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2024

KENYA NATURAL CAPITAL ACCOUNTS FOR FORESTS









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Kenya Natural Capital Accounts for Forests

Published by:
Kenya National Bureau of Statistics
Real Towers, Hospital Road, Upper Hill
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Nairobi, Kenya

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ISBN: xyxyxyyxyxy (print)
Published 2026

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Recommended citation: KNBS 2024. Kenya Natural Capital Accounts for Forests, 2024 . Nairobi, Kenya.

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Acronyms

AFR100	African Forest Landscape Restoration Initiative
CFAs	Community Forest Associations
CIP	Census of Industrial Production
DRSRS	Department of Resource Surveys and Remote Sensing
EO	Earth Observation
GDP	Gross Domestic Product
GoK	Government of Kenya
GPS	Global Program on Sustainability (World Bank)
ICBT	Informal Cross-Border Trade
IMPRESS	Improving Measurements for Payments to Reduce Emissions and Strengthen Sinks
IPCC	Intergovernmental Panel on Climate Change
ISIC	International Standard Industrial Classification
KENMOD	Kenya Macroeconomic Model
KEFRI	Kenya Forestry Research Institute
KES	Kenya Shilling
KFS	Kenya Forest Service
Kgs	Kilograms
KNBS	Kenya National Bureau of Statistics
Ksh	Kenya Shillings
LCLU	Land Cover and Land Use
m^3	Cubic Meter
MoECCF	Ministry of Environment, Climate Change & Forestry
NDC	Nationally Determined Contributions
NFI	National Forest Inventory
NPAEEA	National Plan for Advancing Environmental Economic Accounting
NTFPs	Non-Timber Forest Products
NPV	Net Present Value
PES	Payment for Ecosystem Services

PFA	Physical Flow Account
PSUT	Physical Supply and Use Table
QGIS	Quantum Geographic Information System
RCMRD	Regional Centre for Mapping of Resources for Development
REDD+	Reducing Emissions from Deforestation and Forest Degradation
R-Studio	Statistical computing and graphics software (based on R)
SDGs	Sustainable Development Goals
SEEA	System of Environmental-Economic Accounting
SEEA CF	System of Environmental-Economic Accounting – Central Framework
SEEA EA	System of Environmental-Economic Accounting – Ecosystem Accounting
SLEEK	System for Land-based Emissions Estimation in Kenya
SNA	System of National Accounts
SUT	Supply and Use Table
TJ	Terajoules
TWG	Technical Working Group
UNSD	United Nations Statistics Division
USD	United States Dollar
WB	World Bank

Glossary

Carbon Sequestration: The process by which forests and other ecosystems capture and store carbon dioxide from the atmosphere.

Ecosystem Accounting: A statistical framework (SEEA EA) that measures ecosystems as assets, tracking their extent, condition, and the services they provide.

Ecosystem Services: The contributions of ecosystems to economic and human activity, such as air purification or water regulation, which enable people to derive benefits like clean air and safe water.

Exchange Value: The monetary value that goods or services would fetch in a real or hypothetical market, used in SEEA-based accounts.

Forestland: Is a land area of more than 0.5ha, with at least canopy cover of at least 15%, trees of minimum 2m height in situ, which is not primarily under agricultural or other specific non-forest land use.

Forest Asset Account: An account that records the opening and closing stock of forest resources, along with changes due to natural growth, removals, and degradation.

Forest Ecosystem Asset: The stock of natural forest ecosystems, valued as the net present value of expected future service flows.

Forest Ecosystem Services: Services provided by forests, such as timber, carbon sequestration, water regulation, recreation, and habitat maintenance.

Green GDP: Gross Domestic Product adjusted for environmental degradation and depletion of natural resources.

Market Price Principle: The use of observable market prices, or their proxies, to value goods and services for consistency with the SNA.

Monetary Accounts: Accounts that assign monetary values to stocks and flows of environmental assets and services, making them comparable to traditional economic accounts.

Net Present Value (NPV): The discounted sum of expected future benefits, expressed in today's monetary terms.

Non-Timber Forest Products (NTFPs): Products derived from forests that are not timber, such as honey, fruits, medicinal plants, and resins

Physical Flow Account (PFA): An account that tracks the supply and use of natural resource flows and residuals in physical units (e.g., tonnes, cubic meters).

Physical Supply and Use Table (PSUT): A tabular framework recording physical flows of goods, services, and residuals between the environment and the economy.

Provisioning Services: The material products provided by ecosystems, such as timber, fuelwood, and food.

Raster Data: Gridded spatial data where each cell (pixel) has a value representing a land cover type or other variable; commonly used in satellite-based mapping.

Regulating Services: The contributions of ecosystems that regulate ecological processes, such as climate regulation, flood control, or air and water purification, which support human well-being and economic activity.

Remote Sensing: The use of satellite or airborne sensors to collect information about the Earth's surface without physical contact, widely used in land cover and land use monitoring.

SLEEK: System for Land-based Emissions Estimation in Kenya (SLEEK) is a national program that was designed to estimate emissions using medium-resolution imagery (Landsat) from land cover change maps (1990-2018).

SEEA (System of Environmental-Economic Accounting): An international statistical standard for integrating environmental and economic data

SEEA Central Framework (SEEA CF): The core SEEA standard, focusing on individual environmental assets and flows, consistent with the SNA.

SEEA Ecosystem Accounting (SEEA EA): An extension of the SEEA that includes ecosystem extent, condition, and services

System of National Accounts (SNA): The internationally agreed standard set of recommendations on how to compile measures of economic activity in accordance with strict accounting conventions based on economic principles (SNA, 2008). The SNA provides a comprehensive and detailed record of the complex economic activities taking place within an economy and of the interaction between the different economic agents, and groups of agents, that takes place on markets or elsewhere (SNA, 2008).

Social Discount Rate: A lower discount rate used for public policy to give greater weight to future generations' benefits.

Spatial Disaggregation: The process of breaking down data to smaller geographic units (e.g., counties or sub-counties) to support localised analysis and decision-making.

Supply and Use Table (SUT): A table that shows the supply of products from domestic production and imports and their use by industries, households, and exports, in monetary terms.

Technical Working Group (TWG): A multi-agency body responsible for the coordination, development and validation of natural capital accounts, such as those for land, water or ecosystems.

Welfare Value: The broader value of goods and services, including consumer surplus, beyond their market value (not used in SEEA accounts).

Foreword



The Kenya National Bureau of Statistics (KNBS) is pleased to present the report on Kenya's Natural Capital Accounts for Forests, developed in collaboration with the State Department for Economic Planning and our development partners. This report represents a significant milestone in Kenya's efforts to integrate environmental sustainability into economic planning and decision-making. Forests constitute a critical component of Kenya's natural capital, providing essential ecosystem services including water regulation, carbon sequestration, biodiversity conservation, and livelihoods for millions of Kenyans. Despite their importance, the true value of forests and the services they provide have remained largely unaccounted for in our national economic accounts.

This report follows the internationally recognized System of Environmental-Economic Accounting (SEEA) framework, adopted by the United Nations Statistical Commission, thus ensuring Kenya's forest accounts are not only scientifically robust but also internationally comparable. The development of the forest accounts builds on Kenya's pioneering work in Environmental-Economic Accounting that began in 2017 with a pilot report on Energy accounts. Over time, the Bureau has progressively expanded the natural capital accounting framework across water, energy, land, ecosystems, and forests. The formal adoption of the National Plan for Advancing Environmental-Economic Accounting (NP-AEEA) 2025-2028, in July 2025, established a clear national roadmap for institutionalizing natural capital accounting across the six priority sectors.

> Forests constitute a critical component of Kenya's natural capital, providing essential ecosystem services including water regulation, carbon sequestration, biodiversity conservation, and livelihoods for millions of Kenyans.

The findings of this report have direct relevance for Kenya's national development priorities. The forest accounts provide critical inputs for our Vision 2030 development blueprint and the Bottom-Up Economic Transformation Agenda. They support our commitments under international frameworks, including the Sustainable Development Goals, the Paris Agreement on Climate Change, and the Global Biodiversity Framework.

The analysis also establishes a clear link between forest conservation and broader economic outcomes. The integration of these forest accounts into Kenya's macro-fiscal modelling through the enhanced Kenya Macroeconomic and Fiscal Model (KENMOD) allows us to quantify the macroeconomic impacts of climate shocks on forests and to assess the benefits and trade-offs of green fiscal measures and forest restoration investments. As such, strengthening the

evidence base for aligning fiscal policy with climate and environmental objectives. The report further provides insights aimed at strengthening forest management and governance in Kenya.

As we implement the NP-AEEA over the coming years, these forest accounts will be produced regularly, enabling us to track progress and ensure accountability in natural resource governance. This regular reporting cycle will also provide opportunities for continuous refinement of methodologies, enhancement of data quality, and strengthening of institutional technical capacity as implementation of the natural capital accounting framework advances. It is our hope that this report will serve as a resource for policymakers, researchers, and stakeholders as we collectively work toward achieving sustainable forest management and environmental stewardship.



Dr. Daniel Mwirigi M'Amanja

Chairperson, Board of Directors
Kenya National Bureau of Statistics



Acknowledgments

The Kenya National Bureau of Statistics (KNBS), together with the State Department for Economic Planning, Kenya Forest Service, Kenya Forestry Research Institute, Regional Centre for Mapping of Resources for Development and other relevant stakeholders, developed the inaugural Kenya's Natural Capital Accounts for Forest report. This report presents an overview of the development and compilation of forest accounts in Kenya, which aim to integrate the environmental and economic information to provide a comprehensive picture of the contribution of forests to the economy and their role in supporting sustainable development.

The State Department for Economic Planning, under the leadership of Principal Secretary Dr. Bonface Makokha, has been instrumental in championing the institutionalization of natural capital accounting in Kenya and ensuring alignment with national development priorities. The formation of the National Steering Committee has ensured high-level coordination across government agencies.

The Bureau expresses its sincere gratitude to all data providers across the National Statistical System (NSS) who are the primary sources of data in compiling this report. Thank you for your continued support and cooperation.

Special recognition goes to the KNBS staff for the leadership and technical support throughout the development of this report. We wish to acknowledge the KNBS Directors, notably Mr. Benjamin Muchiri and Mr. Robert Nderitu, for their dedicated leadership in constituting the technical working group, validation of the findings of the study, as well as for their technical guidance throughout the entire report preparation process.

KNBS and the TWG also appreciates and acknowledges the funding and technical support for the development of this report to the Global Program on Sustainability (GPS) a multi-donor Trust Fund administered by the World Bank.

Appreciation is also extended to the members of the Technical Working Group who, in addition to providing the necessary data, play an important role in validating the statistical outputs produced by the Bureau. The Technical Working Group members who contributed to the process and assisted with the compilation and vetting of data included:

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Executive summary



Kenya's forests are integral to the country's social, economic, and environmental well-being, supporting the livelihoods of over four million people, supplying more than 60% of national energy needs through wood fuel and charcoal, and providing approximately 75% of freshwater through the five montane water towers. Despite their importance, their full value has historically been underrepresented in official statistics. This inaugural report presents Kenya's first comprehensive forest asset accounts developed under the System of Environmental-Economic Accounting (SEEA) framework for the period 2019–2024. The work is anchored in the National Plan for Advancing Environmental-Economic Accounting (NP-AEEA) 2025–2028 and aligned with existing forest sector policies and regulatory frameworks. The accounts were compiled using approved methodologies, including the national land cover mapping programme, national forest inventory guidelines, and IPCC-endorsed approaches for estimating forest stocks. Data were harmonised with land and ecosystem accounts and complemented by household survey data and import-export statistics to capture forest product flows and consumption. While the analysis draws on data from 1990 to 2024 to provide long-term context, the primary focus is on the 2019–2024 period, reflecting the influence of recent policy and strategic interventions.

By 2024, Kenya's forest area was estimated at 3,591,486 hectares (6.07% of total land area), down from 3,934,279 hectares (6.65%) in 1990, representing a net loss of 342,793 hectares over the long term. However, in the period 2019–2024, forest cover increased from 3.47 million hectares (5.86%) to 3.59 million hectares (6.07%), reflecting a net gain of 124,003 hectares. This growth was driven by afforestation of 342,427 hectares, which outpaced deforestation of 218,424 hectares, with gains most pronounced in montane areas above 1,500m a.s.l..

At the county level, Samburu, Garissa, Narok, Turkana, and Lamu maintain the largest forest areas, while Nyeri records the highest forest cover relative to county size at 45.76%, followed by Lamu (41.76%), Elgeyo-Marakwet (31.37%), Nandi (30.47%), Bomet (29.41%), Kericho (28.64%), and Nyandarua (28.59%). The highest net gains were observed in Turkana (23,978 ha), Nandi (17,134 ha), Makueni (14,657 ha), and Kakamega (11,184 ha), while notable losses occurred in Narok (13,800 hectares), Kiambu (2,128 ha), Mandera (1,948 ha),



3,591,486 hactares

By 2024, Kenya's forest area was estimated at 3,591,486 hectares (6.07% of total land area), down from 3,934,279 hectares (6.65%) in 1990



6.07%

In the period 2019–2024, forest cover increased from 3.47 million hectares (5.86%) to 3.59 million hectares (6.07%), reflecting a net gain of 124,003 hectares.



343.9 million m3

Total gross fellings reached 343.9 million cubic metres, resulting in removals of 106.5 million cubic metres (under bark).



and Lamu (1,458 ha). On average, afforestation reached 68,485 hectares per year between 2019 and 2024, compared to annual deforestation of 43,685 hectares, with Nandi, Makueni, and Kakamega leading afforestation efforts.

Forest stock analysis shows that plantation species such as Cupressus lusitanica dominate sawlog production, with a stock of 11.746 million m³ recorded in 2024. Plantation forests produce approximately 1.5 million m³ of timber annually and contribute to household incomes through PELIS, generating between KES 182 million and KES 421 million each year. Natural montane forests hold the highest above-ground biomass, contributing to a national stock of 324.96 million tonnes. Between 2019 and 2024, deforestation resulted in the loss of over 22 million tonnes of biomass, with an estimated economic cost of USD 369.6 million, of which montane forests accounted for the largest share. Forests also supply around 34 million tonnes of biomass annually for energy.

The Physical Supply Flow Account shows a net decline of approximately 23.3 million m³ in Kenya's forest stock between 2021 and 2024, despite forest gains exceeding areas affected by deforestation, as newly reforested areas require time to accumulate biomass. Gross fellings were estimated at 343.9 million m³, including 120.4 million m³ of removals over bark and 106.5 million m³ under bark, with 29.8 million m³ utilised for industrial wood production. Households accounted for the largest share of wood-fuel consumption, estimated at over 256.7 million m³, highlighting the substantial pressure from firewood and charcoal demand. The disparity between estimated consumption and recorded production and deforestation data also points to under-recorded small-scale and household-level harvesting, underscoring the need for household consumption surveys to complement existing forest monitoring systems. Overall, rising demand for biomass energy, timber, furniture and construction materials, driven by population growth, urbanisation and economic development, continues to exert significant pressure on Kenya's forest resources.

Realising the full value of these accounts will require addressing key data gaps. Private and community forests remain insufficiently monitored, forest degradation is difficult to quantify, and non-market uses are largely absent from official statistics. The NP-AEEA 2025–2028 provides a framework to address these challenges through regular reporting cycles, strengthened technical oversight, and integration of forest account findings into the KENMOD macro-fiscal model, representing a critical step toward translating these baseline accounts into sustained policy impact.

01 Introduction



1.1 Introduction

Forests are a vital part of Kenya's natural capital, supporting the economy, climate resilience, and livelihoods. They provide a wide range of goods such as timber, fuel wood, honey, fibres and medicinal plants, which support both formal industries and household subsistence needs. The forestry sector also contributes to employment and income generation across the value chains from commercial forestry, community forest enterprises and trade in non-timber forest products. Beyond tangible products, forests also deliver essential ecosystem services — including carbon sequestration, water regulation, soil erosion control, and cultural and recreational opportunities — that sustain agriculture, tourism, energy, biodiversity, and community well-being. These contributions make forests central to Kenya's sustainable development agenda and to the achievement of its national and international commitments, including Vision 2030, the Nationally Determined Contributions (NDCs) under the Paris Agreement, the African Forest and Landscape Restoration Initiative (AFR100) restoration initiative and the country's commitments under the Sustainable Development Goals (SDGs).

Despite this importance, the full value of forests remains largely invisible in Kenya's official economic statistics. Conventional accounting systems, based on the System of National Accounts (SNA), primarily record marketed outputs such as timber, poles and charcoal, excluding many non-market ecosystem services provided by forests. As a result, the contribution of forests to the Kenyan economy, environmental stability and overall natural wealth is often underestimated. This gap in measurement can lead to policies and investments that do not reflect the economic and social costs of deforestation and the benefits of restoration and sustainable forest management.

To address this challenge, this report introduces the System of Environmental-Economic Accounting (SEEA) and an internationally recognized framework for integrating environmental information with economic statistics, compiling more comprehensive forest accounts. This report provides an overview of the concepts, structure, and policy relevance of SEEA forest accounts, describes the current data situation in Kenya, and identifies steps toward developing physical, monetary, and ecosystem accounts for forests.

1.2 Background Information

Kenya has recently developed and adopted the National Plan for Advancing Environmental Economic- Accounting (NPAEEA) 2025-2028, a strategic roadmap for integrating the Systems of Environmental -Economic Accounting (SEEA) into national statistics and policy. The plan describes the conditions which make it critical to account for natural capital in a way that is congruent with sustainable economic development and national planning. The plan emerged from collaboration between the Kenya National Bureau of Statistics (KNBS) and the United Nations Statistics Division (UNSD) in September 2023 and identifies Water, Energy, Land, Forest and Ecosystem Accounts as priority accounts for development. This responds to a clear policy need to account for natural capital, which remains weakly presented in the conventional economic statistics.

