions (M.E.A, 2005). While a properly maintained forest can provide a solution that can be utilized as protection against natural calamities or social unrest in any society (Leemans, R., & De Groot, R. S, 2003).

### 3. METHODOLOGY

#### 3.1 Study Area (Country background)

The Gambia is a small country in West Africa, as indicated in fig.1 below. It has a total land area of 11,300 sq. km that extends as a narrow land strip roughly 748 km inland from the Atlantic Ocean and follows the meandering Gambia River (UN Development Programme, 2021). It has a population slightly above two million with a population density of 432.04 person/km<sup>2</sup> (Net, P.P, 2019). The Gambia is a low-income country due to its high rates of unemployment and poverty, which are over 45% and 35%, respectively (GBoS, 2018), (Dampha, 2021). Close and open forest cover occupy 40% of the country's total land area (FAO, 2020). Forests play an important role in providing basic needs to Gambians (Bojang, 2020). According to the African Commission energy balance (2020), fuel wood, which is derived from the nation's forest resources and accounts for around 82% of the biomass, is the Gambia's main energy source (AFREC, 2020). Due to the need for new settlements and the utilization of natural resources, the forest and its resources are in high demand in the Gambia (Global Footprint Network, 2020). However, the fast expansion of human populations, unmanaged bushfires and firewood collection, overgrazing, and expansion of farmland and human habitation are the reasons putting forest resources under serious threat (FAO, 2020).

The Gambia has a biocapacity of 1.5 million square meters of arable farmland and a 2 million ecological footprint (Global Footprint Network, 2020). Biocapacity is defined by a global footprint network as the ability of ecosystems to replenish what people need from those environments (Global Footprint Network, 2020), (Dampha, 2021). By 2050, The Gambia's ecological footprint is anticipated to double (Global Footprint Network, 2020) because of a greater reliance on natural resources for consumption, income production, and wealth generation (Dampha, 2021). An ecological deficit occurs when a country's ecological footprint surpasses the biocapacity of the land to which the population has access to. An ecological footprint quantifies the demand for natural resources by humans (Global Footprint Network, 2020). The Gambia entered ecological bankruptcy in 2002, and as of 2016, the nation has a 547,341gha ecological deficit (Dampha, 2021) and it is listed among countries with a biocapacity deficit of 102% in 2018 (Global Footprint Network, 2020). This shows that the Gambia will be dependent on other nations with biocapacity reserves to compensate for this

gap as population growth increases (Net, P.P, 2019), and the nation's biocapacity deficit is anticipated to increase significantly (Dampha, 2021).

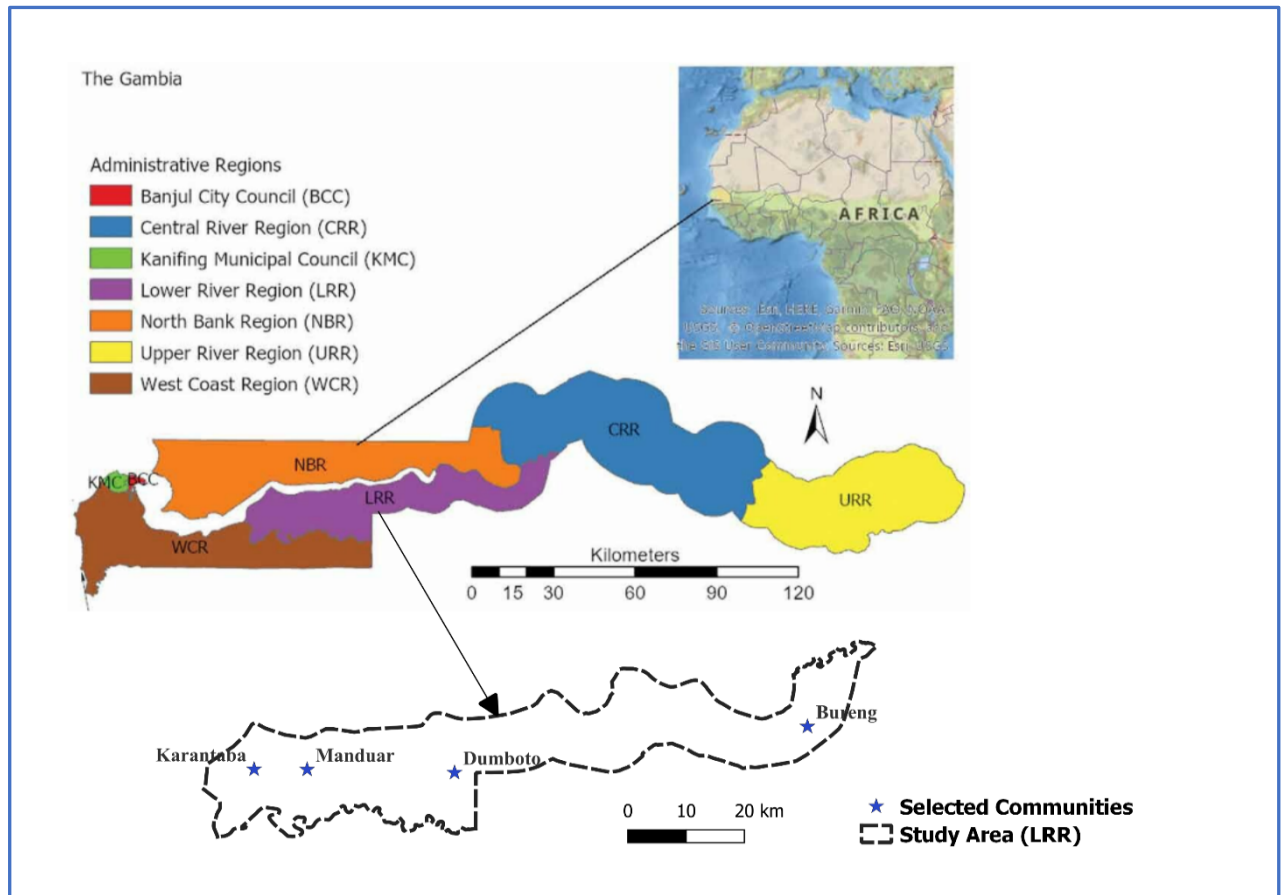


Figure 1: A map of the study location and study site (LRR). Map of the Gambia source: (Dampha, 2021), study area and the processing of the final image was done in GIS software.

### 3.2 Study site (Lower River Region)

This study was carried out in the Lower River Region (a provincial setting) along the south bank of the river Gambia. The analysis covers two sub-regions in the Lower River Region, namely Kiang and Jarra. This rural setting covers an area of 1495 sq. km out of the 11,300 sq. km total land cover of the Gambia with a population of 82,361 (GBoS, 2018). The region's land cover consists of forest, settlement, grasslands, rivers, and tributaries as shown in [fig.4](#). According to FAO, the forest occupies a total area of 66,500 hectares (FAO, 2020). The study area harbours the largest national park in the Gambia (Kiang West National Park) recognized in 1987 covers an area of 19,526 hectares of land currently managed by the department of parks and wildlife of the Gambia (Nag, 2019). The forest ecosystem in the lower river region has many rare and endangered wildlife species of the country's biodiversity, including the Nile

crocodile, clawless otter, marsh mongoose, many plant species, leopards, and West African manatees, over 250 species of birds have been recorded in KWNP including 21 raptors: vultures, harrier eagles, hawks, and falcons. (Jaiteh, 2008)

The resources that make up the Gambia's forest cover—Savannah woodland, tree and shrub Savannah, and mangroves—are crucial to the country's environmental and economic growth (Bojang, 2020).

According to the Gambia forestry act 1998, the Gambian forest is classified into categories such as state forest, community forest, and private forest. The following definitions were given in the forest act (Gambia forest act, 1998).

- State forest: this includes
  - Forest parks: These are forests that the Gambia's department of forestry manages and that are used for producing goods, protecting endangered wildlife and flora species, training forestry workers and research. Fig.2 below is the location of forest parks in the Gambia.
  - Forest reserve: any forest under the control of the Forestry Department, except for those in national parks and nature reserves, which are overseen by the Department of Parks and Wildlife Conservation.

The usage of these forests in one way or another regardless of their location is limited to the rest of the population and in most cases needs permission for its usage. Such limitation undermines the intertwined between the people and the forest.

- Community forests: These are communally owned and maintained forests that provide fundamental needs such as fuel, food, medicine, the production of forest wood, grazing, shelter, and maintenance.
- Private forest: These are forests that are being grown or planted on privately owned or leased property that follows applicable land regulations and whose management is regulated. This includes private natural forests and private plantations.

Therefore, community forests and private forests can be used to determine human-forest relations in the Gambia because of their accessibility and management by local people.

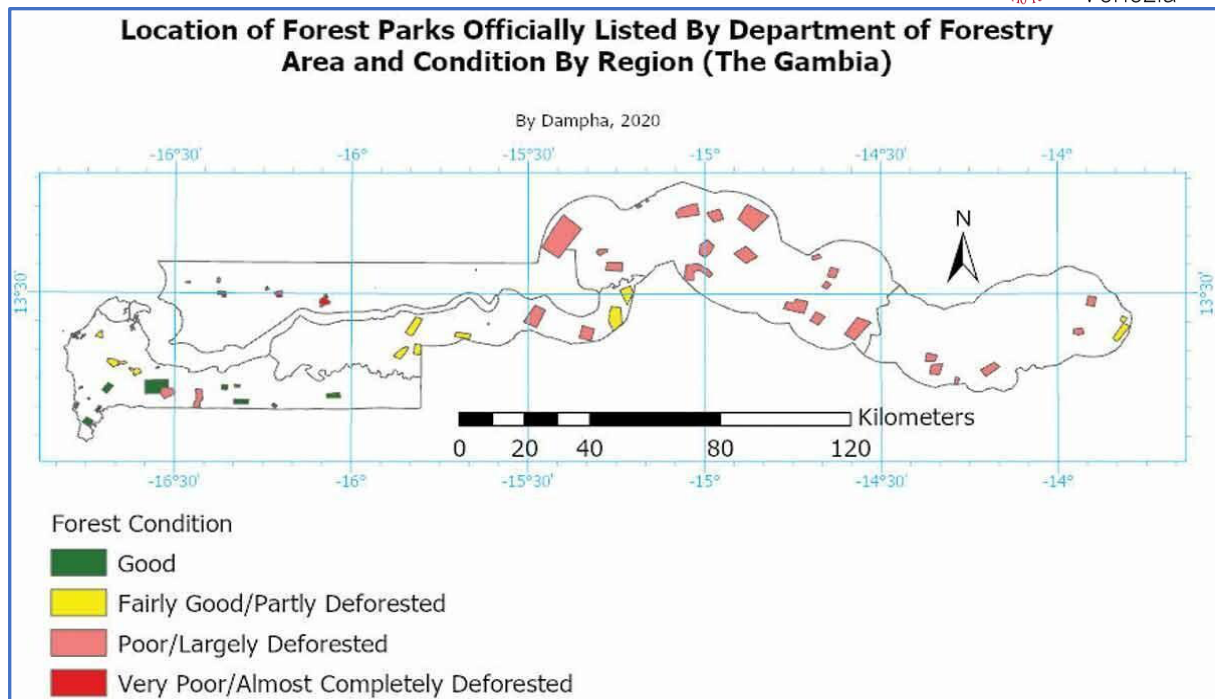


Figure 2: Forest parks in the Gambia. Source: (Dampha, 2021)

According to the National Forestry Strategy (2019 – 2028), The Lower River Region is characterized by degraded savannah forest and mixed agricultural, as well as extensive mangrove forests along the Gambia River (Baldeh, 2018). This paper considers any categories of forest found within the rural Gambia of the Lower River region. For example, Kiang West National Park (KWNP) found in the lower river region was officially declared a national park in 1987 (NACO, 2012). The park is used for the protection, conservation, and management of ecological integrity, diverse wildlife, natural habitats, and natural heritage resources and to offer opportunities for economic, recreation, education, and scientific purposes (NACO, 2012). The large portions of the park are dry deciduous woodland and guinea savannah, The major wild mammals that are known as residents in the Gambia are recorded in KWNP (NACO, 2012). The park contains over 300 bird species and lots of reptiles, but the number of mammals in the reserve is very low (NACO, 2012). The park contains a restoration zone where endangered native species are re-introduced in the zone for conservation purposes. Traditional parks and manage natural environments have an important role in reducing the extinction of experience (Soga, M., & Gaston, K. J, 2016).

### 3.3 Community Forest management and regulations in the Gambia

Community forestry is a term used to describe a set of governance frameworks in which communities participate fully or partially in decision-making, receive benefits, and provide effort and expertise to maintain healthy forests and promote social well-being (Danks and Fortmann, 2004). A community can be a location in the form of a human settlement with a defined territorially constrained local area, a local social structure comprising ties among residents of the same region, or a particular kind of relationship characterized by a feeling of common identity (Wiersum, 2004). Community forestry can depend on the geographical set-up and the laws of the land of a particular country. In the Gambian context, Community forests are characterized as a participatory method of forest management in which a community (ies) designates a forest within its customary territory for official management by the forestry department and community members (Jammeh, 2008). It has been practised in the Gambia since the early 1990s and is like a partnership between the government and local people at the community level. Rural people in the Gambia were formerly restricted from accessing specific forest resources because of rigid forest regulations, which made it difficult for them to take an active role in the preservation and management of what was once referred to as "their forests" (Sonko and Camera, 2000). Traditional use or ownership rights are complicated by the limitation of state laws, which, when combined with population increase, also led to the unlawful exploitation of forest resources (Sonko and Camera, 2000). The land tenure system, which is established on customary law and acknowledges community land ownership, is a vital component of community forestry (Jammeh, 2008).

The Gambia adopts various forms of community forest or forest management systems which lead to current participatory forest management (Jammeh, 2008), (see table.1 below). These are Community Forestry (CF), Joint Park management (JFPM) and Community Controlled State Forest (CCSF). All these forms of forest management used a similar integrated forest management approach. By transferring proprietary ownership rights over forest resources from the government to the communities, the community aims to control access to such resources (Jammeh, 2008). Other objectives include improving livelihoods via the sustainable use of forest goods and services and ensuring sustainable forest management through incorporating neighbouring people (Jammeh, 2008). In the Gambia, community forestry was implemented in three stages: the start-up, planning, and consolidation phases (Sonko and



Camera, 2000). To finalize the transfer of ownership rights to communities, agreements are negotiated between the state and the community, and community forest committees are formed to receive training from the forestry department (Sonko and Camera, 2000). The management is diversified, using a bottom-up approach, putting the people first to actively take part in surveys, planning, training, and evaluation of forest resources with the help of forestry extension workers. Community forestry is the first step in the ecological, economic, and social transition needed to restore a historically unstable system (Sonko and Camera, 2000). Rural communities, community leaders, and appropriate authorities are among the groups targeted in community forestry (Jammeh, 2008).

Table 1: Community Forest management systems in the Gambia (Baldeh, 2018) (Jammeh, 2008)

<b>Community forest management types</b>	<b>Objectives</b>
Community Forestry (CF) 1995	<ul style="list-style-type: none"> <li>● This management system aims to regulate local communities' access to forest resources by transferring exclusive forest resource ownership rights from the government to the communities to enhance the well-being of the local communities through the incorporation of ecologically adapted natural resource management practices.</li> <li>● The strategy intends to manage 75%, or around 240,000 hectares, of the state's forest cover, with local communities maintaining an estimated 200,000 hectares.</li> </ul>
Joint Park management (JFPM)1999-2003	<ul style="list-style-type: none"> <li>● To ensure sustainable management of forest resources, while meeting the basic needs of rural communities: creating jobs and generating incomes, and improving people's living condition</li> <li>● Establishing a long-term leading role in monitoring and analysing changes in the production, use, and</li> </ul>



	<p>trading of forest products as well as in the resources and services provided by forests.</p> <ul style="list-style-type: none"> <li>● The managing partner is granted long-term access rights to certain forest resources under the terms of the agreement. The management comprises more than 240 villages in the Gambia, predominantly in Central River Region, and it encompasses 17300 hectares or 53% of the existing forest park area.</li> </ul>
Community Controlled State Forest (CCSF)	<ul style="list-style-type: none"> <li>● This trained communities to manage designated forest areas and conserve their forests, empowering and involving communities.</li> </ul>
Participatory forest management	<ul style="list-style-type: none"> <li>● Reduce the financial and technical burden on the state</li> <li>● Promote sustainable forest management by actively involving the local communities in the mitigation of forest fires</li> <li>● Responding to international treaties and conventions</li> <li>● To enhance livelihoods via the responsible use of forest goods and services</li> <li>● Preserve the genetic diversity of ecosystems of seed trees and populations of important wood species.</li> </ul>

To support Gambia's sustainable forest management and development, a comprehensive National Forestry Strategy (2019 – 2028) and its long-term core programs have been developed, this strategy considers social fairness, economic growth, income distribution, and environmental values. (Baldeh, 2018). This forest plan's primary goals are to address climate change, dryland and wetland conservation, land degradation, drought, and degradation, as well as to conserve forest resources across countries' boundaries (Baldeh, 2018). This may be accomplished by building up substantial alternative livelihood networks at the community level in rural regions and forest communities (Baldeh, 2018). According to the National Biodiversity Strategy and Action Plan (2015-2020), Due to forest loss and degradation, which is aggravated by the impacts of climate change, a large portion of the Gambia's forest ecosystems are

vulnerable or on the verge of extinction (LDN, 2018), (Baldeh, 2018). Agriculture or crop production is responsible for 50% of forest degradation in the Gambia (LDN, 2018).

### **3.4 Importance of community forest management system in the Gambia**

To guarantee that forest products directly benefit locals, FAO encourages market research and development of forest products and services in the community forest system of the Gambia (Jammeh, 2008). The profit is split between the controlling community(ies) and the national government, with 85% remaining with the communities and 15% going to the government, administered as National Forest Fund (Jammeh, 2008). The money is used to increase the utilization of forest resources, notably wood, and to raise awareness of the significance of forests, community infrastructure is restored, including wells, seed warehouses, and roads, resources (Sonko and Camera, 2000). The decentralised nature of forest management in the Gambia improved regeneration by tree planting which has been achieved in some community forest areas due to the mitigation of bushfires (Sonko and Camera, 2000). Because of the increased livestock feed generated because of farmer engagement in community forestry, many people's opinions of the forest have changed (Sonko and Camera, 2000). Due to the advent of community forestry in the Gambia, rural residents are now more conscious of the economic and environmental impacts of deforestation (Sonko and Camera, 2000).

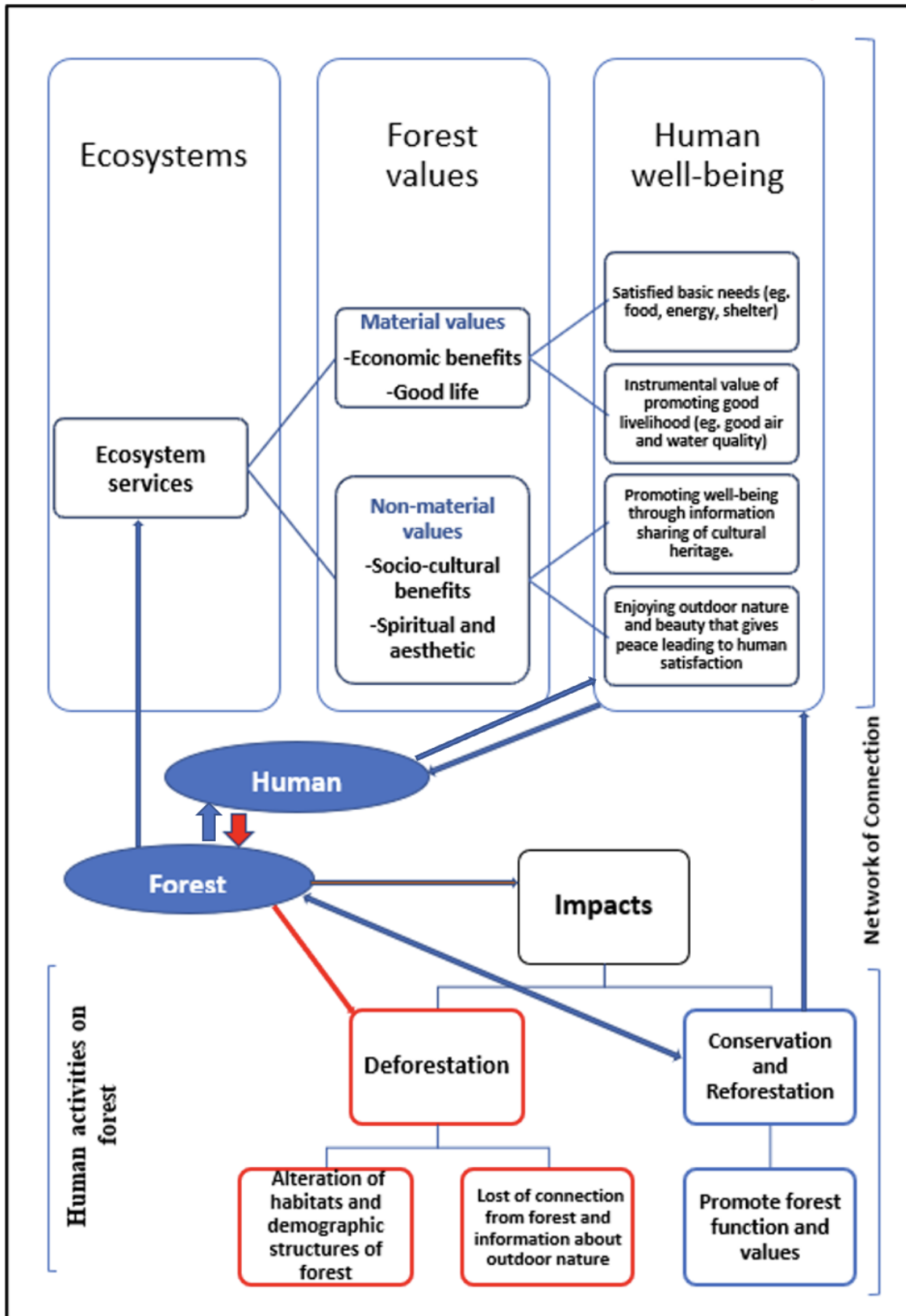


Figure 3: Conceptual framework of the study

### **3.5 Conceptual Framework**

This conceptual framework is designed to describe the linkage or multiple interactive pathways that exist between forest ecosystems and humans. It consists of two main components, namely Forest and Human beings, as shown in fig.3 above. The study involves forest because it plays a central part in providing basic needs to humans for well-being from its ecosystem. The forest ecosystem on the other hand provides instrumental and intrinsic value, all towards human satisfaction. The relationship can be symbiotic because if the forest provides values for human well-being, humans indeed need to maintain the forest in various management processes to ensure a continuous supply of ecosystem services. So, the relationship can be reversible. However, if humans acted on forests in the processes of exploitation for material and non-material benefits, it could lead to impacts. The process of harvesting from forests can lead to positive or negative impacts depending on how sustainable the forest is. If anthropogenic activities in the forest are sustainable in the sense that human drive benefits, yet they try to protect and maintain that forest, the ecosystem will continue to evolve serving their services to humans for well-being. But if the relationship is unsustainable, it will lead to deforestation which will eventually result in a loss of connection between humans and the forest. These will also lead to the extinction of information about the forest to future generations because the physical existences of the forest are important in the mindset of the people, especially the cultural and spiritual functions of the forest. For cultural ecosystem services, the physical being of the forest is needed in symbolising cultural services to humans.

### **3.6 The research approaches**

This study focused on both qualitative and quantitative approaches. Thirty-five semi-structured in-depth interviews were conducted with local people based on their experience of interacting with the forest in their environment. Four communities in the forest enclave such as Manduar, Bureng, Dumbuto, and Karantaba were selected to be representative of the Lower River Region as shown in fig.1 above. The study and its focused-on the human-forest relationship tend to reveal how people interact with the forest. Qualitative primary data were collected from interviews using individual discussions. The study contains two target groups, local people from the identified settlements to relay information about bicultural diversity in relation to the forest, and their perspectives on forest functions and values, The second target groups were officials of the ministry of forestry (rangers) and community forest heads, the responses helped

to know about the management aspect and role of forest in the lives of people at the community level in Lower River Region in the Gambia. Forestry officials will be used to transmit information about the role of government in community forest management and how management is impacting rural people's livelihood and connectivity with the forest.

### **3.7 Data collection**

In administering the questionnaires, I follow the International Society of Ethnobiology (ISE) code of ethics because it recognises local peoples, their various cultures, and control over their lands and languages and linked it with the environment which is directly connected to biological diversity (Society of Ethnobiology, 2006). I employ three principles of the ISE code of ethics that is the principle of respect, self-determination, and diligence (International Society of Ethnobiology, 2006). We give utmost respect to the culture, integrity, and morality of community members whereas, for self-determination, respondents were given the right to speak for themselves which was acknowledged through asking an open question with no restriction to choose between answers. Finally, I am from the society where the interview was conducted, and I have prior knowledge about communities' morals, cultures, social norms, and fluency in the language in which the interview was conducted. This refers to the principle of diligence. The community members see me and those who assisted in interviews as part of their society, and we were accepted to freely do the research.

The interview question was administered to the following age group such as 20-30, 31-40 and 41 above. A maximum of 35 interview questions were administered to community members of four selected communities, out of which 5 are rangers from the department of forestry of the Gambia. The interviews were done to compare the different ways communities and individuals connect with the forest. The interviews were conducted in the Mandingo language in the Gambia. The questionnaire was administered to respondents in person and recorded with the help of Modou Manneh and Lamin Manneh of the department of forestry. The recorded interviews were transcribed from the Mandingo language to English. Moreover, the ratio of women to men respondents is 14:16 for community members. Some participants spent some time in the forest for different purposes. Focus groups of men and women used in these studies are from different age groups to know who is really into the forest. Table.2 below is a description of the participants involved in this study. See table 7 in the appendix for a detailed description of the participants.

Table 2: Description of participants, gender, and language

	<b>Descriptions</b>	<b>Community members participants</b>	<b>Rangers</b>
<b>Gender</b>	Male	16	5
	Female	14	0
<b>Language (Mandingo)</b>	Mother tongue	27	3
	Not mother tongue	3	2
<b>Age groups</b>	20-30	9	2
	31-40	17	3
	41above	4	0
<b>Total number of participants</b>		<b>30</b>	<b>5</b>

To be able to study this relationship, interview questions were developed to provide answers about individuals' relationships with the forest. This indeed reveals people's ways of connecting with the forest, perceptions, and feelings about forest ecosystem function and values, and the benefit they do get from being or living within the forest. Individuals reflect on their experience of interacting with the forest, thereby surfacing what they do in the forest that is substantial to their lives and quite representative of their societal identity. The responses to the Questionnaire were aimed to meet the study objectives and research questions as shown in Table.3 below.