In Kenya, forests support livelihoods, energy, security, water regulation, biodiversity and climate resilience, yet these benefits are partially measured or omitted entirely. The sector directly employs over 750,000 people and supports livelihoods for over four million Kenyans through activities such as

timber production, processing and value addition (FAO,2021)[1]. The sector is also critical in energy provision, supplying over 60% of the country's energy needs through wood fuel and charcoal (KFS, 2016; KNBS, 2020) [2]. In addition, the montane forests are often referred to as the country's 5 water towers (Mau, Mt. Kenya, Aberdares, Cherangany, and Mt. Elgon), regulate hydrological systems and provide around 75% of the country's fresh water supporting agriculture, hydropower and domestic water supply (KEFRI, 2017; Langat et al., 2019)[3]. Forests also store carbon and contribute to Kenya's climate commitments and restoration agenda. These forest benefits underscore the need for forest natural capital accounting.

This technical report provides an overview of the development of Forest Accounts in Kenya. It begins by introducing the context, objectives and significance of SEEA-aligned Forest Accounting within Kenya's broader development planning framework. It then outlines the data sources and methodology used in compiling the accounts. The report proceeds to explain how national and county-level Forest Accounts were compiled and analyzed, and presents key empirical results, through tables, graphics and maps. It also highlights current gaps in monetary valuation and ownership accounts and concludes with recommendations on how to strengthen methods and improve institutional coordination, and enhance the use of forest accounts in planning and budgeting processes.

1.3 Importance of Forest Accounts

Forest accounting addresses key gaps in national statistics by integrating biophysical and economic data. It enables better monitoring of forest resources, supports sustainable management, and informs climate, development, and restoration policies. Forest accounting complements conventional macro-economic statistics by making the full value of forests visible to decision-makers. Consequently, SEEA provides standardized and internationally accepted methods, ensuring comparability and consistency. Forest accounting provides a systematic way to measure and report on the extent, condition, and use of forest resources, capturing both physical and monetary aspects. It supports a broad set of policy, management, and planning goals, including:

- **Monitoring and managing natural capital:** Forest accounts should provide a clear picture of how forest assets contribute to national wealth and how these assets change over time.
- **Integrating environmental and economic data:** Accounts should align biophysical data (e.g., forest area, harvested timber) with economic measures (e.g., value of timber output), enabling better-informed decisions.
- **Improving data coherence:** By using common classifications and accounting principles, forest accounts should overcome the fragmentation typical of standalone environmental datasets.
- **Correcting the limitations of GDP:** Traditional accounts often omit forest degradation and the value of non-market services such as carbon storage or erosion control.
- **Supporting SDG and climate targets:** Forest accounts contribute to monitoring SDG 15.2 (sustainable forest management) and global frameworks like REDD+ and the Global Biodiversity Framework.

[1] FAO. (2021). Integrated Landscape Management for Conservation and Sustainable Development in Kenya. Rome: Food and Agriculture Organization
[2] Kenya National Bureau of Statistics. (2020). Kenya Household Cooking Sector Study. Nairobi: KNBS.
Kenya Forest Service. (2016). National Forest Programme 2016–2030. Nairobi: KFS
[3] KEFRI (2017). *Kenya's Water Towers Protection and Climate Change Mitigation and Adaptation (WaTER) Programme Reports.*



- Identifying opportunities for job creation in sustainable forestry, restoration, and eco-tourism.

1.4 The institutional and policy context for forest accounts

The Forest accounts are anchored in national laws of Kenya, as well as International Multilateral agreements that Kenya is a signatory to. Key relevant policy, legislative and regulatory frameworks for NCA in Kenya are reviewed below.

1.4.1 Constitution of Kenya 2010

The Preamble of the Constitution provides that the people of Kenya shall be respectful of the environment, which is our heritage, and determined to sustain it for the benefit of future generations. Chapter 5 on land and environment article 60 outlines principles of land policy upon which natural capital stocks are entrenched, while article 69 places an obligation on the state to ensure sustainable exploitation, utilization, management, and conservation of the environmental and natural resources with equitable sharing of the accruing benefits.

1.4.2 The Forest Act (Cap 385)

The Forest Conservation and Management Act, enacted in 2016, is designed to give effect to Article 69 of the Kenyan Constitution regarding the sustainable management of forest resources. It aims to ensure the conservation and rational utilization of forests for socio-economic development while protecting the environment and biodiversity. The Act applies to all forests on public, community, and private lands, ensuring comprehensive coverage of forest management practices. The Act mandates the preparation of management plans for all public forests, which outline the goals and practices necessary for sustainable forest management. The Act regulates the trade of forest products, ensuring that such activities are conducted sustainably and legally.

1.4.3 The National REDD+ Strategy of 2021

The Strategy aims to reduce carbon emissions from deforestation and forest degradation while enhancing carbon stocks, supporting the nation's climate commitments, and increasing tree cover to over 10%. The programme also proposes incentivising business in the forest sector through the development of forest business models/schemes/investment packages, establishment of cost/benefit sharing schemes, establishment of forest insurance schemes and tapping into the existing government financing schemes.

1.4.4 National Land Use Policy 2014

The policy provides a framework for optimal utilization and productivity of land-related resources in a sustainable and desirable manner at the national, county and community level: Section 2.5.7 recognizes nature reserves and human settlements as among the various land uses in Kenya, hence the need for planned use of land and its resources, measures for equitable and sustainable utilization for optimal production. Section 3.1 gives highlights on the procedure for the allocation of land and issuance of title, which should be done based on the approved Physical Development Plan, approved Survey plans, approved local areas zoning regulations and policy guidelines. It also recognizes that allocation of public land identified to have high public value, like wildlife habitat, will not be allocated except under leases with conditions that reflect the high value or period by which the land may be required for a reserved use. Section 3.1. (ix) shows that areas protected for specific use by any law shall not be de-gazettement except in circumstances prescribed in the laws governing such areas. It further says that the protection of land rights of illegally occupied lands shall be pursued through litigation by the owners. Section 3.8 and 3.14 discusses more on the orderly management of land, such as biodiversity conservation, which includes mapping of wildlife corridors, planning, securing wildlife dispersal and migratory corridors

> The SDG Goal 15 targets seek to ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains, and drylands. The goal seeks to promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and substantially increase afforestation and reforestation.

through the provision of easement and fiscal incentives programs to the affected communities or individuals.

1.4.5 Relevant Multilateral Environmental Agreements (MEAs)

Kenya is a signatory to several international conventions and treaties geared towards environmental protection and conservation. Under the Bonn Challenge/ AFRI 100 commitments, Kenya committed to restore 5.1 million hectares of degraded forests and developed the forest and landscape restoration action plan 2021-2025 to implement the Bonn Challenge. This commitment was later enhanced to the 15 billion tree planting target by 2032, which seeks to convert 10.5 million ha of national land into forests and therefore increase national forest cover by 18%. Kenya is a signatory to the Glasgow commitment to work collectively to halt and reverse forest loss and land degradation by 2030

1.4.6 Sustainable Development Goals

In the advancement of the national effort in the achievement of SDGs, natural capital accounting plays a key role towards attainment of the targets set for Goal 15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss. The SDG Goal 15 targets seek to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains, and drylands. The goal seeks to promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and substantially increase afforestation and reforestation.

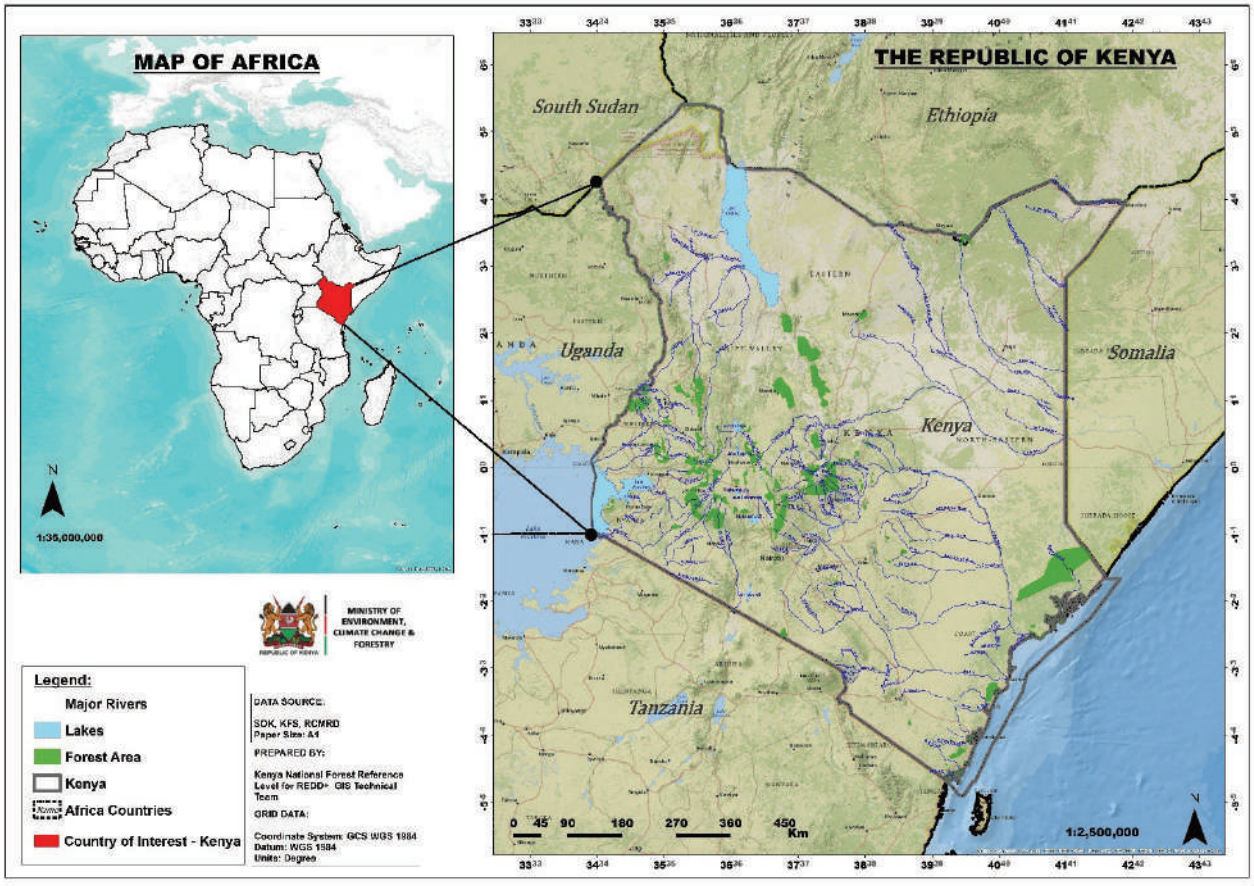
1.5 Forests in Kenya

1.5.1 Kenya's Geographical and Forest Ecological Context

Kenya is an equatorial country in East Africa (Figure 1) covering approximately 59 million hectares, with a highly diverse physical environment that strongly influences the distribution and characteristics of its forest ecosystems. Forests occur along a broad altitudinal and ecological gradient, from coastal mangroves at sea level to montane forests in the highlands, including Mount Kenya at 5,199 metres above sea level. The Great Rift Valley plays a central role in shaping forest patterns by influencing rainfall, drainage, and ecological transitions across the country.

Kenya's forested highlands form the core of its hydrological system, with most of the country's six major drainage basins originating in these areas. Key forested catchments, often referred to as water towers, including the Mau Forest Complex, Mount Kenya, the Aberdares, Mount Elgon, and the Cherangany Hills, are essential for regulating water flows and sustaining hydropower generation, irrigation, urban water supply, and downstream ecosystem services.

Figure 1. Geographical location of Kenya



Source: Ministry of Environment, Climate Change and Forestry, Kenya

1.5.2 National Forest and Tree Definitions

The national definition of forests in Kenya is a land area exceeding 0.5 hectares, with a minimum canopy cover of 15% and trees of a minimum height of 2 meters, which is not primarily under agricultural or other specific non-forest land use. Within this definition, a tree is a woody perennial plant of 2m in height with one or several stems, having a definite crown. Includes bamboos, palms, fruit trees, and excludes non-perennial non-woody species such as banana, shrubs and climbers.

1.5.3 Forest Stratification Types and Ecological Importance

Kenya's forests occur across diverse ecological zones ranging from high altitude montane forests to coastal mangroves and arid woodlands. The forests are categorized into six distinct strata (Figure 2) reflecting both ecological characteristics and management objectives. Five strata are derived from broad ecological zones, aligned with the Intergovernmental Panel on Climate Change (IPCC) classification used for greenhouse gas accounting, while the sixth represents forests established primarily for commercial timber production. This stratification facilitates forest monitoring, biomass estimation, ecosystem accounting and sustainable forest management. The Forest Strata include:

- **Montane Forests:** Situated above 1,500 meters, these "Water Towers" (Mau, Cherangani Mt. Kenya and Aberdares Range) are critical for watershed protection, climate regulation and biodiversity conservation. Vegetation composition varies with altitude.

Lower montane zones are typically dominated by moist broad-leaved forests consisting of species such as East African camphor *(Ocotea usambarensis)*, African cherry *(Prunus africana)*, East African yellowwood (Podocarpus latifolius), olive *(Olea capensis)*, and Croton *(Croton megalocarpus)*. At mid-elevations, forests may include mixtures of Juniper (*Juniperus procera)*, *Hagenia abyssinica*, and *Dombeya* species, while leeward slopes often support relatively drier forest types. At higher elevations, these forests transition into extensive bamboo zones dominated by *Oldeania alpina* and *Hagenia-Hypericum* woodlands, which form the upper forest boundary below afro-alpine ecosystems. These forests also support important bird species such as the *Hartlaub's turaco (Tauraco hartlaubi)*, Abbott's starling *(Poeoptera femoralis*), and the Jackson's francolin *(Pternistis jacksoni)*, as well as numerous amphibians and insects adapted to cool montane environments. Several plant species occurring in these forests, including *Prunus africana*, are globally important due to their medicinal value and conservation status. These ecosystems are among the most biologically diverse in Kenya and also provide important habitat for iconic wildlife species such as elephants, buffalo, and various primates, making them important for nature-based tourism and conservation.

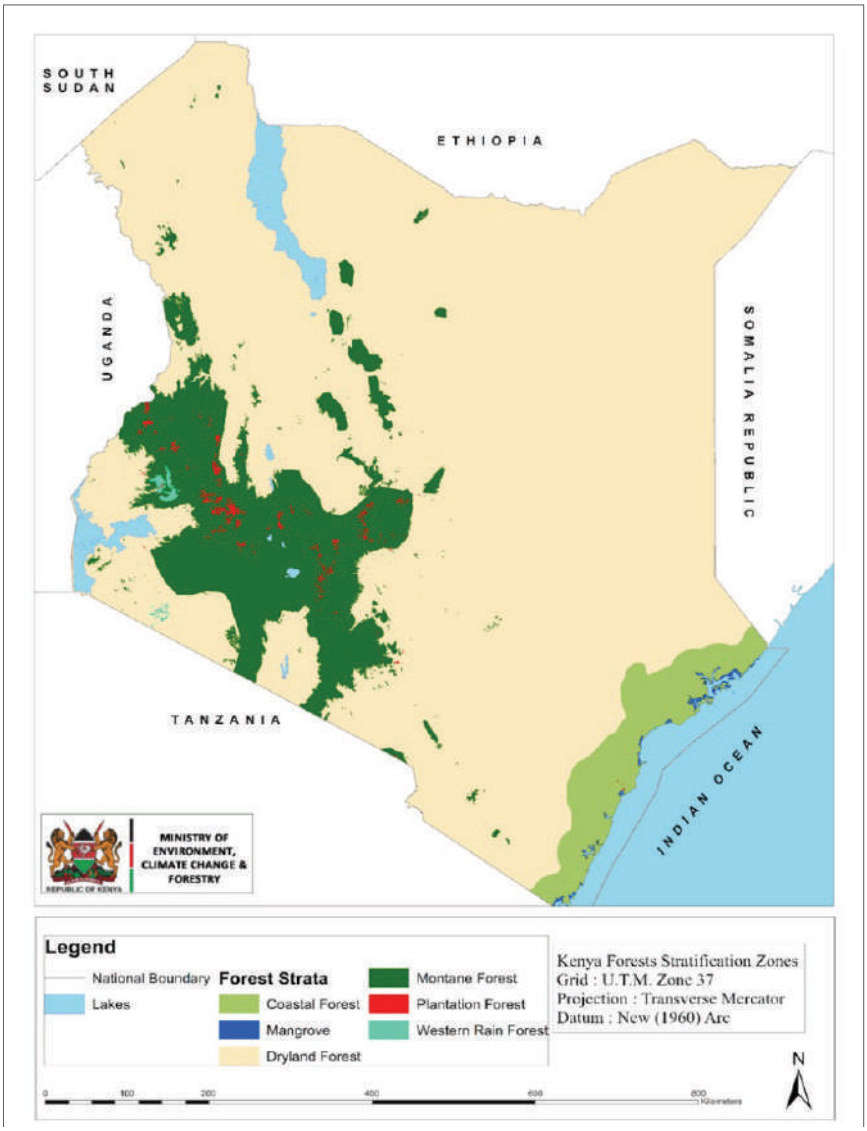
- **Western Rain Forests:** Characterized by *Guineo-Congolean* traits, these forests (e.g., Kakamega and Nandi) feature significantly larger and taller trees than other Kenyan strata. The forests are characterized by tall, multi-layered canopies and high species richness, dominated by tree species such as Elgon teak *(Olea welwitschii)*, East African mahogany (*Khaya anthotheca)*, African teak *(Milicia excelsa)*, Croton *(Croton megalocarpus)*, and *Prunus africana*. The ecosystem also supports rich faunal diversity, including primates such as the De Brazza's monkey *(Cercopithecus neglectus)*, blue monkey *(Cercopithecus mitis)*, and black-and-white colobus *(Colobus guereza).* Birdlife is particularly notable, with species such as the Great blue turaco *(Corythaeola cristata)*, Turner's *eremomela (Eremomela turneri),* and the blue-headed bee-eater *(Merops muelleri).* The ecological importance of western rainforests is complemented by their growing role in ecotourism, biodiversity conservation, and scientific research, particularly within Kakamega Forest National Reserve and surrounding community forest areas.
- **Coastal Forests:** Located within 30 km of the Indian Ocean shoreline, and part of the East African Coastal Forest Biodiversity hotspot, these forests include the Arabuko-Sokoke and Tana River complexes, dominated by Combretum and Brachystegia woodlands. It is one of the biologically rich and threatened regions globally (Burgess et al., 2000[4]; CEPF, 2014[5]). It hosts high levels of endemism and rare biodiversity, including species such as Aders' duiker *(Cephalophus adersi),* golden-rumped elephant shrew *(Rhynchocyon chrysopygus),* and globally threatened birds such as the Sokoke scops owl *(Otus ireneae)* and Clarke's weaver *(Ploceus golandi*) (BirdLife International, 2020; Nature Kenya, 2015)[6]
- **Mangrove Forests:** Saline-adapted ecosystems featuring several species (e.g., *Rhizophora mucronata, Avicennia marina)*. They

[4] Burgess, N., Clarke, G., & Rodgers, W. (2000). *The Coastal Forests of Eastern Africa. IUCN.*
[5] CEPF. (2014). *Eastern Afromontane and Coastal Forest Ecosystem Profile.*
[6] BirdLife International. (2020). *Important Bird Areas factsheets: Arabuko-Sokoke Forest.*

follow distinct zonation patterns and are vital for the protection of coastal shorelines and their ecosystems.