Table 3: Research objectives its corresponding questions

<b>Objectives</b>	<b>Research Questions</b>
Examining human-forest relationship in LRR	<ul style="list-style-type: none"> <li>• How frequently they visit the forest and what they do, how they feel when they are in a forest environment.</li> <li>• What spiritual and cultural bond people of LRR have with forest?</li> </ul>

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<p>To identify people's perception about various ecosystem services and role of forest in their livelihood</p> <p>To access people's influences in managing and maintaining forest for the future generations.</p>	<ul style="list-style-type: none"> <li>● If there are changes in people's socio-economic life's, how does that influence their connectivity with the forest?</li> <li>● What are the consequences of human-forest relationship?</li> <li>● What life experiences do the inhabitants have with the forest?</li> <li>● What kind of resources can be obtained from the forest that is relevant to their livelihood?</li> <li>● What form of community forest management system is adopted in LRR?</li> <li>● Who is involved in day-to-day management of forest resources?</li> <li>● The guiding principles in managing forest ecosystems in LRR?</li> </ul>
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This study will help the local people to realise the role they play in maintaining the sustainability of the forest ecosystem and rather appreciate themselves for strengthening bicultural diversity from one generation to the other. It will also help to understand rural dependence of basic needs from forest in LRR. The results obtained from this study can serve as yardsticks for the government in formulating forest policy regarding the rural people.

### **3.8 Data analysis**

The semi-structured interviews were translated and transcribed for analytical purposes. For a more conceptual analysis, a QGIS data-based analysis was used about forest cover to know change detection in land cover maps. The participants' responses about changes in the physical vegetation of the forest, will be used to compare to land cover analysis from GIS. The responses will authenticate software results. Interview questions 1 and 7 were analysed using a pie chart.

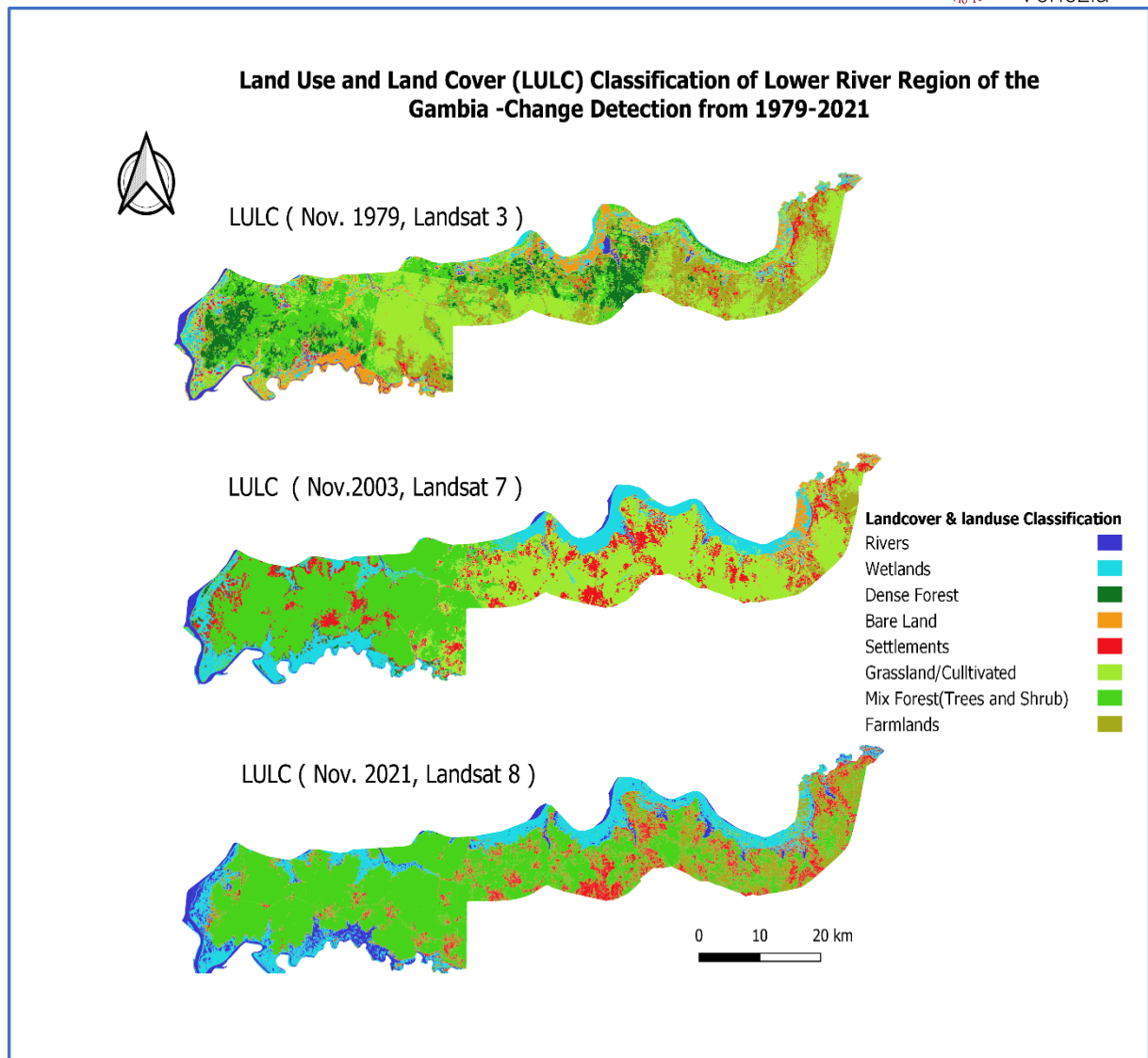


Figure 4: Land use and land cover map of the Lower River Region

This study uses the Google Earth engine with remote sensing data from Landsat 3,7 and 8 satellites to generate land use land cover imagery data for the Lower River Region of the Gambia. Both the Google Earth engine and GIS were used for the visualisation of the projection from 1979 to 2021. LULC are classified into eight types as shown in fig.4 above (see the description of the class in table.3 below). These are Rivers, Wetlands, Dense forests, Bare Land, Settlements, Grassland/cultivated, Mixed forests (Trees and Shrubs) and Farmlands. The generated imagery from Landsat was processed in GIS software.



## 4. RESULTS

The analysis of the intertwined between the forest and people in the Lower River Region of the Gambia is presented below. The results indicated the respondents' reason for being-in-the-forest relates to their economic gains and social and cultural functions. These relational activities in the forest result in a more specific theme of individuals' life experiences and feelings, shaping their perceptions and thoughts about the forest in their communities. Furthermore, well-being is expressed by respondents as the role forest plays in their livelihood through the services it offers to the people and community at large. On the contrary, unsustainable anthropogenic activities of extracting forest products lead to forest ecosystem changes, which in turn impact on socio-economic and cultural lives of peoples. This is responsible for the loss of connection between the forest and people and the extinction of information. Finally, the findings indicate that the communities have had traditional customary laws for the protection of the forest in the past. In the present generation, state forest policy is the guiding principle for the community forest management system in the Lower River Region of the Gambia

### 4.1 Reason and frequency of visiting the forest

Based on the responses to these questions, individuals' reasons for going or being in the forest appear to relate to their sustenance and emotions (moods). To be able to describe these activities they do within the forest, the respondents mainly talk about two aspects namely, different forest provisioning and cultural ecosystem services such as fruits or food collection, firewood collection, fetching tree branches for fencing poles and roofing, collection of herbs (roots, leave, the bark of trees) for medicinal purposes, respectively forest provision. While meditation, the performance of initiation ceremonies, informal education, and the performance of rituals are some of the cultural activities they do or used to happen in the forest. Responses to these activities by respondents are:

**R5:** I go to the forest to look for foddors for my livestock such as sheep and goats and sometimes take them to forest sides for grazing. I also collect firewood from the forest for cooking. During the fruit season of some trees, I do go there to collect fruits. I collect some traditional herbal tea from the forest, for example “borbori”

**R14:** I Take my cows to the forest for grazing, I sleep in the forest when I find a good spot for my cattle to graze, I spend my entire day in the forest, it is so peaceful.

**R18:** I patrol in the forest and am community forest committee. I usually check whether the trees transplanted are growing well, check whether illegal smugglers are cutting forest trees.

**R26:** If I go to the forest, I collect parts of trees of different species for different purposes such as firewood collection, fetching tree branches for fencing poles and roofing which I sell to other community people.

**R30:** Nature is beautiful, I go to the forest to enjoy outdoor nature. Forest is a wonderful place to know the existence of God. Sometimes I walk within the forest for meditation, reflecting on past cultural activities we used to do in the forest, which gives me peace of mind.

I also found that the activities people do in the forest determine their frequency of visiting. For example, cattle owners visit the forest every day because the cows need to be fed every day. Those who visit the forest for cultural ecosystem services such as meditation or reflection, to experience the beauty of the forest, and aesthetic value to visit the forest a couple of times a week. From the results, 31% of the respondents visit the forest at least 3 times or more in a week, 23% go there on daily bases, and 20% of the respondents visit the forest a couple of times a month. 11% of the respondents visit the forest less frequently (see figure 5 below).

### How often do you go to the forest?

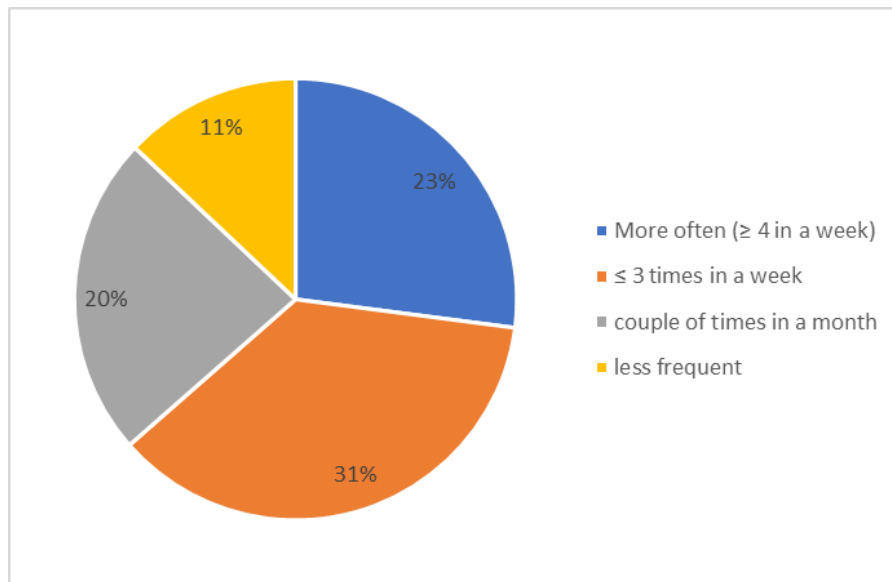


Figure 5: Frequency of visiting the forest by local community members

#### 4.2 Feelings, relationships, and life experiences of being in the forest.

The responses about people's life experience with the forest reveal the importance of their childhood personal memories of the past that shows a relationship between the forest and the people. Most responses to their life experiences are true manifestations of the historical cultural activities of their communities. Culture is of paramount importance in connecting people with forests, but most of them are in the past according to some respondents. Example of a comment from a respondent:

**R22:** My experience with the forest is about my childhood experience, where me and my age mates used to go hunting for small bush animals with our dogs. These memories will always live with me. Some friends left the community to settle in the town.

The individual connection to the forest is about peoples' cognitive beliefs that serve as signs of cultural identity, sense of place and the instrumental value of forest offer to communities for well-being. Moreover, some respondents express their mood of being in the forest with spiritual beliefs, bodily language, and feelings. Some identifying comments about human-forest relationships are shown below.

**R1:** My relationship with the forest is simply about my culture, health, and well-being. I used traditional medicine. The herbs I usually collected from the forest helped to regulate my blood pressure for the past 4 years. Also, some trees in the forest symbolised the cultures of our village. There are some specific trees whose bark and leaves are used for the dressing of our traditional masquerades known as “kosewo” for the village's yearly traditional festival called “jonbondo”. It is because of those trees in the forest that makes this traditional festival possible.

**R16:** The cultures of the community connect us with the forest. My relationship with the forest is mostly about my livestock, but also collectively we observe some of our cultural rituals in the forest. For example, we do initiation and circumcision of our male children into manhood inside the forest and that’s where we educate them on what is acceptable or not according to our cultural setup to be responsible men in the future.

“**R7:** I am always in the forest; some areas are so scary. I don’t feel comfortable because I believe that they are possessed by the devil, so I don’t stay long in those areas searching for forest products. But in some areas, I feel comfortable, energetic, and happy to continue doing my work”.