- **Dryland Forests:** Found in Arid and Semi-Arid Lands (ASALs), these are dominated by *Acacia-Commiphora* species. Their unique deciduous nature and rooting systems differentiate their biomass dynamics from those of moist forests.
- **Plantation Forests:** This class is further subdivided into two categories:
  - **Public Plantations:** Managed by the Kenya Forest Service (KFS) across 152,790 hectares, primarily consisting of even-aged monocultures (*Cupressus lusitanica*, Eucalyptus, and Pinus species).
  - **Private Plantations:** Commercial woodlots and plantations established on private land to supplement the national wood supply.

Figure 2. Spatial distribution of the forest strata



Source: Ministry of Environment, Climate Change and Forestry, Kenya

Further to the classification of forests by climatic and altitudinal zones, the forests are also classified based on canopy closure to aid monitoring of afforestation, deforestation and forest degradation activities, as shown in Table 1.

Table 1: Kenya's Classification of Forest by Strata

Land Category	Stratification By Ecological Zones	Canopy Cover Definitions
Forest land	Montane Forests	Dense (Canopy cover % ≥65%)
		Moderate (≥40 Canopy cover % <65)
		Open (≥15 Canopy cover % <40)
	Western-Rain Forests	Dense (Canopy cover % ≥65%)
		Moderate (≥40 Canopy cover % <65)
		Open (≥15 Canopy cover % <40)
	Coastal Forests	Dense (Canopy cover % ≥65%)
		Moderate (≥40 Canopy cover % <65)
		Open (≥15 Canopy cover % <40)
	Mangrove Forests	Dense (Canopy cover % ≥65%)
		Moderate (≥40 Canopy cover % <65)
		Open (≥15 Canopy cover % <40)
	Dryland Forests	Dense (Canopy cover % ≥65%)
		Moderate (≥40 Canopy cover % <65)
		Open (≥15 Canopy cover % <40)
	Plantation	Public Plantations
		Private Plantations

1.5.4 Forest Tenure and Governance Framework

Forest stewardship in Kenya is established under the Constitution of Kenya (2010) and the Forest Conservation and Management Act (2016). The public forest areas are mainly under the management of the Kenya Forest Service and are managed with the objective of biodiversity conservation, water catchment protection, and sustainable commercial production. Community forests are found in community lands, while private forests are found in lands that are privately owned. Forests in private lands have varied roles based on the objectives of the owner and are largely the source of wood products such as poles, timber and charcoal.

02
Methodology



2.1 Introduction

Physical forest accounts are a primary component of the System of Environmental-Economic Accounting (SEEA) Central Framework, designed to monitor longitudinal changes in forest extent and biomass. The compilation of these accounts draws on an integrated body of data sources, including geospatial land-cover data, national forest inventory statistics, and key publications from the Kenya National Bureau of Statistics (KNBS) such as the Economic Survey 2025. This integration ensures a precise and verifiable representation of the country's natural capital. By documenting opening and closing stocks alongside the flows that drive changes in these resources within each accounting period, physical forest accounts establish the quantitative baseline required for monetary valuation and the assessment of ecosystem service flows. Supply and use tables further complement this framework by tracking the sources and uses of natural capital, thereby generating evidence to inform policy formulation.

The sections that follow describe how the specific datasets used in developing the forest accounts were obtained and integrated. It should be noted that data limitations and gaps in availability precluded certain calculations — most notably, the monetary valuation of some forest resources. Where such constraints were encountered, estimates were derived from available data and supplemented by the expert knowledge of the Technical Working Group, in line with established methodological conventions.

2.2 Land Cover Data

2.2.1 Sources

The forest ecosystem accounts were compiled using spatially explicit land cover datasets derived primarily from two nationally coordinated initiatives: the System for Land-based Emissions Estimation in Kenya (SLEEK) and the Improving Measurement for Payments to Reduce Emissions and Strengthen Sinks (IMPRESS) project. These initiatives provide the core geospatial inputs required for the construction of forest ecosystem extent and condition accounts, in alignment with the System of Environmental-Economic Accounting – Central Framework (SEEA CF).

The SLEEK programme, funded by the Australian Government[7], was established with the objective of developing a comprehensive National Carbon Accounting System (NCAS) that integrates data from the forestry and agricultural sectors to support consistent measurement, reporting, and verification (MRV) of greenhouse gas emissions and removals. SLEEK produced a nationwide, gridded, satellite-based time series of land cover and land use (LCLU) data at 30-metre resolution, covering 18 reference years (1990, 1995, 2000, 2002–2015, and 2018), generated through supervised classification using a random forests algorithm. These datasets served as the historical baseline for estimating land cover in more recent years, providing a longitudinal record that captures long-term trends and establishes the stock position from which current conditions are assessed. The primary focus period for the accounts is 2019 to 2024.

The IMPRESS project was a multi-partner initiative led by the Food and Agriculture Organization of the United Nations (FAO), designed to strengthen Kenya's National Forest Monitoring System (NFMS) by improving the accuracy, consistency, and timeliness of forest-related data through the application of modern forest monitoring technologies. The FAO-supported

[7] Australian Government Department of Foreign Affairs and Trade. (2016). System for land-based emissions estimation in Kenya (SLEEK): Mid-term review and management response. https://www.dfat.gov.au/sites/default/files/kenya-system-land-based-emissions-estimation-mtr-man-resp.pdf

methodology employed Sample-Based Area Estimation (SBAE) techniques, utilising statistically generated sample points to record land cover change over time. Data were collected and interpreted using a wide combination of satellite imagery on the Collect Earth Online (CEO) platform, yielding national land cover statistics for the period 2015 to 2023.

The two datasets were integrated to produce a complete time series spanning 1990 to 2023. Estimates for 2024 were subsequently derived through statistical projection, incorporating mapped levels of afforestation and deforestation, with particular reliance on trends observed in the most recent five-year period.

2.2.2 Justification: Methodology and Data Adoption

- **Consistency — Supporting All Natural Capital Accounts Data Requirements (Inter-Account Consistency and Integration):** The SLEEK dataset, serving as the baseline, fulfills the data requirements across all Natural Capital accounts, including Land, Water, Energy, and Ecosystems. These accounts require physical land cover maps as well as historical data, and consistent information must be reported across all of them. As the parent account, the Land Account has formally adopted the SLEEK datasets, establishing a unified foundation for the entire accounting framework.

- **Time Series and Historical Data Requirements:** Annual data spanning from 1990 to the present was required across all accounts. This longitudinal dataset provides a comprehensive picture of historical trends and establishes the stock position from which current conditions can be assessed and understood.

- **Addressing Data Gaps - Statistical Robustness and Predictive Modelling:** To address identified data gaps, the technical team applied rigorous statistical algorithms—including Linear Regression and Exponential Growth models—to derive estimates for recent years. Relying on a standalone dataset (such as 2021) is insufficient for such projections; a deep time series is a mechanical necessity for generating mathematically sound and defensible forest-cover forecasts.

- **Comparability Between IMPRESS and SLEEK Datasets:** Analysis of the overlapping years shows no statistically significant differences between the IMPRESS and SLEEK datasets. Since both datasets also provide time series data, and both were deemed suitable for generating projections, SLEEK was adopted as the baseline for its consistency across all accounts.

- **Endorsement by the Forest Accounts Technical Working Group (TWG):** The selection of data for the Forest Accounts was rigorously evaluated by a multidisciplinary team of experts drawn from across the forestry sector. Their assessment considered data availability, adherence to SEEA guidelines, and the need to maintain consistency across all accounts. On this basis, the adopted dataset was deemed the most appropriate choice.

2.2.3 Recent Years' Land Cover Statistics through Predictive Modeling—Addressing Data Gaps

The development of the Kenya Forest Accounts Land Cover dataset for the period 2019 to 2024 employed a multi-tiered data integration strategy designed to ensure longitudinal consistency and scientific rigour.

A. Time Series and Historical Data Adoption

The analysis draws on two complementary datasets to establish a continuous and consistent historical baseline. The SLEEK dataset provides land cover data spanning 1990 to 2018, while the IMPRESS dataset covers forest land cover for the period 2015 to 2023. Together, these datasets form the foundation for all statistical estimations and projections. Therefore, to establish a robust baseline and maintain continuity across all Natural Capital Accounts, the following datasets were harmonized:

B. Statistical Modeling and Projections

To address data gaps for 2024 and ensure the accounts remain current, robust statistical techniques were applied:

- **Linear Regression Analysis:** Predictive modelling was conducted using the 'Forecast' algorithm in Excel, utilizing the IMPRESS 2015–2023 trend as the independent variable to project 2024 forest-cover values.

$$Y_{2024} = \text{FORECAST.LINEAR}(2024,\ Y_{2015:2023},\ X_{2015:2023})$$

- **Temporal Extrapolation via Pro-Rata:** For years not directly covered by the SLEEK dataset, values were estimated through proportional extrapolation, using both datasets as reference baselines. This cross-dataset normalisation was achieved through the following pro-rata formula: *SLEEK Estimated (Year X+1) = (SLEEK Year X ÷ IMPRESS Year X+1) × IMPRESS Year X*

Formula Example;

$$2019_{SLEEK_Est} = \left(\frac{2018_{SLEEK}}{2019_{IMPRESS}}\right) \times 2018_{IMPRESS}$$

This approach preserves the proportional relationship between the two datasets across their overlapping period, ensuring methodological consistency when bridging data gaps and maintaining coherence across the full time series.

C. County-Level Statistics

Sub-national estimates were derived using Zonal Statistics, delineated against county boundaries sourced from the Kenya National Bureau of Statistics (KNBS). This approach provided spatially explicit extent statistics and activity data at the county level, enabling disaggregated analysis and reporting in line with Kenya's administrative structure.

2.3 Emission Factors for Biomass Assessment

To estimate biomass content in forests and associated losses and gains from deforestation and afforestation, data sets were obtained from the National Greenhouse Gas Inventory. The Data comprises emission factors collected from field inventories that provide stocks for each of the forest strata described above and their specific canopy categories. This data has been used in developing submissions to the United Nations Framework Convention on Climate Change (UNFCCC), namely, Kenya's Forest Reference Level[8] (Republic of Kenya, 2019) and also the Biennial Transparency Report [9] GoK, 2024).

[8] Republic of Kenya. (2019). *The national forest reference level for REDD+ implementation. Ministry of Environment and Forestry.*

[9] Government of Kenya. (2024). *Kenya's first biennial transparency report (BTR1) to the United Nations Framework Convention on Climate Change.*

Biomass stock changes in deforestation, forest degradation and from other sources (sustainable management, wooded grasslands, trees outside forests, etc.) were used to estimate the role of tree resources for biomass supply as a source of energy. Calculation of emissions associated with deforestation and afforestation activities was done using the stated Emission factors following the 2019 IPCC guidelines[10] and aligns with Kenya's GHG inventory programme. The specific assumptions applied are listed below

a) The above-ground biomass (AGB) was estimated from inventory data and using the global allometric equation by Chave et al. (2014)[11]; data for measured parameters of diameter at breast height, total height, and wood density were converted into above-ground biomass.

b) A root-shoot ratio was adopted for each forest stratum following IPCC guidelines (Table 2) and used to calculate the below-ground biomass (BGB) stock for each stratum.

c) A summation of the above-ground and below-ground biomass was used to calculate the total biomass stock in the forests.

d) An increase in stocks was assumed to take place when growth (afforestation) occurs, and the IPCC growth rates were applied, as shown in Table 3. However, when deforestation occurred, the whole stock in the forest was assumed to be lost. This implied that deforestation implies a big loss in forest stock as compared to the modest gain that is achieved when afforestation occurs.

e) The IPCC default factor of 0.47 was used to convert biomass to carbon, while the CO2 molecular formula (44/12) was used to convert the carbon into CO2 sequestered during growth or lost through deforestation.

Table 2. Shoot root ratios used to estimate below-ground biomass stocks in forests

Forest Strata	Root Shoot Ratio	Source in table 4.4 of IPCC 2006 guidelines V4.4
Montane	0.37	for Tropical rainforest
Dryland	0.28	Above-ground biomass >20 tonnes ha-1 for Tropical Dryland forests
Coastal and Mangrove	0.20	Above-ground biomass <125 tonnes ha-1 for Tropical moist deciduous forest
Plantation	0.27	For Tropical Mountain systems

[10] Intergovernmental Panel on Climate Change, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use – Chapter 2: Generic Methods.

[11] Chave, J., et al. (2014). Improved Allometric Models to Estimate the Aboveground Biomass of TROPICAL Trees. Global Change Biology, 20, 3177-3190. https://doi.org/10.1111/gcb.12629

Table 3: An illustration of the forest CO_2 gain through afforestation

Forest strata	Biomass gain (Tonnes/ha)			Carbon from Biomass	CO_2 sequestered (Tonnes/ha)	Reference AGB value from IPCC V4.4
	AGB	BGB	Total			
Montane and Western rain	10	3.70	13.70	6.44	23.61	Table 4.9 for the African tropical rain forests for forests <20 yrs
Dryland	2.4	0.67	3.07	1.44	5.29	Table 4.9 for Africa tropical dry forests for forests< 20 yrs
Coastal and Mangrove	5	1.00	6.00	2.82	10.34	Table 4.9 for Africa tropical moist deciduous forests for forests < 20 yrs

f) **Biomass & Carbon Emissions Accounting:** Biomass loss and gain were converted to CO_2eq. Afforestation and deforestation activity data from the IMPRESS dataset were used to compute greenhouse gas emissions, expressed in CO_2 equivalent (CO_2eq), using the following standard IPCC-aligned equation: ***Emissions (CO2eq) = Activity Data (ha) × Emission Factor.*** Emission factors were derived from the National Forest Inventory, ensuring alignment with nationally validated parameter.

Formula;

$$\text{Emissions } (tCO_2e) = \text{Activity Data (ha)} \times \text{Emission Factor}$$

where, tCO_2e = tonnes of Carbon dioxide equivalent

ha = Hectares.

2.4 Forest Volumes in Public Plantations

Data on the volumes of wood for different species were obtained from the KFS. It indicates the estimated volumes of wood in the forest over recent years. This volume provides an estimate of available wood for harvesting to allow a sustainable harvesting programme. It was not possible to get wood volumes from private forests. In developing the Supply and Use tables for furniture and construction material, it was estimated that the balance of wood supply from the public plantation forests is provided by the private forests.

2.5 Food Resources from The Forest

Food resources from the forest were estimated based on the area of the Plantation Establishment and Livelihood Establishment Scheme - PELIS (KEFRI, 2014)[12] for the recent years. The PELIS programme operated by the KFS allocates land to forest adjacent communities to till and plant annual crops. In these lands, the communities work with KFS to plant commercial tree species (mainly *Cupressus lusitanica* and *Pinus spp*), and the farmers continue tending the trees as they cultivate their crops. Commonly cultivated crops are maize, legumes, potatoes and kales.

The estimated profitability of the PELIS obtained from literature and expert judgement was KES 50,000 per hectare per year, and this was used to estimate the income arising from crops that are grown in forests. It is noted that this estimate is lower than the realistic estimate because some indigenous vegetables growing in natural forests, such as stinging nettle, *amaranthus, solanum nigrum*, mushrooms and a variety of insects were not estimated.

[12] Kenya Forestry Research Institute. (2014). Contribution of PELIS in increasing tree cover and community livelihoods in Kenya. https://www.kefri.org/assets/publications/extension/Contribution%20of%20pelis%20in%20increasing%20tree%20cover%20and%20community%20livelihoods%20in%20Kenya.pdf

2.6 Developing Supply and Use Tables for Wood Products

The development of Physical Supply and Use Tables (PSUT) was undertaken in accordance with the principles of the System of Environmental-Economic Accounting (SEEA) framework, ensuring consistency, transparency, and alignment with national statistical standards. The methodology followed a structured, multi-stage process encompassing data compilation, harmonization, estimation, balancing, and reporting.

2.6.1 Data Collection and Source Integration

The development of the PSUTs required the compilation and harmonisation of data from multiple authoritative institutional sources. Primary data was sourced from the following entities:

- Kenya National Bureau of Statistics (KNBS) — for national production, consumption, and trade statistics;
- Kenya Revenue Authority (KRA) — for export, import, and fiscal data related to forest products;
- Kenya Forest Service (KFS) — for forest resource extraction and management data;
- Kenya Forestry Research Institute (KEFRI) — for research-based estimates and technical parameters;
- Kenya Ports Authority (KPA) — for trade flow data on forest product imports and exports.

Following data collection, a harmonization and standardization phase was undertaken. Data from diverse sources were converted into consistent physical units (e.g., tonnes, cubic metres, hectares) and aligned to a common classification system in accordance with SEEA and national accounts frameworks. This process ensured comparability across sectors and datasets, while addressing discrepancies in definitions, reporting periods, and measurement units.

Each dataset was subjected to a rigorous quality assessment to evaluate completeness, reliability, and internal consistency prior to integration. Where multiple sources reported on the same variables, cross-validation was conducted to reconcile differences and ensure overall coherence within the tables.

2.6.2 Construction of the Supply Table

The Supply Table documents the total quantity of forest resources and products made available within the economy during a given accounting period. It captures domestic production - including timber, woodfuel, charcoal, non-wood forest products, and ecosystem services - as well as imports of forest-related goods. Each product category is recorded in its respective physical unit of measurement, such as cubic metres for timber or metric tonnes for biomass, ensuring comparability and precision across entries. Data from KFS and KEFRI formed the primary basis for domestic supply estimates, supplemented by trade data from KRA and KPA for import figures.

Net increment was estimated using a growth rate of 6.2 t/ha/year, (Table 4.9 of the 2006 IPCC Guidelines), and applied to areas identified as forest gains. Forest gains were assumed to have occurred over a minimum period of five years, reflecting the estimated time required for newly established forests to become detectable and mappable using Sentinel-2 imagery. Annual biomass gains were estimated for each year within this period. The resulting biomass estimates (tonnes) were converted to volume using a conversion factor of 0.725 m^3 per tonne, in accordance with IPCC guidelines.

Volumes lost due to deforestation were estimated using areas identified as forest loss. Lost biomass was calculated by applying an above-ground biomass density of 215 t/ha for mature forests, as reported in Table 4.7 of the 2006 IPCC Guidelines. The estimated biomass losses (tonnes) were subsequently converted to volume using the same conversion factor of 0.725 m^3 per tonne.

For the compilation of the PSUT, roundwood volume (under bark) was estimated using domestic production data derived from economic surveys conducted by KNBS. Bark volume was estimated at 13% of roundwood volume, corresponding to the midpoint of the 8–20% bark-to-stem volume range reported in the 2019 IPCC Guidelines. Roundwood (under bark) was estimated to account for 28% of total removals (under bark). Additionally, it was assumed that 65% of felling residues remain in the forest and are not removed, based on estimates from a Central African study reported by the World Bank (2005).

2.6.3 Construction of the Use Table

The Use Table records how the forest resources identified in the Supply Table are consumed or utilised across different sectors of the economy. This includes intermediate consumption by industries such as manufacturing, construction, and energy production, as well as final consumption by households and the government. Exports of forest products are also recorded as a use of the domestic supply. The Use Table was populated using production and trade statistics from KNBS and KRA, ensuring that total supply and total use are balanced within acceptable statistical margins.

2.6.4 Addressing Data Gaps

To address data gaps and inconsistencies, estimation techniques were applied where necessary. These included the use of proxy indicators, interpolation and extrapolation methods, and proportional allocation (pro-rata approaches) based on available benchmarks and incorporation of smart assumptions (Annexes). In cases where time series data were incomplete, statistical methods such as linear regression were used to generate consistent estimates, ensuring continuity and coherence in the dataset.

2.6.5 Balancing and Validation

A critical step in the PSUT construction process is ensuring that total supply equals total use for each product category — a principle fundamental to the integrity of the accounting framework. Where imbalances were identified, a systematic reconciliation process was undertaken, drawing on supplementary data sources or applying established statistical adjustment techniques. This process was iterative, with each round of adjustments reviewed against source data to ensure that no material distortions were introduced. The final balanced tables reflect the best available estimates consistent with both the underlying data and the SEEA methodological guidelines.

2.6.6 Temporal Coverage and Time Series Consistency

The PSUTs were compiled to cover the full accounting period from 1990 to 2024, in alignment with the time series requirements of the broader Natural Capital Accounts. For years in which primary data was unavailable or incomplete, values were estimated using the statistical methods described in the preceding sections — including linear regression projections and pro-rata extrapolation — ensuring a continuous and internally consistent time series across the entire reporting period. However due to the identified data gaps, the results presented here are only for the period 2021-2024.

2.6.7 Reporting

The final stage focused on analysis and reporting. The balanced PSUTs were used to derive key indicators on production, consumption, trade, and resource use efficiency. The draft outputs underwent internal validation followed by external technical review to ensure methodological soundness and credibility. Overall, the methodology ensured that the PSUTs provide a comprehensive and coherent representation of physical flows within the economy, supporting evidence-based decision-making, policy formulation, and reporting under national and international frameworks.

03

Asset Accounts for Forests



The compilation of these physical accounts utilizes a robust, multi-source methodology, as detailed in Chapter 2. This process integrates high-resolution geospatial land-cover data from the IMPRESS and SLEEK projects, generating projected estimates for 2024 derived from the two established datasets. Furthermore, national forest inventory statistics and remote sensing-derived biomass estimations are incorporated to ensure a precise and verifiable representation of Kenya's natural capital.

3.1 Forest Assets in Kenya

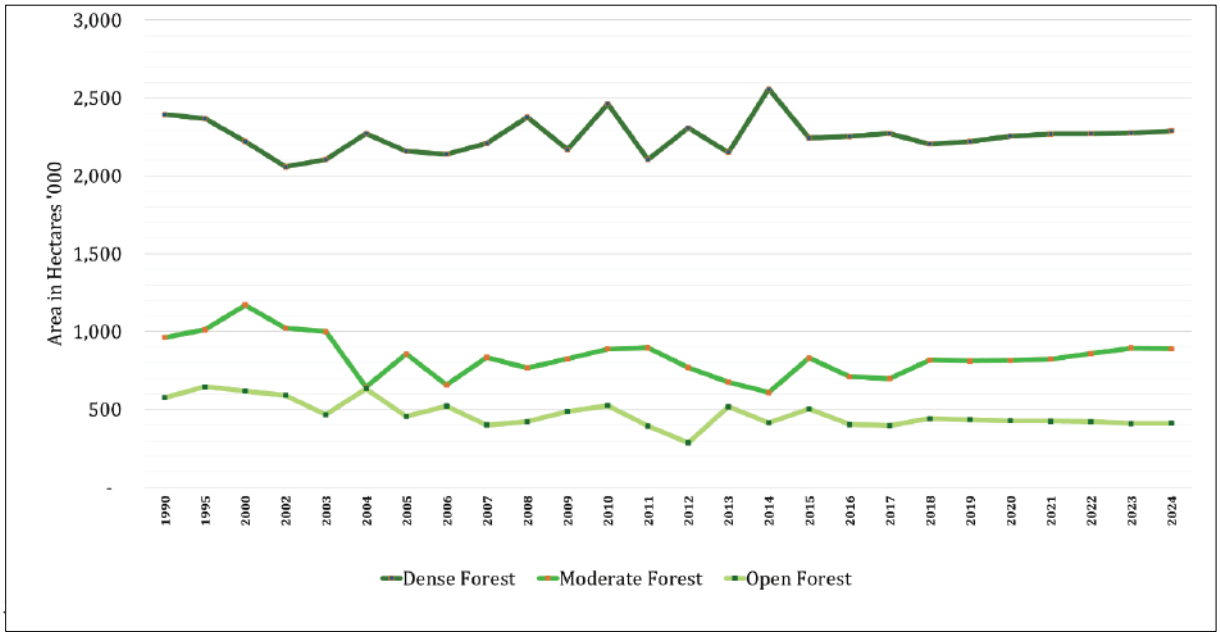
This section presents forest data generated from the IMPRESS and SLEEK projects as described in the methods section. It provides an overview of Kenya's historical forest cover trends from 1990 to 2024 in order to contextualize long-term changes in forest resources. However, the accounts have focused on recent trends based on current drivers of change using the period 2019 to 2024.

3.1.1 Historical Forest Cover Trends and Status (1990–2024)

Historical data spanning 1990 to 2024 reveals that Kenya's forest landscape underwent nearly three decades of steady decline before entering a period of modest recovery from 2020 onwards (Figure 3). Total forest area fell from 3.93 million hectares in 1990 to a low of 3.47 million hectares in 2019, with national forest cover contracting from 6.65% to 5.86%. While recent years have seen a positive reversal, with forest cover recovering to 6.07% by 2024, these gains have not yet restored forest extent to its 1990 baseline.

The decline in forest cover since 1990 is described in Kenya's REDD+ Strategy[13] (GoK 2022) and was influenced by drivers such as forest excisions, expansion of agricultural area, illegal logging, inadequate enforcement and urbanization among others.

Figure 3: Forestland Cover Trends From 1990 – 2024



[13] Government of Kenya. (2022). National REDD+ Strategy 2022. Ministry of Environment and Forestry. https://www.un-redd.org/sites/default/files/2022-05/NATIONAL%20REDD%2B%20STRATEGY%202022.pdf

3.1.2 Forest Cover Trends and Status (2019–2024)

Results from recent forest cover changes show that in the period 2019 to 2024, Kenya's total forest area saw a steady growth, rising from 3.47 million to 3.59 million hectares (Figure 4). This net increase of approximately 124,000 hectares raised national forest cover from 5.86% to 6.07% of the country's 59.2-million-hectare national area. As illustrated in Table 4;

- **Dense Forests:** Remained the dominant class, expanding from 2.22 million to 2.29 million hectares.
- **Moderately dense Forests:** Recorded the most significant expansion among the forest categories, increasing from 811,233 hectares in 2019 to a peak of 894,333 hectares in 2023, before slightly declining to 890,128 hectares in 2024.
- **Open Forests:** exhibited a gradual decline over the same period, decreasing from 434,383 hectares in 2019 to 412,127 hectares in 2024. This reduction coincides with increases in moderate and dense forest classes, suggesting improvements in forest structure and canopy density rather than a net loss of forest land. The results may also imply that open forests, which are often degraded, are more vulnerable and can easily be converted to other non-forest land uses.

Figure 4. Gradual recovery of forest area in the period 2019–2024

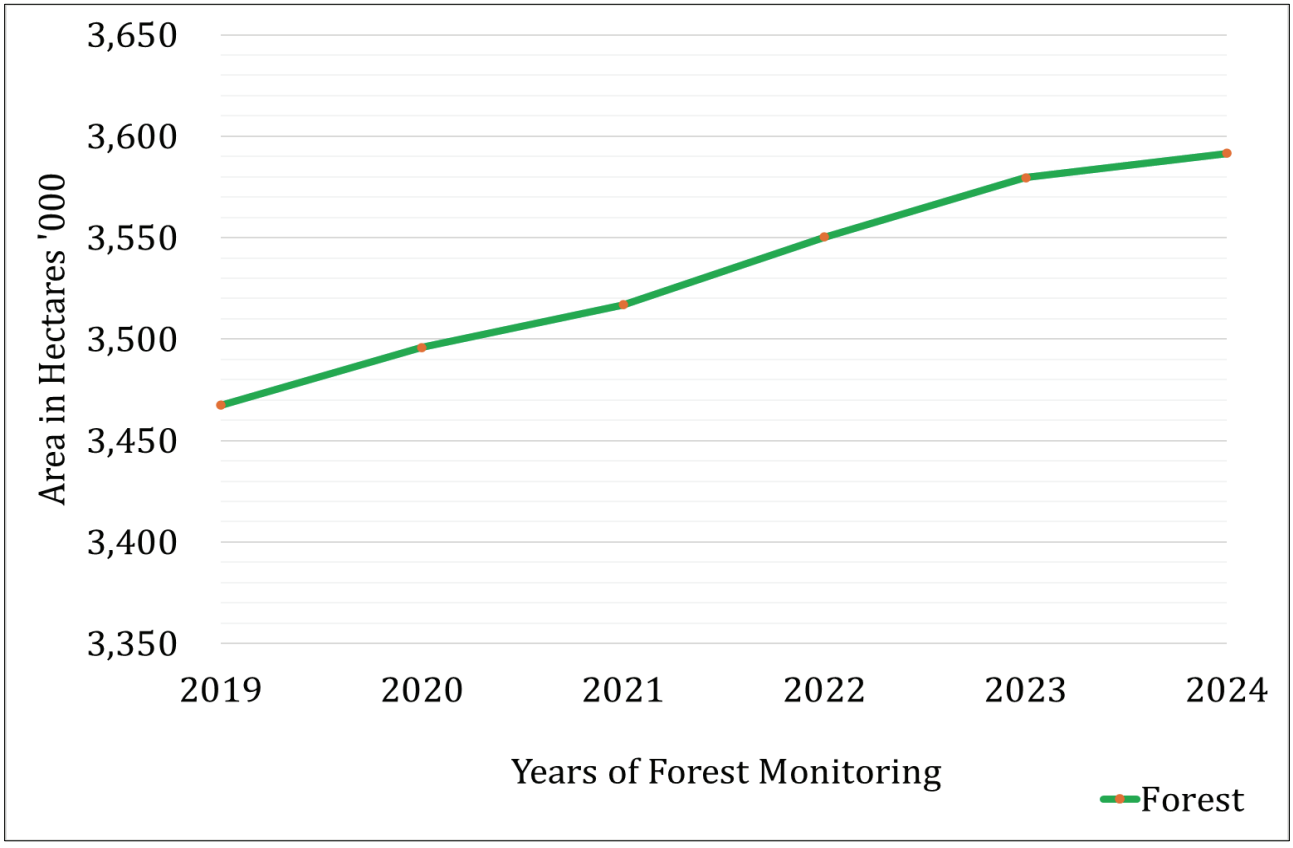


Table 4. Status of forests, 2019–2024

	2019	2020	2021	2022	2023	2024
Forest Canopy Density						
Dense Forest	2,221,867	2,255,999	2,269,186	2,269,380	2,275,392	2,289,231
Moderate Forest	811,233	813,928	823,810	859,296	894,333	890,128
Open Forest	434,383	425,896	423,859	421,652	409,940	412,127
Total Forest Area [Ha]	**3,467,483**	**3,495,823**	**3,516,855**	**3,550,328**	**3,579,664**	**3,591,486**
% Forest Cover	**5.86%**	**5.90%**	**5.94%**	**6.00%**	**6.05%**	**6.07%**
Kenya Area	**59,203,788**					

3.1.3 Forest Assets by Strata (2019-2024)

Kenya's forest resources are distributed across several ecological strata, as presented in Figure 5 for the period 2019–2024. Table 5 shows that a significant share of the country's forests is located in montane ecosystems, followed by dryland areas, with smaller portions found in coastal and mangrove zones.

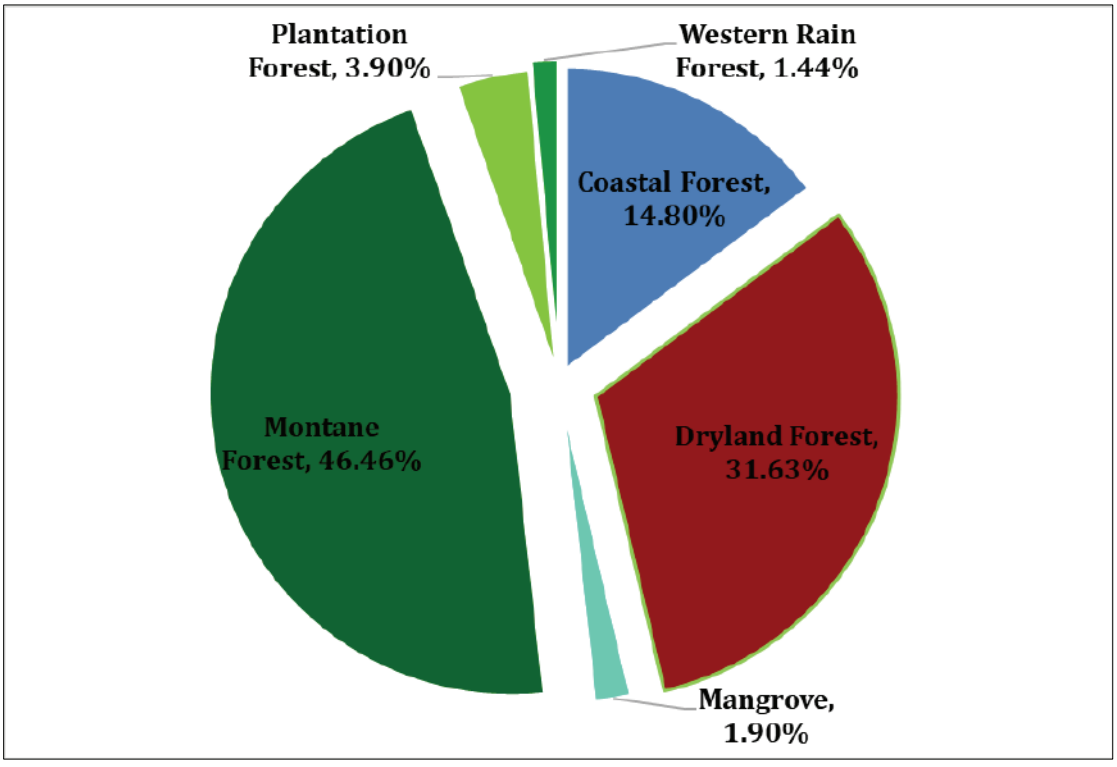
Table 5: Forest Area by Forest Strata (2019-2024)

Strata	Area of forestland ('000 ha) in the period 2019 -2024					
	2019	2020	2021	2022	2023	2024
Coastal Forest	538	537	536	538	542	539
Dryland Forest	1,112	1,081	1,093	1,108	1,119	1,130
Mangrove	67	67	66	67	67	67
Montane Forest	1,615	1,625	1,633	1,644	1,657	1,659
Plantation Forest	133	136	138	143	144	147
Western Rain Forest	51	50	49	50	51	51
Grand Total	**3,467**	**3,496**	**3,517**	**3,550**	**3,580**	**3,591**

Montane forests constituted the largest share of total forest area throughout the period, expanding consistently from 1.62 million hectares in 2019 to approximately 1.66 million hectares in 2024. Dryland forests, the second largest stratum, experienced a slight contraction in 2020 before recovering steadily to 1.13 million hectares by 2024.