Also, some people believe that they feel good and comfortable being in the forest, but others as illustrated above feel uncomfortable and scared as shown in (figure 6)

### What mood do you get from being in the forest?

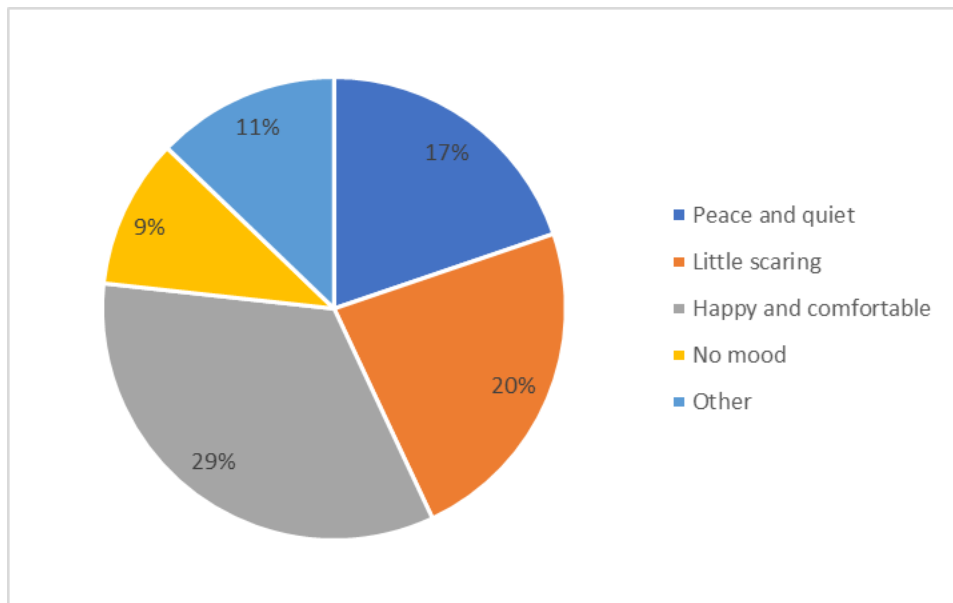


Figure 6: People's moods do you get from being in the forest

Based on the responses, 29% of the respondents feels happy and comfortable in the forest, 20% feel a little scared, 17% find the forest as quiet and peaceful, and they give high recognition to forest aesthetic value. On the other hand, 9% of the respondents did not express any form of mood with regard to being in the forest environment and 11% of respondents gave a combination of different moods.

#### 4.3 Benefits of forest ecosystem services

Many people expressed that their basic benefit from the forest relates to their reason for visiting the forest. The responses reveal a balance among benefits from various ecosystem services. Prominent of all the services is the economic benefits being mentioned by the respondents. Almost all the respondents mentioned their source of energy for cooking is from the forest, like firewood and charcoal. However, the benefits can be categorised into various ecosystem services of the forest. These are provisioning, regulating, cultural, and supporting services respectively, from the forest as described in the next section.

##### 4.3.1 Benefit from provisioning service of the forest

The people of LRR benefit from the provisioning services of the forest. Some of the benefits they mentioned regarding provisioning services are firewood, forest food (bush meat and

fruits), herbs for medicinal purposes and tea. According to the responses, these benefits contribute to people's well-being. A response from one of the respondents is

**“R24:** The basic benefit I get from the forest is: it is my main source of energy. We used tree branches for cooking, and apart from our agricultural harvest, the forest serves as a second source of food for my family. I collect some fruits and nuts such as palm tree fruits, and locust beans for family consumption. We still eat some bush meat from forests such as antelopes, birds etc. It is our main source of shelter. The roofing of my house is from forest trees, the furniture is from the timbers collected from the forest.”

Many assert that the material benefits they do get from the forest are fundamental to their livelihood. This creates a concern in their communities that they are responsible for protecting the forest because, in turn, they are protecting the source of their basic benefits.

#### **4.3.2 Benefit from regulating service of the forest**

The environmental benefits can be associated with regulating the services of the forest. Among them, there are reductions in the impact of windstorms, flood regulation, temperature regulation, improving air quality and maintaining soil structure. Below are some distinctive responses about such services.

**“R1:** As we all know Gambia is always a victim of windstorms, some big strong trees are found in the forest for example, mahogany trees serve as windbreaks thereby preventing our structures and houses from collapsing during intense winds. Forest provides fresh air to the community.

**R2:** It reduces the risks of floods because if you observe around, areas with large gullies are deforested areas but where there are so many trees, those areas are not affected by erosion. It regulates temperatures, especially during hot seasons. And because of the forest trees, we are having rainfall.

**R9:** During community work of building dikes, commonly called “tesito” in the olden days, we used forest trees in the regulation of flood areas. Because flooding is a serious natural hazard in the country”.

#### **4.3.3. Benefit from supporting service of the forest**

In a broader perspective, the services that all other services depend on are mentioned by responders as underpinning services that support other services to function are nutrient cycling and soil formation. The responses reveal that forests help to add the nutrient content of the soil and soil formation, respectively, which support the growth of trees that they benefit from. A response to this service is

“**R6**; the forest prevents us from windstorms and the leaves litter in the forest improve the soil fertility. This serves a long way to maintain the nutrient capacity of the soil, and it also helps the forest regenerative capacity as bushfires in the region are recurring every year”.

#### **4.3.3 Benefit from the cultural service of the forest**

The intrinsic value of the forest is honoured among communities because those cultures related to the forest are their symbol of identity that differentiates them from other groups, especially when there are cultural festivals. This non-material benefit is mentioned by respondents in different cultural benefits such as religious and spiritual, educational, and aesthetic benefits. Some respondents expressed these cultural benefits in both the past and the present, that is some of the cultures that they used to observe in the forest, are no longer being observed. This is due to several factors that include formal education, deforestation, and migration. For instance, respondents mentioned:

**R6:** We used to have a spiritual and cultural connection with the forest in those days, I and my age mate circumcision were done in the forest, but now those things are not happening, also during raining season, when so many days have passed without rain, the elders of the community used to go the forest to do some cultural rituals for the rain to come.

**R14:** In the past, there was one big tree in the forest where the community performed initiation of male children into adulthood. In yearly initiation events, male children are circumcised and stay in the bush (forest) for one to two months where they will be educated about communities' cultures, how to respect elders and become responsible in future. Elders communicate to the kids in rituals and irony. Also, when the villages were facing some natural hazards (less or too much rain, wind, flooding), the elders used to gather in the forest under a tree to supplicate according to our traditional beliefs to stop the hazard, now that tree fell,

it was a symbol of culture, peace for our community. But now because of modernization, and formal education, Islamic religious beliefs, villages take their male children to the doctors for circumcision, that culture is no longer practised here.

Moreover, the responses reveal that a forest is a place where informal education and most cultural activities in the communities take place. And because some of those activities are in the past, now the forest has become a place of aesthetic benefits where people go there to meditate and reflect on their past. Some expressed that it gives inner peace, thinking about the life-world experience from the past.

#### **4.4 Changes to forest ecosystems and people's socio-economic and cultural lives that reduce or strengthen human-forest relationships**

From the responses, I detected several changes, be it physical changes to the forest or individuals' social life's serving as drivers of change. Such changes have an impact on both the productive and intrinsic value of the forest, triggered by drivers of change to the forest ecosystem. Most expresses the changes as a trickle-down effect on the forest, leading to a loss of connection between the people and the forest. The responses to interview questions about changes can be categorised into morphological changes in forest cover and changes in the socio-economic and cultural life of people, respectively.

##### **4.4.1 Responses about changes in forest cover**

Responses to change in forest cover were described as changes in the physical structure of the forest, regarding disappearances of some indigenous trees and wild animals. What indeed they said is one of the driving forces that reduce and is reducing their connectivity with the forest. Some of these changes described by respondents are:

**R2:** Our forest has changed a lot. It is sad that most of our mother trees and wild animals (elephants, giraffes, and lions) are gone. We used to have a closed forest (dense) with wood savannah, but now we have an open forest because grassland and shrubs in the mixed forest are always burnt by bushfires.

**R1:** Yes, there are changes in the overall ecosystem, such as the disappearance of some trees and animals due to occurrences of bushfires every year during the dry season. The forest is no longer dense. This part in the 1970s used to have thick



forests, even if you go to the forest, you used to be scared because of darkness but now Jarra east is the most deforested area in the Lower River Region. Some trees and animals are gone. Also, people cutting down big trees for charcoal production led to the extinction of our traditional trees as the saying goes forest belongs to everyone in the community. Some of these human activities make the forest lose its cultural value. But now the government is helping us to reduce that indiscriminate felling of trees for energy production.

In addition to these changes, the respondents associated the drivers of changes in forest cover as both natural and anthropogenic. They believe that the main threat to their forest is bushfire which they believe is naturally occurring while anthropogenic activities mentioned by them are cutting off trees in the woodland forest for timber production, firewood, and burning of trees for charcoal. The respondents describe these human activities as unsustainable exploitation of the forest values. One of the responses is.

**R16:** yes, there are changes to the forest. The forest size and thickness have reduced and are still changing because of two main things. 1. Bushfires are consuming our forests every year. Old trees died and new trees that are replacing the old ones can easily be burnt by bushfires. We, the livestock farmers, find it so difficult to feed our animals, especially during the dry season. 2. Many trees are cut by people either for timber, firewood, or charcoal production. These activities have a great impact on our forest cover.

#### **4.4.2 Land use and land cover change results**

The results of the image interpretation of the forest cover in the Lower River Region of the Gambia show a significant change in land use and land cover between 1979 and 2021 (see figure 4 in the materials and methods). In 1979, 32% of the total area of LRR was covered by forest, but the total green space including grassland was 60%. This green area includes a forest of different types such as dense forest, grassland/cultivated, and mixed forest (trees and shrubs). There is a net decrease of 6% in forest area in 2003, and 17% from 1979 to 2021, (see Tables 4 and 5 below) for the net change composition of relative land cover description and land cover percentage values. In 1979, the western part (Kiang) and central part (Jarra) had some dense forest, which eventually disappeared by 2003 and 2021 to mix forest of shrubs and trees. On the contrary, settlements and bare lands increased by 3% from 1979 to 2003, and 4%

from 1979 to 2021. From the land use and land cover map in figure 4 above, settlement and developments are more concentrated in the central part towards the east in LRR. River encroachment and wetland extended by 15% from 1979 to 2021.

Table 4: Description of Land use and Land cover classification

<b>Classes of LULC</b>	<b>Descriptions</b>
Rivers / Wetlands	It comprises rivers, tributaries called “bolongs” in the Gambia, wetlands, and ponds.
Dense forest	It consists of woodland savannah trees, with 50% or more of canopy cover
Bare lands	It consists of some agricultural lands that are barren, unpaved roads, beaches along the river or bare lands in transition zones between terrestrial and aquatic ecosystems, and football fields.
Settlements	It consists of houses or buildings
Grassland/ cultivated/ farmlands	This comprises grasslands, orchards (that includes mango, orange, and cashew plantations), horticultural gardens, ongoing deforested areas, and newly reforested areas
Mix forest	This consists of shrubs, trees together with grasslands. It can be regarded as an open forest in Gambia context.

Table 5: Land Use Land Cover Change (LULC) in percentage (1979, 2003, and 2021)

Types of LULC	1979 (sq.km)	2003 (sq.km)	2021 (sq.km)	Net % change (1979- 2003)	Net % change (2003- 2021)	Net % change (1979- 2021)
Dense and mix forest	485,64	395,01	225,09	-6	-11	-17
grassland	406,29	450,87	512,23	3	4	7
Farmlands	312,23	170,36	185,33	-9	1	-8
Bare lands and settlements	168,8	211,28	228,49	3	1	4
Wetlands and rivers	122,04	267,48	343,81	10	5	15
Total area	1495	1495	1494,95			

#### 4.4.3 Changes in the social and cultural lives of people

Several respondents mentioned the socio-economic and cultural transformation of their life in the past couple of decades. Some expressed that formal education led to the disappearance of informal education used to be conducted in the forest during circumcision ceremonies. The presence of hospitals and clinics in the communities made the function of traditional healers less needed, whose source of medicine is herbs from the forest. In addition to the introduction to hospitals in the community, many people prefer to take their children to the hospital to be circumcised. And some activists are getting successful in the abolition of female circumcision. So, all these lead to a reduced connection between the people and the forest. Some key social functions that were important as mentioned by respondents are wrestling competitions and social age groups responsible for entertainment and are a labour force in forest protecting activities. The social age groups are known as “Kafo” in the Mandingo language. For example, one of the responses to this questionnaire is

“R8; we used to have rigid cultures, and they are observed in the forest, but these places are now too open, sometimes you can be working there, but if you



don't know that before they are cultural places, you will not even know. Those cultures are disappearing because many people did not believe in them anymore and did not observe them all because of education and modernization”.

One of the cultures that are no longer happening as confirmed by most of the respondents from all the communities is wrestling whose yards are found in the forest or village outcast near the forest. One respondent said that the most useful social life is social age groups. They said that every year different age groups, with the help of community forest communities, embarked on tree planting or reforestation to recover the damage to the forest. This strengthens people's activities in the forest and is a form of reconnecting individuals with the forest”. With the introduction of technological appliances, many stay indoors spending more time watching television programmes and normally depend on other community members for forest products by purchasing firewood as a source of energy for cooking. In the present generation, the forest is not a primary source of food for people in the communities because most of them depend on food that is imported into the country.

#### **4.5 Forest management in the Lower River Region**

According to the responses from all four communities, a community forest management system was established in their communities 20 years ago under the name participatory forest management system (see Table.1 in the materials and methods). From the interview, they said their communities select forest committee members which include the president of the committee, like an institutional setup. The forest committee is answerable to state forestry officials on their management processes and benefits from the forest. The committees are responsible for the management of day-to-day forest affairs for the maintenance and sustainability of the forest for generations to come. The extension workers help to educate the committee about forest management guided by the forest act 2018-2028. And in the forest, they are assisted by forest rangers for the monitoring of the forest. The organisation of the people involved in the management is hierarchical, starting from the community to forest rangers and state forestry officials.

Moreover, as said by the respondents, the community manages their own forest, and they are given the freedom to benefit from it. On the contrary, if the forest recognized by the state as a forest park happens to be in a community, the management of such forest is not fully bestowed

on the community. The reason is that forest parks are Gambia's nature reserves mainly for conservation purposes and are fully monitored by forest guards or rangers.