Coastal forests remained relatively stable, fluctuating marginally around 0.54 million hectares with minimal net change over the period. Plantation forests recorded the most notable proportional growth, expanding from 133,000ha to 147,000ha in the period 2019 – 2024, and this reflects the results of an active planting programme to reduce backlogs of planting that had been experienced previously. Mangrove forests and Western Rainforests showed very little variation, maintaining areas of approximately 0.067 million ha and 0.051 million ha, respectively, throughout the five-year period. Overall, these strata have experienced gradual changes in forest area, collectively contributing to the observed national trends in forest extent.

Figure 5. An illustration of the proportions of forests found in different strata of Kenya



3.1.4 Spatial Distribution of Forest Assets by County

Forest cover is unevenly distributed across Kenya (Figure 6), with the largest concentrations found in the Water Tower regions and the Arid and Semi-Arid Lands (ASALs). Between 2019 and 2024, most counties in Kenya recorded increases in forest cover. As shown in Table 6, Counties with the largest forest areas in 2024 include Samburu (318,983 ha), Garissa (307,668 ha), Narok (271,322 ha), Turkana (269,213 ha), and Lamu (262,405 ha). In contrast, the smallest forest areas are recorded in Mombasa (1,972 ha), Mandera (2,654 ha), Nairobi (7,232 ha), Kisumu (7,595 ha), and Wajir (8,146 ha). Turkana saw the largest gain, rising from 245,235 to 269,213 hectares, followed by Nandi (69,692 to 86,825 hectares) and Makueni (71,445 to 86,102 hectares).

Several counties recorded minimal changes or nearly stable forest cover, including Nakuru, Mombasa, Nairobi, Taita/Taveta, and West Pokot. A few counties experienced declines in forest cover. Notable reductions occurred in Murang'a (62,021 to 61,901 hectares), Elgeyo/Marakwet (95,990 to 95,101 hectares), Wajir (9,205 to 8,146 hectares), Lamu (263,864 to 262,405 hectares), Mandera (4,602 to 2,654 hectares), Kiambu (45,804 to 43,675 hectares), and Narok (285,122 to 271,322 hectares). Overall, counties in the central highlands and Rift Valley exhibit high forest density, while northern and coastal counties tend to have large forest areas that are more sparsely distributed.



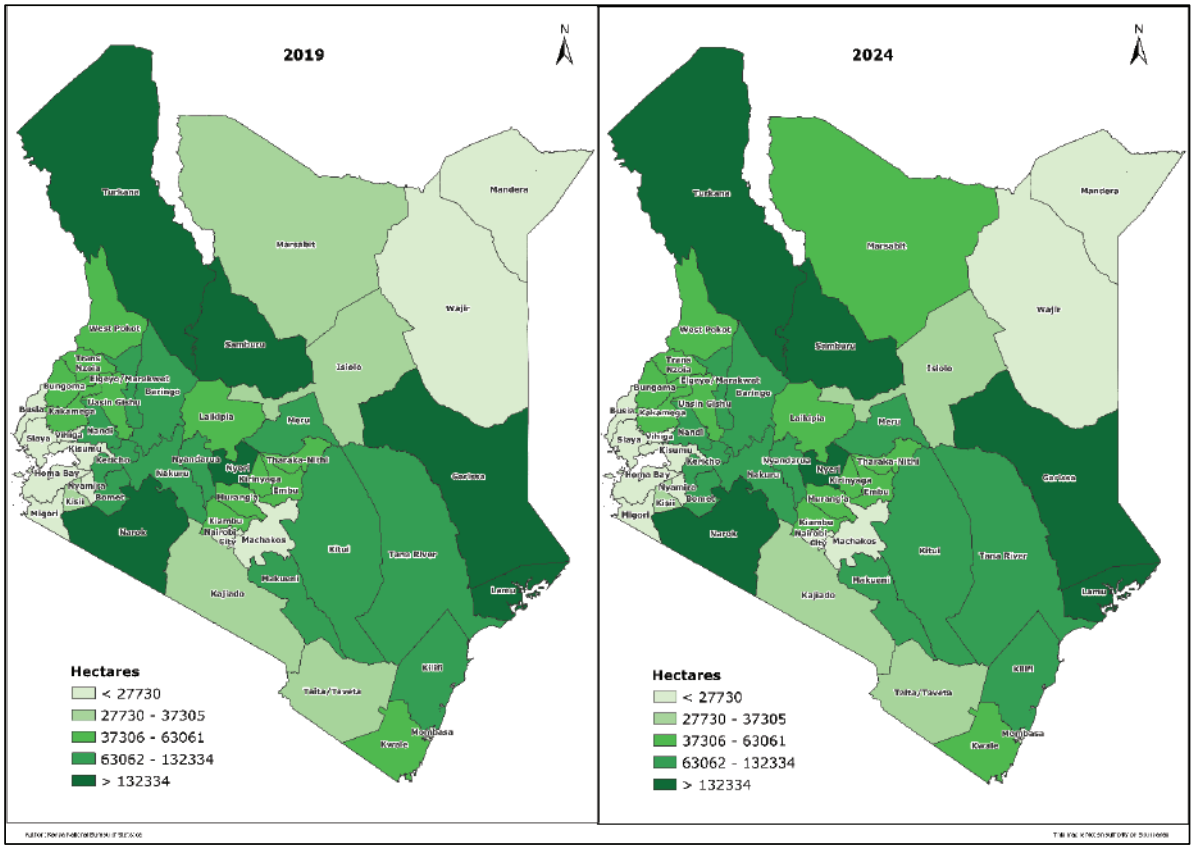
Table 6. Comparison of forest statistics by county

County	2024 Forest Cover (ha)	2024 Rank by Forest Area	2024 Forest Cover in % in relation to County Size	2024 Rank by % of Forest Area
Baringo	118,921	7	10.83%	24
Bomet	73,744	17	29.41%	5
Bungoma	48,011	24	15.88%	18
Busia	11,291	41	6.64%	31
Elgeyo/Marakwet	95,101	10	31.37%	3
Embu	45,558	27	16.15%	17
Garissa	307,668	2	6.87%	30
Homa Bay	11,863	40	3.76%	37
Isiolo	31,019	34	1.22%	44
Kajiado	36,590	32	1.67%	43
Kakamega	60,494	21	20.05%	13
Kericho	69,769	18	28.64%	6
Kiambu	43,675	30	17.20%	16
Kilifi	75,497	16	6.01%	34
Kirinyaga	41,399	31	28.00%	8
Kisii	30,258	35	22.87%	12
Kisumu	7,595	44	3.64%	38
Kitui	108,085	8	3.55%	39
Kwale	63,018	19	7.64%	29
Laikipia	59,491	22	6.26%	32
Lamu	262,405	5	41.76%	2
Machakos	19,026	38	3.15%	40
Makueni	86,102	14	10.53%	25
Mandera	2,654	46	0.10%	47
Marsabit	44,929	28	0.63%	45
Meru	101,520	9	14.49%	21
Migori	24,453	37	9.36%	27
Mombasa	1,972	47	8.97%	28
Murang'a	61,901	20	24.54%	11
Nairobi	7,232	45	10.27%	26
Nakuru	90,960	12	12.12%	23
Nandi	86,825	13	30.47%	4
Narok	271,322	3	15.13%	19
Nyamira	24,571	36	27.38%	9
Nyandarua	93,926	11	28.59%	7
Nyeri	152,155	6	45.76%	1

Table 6. Comparison of forest statistics by county *Continued*

County	2024 Forest Cover (ha)	2024 Rank by Forest Area	2024 Forest Cover in % in relation to County Size	2024 Rank by % of Forest Area
Samburu	318,983	1	15.13%	20
Siaya	9,800	42	3.87%	36
Taita/Taveta	31,339	33	1.83%	42
Tana River	75,566	15	1.99%	41
Tharaka-Nithi	46,014	26	17.94%	15
Trans Nzoia	46,146	25	18.49%	14
Turkana	269,213	4	3.95%	35
Uasin Gishu	44,390	29	13.06%	22
Vihiga	14,565	39	25.84%	10
Wajir	8,146	43	0.14%	46
West Pokot	56,323	23	6.17%	33
Total	**3,591,486**			

Figure 6: Forest Cover in Hectares per County for 2019 and 2024 in Relation to the Total Land Area of Kenya

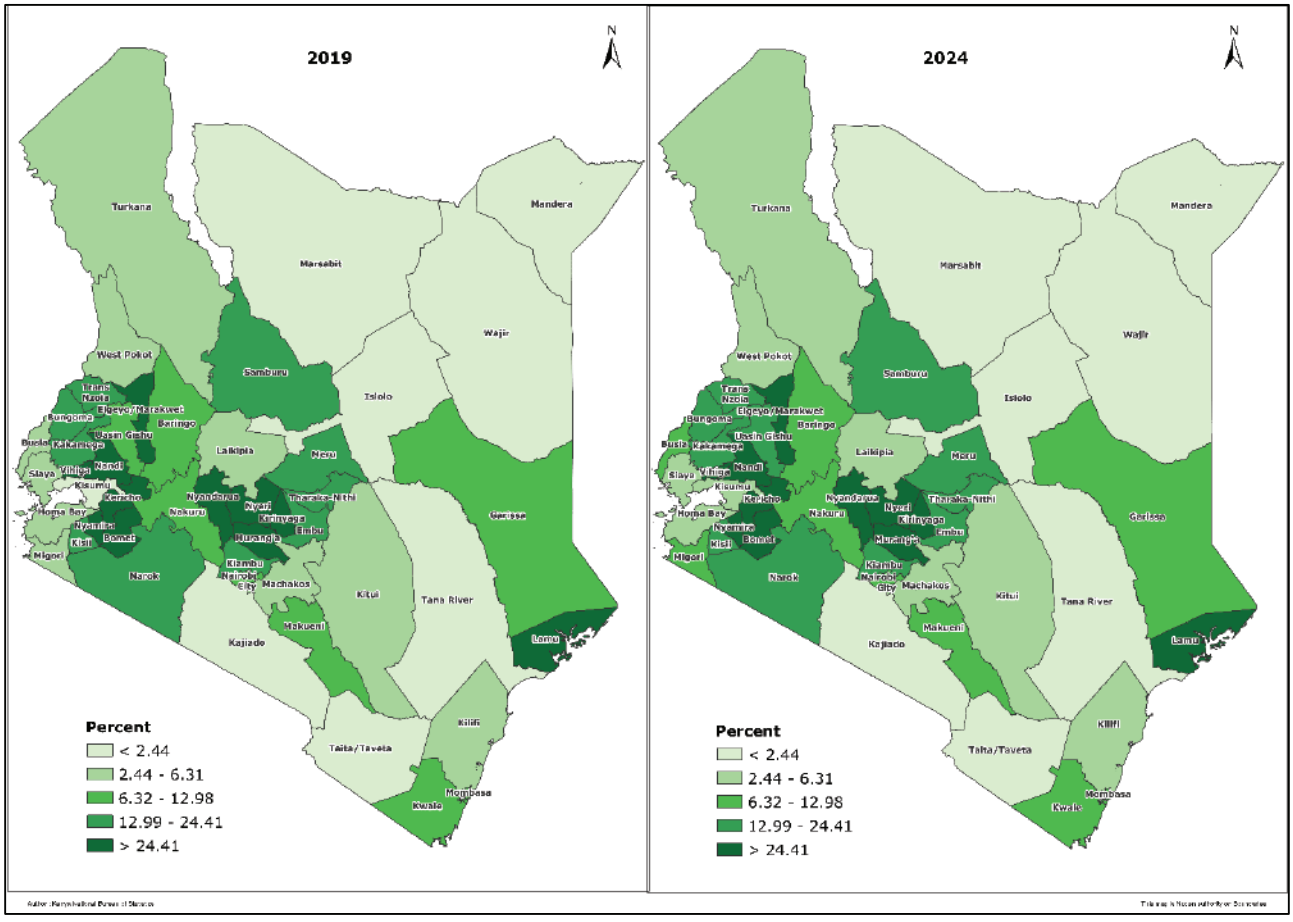


Source: KNBS

3.1.5 Forest Cover as a Proportion of County Land Area: 2019 and 2024

This section examines forest cover in each of Kenya's 47 counties expressed as a percentage of the respective county's total land area. This proportional measure provides a more meaningful basis for inter-county comparison than absolute hectare figures alone, since it accounts for the substantial variation in county size across the country. As shown in Figure 7, Nyeri had the highest proportion, rising from 44.03% to 45.76%, followed by Lamu (42.00% to 41.76%) and Elgeyo/Marakwet (31.66% to 31.37%), which remained relatively stable. Significant growth was observed in Nandi (24.46% to 30.47%), Kakamega (16.35% to 20.05%), Migori (6.21% to 9.36%), Kisii (21.20% to 22.87%), and Makueni (8.74% to 10.53%). Some counties saw little to no change, such as Mombasa, Nairobi, Nakuru, Taita/Taveta, and West Pokot, while a few experienced slight declines, including Kiambu (18.04% to 17.20%), Narok (15.90% to 15.13%), Murang'a (24.58% to 24.54%), Wajir (0.16% to 0.14%), Lamu (42.00% to 41.76%), and Elgeyo/Marakwet (31.66% to 31.37%).

Figure 7: County-Level Forest Cover (%) Relative to County Land Area in 2019 and 2024



Source: KNBS

3.1.6 Net Change in Forest Cover by County, 2019–2024

Figure 8 presents the net change in forest cover by county in Kenya between 2019 and 2024. Kenya recorded a net increase of approximately 124,003 hectares of forest cover across counties. It was noted that there were good performers in terms of forest increase (Table 7). Turkana registered the highest increase of +23,978 hectares (245,235 to 269,213 ha), followed by Nandi (+17,134 ha) and Makueni (+14,657 ha). Other notable gains include Kakamega (+11,184 ha), Migori (+8,236 ha), and Marsabit (+8,111 ha). Moderate increases were observed in Uasin Gishu (+6,257 ha), Nyeri (+5,759 ha), Nyandarua (+4,949 ha), and Tana River (+4,340 ha).

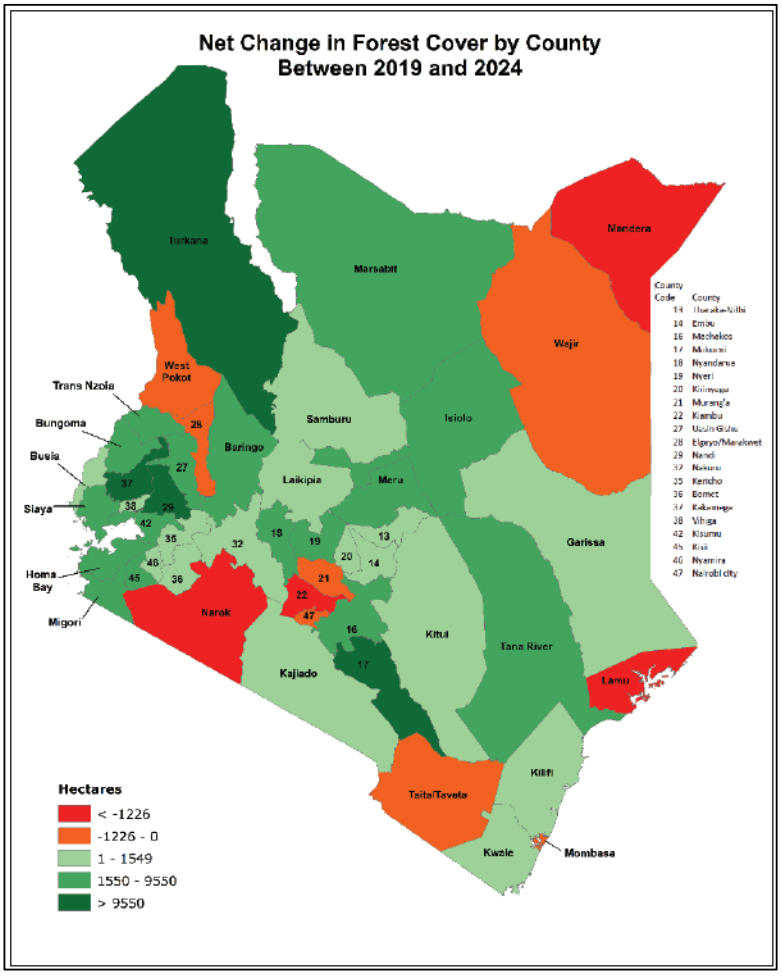
Conversely, forest losses were recorded in several counties, with Narok experiencing the largest decline of -13,800 hectares (285,122 to 271,322 ha). This was followed by Kiambu (-2,128 ha), Mandera (-1,948 ha), Lamu (-1,458 ha), Wajir (-1,059 ha), and Elgeyo/Marakwet (-889 ha). Murang'a recorded a marginal decline of -120 hectares, while West Pokot remained stable at 56,323 hectares.

Table 7. Comparison of forest gains and forest losses by county (2019–2024)

Top Ten Counties with Forest Gains				
County	**2019 Forest Cover in Hectares**	**2024 Forest Cover in Hectares**	**Net Change**	**Rank by Net Change**
Turkana	245,235	269,213	23,978	1
Nandi	69,692	86,825	17,134	2
Makueni	71,445	86,102	14,657	3
Kakamega	49,310	60,494	11,184	4
Migori	16,218	24,453	8,236	5
Marsabit	36,818	44,929	8,111	6
Uasin Gishu	38,133	44,390	6,257	7
Nyeri	146,396	152,155	5,759	8
Nyandarua	88,977	93,926	4,949	9
Tana River	71,226	75,566	4,340	10

Counties with Forest Loss				
County	**2019 Forest Cover in Hectares**	**2024 Forest Cover in Hectares**	**Net Change**	**Rank by Net Change**
West Pokot	56,323	56,323	-	40
Murang'a	62,021	61,901	(120)	41
Elgeyo/Marakwet	95,990	95,101	(889)	42
Wajir	9,205	8,146	(1,059)	43
Lamu	263,864	262,405	(1,458)	44
Mandera	4,602	2,654	(1,948)	45
Kiambu	45,804	43,675	(2,128)	46
Narok	285,122	271,322	(13,800)	47

Figure 8: Net Change in Forest Cover (Hectares) by County Between 2019 and 2024



3.2 Forest Opening and Closing Stocks

The section assesses the dynamics of Kenya's forest assets between 2019 and 2024, focusing on afforestation, deforestation, and the resulting changes in forest opening and closing stocks at both national and county levels.