**R4 & R8:** These forests are managed by communities under the supervision and technical guidance of the state through the department of forestry. For the management, the community has an agreement with the department of forest for the management of the forest. In other words, the state bestows the responsibility to the community itself, so that we can benefit from what belongs to us but sustainably. Taking into consideration state forestry laws, the forest president together with her committees decided what can be harvested from the forest and at what time. For example, baobab fruit. The community recognized special people as part of their job to cut palm trees or mangroves for roofing. These people will sell to the rest of the community, and the money obtained from this forest product is used for the payment of the people involved in the job. Part of the money goes to the state and the rest of the money is used for community development processes and reforestation.

The ranger's duty in the forest is to monitor and according to them, on many occasions, they come across people cutting big trees that are regarded as endangered species in the country because they are few, and their existence is threatened by deforestation and human activities.

A response from the rangers is:

**“R31:** Yes, I used to come across some illegal smugglers from local people and non-natives in connection with wood vendors through their Chinese operators by illegally lodging forest products such as redwood timber for exportation. They used chainsaw operators to fell big trees. Sometimes I feel sad for local people because deforestation is hitting the sub-region so much, and they are vulnerable because they depend on the forest for their livelihood”.

## 5. DISCUSSION

The results indicate that forest values are substantial and integral to the lives of local people in the Lower River Region. It shapes their lives and serves as a cultural identity for communities. I find out that the benefit the local people derived from the forest determines their frequency of visiting the forest and the activities, how often they undertake those activities also depends on their needs, moods, feeling and perception they have about a particular section of the forest. The findings also reveal the past activities (namely initiation or circumcision ceremony, wrestling competition) and present activities (food, herbs, firewood collection, hunting) that are used to happen in the forest in association with various forest ecosystem services to local people. Indeed, in the past, people had stronger spiritual beliefs and cultural bondage to the forest than the present time. The present generation recognized provisioning services as more valuable because it is more instrumental to their well-being than cultural services. Talpha and Lozan (2022) suggest that People directly noted that other types of ecosystem-based services are important, however, choosing a specific type of ecosystem service is clearly influenced by their access to the main forest resource of their livelihood and indirectly by their perception of a decline in the availability of non-timber resources. However, in addition to past and present activities in the forest by local people, the activities are also influenced by the socio-economic and cultural transformation of peoples' lives and overall changes in forest ecosystems in their communities. These various changes create a growing interest among local people and the need to manage their forest natural resources wisely for their continued benefit and conservation purposes to future generations.

The results indicate that the outdoor activities for people being-in-forest appear to relate to their sustenance or the benefits and feelings they derive from the forest. Thus, the physical appearance of people in the forest relates them to individual species they do benefit from. According to Häggström (2019), human and ecological perceptions of "seeing" and "being in" the forest are interwoven. The findings also reveal the act of being in the forest is geared towards human well-being. The finding is in line with other research that people visit the forest because it makes them feel good for primarily two reasons: identifying and appreciating a particular forest activity and enjoying the advantages of the serenity of the forest. (Häggström, 2019). Others who visit the forest are resting and recharging their brains following the experiences they formerly had there (Stålhammar and Eja, 2017). In this study, the recharging of the brain is an

arbitrary term that describes people's indifferent ways of reflecting or pondering on their past activities in the forest. Also, the findings reveal that not all community members are physically involved in the above-mentioned activities happening in the forest, but instead, they depend on other community members for forest goods because they have the purchasing power due to improvement in their economic gains. However, this gave them the privilege to benefit more from forest products. This is called indirect benefit from the forest. According to another research, the amount of forest products gathered and utilized, which is larger in middle-income families, fluctuates as people's or households' earnings rise Talpha and Lozan (2022).

It is interesting to question how people's feelings and relations to the forest underlying factors for their life-world experience with the forest are if it is experienced as outdoor activities of being-in-the-forest. This study finds that individuals' moods in the forest are conditioned by their bodily interaction with the forest environment, with the help of spiritual and cultural beliefs that shape their thoughts about the forest. This determined rural people's adhesions to the forest or detachment from some sections of the forest. Such bodily interaction entailed people's life experiences in the forest. A study demonstrates that the phenomenological approach and cultural connections between human-nature relationships have showcased the intertwined and complex internal and external experiences of being in the forest (Hägström, 2019). Participants used bodily language to communicate their feelings of being in the forest, such as mood changes to happy, peaceful, and scary feelings that shape their understanding of reality or their perception of the forest. The study demonstrates that feeling good in the forest is a sense of connectedness that infer a feeling of thoughts that indicates the forest as a peaceful environment. Similar research states that feelings and thoughts construct our understanding of reality, and hence these pauses for reflection may play a crucial role in the lived experience of being in the forest (Tuan, 1977). The respondents stress that their life experiences in the forest are a true manifestation of the historical cultural activities of their communities, and they feel that those cultures are their identity and are shaped by the forest. Some hold spiritual and cultural beliefs that they are passing the information to the younger generation by teaching them ethics during initiation ceremonies in the forest. Konczal (2013) suggests that understanding the relationships between people and forests may be crucial to appreciating a society's identity. In addition, the study finds that individual life experience of being in the forest is about their childhood experience where the community's initiation ceremonies are

held, and such memories are lifelong memories. Another study demonstrates that the participants viewed their experiences in nature as something unique and incommensurable and the idea of quantifying benefits was incompatible with their views and these views are thus disparate to the idea in preference-based valuation that natural capital (Stålhammar and Eja, 2017)

Forest plays a vital role in the livelihood of local people in the Lower River Region through services provided by the forest ecosystem for their well-being. A study demonstrates articulations of benefits can be described as axiomatic since they were large implicit, taken for granted, difficult to articulate, and indivisible (Stålhammar and Eja, 2017). Most of the respondents cannot clearly differentiate the benefits because of their independence and connectedness. Similar research shows that the provisioning of food and medicines from forests benefits human well-being, quality of life, food security and social cohesion (Constant et al, 2019). Another study shows that the interconnections between the collection of food from the forest establish social relations by spending time with friends (Propper and Haupts, 2014).

Forest holds a sense of place for local communities because their responses signify that a forest is a place that holds cultural and spiritual values given to people, and such forests are regarded as sacred forests. The forest is paramount important in the history of the communities because they are places where rituals or traditional ceremonies are performed that promote peace, harmony, and happiness among local people. The findings are in line with this research, which states that Ritual ceremonies are also conducted to facilitate important social interactions with clan members and to cultivate traditional forms of respect (Constant et al, 2019).

Some responses indicate that the act of doing traditional prayers of supplication in the forest is a form of communicating to their spiritual gods that illustrates their spiritual beliefs (mostly to prevent natural disasters). Such connectedness to the forest is difficult to express in real terms by respondents, and they feel that they communicate to gods if natural disasters have stopped because their prayers have been answered.

The analysis of land use land cover indicates that there is an overall decrease of 17% in forest cover for a period of 43 years, resulting in deforestation or a change of forest ecosystem in the Lower River Region. Since 1946, human activities and climate change impacts have led to the destruction of nearly 50% of the Gambia's forest cover relative to 2019 estimates (Dampha,



2020). Conversely, from the results of the land use land cover map, the dense forest has completely disappeared, resulting in an increase in grassland from 3% in 1979 to 7% by 2021. Such ecological succession has given the opportunity for grazing and unsustainable agriculture, leading to deforestation. Because those grasslands regarded as open access are being converted to farmlands, after several years of exhausting the soil nutrient, the fields are abandoned in a form of barren land susceptible to many forms of land degradation. This can be confirmed in land use land cover classification that bare land and settlements have an exponential increase from 2003 to 2021. Similar studies in the Southwestern region find that open-access forests under community management are highly susceptible to human-induced activities causing irreparable environmental damage and non-substitutable loss of critical natural capital (Dampha, 2020).

From the findings, the primary drivers of change or degradation of forest cover of the Lower River Region are degradations due to bushfires, land use change by converting forest or grasslands into farmlands and settlement, illegal timber logging by exploiting hardwood forest, charcoal production, and firewood collection for domestic use. The collected firewood and charcoal are transported to urban cities to meet their energy needs for cooking. Similar studies have been done in the southwestern region of the Gambia (west coast, Kanifing municipality) stating that the driver of deforestation in that region is due to climate change (drought resulting in bushfire), commercial illegal timber production, large-scale firewood collection for domestic use (Dampha, 2021) (Heß et al, 2018).

Consequently, the overall changes are resulting in the transformation of local people's socio-economic and cultural life away from the forest. For example, the introduction of schools for formal education is one of the drivers for disconnecting local people from the forest. With this intervention, informal education that used to be conducted during initiation was replaced by formal education. Religious studies are integrated into the formal education curriculum teaching the younger generation western cultures, beliefs and social life portraying spiritual beliefs and cultural activities that used to happen in the forest redundant. Such teachings are not in support of some spiritual beliefs and cultural rituals. Currently, from the findings, because of the Islam introduced by Arab traders and Christianity introduced by Portuguese and British colonial masters, many local people no longer believe in the traditional cultural and spiritual beliefs, they practice the ethics of religions instead of traditional or “soninke” beliefs.

The forest aesthetic value serving cultural ethics has been gradually fading away, and it's losing its sense of place as a hotspot for cultural performances. In addition, the introduction of hospitals in 1843 by British colonial masters, and the extension of clinics in the communities 1950s onwards have created a lasting impact on cultural disappearances and disconnection of people from the forest. The responses reveal that community members use hospital services over traditional healers. Therefore, the forest's value as a source of traditional medicines is diminishing among local people. Also, because of modern health facilities, people prefer taking their male children to be circumcised in the hospital instead of taking them to the bush or forest for initiation ceremonies. Cultural performances are in the past. Nevertheless, another social and economic life transformation preventing people from spending more time in the forest or outdoor nature is people spending more time on games and watching movies or television programs. This reduces outdoor activities and community members spend less time together in the forest collecting food. This change in socioeconomic life has reduced people's connections with the forest and the social bonds among community members. Miller (2005) suggests that people's direct nature experiences become progressively unavailable to new generations; this creates an ever-narrowing spectrum of nature experiences due to sedentary activities. Nevertheless, another driver to changes in intertwined people with the forest is urbanisation and rural-urban migration. With the expansion and development of urban cities in terms of infrastructures, social amenities, and modern technological facilities such as roads, electrification in urban cities, schools, hospitals, and job opportunities. The findings show that rural people migrate to cities in search of job opportunities and better social and economic standards. This also reduces rural people's interaction with their local environment.

The results indicate except for natural occurrences such as bush fire, some cultural trees or animals in the forest are tabooed by traditional customary laws not to fell or kill respectively by anyone due to the spiritual and cultural value attached to those species in the forest. This was a form of conservative practices to maintain the forest by local communities in the past. This was incumbent upon every community member to be respected and be observed. Similar studies have shown that cultural practices protect and maintain sacred forests for biodiversity protection, but also allow mechanisms for local people to connect spiritually with the land, ancestral spirits, and God (Constant et al, 2019). However, the results suggest that the present community forest management system used a top-down approach where the guiding principle



for maintaining the forest is formulated by the legislative councils held by forestry officials instead of traditional customary laws. With a decentralised management system, community forest committees are responsible for the implementation of the forest forestry laws with an agenda of “benefit from what belongs to you”. The system gives 85% benefit to communities where they belong, while in the olden days, the community was in full control and benefited 100% from what belonged to them. Nevertheless, its local people are satisfied with recent participatory forest management because of the cooperation between different stakeholders. This cooperation benefits them in multiple ways, such as training local people in new conservation practices, forest product marketing strategies, and decentralised management systems.

Community or participatory forest management systems have realistic objectives to involve local people in managing the forest that belongs to their community, but on the contrary, the system creates some problems to promote widespread illegal timber logging by disguising themselves as community members. Also, the system presents a conflict of interest between communities and the state as Gambia forest policy banned charcoal production to conserve the already degraded forest while the local people's only source of energy for cooking is firewood or charcoal.

The limitation of the study is that respondents find it difficult to express their connection with the forest due to abstract language, getting people to interview and the inability of some respondents to express their cultural and spiritual connection with the forest more explicitly was not easy.

## 6. CONCLUSIONS

The results of this study indicate that people of the Lower River Region of the Gambia going to the forest relates to their economic gains and social and cultural functions from the forest. This determines their frequency of visiting the forest. Further findings show that 23% of the respondents often visit the forest daily or greater than or equal to four times per week. This results in the perception of the forest which has a direct connection to individuals' cognitive beliefs, experiences, moods, or feelings. For example, respondents' childhood experience signifies that they used to spend ample time in the forest for hunting, food collection, and firewood collection for their well-being. Also, they believe that forests serve as signs of cultural identity and a sense of place for conducting cultural performances. For example, there are some specific trees whose bark and leaves are used for the dressing of their traditional masquerades. Some respondents buttress the fact that their activity in a certain part of the forest depends on their experience and the mood they got during that activity. Some express that some section of the forest is possessed by the devil and such areas are avoided by community members. Furthermore, the communities acknowledge the vital role the forest is playing in their well-being, and it is integral to their livelihood. Such well-being they derive from forest ecosystem services are provisioning (food, herbs for medicine, and firewood for cooking), regulation (windstorm, flood, and temperature regulation), cultural (informal education, meditation place, performance of initiation ceremonies), and supporting (nutrient cycling from leaf litter). From the findings, the perception of the local communities about various ecosystem services offered by the forest is based on their individual needs, creating preferences as to which services are more beneficial to the person. This creates a trade-off among various forest ecosystem services, as some are more valuable than others to them. The preferred services are services that give the economic benefit that serves as the driving force in connecting people with the forest. On the other hand, the less preferred cultural ecosystem services are not viewed as an important value of the forest in the present generation, which promotes individuals' less interaction with the forest. This is because people prefer to take their children to school for formal education and hospitals for circumcision instead of the traditional way.