3.2.1 National-Level Forest Opening and Closing Stocks (2019–2024)

At the national level, the data indicate a gradual increase in forest area over the period. The opening forest stock stood at 3,467,483 hectares in 2019 and rose steadily to 3,591,486 hectares by 2024 (Table 8), representing a net gain of approximately 124,003 hectares, equivalent to an annual gain of 24,801 hectares. Annual additions to forest area through afforestation varied during the period, beginning at about 56,035 hectares between 2019 and 2020, remaining similar in the following year, and then increasing significantly to 92,426 hectares between 2021 and 2022 and 98,275 hectares between 2022 and 2023. This was followed by a lower level of afforestation of 39,604 hectares between 2023 and 2024. Over the same period, as shown in Table 5, deforestation ranged from 27,696 hectares to 68,939 hectares, with the highest level of forest loss recorded between 2022 and 2023. Despite these reductions, afforestation consistently exceeded deforestation across the accounting period, resulting in a steady increase in the national forest stock.

Table 8: Forest Opening and Closing Stocks (2019–2024)

Land Category	2019	2020	2021	2022	2023	2024
Opening Stock (ha)	**3,467,483**	**3,495,823**	**3,516,855**	**3,550,328**	**3,579,664**	**3,591,486**
Additions - Afforestation [ha]	56,035	56,087	92,426	98,275	39,604	
Reductions - Deforestation [ha]	27,696	35,054	58,953	68,939	27,782	
Closing Stock (ha)	**3,495,823**	**3,516,855**	**3,550,328**	**3,579,664**	**3,591,486**	

3.2.2 County-Level Forest Opening and Closing Stocks (2019–2024)

Forest dynamics in Kenya are largely determined by the interplay between afforestation and deforestation processes. Between 2019 and 2024, the country recorded an overall positive trend in forest cover, with a net increase of approximately 124,003 hectares. This expansion is primarily attributable to cumulative afforestation of 342,427 hectares, which substantially exceeds total deforestation of 218,424 hectares. On an annual basis, this corresponds to an average of about 68,485 hectares afforested, compared to 43,685 hectares deforested, underscoring the dominant role of restoration efforts in driving net forest gains.

At the county level, the data reveal considerable variation in both the extent of forest holdings and the direction of change over the accounting period. Among Kenya's 47 counties, several recorded substantial increases in forest area, largely driven by significant afforestation efforts. The most dramatic forest growth was recorded in Turkana County (Table 9), which added an extraordinary 45,280 hectares through afforestation while losing 21,302 hectares to deforestation, yielding a net gain of nearly 24,000 hectares — the largest absolute net gain of any county. Similarly, Nandi registered notable growth from 69,692 ha to 86,825 ha, driven by an impressive 33,496 ha of afforestation. Similarly, Makueni County recorded the second-highest afforestation volume at 26,434 hectares, expanding its forest estate from 71,445 to 86,102 hectares, a net increase of roughly 14,657 hectares.

Kakamega, Kenya's home to one of the last remnants of equatorial rainforest, showed encouraging momentum — afforesting 16,258 hectares against just 5,074 hectares lost, growing from 49,310 to 60,494 hectares. Tana River, Nyandarua, and Nyeri also posted meaningful net gains, with Nyeri growing from 146,396 to 152,155 hectares, underlining the continued importance of the Mt. Kenya Forest ecosystem corridor.

Other counties with marked increases include Marsabit (from 36,818 ha to 44,929 ha), and Uasin Gishu (from 38,133 ha to 44,390 ha), all reflecting strong gains, where afforestation clearly surpassed deforestation. Smaller but consistent increases are also observed in counties such as Embu, Kirinyaga, Nyeri, and Trans Nzoia.

Conversely, some counties experienced net declines due to higher deforestation relative to afforestation. Narok recorded the most significant loss, decreasing from 285,122 ha to 271,322 ha, as deforestation (28,240 ha) far exceeded afforestation (14,440 ha). Mandera also showed a sharp decline from 4,602 ha to 2,654 ha, driven by relatively high deforestation. Kiambu and Lamu similarly registered modest reductions in forest area.

A number of counties exhibited relatively stable forest cover where gains and losses were nearly balanced. For example, Nakuru, Laikipia, and West Pokot showed minimal net change, indicating equilibrium between afforestation and defor-

estation. In addition, counties such as Mombasa, Nairobi, and Taita Taveta reported no recorded changes during the period.

In summary, the data indicates that while afforestation initiatives are having a positive impact across most counties, localized deforestation pressures remain significant in certain regions. Sustaining and scaling up afforestation efforts, particularly in counties experiencing net losses, will be critical to maintaining the overall upward trend in national forest cover. The afforestation efforts, however, do not ensure that the value and quality of afforested areas mirror those of forests that were previously there.

Table 9. County statistics of opening and closing stocks of forest area (2019–2024)

County	Areas of Forest in Ha (2019 -2024)			
	Initial Area in 2019	Total Afforestation	Total Deforestation	Closing Area 2024
Baringo	117,029	5,588	3,697	118,921
Bomet	72,541	7,736	6,533	73,744
Bungoma	45,804	6,952	4,745	48,011
Busia	9,862	3,486	2,058	11,291
Elgeyo-Marakwet	95,990	4,775	5,664	95,101
Embu	44,050	4,045	2,538	45,558
Garissa	306,380	4,345	3,057	307,668
Homa Bay	8,547	4,315	999	11,863
Isiolo	27,833	3,186	-	31,019
Kajiado	36,161	429	-	36,590
Kakamega	49,310	16,258	5,074	60,494
Kericho	68,596	9,450	8,276	69,769
Kiambu	45,804	929	3,057	43,675
Kilifi	74,732	3,057	2,292	75,497
Kirinyaga	40,544	1,499	644	41,399
Kisii	28,052	6,861	4,655	30,258
Kisumu	4,164	6,348	2,917	7,595
Kitui	107,825	3,856	3,596	108,085
Kwale	62,679	1,269	929	63,018
Laikipia	59,391	3,586	3,486	59,491
Lamu	263,864	1,079	2,537	262,405
Machakos	15,560	5,464	1,998	19,026
Makueni	71,445	26,434	11,777	86,102
Mandera	4,602	539	2,487	2,654
Marsabit	36,818	9,650	1,538	44,929
Meru	97,524	5,354	1,358	101,520
Migori	16,218	9,774	1,538	24,453
Mombasa	1,972	-	-	1,972

Table 9: County Statistics of Opening and Closing Stocks of Forest Area (2019-2024) *Continued*

County	Areas of Forest in Ha (2019 -2024)			
	Initial Area in 2019	Total Afforestation	Total Deforestation	Closing Area 2024
Murang'a	62,021	11,009	11,129	61,901
Nairobi	7,232	-	-	7,232
Nakuru	90,950	6,828	6,818	90,960
Nandi	69,692	33,496	16,362	86,825
Narok	285,122	14,440	28,240	271,322
Nyamira	24,107	8,026	7,563	24,571
Nyandarua	88,977	12,401	7,452	93,926
Nyeri	146,396	8,137	2,377	152,155
Samburu	318,653	6,973	6,643	318,983
Siaya	7,232	2,567	-	9,800
Taita Taveta	31,339	-	-	31,339
Tana River	71,226	14,215	9,875	75,566
Tharaka-Nithi	45,584	429	-	46,014
Trans Nzoia	42,735	9,599	6,188	46,146
Turkana	245,235	45,280	21,302	269,213
Uasin Gishu	38,133	9,255	2,998	44,390
Vihiga	14,026	539	-	14,565
Wajir	9,205	999	2,058	8,146
West Pokot	56,323	1,968	1,968	56,323
Total [ha]	**3,467,483**	**342,427**	**218,424**	**3,591,486**
Average [ha/yr]		**68,485**	**43,685**	

3.2.3 County-Level Trends: Annual Afforestation and Deforestation (2019–2024)

The average levels of afforestation and deforestation across counties between 2019 and 2024 show notable spatial variation in forest dynamics (Figure 9). At the national level, afforestation averaged 68,485 hectares per year, substantially surpassing the average annual deforestation rate of 43,685 hectares per year, thereby resulting in an overall net gain in forest area over the period.

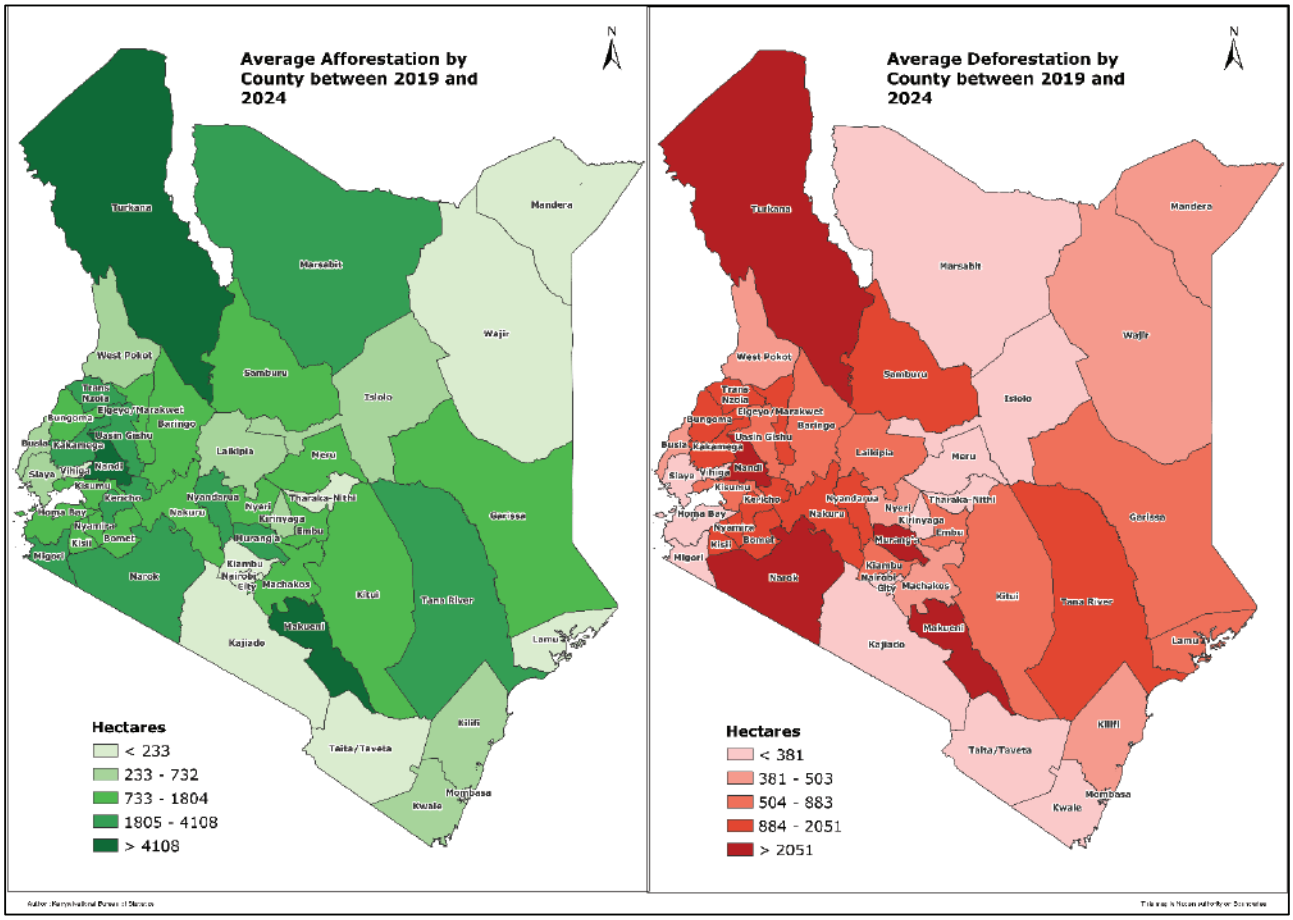
At the county level, distinct patterns emerge when focusing on annual rates. Several counties demonstrated exceptionally high afforestation rates, significantly outpacing deforestation. Counties with the strongest positive balances include Turkana (9,056 vs 4,260 ha/yr), Nandi (6,699 vs 3,272 ha/yr), and Makueni (5,287 vs 2,355 ha/yr), where afforestation significantly exceeded deforestation. Kakamega (3,252 vs 1,015 ha/yr) and Tana River (2,843 vs 1,975 ha/yr) also recorded notable gains.

Moderate gains were observed in counties such as Marsabit (1,930 vs 308 ha/yr), Migori (1,955 vs 308 ha/yr), Trans Nzoia (1,920 vs 1,238 ha/yr), and Uasin Gishu (1,851 vs 600 ha/yr), where afforestation consistently outpaced deforestation.

In contrast, Narok (2,888 vs 5,648 ha/yr) recorded the highest imbalance in favour of deforestation, followed by Mandera (108 vs 497 ha/yr), Lamu (216 vs 507 ha/yr), and Kiambu (186 vs 611 ha/yr), indicating net forest losses.

Counties such as Nakuru (1,366 vs 1,364 ha/yr), Laikipia (717 vs 697 ha/yr), Samburu (1,395 vs 1,329 ha/yr), and West Pokot (394 vs 394 ha/yr) showed near balance between gains and losses. Overall, while high-afforestation counties are driving national recovery, elevated deforestation rates in a few counties continue to constrain overall progress.

Figure 9: An Illustration of the Area (Hectares) of Afforestation (left) and Deforestation (right) by Counties in the 5 years (2019-2024)





3.3 Forest Biomass and Volume Estimations

Forest stocks are presented here in two units: volume for public plantations and biomass for the natural forests. The volumes relate to exotic plantations that are planted under a commercial forestry programme comprising about 152,000 ha and is managed by the Kenya Forest Service.

3.3.1 Volumes of Standing Wood

Forest volumes were estimated using wood stock data from public plantations managed by the Kenya Forest Service (KFS). These plantations are managed to meet national demand for wood products and are operated under a rotation cycle of up to 30 years. Under this management system, approximately 5,000 hectares are scheduled for harvesting annually, followed by replanting to ensure the continued sustainability of plantation resources.

The results show that about 26.3 million m^3 of wood stocks were available in Kenya's public plantations, representing forest stands at different stages of growth and development. As shown in Table 10, wood stocks in public forests managed by KFS increased steadily from 24,614 thousand m^3 in 2019 to 26,333 thousand m^3 by 2022, after which the total volume remained stable through 2023 and 2024. This increase reflects the gradual maturation of plantation forests as well as improvements in forest management during the early years of the period.

Among the species, *Cupressus lusitanica* consistently accounted for the largest share of total wood stocks, increasing from 10.98 million m^3 in 2019 to 11.746 million m^3 by 2022, after which the stock levels remained stable. *Pinus patula* represented the second-largest component, rising from 5.468 million m^3 in 2019 to 5.850 million m^3 in 2022, and remaining constant through 2024. The category classified as other species also exhibited steady growth, increasing from 6.448 million m^3 in 2019 to 6.899 million m^3 by 2022, before stabilizing at that level in the subsequent years.

Although contributing a smaller share of the total wood stock, *Eucalyptus* species followed a similar pattern, increasing gradually from 1.718 million m^3 in 2019 to 1.838 million m^3 in 2022, after which no further changes were recorded. Overall, the data indicate moderate growth in wood stocks between 2019 and 2022 (Figure 10), driven largely by the expansion and maturation of major plantation species, followed by a period of stability thereafter.

Data on standing wood stocks in private plantations were not available. Consequently, an assumption was made that private plantations could contribute an additional volume equivalent to 50% of the estimated annual wood supply from public plantations. Based on this assumption, Kenya's estimated annual wood supply from public and private plantations is approximately 1.5 million m^3, potentially supporting key wood-dependent industries, including furniture manufacturing and construction.

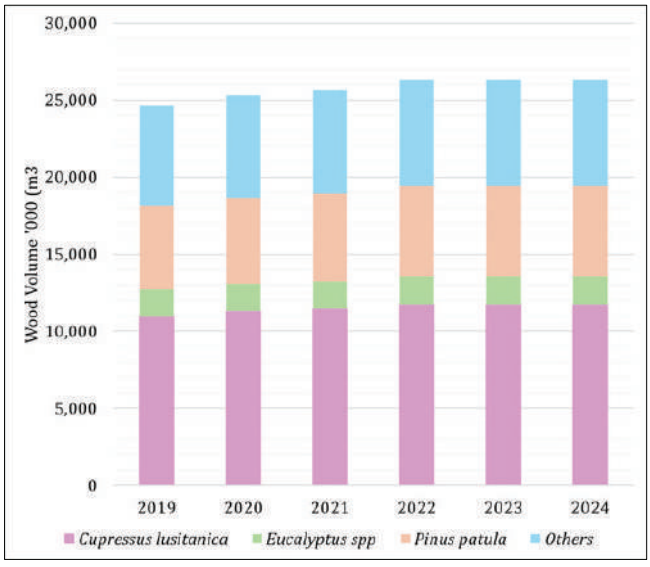
This estimate is based on an annual allowable harvest of 5,000 hectares from public plantations, with an assumed average standing timber volume of 200 m^3 per hectare. This translates to an estimated annual wood supply of 1.0 million m^3 from public plantations (5,000 ha × 200 m^3/ha). Applying the assumption that private plantations contribute an additional 500,000 m^3 annually, equivalent to 50% of the estimated public plantation supply, brings the total estimated annual wood supply to approximately 1.5 million m^3.

Table 10: Volume of Wood Stocks for Different Commercial Forestry Species (2016-2024)

Species	Wood Stocks in '000 m³ for Different Species in the Public Forests under KFS					
	2019	2020	2021	2022	2023	2024
Cupressus lusitanica	10,980	11,286	11,440	11,746	11,746	11,746
Eucalyptus spp	1,718	1,766	1,790	1,838	1,838	1,838
Pinus patula	5,468	5,621	5,697	5,850	5,850	5,850
Others	6,448	6,628	6,718	6,899	6,899	6,899
Total stocks	**24,614**	**25,301**	**25,645**	**26,333**	**26,333**	**26,333**

Source: KFS

Figure 10: A Cumulative Bar Graph Showing the Contribution of Different Commercial Tree Species in The Wood Stocks of Public Plantations



Source: KFS

3.3.2 Above-Ground Biomass by Forest Stratum (2019–2024)

Forest biomass stocks were estimated using specific emission factors applied to each forest stratum, as employed in the development of Kenya's Forest Reference Level for REDD+[14] (Republic of Kenya, 2019) and the Biennial Transparency Report (Government of Kenya, 2024). These estimates account for stock at a given time, as well as changes due to deforestation and afforestation.

As indicated in Table 11, Montane forests, with an average above-ground biomass (AGB) of 132.79 t/ha, maintain a higher closing stock of 201,687,323 tonnes compared to dryland forests, which have an average stock of 52.66 t/ha and a closing stock of 55,600,040 tonnes, despite the latter covering larger areas. This indicates that deforestation in montane and Western Rain forests, which have higher biomass per hectare, results in greater total biomass losses than in forests with lower per-hectare stocks.

Overall, deforestation activities in Kenya's forests led to a total loss of 20,191,868 tonnes of above-ground biomass over the period 2019 - 2024, corresponding to an average annual loss of 4,038,374 tonnes.

[14] Republic of Kenya. (2019). T*he National Forest Reference Level for REDD+ implementation. Ministry of Environment and Forestry.*

[15] Government of Kenya. (2024). *Kenya's First Biennial Transparency Report (BTR1) to the United Nations Framework Convention on Climate Change. Ministry of Environment, Climate Change and Forestry.*

Table 11: Opening and Closing Stocks of Above-Ground Biomass in The Recent Years (2019-2024)

Strata	Above Ground Biomass (Tonnes) in the Period 2019 - 2024			
	Opening stock in 2019	Increase from Afforestation	Decrease from Deforestation	Closing stock in 2024
Coastal Forest	57,331,754	36,689	1,089,860	56,278,582
Dryland Forest	59,345,568	368,647	4,114,174	55,600,040
Mangrove	1,092,136	-	39,088	1,053,049
Montane Forest	216,266,758	1,527,875	16,107,311	201,687,323
Western Rain Forest	11,116,445	55,441	830,086	10,341,800
Grand Total	**345,152,661**	**1,988,651**	**22,180,519**	**324,960,794**

3.3.3 Economic Losses from Forest Loss Across Forest Strata (2019–2024)

To quantify the fiscal impact of forest cover change, losses in forest biomass were converted to carbon dioxide equivalent (CO_2e) emissions in strict accordance with the 2019 IPCC Guidelines[16] for National Greenhouse Gas Inventories. The resulting emissions were then assigned an economic value using a conservative carbon price of USD 10 per tonne, a figure grounded in prevailing market conditions and benchmarked against South Africa's current carbon price of USD 13 per tonne (World Bank Group, n.d.)[17]. The resulting estimates indicate a substantial depletion of natural capital across all forest strata between 2019 and 2024. The total economic loss over the period is estimated at USD 369,637,228 (KES 48,052,839,640), representing an average annual fiscal impact of approximately USD 73,927,446 (KES 9,610,567,980), as indicated in Table 12.



Montane forests account for the largest share of the losses, totalling approximately USD 251.3 million, followed by dryland forests at USD 64.5 million. As highlighted in the biomass analysis, the greatest economic losses occur when forests with higher biomass stocks, such as montane and western rainforests, are deforested. Plantation forests recorded losses of USD 21.7 million, while coastal forests and western rainforests accounted for USD 18.1 million and USD 13.3 million, respectively. Mangrove forests experienced the lowest losses, amounting to USD 0.67 million over the assessment period.

[16] Intergovernmental Panel on Climate Change, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use – Chapter 2: Generic Methods (Kanagawa, Japan: IPCC-NGGIP, 2019), available at: https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch02_Generic%20Methods.pdf

[17] World Bank Group. (n.d.). Carbon pricing dashboard: Compliance prices. Retrieved March 7, 2026, from https://carbonpricingdashboard.worldbank.org/compliance/price

Table 12: Economic Loss in USD Due to Deforestation in The Period (2019-2024)

Strata	Economic Loss (Million USD) due to forest loss	
	Annual loss for the period 2019-2024	Total loss for the Period 2019 - 2024
Coastal Forest	3,629,932	18,149,661
Dryland Forest	12,909,585	64,547,924
Mangrove	134,723	673,614
Montane Forest	50,250,454	251,252,269
Plantation Forest	4,332,809	21,664,044
Western Rain Forest	2,669,943	13,349,716
Grand Total	**73,927,446**	**369,637,228**

3.3.4 Biomass Supply by Tree Resources

Based on estimated rates of deforestation and forest degradation over the period 2019 to 2024, Table 13 presents calculated biomass supply estimates derived primarily from tree resources to meet Kenya's charcoal and firewood demand. The data indicate that tree resources supply a total of approximately 34,060,905 tonnes of biomass annually, supporting both industrial energy requirements, such as those of tea processing factories, and domestic household consumption.

Kenya's woodlands, which cover an estimated 40% or more of the national land area, constitute the principal source of this biomass. This finding is consistent with the results of the land cover analysis presented in the land accounts, which show that these woodland areas are undergoing rapid conversion to open grasslands and annual croplands.

Table 13: Average Annual Biomass Supply from Tree Resources in The Period 2019-2024)

Sources of Biomass	Average Annual Biomass Supply (Tonnes) In the Period 2019 - 2024
Deforestation	4,038,374
Forest degradation	3,028,780
From agroforestry	6,057,560
From woodlands	10,095,934
From plantation forests	744,323
From private forests	10,095,934
Total	**34,060,905**



3.3.5 Forests As Food Sources

Kenya's public forests contribute to food security through the Plantation Establishment and Livelihood Improvement Scheme (PELIS)[18]. PELIS is a community-based forest management programme implemented by the Kenya Forest Service (KFS) that integrates food production with forest restoration efforts (KEFRI, 2014). Under the program, forest-adjacent communities, typically organised into Community Forest Associations (CFAs), are granted temporary rights to cultivate small plots within young plantation forests. In exchange, they are responsible for planting and nurturing tree seedlings, creating a mutually beneficial system where communities gain access to food and income, while forests receive active protection and care.

Common crops grown under PELIS include maize, beans, potatoes, and vegetables, providing direct nutritional and economic benefits to households that often have limited access to arable land. As the trees mature and the canopy closes, crop cultivation is gradually phased out, leaving the trees fully established and reducing pressure on natural forest resources.

Through this approach, Kenya's public forests act as both a restoration area and a source of food resources, contributing an estimated KES 182–420 million annually to domestic incomes (Table 14). This estimate is conservative, as it excludes additional forest-derived foods such as traditional vegetables, insects, and other non-timber forest products.

Table 14. Estimated area and income related to food resources obtained from forests (2016–2024)

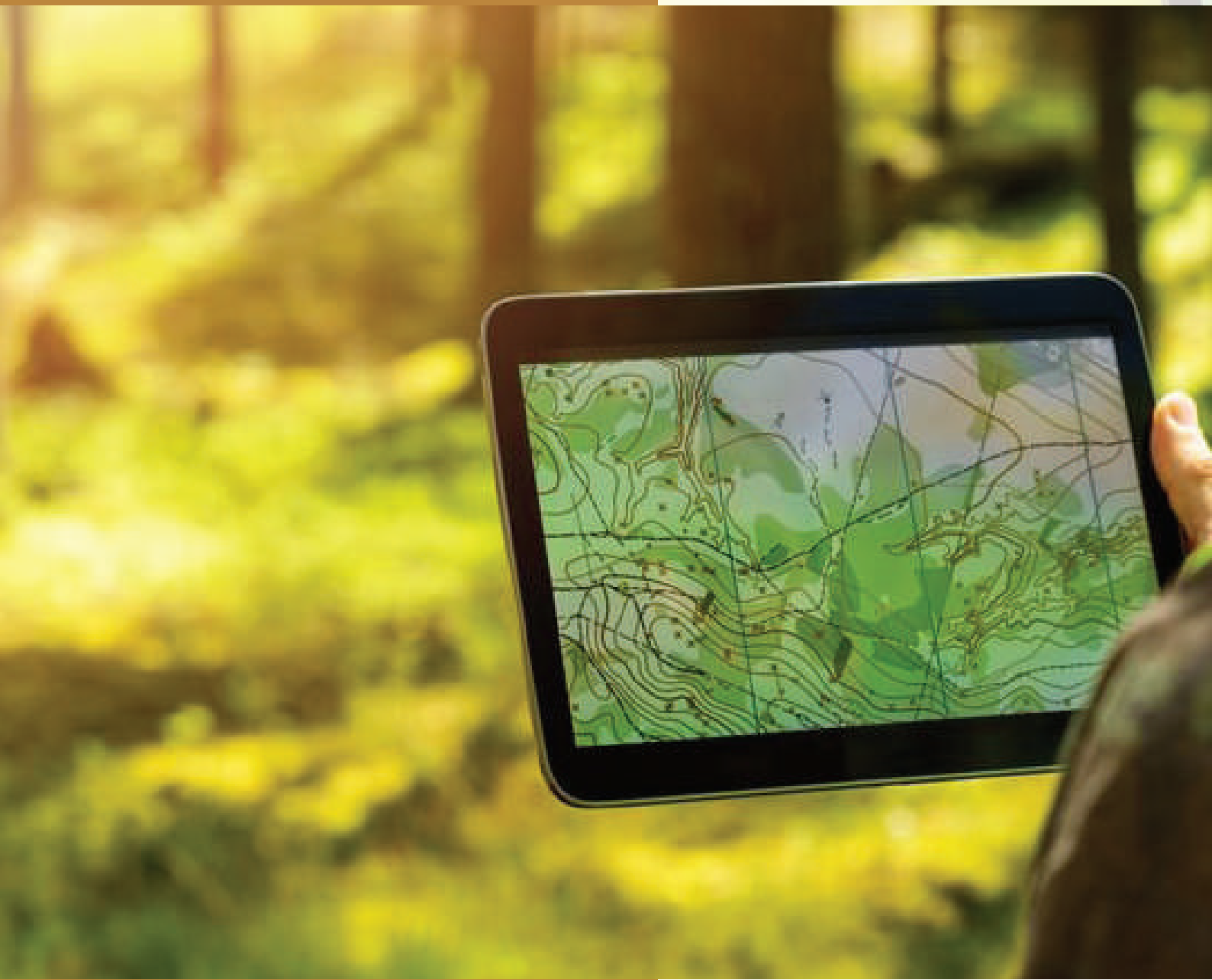
Types of Food	Area (Ha) Supporting the Production of Different Types of Foods in Forests					
	2019	2020	2021	2022	2023	2024
Maize	3,814	2,859	2,382	1,427	1,427	1,427
Potatoes	1,526	1,144	953	571	571	571
Cabbage and Kales	1,526	1,144	953	571	571	571
Peas	763	572	476	285	285	285
Others	782	782	782	782	782	782
Total	**8,410**	**6,500**	**5,545**	**3,636**	**3,636**	**3,636**

Types of Food	Income (Ksh in Millions) From Food Resources Obtained in Forests					
	2019	2020	2021	2022	2023	2024
Maize	191	143	119	71	71	71
Potatoes	76	57	48	29	29	29
Cabbage and Kales	76	57	48	29	29	29
Peas	38	29	24	14	14	14
Others	39	39	39	39	39	39
Total	**421**	**325**	**277**	**182**	**182**	**182**

[18] Kenya Forestry Research Institute. (2014). Contribution of PELIS in increasing tree cover and community livelihoods in Kenya. https://www.kefri.org/assets/publications/extension/Contribution%20of%20pelis%20in%20increasing%20tree%20cover%20and%20community%20livelihoods%20in%20Kenya.pdf

04

Supply and Use Tables



The Physical Supply and Use Tables (PSUTs) constitute a core analytical component of the Natural Capital Accounts, providing a structured framework for tracking the flow of forest resources, in physical units, from their point of origin through to their final use. The PSUTs are constructed in accordance with the **System of Environmental-Economic Accounting (SEEA)** framework, which prescribes standardised methods for integrating environmental data with economic statistics. The tables capture the full lifecycle of forest products and services, encompassing extraction, processing, trade, and consumption, thereby enabling a comprehensive assessment of how forest resources contribute to the national economy.

4.1 Physical Supply and Use Tables

The Physical Supply and Use Tables (PSUTs) for the period 2021–2024 provide a comprehensive overview of the production, supply, and utilization of forest resources in physical terms.

4.1.1 The Physical Supply Flow Account

Table 15 presents the results of the biomass assessment, indicating that the net cumulative change in forest resources between 2021 and 2024 amounted to approximately −23.3 million m³, reflecting an overall decline in forest stock volume. Although the area experiencing forest gain remains larger than the area affected by deforestation, the volume of wood lost substantially exceeds the volume gained. This difference arises because newly established or reforested areas require time to accumulate wood volume, whereas deforestation results in the immediate loss of accumulated wood stock, particularly in mature forests.

Regarding the extraction of forest resources, total gross fellings were estimated at 343.9 million m³. Of this volume, approximately 223.6 million m³ (65.0%) remained as felling residues, while 120.4 million m³ (35.0%) was removed from the forest as roundwood and bark. After accounting for 13.8 million m³ of bark, removals under bark amounted to 106.5 million m³. Of this volume, approximately 29.8 million m³ was recorded as roundwood output for industrial and other wood-product uses. Imports of 14.8 million m³ increased the total roundwood supply to 44.6 million m³, indicating that imports accounted for approximately one-third of the total roundwood available to the economy. These imports helped meet domestic demand for wood products. However, the lack of disaggregated import data meant that the imported volumes could not be allocated to specific product categories in the Physical Supply and Use Tables (PSUT). The recorded industrial roundwood products comprised sawlogs and veneer logs (23.9 million m³), pulpwood, round and split (2.7 million m³), and other industrial roundwood (3.3 million m³).

Wood fuel was by far the largest forest product category by volume. Domestic production was estimated at 258,495,655 m³, supplemented by negligible imports of approximately 3,300 m³, resulting in a total supply of approximately 258,498,951 m³. Wood fuel accounted for roughly 82% of the combined supply of bark, roundwood and wood fuel, highlighting the substantial reliance of Kenyan households and enterprises on wood-based energy resources.



23.3 million m³

Net Forest Stock Decline (2021–2024). Despite greater forest area gains, wood losses exceeded gains due to the immediate loss of mature forest stocks and the slow growth of newly established forests.



343.9 million m³

Total gross fellings were estimated at 343.9 million m³, of which 223.6 million m³ remained as felling residues, leaving removals (over bark) at 120.4 million m³.



258.5 million m³

The supply of forest products is dominated by wood fuel, which reached 258.5 million m³, highlighting its critical role in the energy mix.

Table 15. Physical Supply Flow Account Tables (2021–2024)

Cubic Metres

Product	Forestry activity (ISIC 021)	Logging activity (ISIC 022)	Total Output	Imports	Total Supply
Net cummulative Increment (M^3)	-23,293,077.30		**-23,293,077.30**		**-23,293,077.30**
Gross fellings		343,932,115.13			-
Felling residues (not removed)		223,555,874.83			-
Removals (over bark)		120,376,240.29			-
Bark		13,848,594.02	**13,848,594.02**		**13,848,594.02**
Removals (under bark)		106,527,646.28			-
Roundwood (under bark)		29,827,740.96	**29,827,740.96**	14,793,510.05	**44,621,251.00**
of which industrial roundwood:					
Sawlogs and veneer logs		23,862,192.77	**23,862,192.77**		**23,862,192.77**
Pulpwood, round and split		2,684,496.69	**2,684,496.69**		**2,684,496.69**
Other industrial roundwood		3,281,051.51	**3,281,051.51**		**3,281,051.51**
Wood fuel		258,495,655.07	**258,495,655.07**	3,295.51	**258,498,950.58**
Other goods (non-wood forest products)			-		-



4.1.2 The Physical Use Flow Account

The Physical Use Flow Account (Table 16) presents the allocation of forest products across industrial activities, household consumption, exports and other uses in Kenya for 2021–2024. It highlights the contribution of forest resources to wood processing, furniture manufacturing, construction and energy supply.

Bark recorded total use of 13.85 million m³, comprising 11.08 million m³ for industrial consumption and 2.77 million m³ for household final consumption and other uses. Roundwood under bark recorded total use of 44.62 million m³, of which 36.18 million m³ was allocated to intermediate industrial consumption, 4.46 million m³ to household final consumption and other uses, and 3.98 million m³ to exports. The leading industrial users were wood and wood products manufacturing (17.42 million m³), furniture manufacturing (7.52 million m³), other manufacturing (4.39 million m³), construction (3.49 million m³), food-product manufacturing (1.57 million m³), and energy generation, including charcoal (1.79 million m³).