Moreover, the results reveal that human influences on forests resulted in changes in forest cover due to land use and land cover change for short-term benefits. These human activities are bushfires, land use change by converting forest or grasslands into farmlands and settlements,



illegal timber logging by exploiting hardwood forests, charcoal production, and firewood collection for domestic use. The eventual repercussion of anthropogenic activities on forest cover is deforestation, leading to the loss of traditional knowledge about forests and the loss of connectedness between communities and their natural forest. As forest cover decreases, cultural activities, spiritual beliefs, ritual ceremonies, and outdoor activities that used to happen in the forest also disappear resulting in the extinction of traditional knowledge about forests, and traditional socio-economic lifestyles. On the other hand, human contributions and influences on forests lead to the maintenance of the forest for future generations through community forest management systems. The findings show that various stakeholder involvement in forest management systems by integrating both traditional and state forest management systems will be instrumental in the maintenance of forests in the long term. But on the contrary, the traditional customary forest management system replaced the state forest management system, integrating local people into the forest management but using state forest policy as a guiding principle.

Further research is needed in studying local people's biocultural diversity, comparing communities' past and present cultural relationships with the forest. This enables them to reveal the importance of sacred forests in the region.



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## 8. APPENDIX

### 8.1 Summary of ecosystem services

Table.6 is a summary of the Customised CICES Framework for ecosystem services originating from the Common International Classification of Ecosystem Services (CICES 5.1) adapted from (Tiemann and Ring, 2018)

Table 6: Summary of ecosystem services

Section	CICES Class	Forest Ecosystem Service	CICES Code	Descriptions
Provisioning (Biomass)	Fibres and other products made from cultured fungus, bacteria, algae, and plants that may be used immediately or processed (including genetic resource)	Timber provision	1.1.1.2	Availability of climate-friendly, renewable energy sources (such as those used in manufacturing chemicals, furniture, paper, and building). Reproductive resources; preserving and enhancing forest genetic variety and productivity (of plants) industries

Provisioning (water)	Groundwater and subsurface water for drinking purposes	Drinking and non-drinking water	4.2.2.1	Provision of household drinking water from groundwater sources  Non-domestic usage of water (e.g., animal consumption, irrigation, industrial production)
Regulation & Maintenance	Microorganisms, algae, plants, and mammals filter, sequestration, storage, and accumulation.	Reduction of air pollution	2.1.1.1	Capturing or filtering (fine) dust, pollutants, and odours by trees located between a known transmitter and a safe zone
	Regulating the chemical composition of the atmosphere and seas	Global climate regulation	2.2.6.1	Sequestration of carbon and storage by trees
	Temperature and humidity regulation at the local level, including ventilation and transpiration	Reduction of extreme events.	2.2.6.2	Balancing temperature and humidity anomalies or improving animal or human life requirements

Cultural	Features of living systems that allow active interactions to promote health, restoration, or happiness.	Recreation (primarily connected to a conscious perception of nature	3.1.1.2	Recreation focused on a conscious awareness of nature (forest attributes, scents, noises, etc.)  Physical, social, and mental well-being are improved, as is motivation, cognition, spiritual practice, and nature consciousness.
	Features of living systems that allow for teaching and training	Education and training	3.1.2.2	Nature or forest-related training and learning (for example, forest schools, forest elementary schools, or forest adventure centres)

Table 7: Information about Respondents

No. of Respondents	Gender	Age group	Language (Mandinka)	Respondent: Community member/ Ranger
1	Female	31-40	Mother tongue	community member
2	Male	Above 41	Mother tongue	Community member
3	Male	31-40	Mother tongue	Community member
4	Male	31-40	Not mother tongue	Community member
5	Male	20-30	Mother tongue	Community member



6	Male	31-40	Mother tongue	Community member
7	Male	31-40	Mother tongue	Community member
8	Female	20-30	Not mother tongue	Community member
9	Female	31-40	Mother tongue	Community member
10	Male	Above 41	Mother tongue	Community member
11	Female	31-40	Mother tongue	Community member
12	Male	20-30	Mother tongue	Community member
13	Male	31-40	Mother tongue	Community member
14	Male	31-40	Mother tongue	Community member
15	Female	20-30	Mother tongue	Community member
16	Male	31-40	Not mother tongue	Community member
17	Female	31-40	Mother tongue	Community member
18	Female	Above 41	Mother tongue	Community member
19	Female	20-30	Mother tongue	Community member
20	Female	31-40	Mother tongue	Community member
21	Male	20-30	Mother tongue	Community member
22	Male	20-30	Mother tongue	Community member
23	Female	31-40	Mother tongue	Community member
24	Female	20-30	Mother tongue	Community member
25	Male	31-40	Mother tongue	Community member
26	Male	Above 41	Mother tongue	Community member
27	Female	31-40	Mother tongue	Community member
28	Male	31-40	Mother tongue	Community member
29	Female	20-30	Mother tongue	Community member
30	Female	31-40	Mother tongue	Community member
31	Male	31-40	Mother tongue	Ranger



32	Male	31-40	Not mother tongue	Ranger
33	Male	20-30	Not mother tongue	Ranger
34	Male	31-40	Mother tongue	Ranger
35	Male	20-30	Mother tongue	Ranger

## 8.2 Questionnaires

1. How often do you go to the forest?
2. What do you do if you go to the forest?
3. Do you have stories or experience with the forest? Can you tell them?
4. What is your relation or connection with the forest?
5. What basic benefit do you derive from the forest?
6. What environmental benefit did the forest provide for your community?
7. What mood do you get from being in the forest?
8. Are there any changes in the forest ecosystem or your socio-economic life that might strengthen or reduce your connectivity to the forest?
9. In doing your work as a ranger, do you experience some form of illegal smuggling from local people from the forest? (Only for rangers)
10. Did your community have a forest management system? If yes, who is involved in managing or maintaining the forest?
11. How are they managing the forest?

## 8.3 Responses from the participants

### 1. How often do you go to the forest?

1. I go to the forest at least 3 times a month.
2. I go to the forest almost every day because my source of sustenance depends on it
3. I go to the forest most times or at least more than 3 times a week
4. I don't often go to the forest
5. I go to the forest every day
6. I go to the forest 3 times every week
7. I used to go forest 4 times a week
8. I walk in the forest 3 times every week



9. Am always in the forest (4-5times a week)
10. I visit the forest twice a month
11. I go to the forest 2-3 times a week
12. I don't often go to the forest
13. go to the forest 6 times a week
14. I visit the forest once everyone and a half week
15. I go to the forest 5times a week
16. My going to the forest is not frequent, maybe twice to 4 times a month
17. I go to the forest more than 4 times a week
18. I go to the forest 2-3 times a week
19. I go to the forest once every week to collect firewood
20. I go to the forest twice a week
21. I go to the forest daily
22. I collect firewood in the forest 3times every week
23. Forest is like a second home for me. I go there more than 4 times a week
24. I go to the forest 2-3 times a week
25. I walk around the forest three times a month
26. I go to the forest 3 times every week
27. I collect fruits and firewood at least two to three times a month.
28. I collect herbs in the forest 2times every week
29. I visit the forest but is less frequent
30. I go to the forest 3 times every week

## **2. What do you do if you go to the forest?**

1. Whenever I go to the forest, I used to do one of the following: fetch firewood, collect fruits and nuts, extract herbs from trees and sometimes walk around for meditation, which gives me peace of mind and to enjoy outdoor nature
2. If I go to the forest, I collect parts of trees of different species for different purposes such as fetching firewood, tree branches for fencing poles and roofing, herbs for medicine
3. the same as R2 I collect parts of trees of different species for different purposes such as fetching firewood, tree branches for fencing poles and roofing





4. I visit the forest to fetch firewood, collect ripe forest fruits and bring them to my family
5. I go to the forest to look for fodders for my livestock e.g., sheep and goats and sometimes take them to the forest sides for grazing. I also collect firewood from the forest for cooking. During the fruit season of some trees, I do go there to collect fruits. I collect some traditional herbal tea from the forest, such as “borbori”
6. I am the traditional hunter of this community, I go to the forest to hunt bush animal like antelopes, big birds, etc and sell it to village people.
7. I go to the forest to collect firewood and fruits, and sometimes I collect branches of trees for fencing and roofing.
8. I have ruminant animals such as sheep and goats, so every day I took them to the forest for grazing. I also do a honey collection
9. I am a vendor; I usually visit the forest to harvest sorrel and fruits for selling.
10. I patrol the forest to perform my duty as the forest committee of this community, to safeguard our natural resources for the future generation. I observe whether the endangered plants were cut and watch out for the illegal strugglers.
11. In the forest, walk around, think about the past, the moments of our past circumcision activities, and the performance of village traditional outdoor activities. I also collect herbs.
12. As a forest committee, walk around to ensure that the forest is protected from exploitation. I also collect firewood and herbal tea for my family.
13. I am a charcoal seller; I have an oven in the forest where I gather stems and big branches of trees and burn them to produce charcoal.
14. I Take my cows to the forest for grazing, I sleep in the forest when I find a good spot for my cattle to graze, I spend my entire day in the forest, it is so peaceful.
15. When am in the forest I meditate a lot and reflect. I also collect traditional medicine for herbs and fetch firewood.
16. Normally, when I went to the forest, I relax because the place is peaceful and enjoy the beauty of nature.
17. I do lots of work in the forest, sometimes I collect firewood, sometimes I cut some roots & bark of trees for my mother for traditional medicines. Sometimes me and my friends with our dog’s hunt for small bush animals.



18. I patrol in the forest and am on a community forest committee. I usually check whether the trees transplanted are growing well, check whether illegal smugglers are cutting forest trees.
19. Forest is the source of energy for our community, so in the forest, I collect dry branches of shrubs and trees, and sometimes I collect chewing sticks for cleaning my teeth. I also collect fruits during fruit season.
20. I don't frequently visit the forest, but the little times I visit there, I look for firewood.
21. My family are cattle rarer; I am responsible for taking the cattle to the bush during the day for grazing and returning them home daily.
22. I am a construction, I sometimes used forest tree branches for roofing. It is not frequent, but on a few occasions, I cut branches of trees useful for building houses.
23. I go to the forest to collect firewood and fruits, and sometimes I collect branches of trees for fencing and roofing.
24. I collect fruits from the forest, I hunt small animals with friends, and during ceremonies, and village festivals we also collect the bark and leaves of trees to dress our traditional masquerades called "kakuranwo and cosewo".
25. Basically, I enjoy being on the premises of the forest. Most of the time I just walk around to see the beauty of nature. Sometimes I collect useful things like the roots of trees as traditional medicine and leaves of shrubs or trees for tea.
26. I go to the forest during the rainy season because our swamp (rice fields) is beside the forest. So, we do our nursery bed for rice within the forest before they will be due for transplanting.
27. I am a firewood seller, and my sole job in the forest is to collect firewood and charcoal and settle it bundles for village people.
28. I visit the forest to fetch firewood, collect forest fruits herbs from trees and bring them to my family. I collect branches of trees for fencing the compound. This is not frequent
29. In the forest, I check for illegal smugglers and observed around.
30. Nature is beautiful, I go to the forest to enjoy outdoor nature. Forest is a wonderful place to know the existence of God. Sometimes I walk within the forest for meditation, reflecting on past cultural activities we used to do in the forest, which gives me peace of mind.



**3. Do you have stories or experiences with the forest? Can you tell them?**

1. Yes, I have a story during my teenage time, we want to collect the fruits of bao
2. No stories
3. We believe in taboos and spiritual beliefs. Some areas since ancient days were believed to be possessed by devils, so we always avoid those places
4. I don't have a personal story about the forest.
5. No stories
6. R5: The experience I have in the forest that I will never forget was my "bees biting experience" Once upon a time, I went to the nearby forest to collect some baobab tree fruits, I accidentally touch a beehive and the bees started chasing me and biting all over my head and body. It took me two weeks to recover from that incident.
7. I used to go to the forest, but I don't have any stories about the forest.
8. My roots are wood carvers, and I was told by a granny that before they cut any tree in the forest, they make sacrifices and communicate with the devil to allow them to cut that tree. Such places are possessed by the devil. according to him if you did not do that, the devil can hunt you in yours and disturb your normal life.
9. I benefit from the forest, but I have no experience with the place.
10. I used to hear those awkward things used to happen to people but I never experience it.
11. I have a story about a snake, I was bitten by a snake while fetching firewood. The branches I gather, I went to collect the rope I come with before I came, but the snake enter the gather branches, so when I want to tie the firewood properly, I was bitten by the snake. It took me weeks before I heal from the pain.
12. I have no story
13. I did not have a story
14. I have once seen something in the forest, it was so scary but after some time I didn't see it again, it disappeared. When I get back home, I feel sick for some time, and I recover from it.
15. I did not have a story, the only thing is, if you are in the forest, you must be conscious of your surrounding and be careful with your working tools.
16. to 21 they did not have a story



17. My experience with the forest has to do with my childhood experience where we go hunting for small bush animals with our dogs. This memory will always live in me because those days are gone and can never come back. Some friends left the community to settle in the town.
18. to 30. They said they don't have stories to tell because they have never experienced it themselves.

**9. What is your relation or connection with the forest?**

1. My relationship with the forest is simply about my health and well-being. I used traditional medicine. The herbs I usually collected from the forest helped to regulate my blood pressure for the past 4 years. Also, some trees in the forest symbolised the cultures of our village. There are some specific trees whose bark and leaves are used for the dressing of our traditional masquerades known as "kosewo" for the village's yearly traditional festival called "jonbondo". It is because of those trees in the forest that makes this traditional festival is possible.
2. My relationship with the forest provides shelter for me. Most importantly, we perform our traditional rituals in the forest. For example, the initiation of male children into adulthood is performed in the forest for months.
3. R5: The cultures of the community connect us with the forest. My relationship with the forest is mostly about my livestock, but also, we observe some of our cultural rituals in the forest. For example, we do initiation and circumcision of our male children into manhood inside the forest and that's where we educate them on dos and don'ts according to our cultural setup to be responsible men in their adulthood.
4. My basic need connects me with the forest. Like I said before my source of energy is the forest.
5. Meditating in the forest gives me a good feeling. I feel attached to the environment by enjoying the outdoor nature. Is so peaceful.
6. The forest is like a second home to me; I collect lots of my basic needs from the forest.
7. I can say personally the forest satisfies my well-being by providing necessities such as food, energy, material for shelter, and herbs for traditional medicine.
8. R8: I am a charcoal seller, I fell trees and burnt them to charcoal, sell it. Is a source of income and helps me in the upbringing of my family.



9. As a forest committee, I am obliged to serve my community, so protecting the forest feels like I am ensuring a sustainable supply of people's needs from the forest and maintaining the physical environment of areas that exist before for cultural activities. My desire in serving my people connects me to the forest.
10. The benefits I am getting from the forest define my relationship with the forest. As an owner of a herd of cattle, I spend most of my daytime in the forest monitoring the cattle while grazing. I have been used to the environment and I feel at home in the forest.
11. Forest is integral to life, the forest makes day-to-day life easier because I get benefits such as firewood, food, medicine, and materials used for dressing traditional masquerades from the forest.
12. Forest strengthens the relationship between us and the culture of our land. Its existence is a symbol of identity.
13. The presence of forests in the community is very important. It makes habitation easy because we use trees in it for our housing construction, and the fresh air it provides for us helps in regulating our temperature. This makes us feel good. But without the forest, this place will be difficult to survive here.
14. Our culture connects us with the forest. Some of our spiritual beliefs are relational to the forest. It senses of place to performance of some spiritual and cultural activities and needs the presence of a forest.
15. I can say I relate to the forest because it provides basic needs to promote my well-being. In another word, the existence of some trees up to the present generation serves as keeping the history of our ancient peoples.
16. The cultures of the community connect us with the forest. My relationship with the forest is mostly about my livestock, but also collectively we observe some of our cultural rituals in the forest. For example, we do initiation and circumcision of our male children into manhood inside the forest and that's where we educate them and don'ts according to our cultural setup to be responsible men in the future.
17. Cultural activities we perform in the forest relate to our environment. We perform some rituals in the forest such as the initiation of male children into adulthood before but now I can say our connections with the forest is the benefit we drive from the forest.



18. My connection with the forest is about the benefits, of grazing for my livestock, but also, we observe some of our cultural activities in the forest. Those activities create memories that we always remember and appreciate in the forest in our lives.
19. My basic need connects me with the forest. Our source of energy is the forest. Without the forest in our community, we may face some difficulties in meeting our basic needs.
20. I feel good in the forest environment. I sometimes feel like meditating in the forest connects me to the forest as an emotional feeling that reminds me of my good moments in life.
21. I Like the forest. I spend most of my daytime in the forest fetching firewood to sell to the community.
22. The forest providing us with basic materials relates us to it. These necessities such as food, energy, material for shelter, and herbs for traditional medicine are important in livelihood.
23. I am a charcoal seller, I fell trees and burnt them to charcoal, sell it. Is a source of income. So, my source of income relates to the forest.
24. My function to serve my people as a forest committee connects me to the forest.
25. The benefits I am getting from the forest define my relationship with the forest. As an owner of a herd of cattle, I spend most of my daytime in the forest monitoring the cattle while grazing. I have been used to the environment and I feel at home in the forest.
26. Forest as a physical figure relates us to our culture. It is a symbol of identity. However, I drive some benefit like bush meat that provide protein for us.
27. I think the benefit we get from the forest relates us to it. It also regulates the temperature which provides good air and promotes a good living environment.
28. My childhood memories of the forest remind me of the good times I spend in the forest with friends. The memories serve as a form of connection to the forest.
29. I relate to the forest because it provides basic needs. the existence of some trees up to the present generation serves as keeping our history and it feels like a form of belonging.
30. The forest is the source of happiness, and peace for me. I enjoy the beauty of trees and grasses covering the ground. This beauty is all I think about when I remember the word forest.



## 5. What basic benefit do you drive from the forest?

1. I fetch firewood for cooking, which is a source of food for my family. The roofing of my house is from forest trees, the furniture is from timbers collected from the forest.
2. The forest is a source of shelter and energy for me and my family. We only cook with forest trees. It is a source of food and traditional medicines such as bush meat, and fruits.
3. The material I drive from the forest, I sell and use to provide a basic need for the family.
4. The basic I do drive from the forest is firewood as a source of energy, and roofing material to provide shelter.
5. The firewood I use for cooking is from the forest, timbers for our furniture, I collect some fruits and nuts from the forest, I also buy forest meat from hunters in the community and fencing materials for my gardens
6. I collect firewood from the forest and sell it to the community people. Then I got there. I used it to feed my family and take care of my garden.
7. I extract charcoal from and collect pakiya dico busa (locust beans from the forest). I also collect tag grass for covering our houses.
8. I do a honey collection and sell it to community members.
9. It is our main source of shelter. The roofing of my house is from forest trees, the furniture is from timbers collected from the forest.
10. I can say the most important basic need I collect is tag grass. All my houses are covered with tag grass.
11. The basic need I collect from the forest is herbs for traditional medicines.
12. Here the whole community use firewood for cooking and the source is the forest. Besides that, we sometimes collect fruits, harvest herbal tea and so on.
13. Being a charcoal settler, after selling my charcoal (source from the forest), I used it to provide feeding, clothing, and shelter for my family.
14. Cattle owner, besides taking my cattle for grazing, which is a basic need for the animals too, I also collect firewood, fruits, and herbs from the forest like any other community member.
15. I think the basic benefit I got from the forest is traditional herbal medicines that improve my health condition.



16. Am not too involved in fetching firewood for the family because teenagers do that in my family. But I can say the forest is a peaceful environment that gives me happiness.
17. The basic benefit we get from the forest is food, firewood, herbs, and material for housing.
18. I get ripe fruits that are edible, which is a source of vitamins, I also buy bush meat from hunters. My furniture is made of wood, which we got from the hardwood forest. So, the forest is my source of food and shelter for me.
19. Is the source of food, and energy and provides shelter for us.
20. The forest provides firewood for me and the community at large. It is the source of survival for most of us in this community.
21. Forest gives us food in terms of fruits, meat, and energy in terms of firewood and charcoal. We surround our compounds with branches of trees from forests that provide shelter for us.
22. I can say this community forest is important in providing the basic needs of people.
23. The existence of forest is good for us because it provides fruits and nuts, firewood, and roofing material. The collection of these materials from the forest is divided among family members but collectively we all benefit from it.
24. The basic benefit I get from the forest is: it is my main source of energy. We used tree branches for cooking, and apart from our agricultural harvest, the forest serves as a second source of food for my family. I collect some fruits and nuts such as palm tree fruits, and locust beans for family consumption. We still eat some bush meat from forests such as antelopes, birds etc. It is our main source of shelter. The roofing of my house is from forest trees, the furniture is from the timbers collected from the forest.” Many assert that the material benefits they do get from the forest are fundamental to their livelihood. This creates a concern in their communities that they are responsible for protecting the forest because, in turn, they are protecting the source of their basic benefits.
25. Irrespective of whatever role you play in a family getting materials from the forest is a shared responsibility. The forest provides food, energy, and shelter for the family.
26. They help me and my children by providing basic needs such as food, and firewood.
27. Being a firewood seller, my source of income is from the forest. The income I do get from forests is what I used in providing for the basic needs of my family.





28. Forest is the source of food and shelter for us.
29. It provides firewood that makes it easy for us during cooking our daily meals.
30. I can say the forest is a peaceful environment that improves health to well-being. Is a source of firewood for the family.

**6. What environmental benefit did the forest provide for your community?**

1. As we all know Gambia is always a victim of windstorms, some big strong trees are found in the forest for example, mahogany trees serve as windbreaks thereby preventing our structures and houses from collapsing during intense winds. Forest provides fresh air to the community.
2. It reduces the risks of floods because if you observe around, areas with large gullies are deforested areas but where there are so many trees, those areas are not affected by erosion. It regulates temperatures, especially during hot seasons.
3. I can say forests prevent our community from flooding during torrential rains.
4. R5: forest helps in providing good and fresh air to the community, it is also a barrier during windstorms and during community work of building dikes, commonly called “tesito” in the olden days, we used forest trees in the regulation of flood areas. Because flooding is a serious natural hazard in the country.
5. The forest prevents us from windstorms and the leaf litter in the forest improves the soil fertility. This serves a long way to maintaining the nutrient capacity of the soil, and it also helps the forest’s regenerative capacity as bushfires in the region are recurring every year.
6. Forest serves as maintaining the nutrient balance of the soil. My family have different farmlands, around the forest, and the crop does well better.
7. It helps a lot because, with windstorms, we have more rainfall
8. During community work of building dikes, commonly called “tesito” in the olden days, we used forest trees in the regulation of flood areas. Because flooding is a serious natural hazard in the country”.
9. The forest is like a seal in terms of preventing us from windstorms and it regulates the temperature in this settlement.
10. I think forests play an important role in preventing flooding in our community.



11. The forest prevents us from windstorms and the leaf litter in the forest improves the soil fertility.
12. From the training as a forest committee member conducted by the department of forestry of the Gambia, I understand forest did not only prevent flooding and windstorm but also this extremely excessive heat.
13. This community is not far from the river, but the forest is between the settlement and the river. So, the community is not flooded by river inundation due to the forest acting as a barrier. So, this settlement is not experiencing flooding like other settlements in the Gambia.
14. **Before** my parents said that the community have lots of trees, they were not used to be suffered from wind, but now because our forest is deforested, every wind damages lots of houses in our community.
15. My knowledge about that is low but I always had from other community members that the reason why we are not experiencing flooding like that of many settlements in the Gambia is because of this forest.
16. Forest provides good air for the community.
17. Forest helps in regulating temperature and prevents storm damage from heavy thunderstorms. It is like before when we have thick forests but still, it plays a role in maintaining the environment.
18. It provides and maintains the nutrient availability of the soil.
19. The forest prevents our land from erosion. Big gullies are not formed here because the forest trees help in preventing carrying soil away.
20. It prevents us from windstorm, and flooding, and provide good air and water.
21. The community forest helps in numerous ways in benefiting the environment, it provides good air, and prevent us from being damaged by windstorm because the big trees serve as a source of the windbreak.
22. It prevents the community from flooding during a heavy thunderstorm. it provides good air to the settlement.
23. It helps in providing nutrients to the soil. When the leaves of trees fall after some time, they dry up and turn to manure. This help to maintain the fertility of the soil.
24. The air blowing from the forest is good air. During the hot season, the community relied on forests for a lower temperature.



25. I don't have much idea about that.
26. I think it maintains the nutrient content of the soil. The structure of the soil is still good, erosion did not affect it.
27. I can say it provides good air. Trees increase the occurrence of rainfall in this settlement.
28. The most important environmental benefit is providing good air but also the forest trees reduce the intensity of windstorms thereby protecting our houses from damage.
29. I have no idea.
30. The importance of the forest to our community at large cannot be overemphasized because it brings good air to the settlement thereby lowering the temperature during dry seasons, we can feel the difference in temperature as you further travel away from the forest.

#### **7. What mood do you get from being in the forest?**

1. I think a forest is a nice place, I found the place very peaceful
2. I am in a good mood when I am in the forest because forest environments are peaceful, and nature is beautiful.
3. In the forest, I feel comfortable, and I think we are part of the forest because it contributes to our daily life.
4. I feel happy whenever I am in the forest. As I said before, it is a place of meditation for me. There are some specific parts of the forest, that serve as a place of reflection because it always reminds me of my late parents. I always remember them teaching me trees that can be used for human consumption, forbidden fruits, and materials that can be used from the forest for medicinal purposes. Those reflections serve as an education that I can also pass on to my children.
5. Sometimes I feel good being opportune to be living next to the forest, which I think is a blessing. But also, in some parts of the forest, I feel scared because we believe that those areas are possessed by the devil. Such an environment, sometimes even the entire environment, is hot, but that place is always cool. So, we did not frequently visit that area unless we needed something around that area that you must pass beside the area regarded as a spiritual area.
6. I feel comfortable in the forest



7. Because I am always in the forest, some areas are so scary. I don't feel comfortable because I believe that they are possessed by the devil, so I don't stay long in those areas, scaring them for forest products. But in some areas, I feel comfortable, energetic, and happy to continue doing my work.
8. I have not been experiencing any mood changes in the forest.
9. I found the forest a little scary because if something happens to you if you are alone, there will be no one to help.
10. Sometimes if I am in the forest in some places, I feel comfortable but, in some areas, I feel scared
11. A forest is a quiet place, if I am in its environment, I normally found myself in a peaceful situation.
12. I don't experience mood changes in the forest. For me is the same whether in the community or in the forest.
13. I feel happy and comfortable in the forest because no bothers.
14. I find happiness in the forest because my cattle graze from it
15. I think a forest is a place that gives me comfortable feelings
16. If I am in the forest working, I have a comfortable and clear mind to think and reflect on my problems
17. I don't think I have any mood while working in the forest.
18. I can say the forest is peaceful and sometimes comfortable, but in some areas, I feel scared.
19. Forest is quiet and peaceful; nature is a beautiful area.
20. I feel scared in the forest if I am alone.
21. Forest is a unique area, the mood you got depends on the area you are in, some areas are nice and beautiful, and you can feel comfortable and happy, but some areas are dark and very scary and uncomfortable.
22. I feel happy and comfortable working in the forest.
23. Forest is scary for me you can never know what will happen to you next because I believe the area has a devil and so many spiritual things can happen.
24. I feel scared in the forest because we believe that some areas are possessed by the devil.
25. I think nature is one of the most beautiful places, feel happy and comfortable in the place.



26. I can say the nature of the forest is such a way that your mood depends on the area you went to, if you found yourself in an area possessed by devils, you will have this scary feeling but an area that we believe is a peaceful area and is not dangerous for human in terms of our spiritual believes, those are comfortable.
27. I feel scared when am in the forest, I always look for company before going there.
28. The forest can be scary sometimes. Something can cause you can meet a wild animal or the devil.
29. I feel uncomfortable and scared when am in the forest.
30. Forest is quiet, peaceful and above all, it is a good place to meditate and reflect on your past and present life.

**8. Are there any changes in the forest ecosystem or your socio-economic life that might strengthen or reduce your connectivity to the forest?**

1. Yes, there are changes in the overall ecosystem, such as the disappearance of some trees and animals due to occurrences of bushfires every year during the dry season. The forest is no longer dense. This part in the 1970s used to have thick forests, even if you go to the forest, I used to be scared because of the darkness but now Jarra east is the most deforested area in the Lower River Region. Some trees and animals are gone. Also, recently cutting down big trees for charcoal production led to the extinction of our traditional trees as the saying goes forest belongs to everyone in the community. Some of these human activities make the forest lose its cultural value. But now the government is helping to reduce that indiscriminate felling of trees for energy production.
2. Our forest has changed a lot. It is sad that most of our mother trees () and wild animals (elephants, giraffes, and lions) are gone. We used to have a closed forest (dense) with wood savannah but now we have an open forest because grassland and shrubs in the mixed forest are always burnt by bushfires.
3. People's ways of life have changed. People prefer to go to the hospital rather than use herbal medicine. Still, we use traditional herbal medicine from the forest if a particular sickness persists. In this situation, I can say we are getting disconnected from the forest.
4. Formal education is key to distancing people from the forest. People spend most of their time acquiring education or they travel to cities to further tertiary education.



5. The forest used to be dense with trees but now frequent bushfires and domestic firewood collection, charcoal production, and timber lodging lead to deforestation. This is also leading to the extinction of sometimes cultural activities that use to happen in the forest.
6. We used to have a spiritual and cultural connection with the forest in those days, I, and age mate circumcision in the forest, but now those things are not happening, also during raining season, when so many days have passed without rain, the elders of the community used to go the forest to do some cultural rituals for the rain to come.
7. There have been lots of changes. In the past, there was one big tree in the forest where the community performed initiation, and supplication according to our beliefs but that tree fell, it was a symbol of culture, and peace for our community. But now because of modernisation, and formal education, villages take their male children to the doctors for circumcision, and that culture is no longer practised here.
8. We used to have rigid cultures, and they are observed in the forest, but these places are now too open, sometimes you can be working there, but if you know that before they are cultural places, you will not even know. Those cultures are disappearing because many people did not believe in them anymore and did not observe them all because of education and modernisation.
9. In the present generation, life has changed, some cultural activities are becoming a thing of the past, and people think they should embrace modern lifestyles to fit into modern society. This is leading to the disconnection of people from the forest.
10. I think rural-urban migration can be a reducing factor that disconnects many people from the forest. When people migrate to cities looking for greener pastures, abandoning communities, and forests.
11. Yes, there are lots of human activities that have gone on in the forest leading to deforestation, but community members are joining the effort to stop deforestation.
12. The ways of life, and attending formal education occupy people's valuable time instead of having so much time to do some activities in the forest.
13. I think people adopting a modern lifestyle can be a cause of the reduced relationship between forest and people but the greatest damage to this relation is the occurrence of bush fire. It is making the forest become bare lands and people are not left with much choice but to go other ways of life instead of relying on the forest.



14. In the past, there was one big tree in the forest where the community performed initiation of male children into adulthood. In yearly initiation events, male children are circumcised and stay in the bush (forest) for one to two months when they will be educated about communities' cultures, how to respect elders and become responsible in future. Elders communicate to the kids in rituals and irony. Also, when the village was facing some natural hazards (less or too much rain, wind, flooding), the elders used to gather in the forest under a tree to supplication according to our traditional beliefs to stop the hazard, now that tree fell, it was a symbol of culture, peace for our community. But now because of modernisation, formal education, and Islamic religious beliefs, villages take their male children to the doctors for circumcision, and that culture is no longer practised here.
15. Even though the forest is not the same as it used to be, but still this community used the forest in their daily lives. We are still connected to the forest.
16. Yes, the forest size and thickness have reduced and are still changing because of two main things. 1. Bushfires are consuming our forest year. Old trees died and new trees that are replacing the old ones can easily be burnt by bushfires. We livestock farmers find it so difficult to feed our animals, especially during the dry season. 2. Many trees are cut by people either for timber, firewood, or charcoal production. These activities have a great impact on our forest cover.
17. Yes, some areas were deforested, but now they are regenerating due to reforestation processes
18. Migration plays a role in disconnecting the youth of this village from the forest. But still, those who are still in the village can't do away without the forest. We are still connected to the forest.
19. People's ways of life have changed many people think that the forest is a mere existence providing people with firewood.
20. The intervention of schools and hospitals in the community makes people to abandoned informal education that use to occur in the forest during the initiation ceremonies.
21. Deforestation is caused by bushfires and human activities eating up the forest. The forest has become an open forest and some of the spiritual activities we do there are no longer possible.



22. People's social life is changed, they spend the most time in schools, watching TV programs. The people's activities in the forest are reduced to fetching firewood and collecting fruits, and herbs.
23. There are changes in forest cover, the is no longer dense. But still, we extract some basic need from the forest that is meaningful to our lives.
24. Yes, some areas were deforested, but now they are regenerating due to reforestation processes, but this regeneration process is hindered by bushfires.
25. Modern lifestyle can be a cause of people not preferring to live a life that involves cultural practices. And such cultures cannot be practised without the use of the forest.
26. There are lots of changes, be it style or forest cover changes. The developments happening in the cities are what is attracting most of our youths here to leave the village to search for greener pastures for them to be able to better the economic status of their family.
27. There are a lot of changes that have happened and are still happening. The deforestation that has been going on is worrying and every year we are battling natural bushfires. Our effort in transplanting is always hindered by fires. The community is trying to maintain the forest because that's what most rely on for self-employment.
28. Yes, there are changes in the cover forest, we have a thick hardwood forest but now most of those trees are cut by people thanks to illegal smugglers for that job. We need to depend on the forest but the benefits that we can get from it have been reduced due to deforestation.
29. I think the building of the clinic contributes to people preferring clinical medicine over traditional herbs.
30. Developments such building of schools and hospitals can contribute to reducing the relationship between us and the forest. But also, religious beliefs change the mindset of people, and they are made to believe that traditional spiritual belief is ungodly. So that's why those spiritual beliefs and practices that used to occur in the forest are not practised here because we are Muslims.





**10. Does your community have a forest management system? If yes, who is involved in managing or maintaining the forest and how are they managing the forest?**

1. Yes, we have a community forest management system backed by the laws of the Republic of the Gambia through the department of forestry. We the community have our own forest management team, managed by the community itself. It consists of forest presidents, and committees responsible for the management of day-to-day forest affairs for the maintenance and sustainability of the forest for generations to come.
2. Yes, we have a management system. The forest committee together with forestry officials managed the affairs of the forest. We also have forest rangers and forest extension workers in the forest to monitor the forest for people who are negatively exploiting the forest for their selfies. The extension workers help to educate us in forest management guided by the forest act 2018-2028
3. Yes, we have forestry members and committee forest committee that oversees the forest's issues and try to protect its sustainability.
4. These forests are managed by communities under the supervision and technical guidance of the state through the department of forestry. They engage in community forest committee responsibilities of safeguarding the forest.
5. Yes, I can say all the community forests in the region are backed by forestry laws and the selected committee from the village managed and safeguarded the forest in the best interest of our community.
6. Yes, we had a community forest management system 20 years ago. Both the community forest committee members and the forestry extension work are involved in managing the forest affairs. The range walks inside the forest to monitor illegal smugglers.
7. There is an established system when it comes to managing the affairs of the forest. But I can say the forest committee who are members of the community managed the forest. The forestry official just monitors and makes committees that are doing the work properly. So, we have our traditional ways of making sanctions periods where with that period no one will harvest those fruit until they get to maturity. We also observe state laws that trees in the forest should not be cut down.
8. Yes, we have a forest management system, the community has an agreement with the department of forest for the management of the forest. In other words, the state bestows



the responsibility to the community itself, so that we can benefit from what belongs to us but sustainably. Taking into consideration state forestry laws, the forest president together with her committees decided what can be harvested from the forest and at what time. For example, baobab fruit. The community recognized special people as part of their job to cut palm trees or mangroves for roofing. These people will sell to the rest of the community, and the money obtained from this forest product is used for the payment of the people involved in the job. Part of the money goes to the state and the rest of the money is used for community development processes.

9. Yes, we have a forest committee responsible for managing the forest.
10. The community has rules that there are set limits to what an individual can harvest from the forest. For example, we are allowed to cut down trees for personal shelter, but no one is allowed to make a commercial business out of it. Failure to do so, the personnel, will be exempted from benefiting from the forest.
11. What the committee does is there is a charge on any who is using forest products as a commercial business, those monies collected from me as a charcoal seller and other people, they used to buy seedlings and transplant trees in the forest.
12. They safeguard the forest and some trees in the forest according to our agreement with the forestry department should be cut by anyone for any purpose, so if the committee had that someone is burning trees for charcoal or other things, they go there to observe whether the person is doing the right thing. They do this by patrolling the forest.
13. Every year, they make plans as to how the community can benefit from the forest sustainably. The committees alongside with forestry department involve the rural population in protecting and managing the forest to maximise benefits and to transfer ownership to the community people.
14. Yes, we have a management system, it's a combination of both traditional and state laws. The forest committees and the department of forestry are responsible for the management. Sometimes they do awareness training on how to protect our forests.
15. I know that we have forest committees that monitor people's activities in the forest. They make laws that everyone will benefit from the forest but will not do destructive exploitation like timber logging.



16. Yes, we have a management system, the forest committee are responsible for safeguarding the forest. I don't know how the management is done but I think is the responsibility of everyone to protect what belongs to the community.
17. We have a forest management system; the committee is responsible for these duties. They monitor people's activities in the forest. Make sure state laws are also inculcated in the management system.
18. Forestry officials are the head of the community forest management system, and the responsibility is transferred to committees at the community level so that we can manage our own forest. And they are using state laws to guide the forest some we have our traditions within ourselves to avoid over-exploitation.
19. Committees and forestry workers do regular patrols to control bushfires in the forest. This serves as a reduced measure to avoid the adverse effect of fires.
20. The community set up a forestry committee and coordination are done with forestry officers to protect and maintain the forest.
21. Yes, the community have a forest management system, the community established a committee that monitors the forest against illegal smugglers, bushfires or those who did not abide by the rules.
22. Yes, we have a management system, Among the committees, there are rules and responsibilities that are assigned to each committee member. It consists of a chairperson, chaser, secretary, patrol person etc. all of them function to ensure that forests are properly managed. If the patrol people detect any problem, it is their responsibility to report it to the entire committee. To take further development on the matter.
23. Yes, there is a management system. The management is the mutual responsibility of both the state and community members.
24. Yes, the committees are responsible for the management. The forestry act 2019 – 2023 is the guiding principle together with our own management, we protect the forest.
25. There is a management system, the committee is responsible for the management. They used to have internal meetings and inform the rest of the community of new developments.



26. Yes, the forest is managed by the committees through the technical support of the state. Sometimes we received some training from the department of forestry on how to protect and maintain our forest.
27. Yes, we have a management system. Before we solely managed our forest but now the state is also involved in the management processes. But the two-management system is running, I don't have much idea about that because am not part of the committee.
28. Yes, we have committees who are monitoring the activities of the people in the forest.
29. Yes, the committee together with state forest officers safeguard the forest.
30. Yes, the rangers and community forest committees are responsible for monitoring the problems and developments of the forest. they make plans as to how the community can benefit from the forest sustainably. The committees alongside with forestry department involve the rural population in protecting and managing the forest to maximise benefits and to transfer ownership to the community people.

#### **8.4 Responses from Rangers**

##### **9. In doing your work as a ranger, do you experience some form of illegal smuggling from local people from the forest? (Only for rangers)**

**31:** Yes, I used to come across some illogical smugglers from local people and non-natives in connection with wood vendors through their Chinese operators by illegally lodging forest products such as redwood for exportation. They used chainsaw operators to fell big trees.

**32:** yes, during my patrol time, I caught some village people cutting trees that are banned by forestry law to be cut because those trees are regarded as endangered native species that are to be protected in any forest they are found. Sometimes I feel sad for them because deforestation is hitting the sub-region so much, and they are vulnerable because they depend on the forest for their livelihood.

**33:** Yes, I observed that many times some community members have connections with chainsaw operators. The local people will use their privilege to cut down trees and illegally smuggle them in exchange for money.



**34:** I do encounter issues with some villagers, especially those involving commercial firewood selling. They feel big trees that are identified as endangered species. Those people always insist that the forest is their source of livelihood, so they don't have an alternative option.

**35:** Yes, because the forest is hardwood forest in the country, it is susceptible to timber exploitation. Some always try to get wood to sell to carpenters who make household furniture.