Sawlogs and veneer logs recorded total use of 32.13 million m³, comprising 28.95 million m³ of intermediate industrial consumption and 3.18 million m³ of exports. Major industrial users were wood and wood products manufacturing (15.92 million m³), furniture manufacturing (7.24 million m³), construction (2.89 million m³), and other manufacturing (2.32 million m³). The difference between sawlog supply and use arises because Table 15 records domestic sawlog production of 23.86 million m³, while imported roundwood is reported only as an aggregate of 14.79 million m³, without a breakdown by product category due to the lack of disaggregated import data. Table 16 allocates total roundwood supply, comprising domestic production and imports, across product categories. Consequently, sawlog use exceeds recorded domestic sawlog supply by approximately 8.27 million m³, a volume implicitly assumed to be met through imports. However, this should be treated as an accounting assumption rather than a verified estimate of imported sawlogs, pending more detailed import data.

Pulpwood recorded total use of 3.57 million m³, including 3.26 million m³ of intermediate consumption and 0.32 million m³ of exports. Other industrial roundwood recorded 4.42 million m³, comprising 3.98 million m³ of intermediate consumption and 0.44 million m³ of exports.

Wood fuel was the largest product category, with total recorded use of 258.50 million m³. Household final consumption accounted for 256.68 million m³, industrial consumption for 1.82 million m³, and exports for approximately 612 m³. This demonstrates the substantial reliance of Kenyan households on wood-based energy.

The results reveal a discrepancy between recorded domestic wood production and consumption, suggesting that significant volumes may originate from small-scale harvesting, farm trees, private land and community woodlots that are not fully captured by existing forest monitoring systems. Household consumption surveys conducted by the Kenya National Bureau of Statistics (KNBS) provide complementary information that can help improve estimates of wood use. Integrating these surveys with forest inventories, plantation records, private-sector production data and trade statistics would strengthen the completeness and reliability of the Physical Supply and Use Tables.

Demand for firewood, charcoal and timber for furniture and construction is influenced by several interconnected factors, including population growth, urbanisation, household energy requirements, economic development and expanding demand for housing and furniture. Manufacturing activities, particularly furniture production, wood processing, construction and agro-processing, also contribute to demand for timber and wood fuel. Where access to affordable alternative energy sources is limited, continued reliance on biomass energy can sustain high levels of wood fuel consumption. Similarly, growth in construction and furniture manufacturing increases demand for industrial roundwood. These trends underscore the importance of sustainable forest management, improved monitoring of wood supply chains, and the promotion of sustainable tree growing and efficient wood utilisation to meet demand while safeguarding Kenya's forest resources.

Table 16. Physical Use Tables (2021 – 2024)

	Intermediate consumption								Total Industry	Household final consumption	Changes in inventories	Exports	Total Use
Product	Logging Industry	Manufacture of Food Products	Manufacture of Wood and Wood Products	Manufacture of Furniture	Other Manufacturing	Construction	Generation of energy products (including charcoal)	Other Industries		Energy and other uses			
Net cummulative increment	-23,293,077.30												-23,293,077.30
Bark					11,078,875				11,078,875	2,769,719			13,848,594
Roundwood (under bark)		1,573,927	17,421,744	7,518,667	4,385,286	3,491,585	1,791,020	-	36,182,230	4,462,125		3,976,896	44,621,251
of which: industrial roundwood									-				-
Sawlogs and veneer logs		578,916	15,920,181	7,236,446	2,315,663	2,894,578	-		28,945,784			3,181,517	32,127,301
Pulpwood, round and split		-	1,302,560	162,820	1,791,020	-	-		3,256,401			318,152	3,574,552
Other industrial roundwood		995,011	199,002	119,401	278,603	597,007	1,791,020		3,980,045			437,459	4,417,504
Wood fuel								1,821,171	1,821,171	256,677,169		612	258,498,951
Other goods (non-wood forest products)									-				

Overall, the accounts indicate a forestry system dominated by biomass energy consumption (258.50 million m³) compared to relatively smaller industrial uses (44.62 million m³ of roundwood use). The negative net annual increment of -23.29 million m³ further suggests unsustainable pressure on forest resources over the 2021–2024 period.

05

Emerging Issues, Recommendations, and Conclusions



5.1 Summary of Key Results

The forest accounts for the period 2019–2024 reveal an important link between ecological change and national economic stability. The integration of both physical and monetary forest accounts shows that, although Kenya has made notable progress in forest restoration, the continued loss of forest resources still imposes a considerable economic burden. Overall, the findings demonstrate that deforestation represents not only an environmental challenge but also a significant depletion of the country's natural capital.

Economic valuation and fiscal impact: The total economic loss associated with forest biomass depletion between 2019 and 2024 is estimated at USD 369,637,228, equivalent to an average annual loss of approximately USD 73.9 million. This valuation is based on a conservative carbon price of USD 10 per tCO_2e and highlights the substantial economic implications of deforestation, reinforcing the importance of forest conservation and sustainable management in safeguarding Kenya's natural capital base.

Hotspots of natural capital depletion: The accounts further indicate that the most significant economic vulnerabilities are concentrated in high-carbon-stock ecosystems. Montane forests accounted for over 68% of the total losses, equivalent to approximately USD 251.3 million, highlighting the growing pressure on the country's key water tower ecosystems. In addition, although some ASAL counties, such as Baringo and Garissa, recorded signs of recovery, substantial localized losses persist. In particular, Narok County experienced a net forest loss of 13,800 hectares, representing a major localised challenge with implications for biodiversity conservation and the achievement of national climate and emission-reduction targets.

> The integration of both physical and monetary forest accounts shows that, although Kenya has made notable progress in forest restoration, the continued loss of forest resources still imposes a considerable economic burden.

5.1.1 Forest Cover Trends and Recovery (1990–2024)

Kenya's forest cover declined steadily from 3.93 million hectares (6.65% of land area) in 1990 to 3.47 million hectares (5.86%) in 2019, largely due to forest excisions, agricultural expansion, illegal logging, and urbanization. However, a gradual recovery has been observed since 2019, with forest area increasing to 3.59 million hectares (6.07%) by 2024, representing a net gain of approximately 124,003 hectares over the five-year period. Although this recovery indicates the positive effects of afforestation and restoration initiatives, national forest cover remains below the 1990 baseline, highlighting the long-term legacy of forest loss. In terms of canopy density, dense forests remain the dominant class, expanding from 2.22 million hectares to 2.29 million hectares, while moderately dense forests recorded the most notable proportional growth, reaching about 890,128 hectares in 2024. The gradual decline in open forests from 434,383 hectares to 412,127 hectares may reflect improvements in canopy density due to regeneration and restoration, although these ecosystems remain vul-

nerable to land-use conversion and degradation.

5.1.2 Forest Distribution by Strata and County

Ecologically, montane forests constitute the largest forest stratum, increasing from 1.62 million hectares in 2019 to approximately 1.66 million hectares in 2024, and continue to function as Kenya's major water towers and carbon reservoirs. Dryland forests, covering approximately 1.13 million hectares, form the second-largest forest type and are particularly important in Arid and Semi-Arid Land (ASAL) counties. Plantation forests recorded notable expansion from 133,000 hectares to 147,000 hectares, reflecting intensified tree-planting initiatives and reforestation programmes. At the county level, forest distribution remains highly uneven, with the largest forest extents recorded in Samburu (318,983 ha) and Garissa (307,668 ha), while Nyeri had the highest forest cover relative to county size at 45.76%. Encouragingly, counties such as Turkana achieved the largest absolute gain of approximately 23,978 hectares, demonstrating the potential for restoration even in traditionally forest-scarce landscapes. However, Narok County recorded a net loss of about 13,800 hectares, highlighting localized pressures on forest ecosystems.

5.1.3 Opening and Closing Stocks: Afforestation versus Deforestation

Kenya's forest area expanded by approximately 124,003 hectares between 2019 and 2024, driven by total afforestation of 342,427 hectares (averaging 68,485 ha/yr), exceeding total deforestation of 218,424 hectares (averaging 43,685 ha/yr). The gains were unevenly distributed across counties. Turkana, Nandi, and Makueni recorded the highest afforestation rates, averaging 9,056 ha/yr, 6,699 ha/yr, and 5,287 ha/yr respectively, collectively



contributing a substantial share of the national net gain. Counties such as Nakuru, Laikipia, West Pokot, and Murang'a showed near-equilibrium conditions, with afforestation closely matching deforestation (1,366 vs 1,364 ha/yr in Nakuru, 717 vs 697 ha/yr in Laikipia, 394 vs 394 ha/yr in West Pokot, and 2,202 vs 2,226 ha/yr in Murang'a), reflecting limited net growth. In contrast, Narok experienced the largest net loss of approximately 13,800 hectares, with deforestation at 5,648 ha/yr far exceeding afforestation at 2,888 ha/yr, while Mandera (net loss 1,948 ha), Lamu (net loss 1,459 ha), Wajir (net loss 1,059 ha), and Kiambu (net loss 2,129 ha) also recorded declines. A few counties, including Mombasa, Nairobi, and Taita Taveta, showed no change in forest cover. Overall, while the national trend is positive, persistent forest losses in ecologically significant counties underscore the need for targeted deforestation control alongside continued afforestation investment.



5.1.4 Forest Biomass, Wood Volumes, and Economic Losses from Deforestation

Kenya's forests hold substantial carbon and biomass stocks, making them critical components of the country's natural capital. Above-ground biomass declined from approximately 345 million tonnes in 2019 to about 325 million tonnes in 2024, reflecting losses associated with deforestation and forest degradation. In total, more than 22 million tonnes of biomass were lost during the period, equivalent to an average annual loss of about 4 million tonnes. When these losses are converted to CO_2-equivalent emissions and valued using a conservative carbon price of USD 10 per tonne, the resulting economic loss from deforestation is estimated at USD 369.6 million, or approximately USD 73.9 million per year. Montane forests account for the largest share of these losses (USD 251.3 million), followed by dryland forests (USD 64.5 million), reflecting their high carbon density and ecological significance. These figures likely represent a conservative estimate, as they exclude the broader economic value of ecosystem services such as water regulation, biodiversity conservation, and climate resilience.

5.1.5 Forests as Sources of Food and Livelihoods

Forests also contribute significantly to food security and rural livelihoods. The Plantation Establishment and Livelihood Improvement Scheme (PELIS) allows forest-adjacent communities, organized through Community Forest Associations (CFAs), to cultivate food crops within young plantation forests while supporting tree establishment. The area under food production declined from approximately 8,410 hectares in 2019 to 3,636 hectares in 2024 as tree plantations matured and canopy cover increased. Nevertheless, the programme continues to contribute an estimated KES 182–421 million annually to house-

hold incomes. Crops such as maize, potatoes, and vegetables provide essential nutritional and economic benefits for rural households with limited access to arable land. This estimate remains conservative, as it excludes other forest-derived foods and non-timber forest products (NTFPs) such as traditional vegetables, insects, and medicinal plants, which also support rural livelihoods and local economies.

5.1.6 Physical Supply and Use Tables

The Physical Supply Flow Account indicates an overall decline in Kenya's forest stock between 2021 and 2024, with a net cumulative reduction of approximately 23.3 million m^3. Although forest gain exceeded the area affected by deforestation, the volume lost was substantially greater because newly reforested areas require time to accumulate biomass, while deforestation causes an immediate loss of mature forest volume. Total gross fellings were estimated at 343.9 million m^3, with 120.4 million m^3 recorded as removals over bark and 106.5 million m^3 under bark, of which 29.8 million m^3 was utilised for industrial wood production. Wood products are mainly consumed by manufacturing, wood processing, furniture, households, and other sectors, while wood fuel consumption is overwhelmingly concentrated in households, accounting for more than 256.7 million m^3. The significant difference between estimated domestic consumption and recorded production and deforestation data suggests that substantial small-scale and household-level tree harvesting may not be adequately captured by existing forest monitoring systems. The findings therefore highlight the importance of household consumption surveys in complementing forest-production data and indicate that increasing demand for firewood, charcoal, timber, and furniture materials, driven by population growth, urbanisation, biomass-energy dependence, construction, manufacturing, and economic development, is placing continued pressure on Kenya's forest resources.

5.2 Emerging Issues

5.2.1 Challenges in Compiling Forest Asset Accounts in Kenya

The integration of the System of Environmental-Economic Accounting (SEEA) into Kenya's national statistical framework is a cornerstone of the National Plan for Advancing Environmental-Economic Accounting (NP-AEEA) 2025–2028. However, several persistent challenges continue to constrain the accurate and consistent compilation of forest asset accounts.

- **Data Scarcity and Methodological Constraints:** A major challenge is the limited availability of high-resolution, long-term data required to measure forest degradation as distinct from deforestation. While satellite imagery is effective for tracking land-cover change, detecting gradual reductions in forest biomass and structural quality remains technically demanding. In addition, significant data gaps persist for private and community forests, which constitute a substantial share of Kenya's tree cover but are not monitored as systematically as public gazetted forests. Furthermore, existing datasets from public forest inventories and resource assessments require more regular updates, ideally on an annual basis, to improve the accuracy and timeliness of forest accounts and related analyses.
- **Limited Visibility of Non-Market Values:** Conventional economic accounting frameworks tend to underrepresent the full contribution of forests by excluding non-market and subsistence uses. Forest products such

as fuelwood, medicinal plants, and charcoal produced and consumed within informal markets are often omitted from official statistics. As a result, the recorded economic contribution of the forestry sector understates its true role in livelihoods, energy supply, and rural economies.

- **Complexity in Ecosystem Service Valuation:** Valuing regulating ecosystem services, including water regulation, flood control, and climate moderation, presents both scientific and economic challenges. The benefits derived from these services vary across locations and socio-economic groups, making it difficult to establish standardized valuation parameters that are applicable across Kenya's diverse forest ecosystems.
- **Institutional and Governance Constraints:** The development of comprehensive forest asset accounts requires coordinated data sharing and collaboration among multiple institutions. In practice, fragmented data systems, overlapping mandates, and inconsistent methodologies hinder the integration of environmental information into national economic accounts. In addition, illegal logging and other unrecorded extractions reduce forest assets without being captured in formal statistical systems.
- **Technical and Financial Capacity Limitations:** Producing SEEA-compliant forest accounts demands specialized expertise spanning environmental science, remote sensing, and macroeconomic accounting. Capacity constraints within public institutions, coupled with the high cost of conducting regular forest inventories needed to validate remote-sensing outputs, remain significant barriers to sustained and high-quality forest accounting.

5.3 Recommendations and Next Steps

- **Implement NP-AEEA (2025-2028):** Operationalize the National Plan to ensure forest accounts are produced regularly, enabling progress tracking and accountability.
- **Strengthen Coordination (TWG):** Empower the Technical Working Group to harmonize methodologies and facilitate data sharing across agencies (KFS, KNBS, MoECCF).
- **Build Technical Capacity:** Develop specialized expertise in SEEA-compliant accounting across environmental science and economics
- **Enhance Data Quality:** Invest in remote sensing validation and better monitoring of private/community forests to capture the full scope of assets and invest in regular forest inventories to validate remote-sensing outputs.
- **Integrate into Policy:** Link findings to macro-fiscal models (KENMOD) to assess climate shocks and support green fiscal measures.
- **Regular Reporting Cycle:** Forest accounts will be produced regularly, enabling progress tracking and accountability in natural resource governance
- **Continuous Refinement:** Opportunities for methodology enhancement, data quality improvement, and institutional capacity strengthening

5.4 Conclusions

This inaugural Forest Account Report for Kenya marks a significant milestone in the country's commitment to integrating natural capital into its national statistical and policy frameworks. The results presented in this report demonstrate that Kenya's forests are on a positive trajectory, with a net increase of approximately 124,003 hect-



ares of forest cover recorded between 2019 and 2024. This recovery, from a historic low of 5.86% national forest cover in 2019 to 6.07% in 2024, reflects the tangible results of active afforestation and restoration programmes undertaken by government, communities, and the private sector. However, the data also reveal that current forest extent remains below the 1990 baseline of 6.65%, underscoring that recovery is ongoing and that sustained policy commitment will be essential to reverse decades of forest loss.

The economic analysis in this report provides compelling evidence of the financial consequences of forest loss. Deforestation between 2019 and 2024 resulted in an estimated total economic loss of USD 369.6 million, an average of nearly USD 74 million annually, when forest biomass losses are valued at a conservative carbon price. Montane forests, which are the most carbon-dense and ecologically sensitive of Kenya's forest types, account for the largest share of these losses. These figures reinforce the economic case for investing in forest conservation and restoration as a fiscal strategy, not merely an environmental one. When the livelihood and food security contributions of forests are factored in, including the estimated KES 182–421 million in annual income generated through PELIS and the approximately 34 million tonnes of biomass supplied annually for energy, the full economic value of Kenya's forests is considerably greater than what is currently reflected in national accounts.

Significant challenges remain in producing comprehensive and consistent forest asset accounts. Data gaps for private and community forests, the technical complexity of measuring forest degradation, and the difficulty of valuing non-market ecosystem services all limit the current scope of the accounts. Addressing these gaps will require sustained investment in remote sensing capacity, regular national forest inventories, and stronger institutional coordination across government agencies. The National Plan for Advancing Environmental-Economic Accounting (NP-AEEA) 2025–2028 provides a strategic framework within which these ambitions can be progressively realised.

In conclusion, this Forest Account Report establishes a critical baseline for monitoring Kenya's forest resources within the SEEA framework. It demonstrates the feasibility and value of integrating environmental and economic data for evidence-based forest governance, and provides a platform for future expansion of the accounts to include monetary ecosystem service values, a full treatment of forest degradation, and coverage of private and community forests. Continued investment in these accounts will strengthen Kenya's capacity to manage its forests as a vital pillar of economic resilience, climate adaptation, and sustainable development.

06

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07

Annexes

7.0 Assumptions

Assumptions Used in the Compilation of the Physical Supply and Use Tables (PSUTs)

The Physical Supply and Use Tables (PSUTs) capture forest resource flows for the period 2021–2024 and are based on a set of technical assumptions informed by international guidelines and regional evidence.

1. A sofa set is valued at approximately KES 55,000, with an assumed weight of 55 kg.
2. A bamboo coffee table is assumed to weigh 7 kg.
3. A black bed valued at KES 12,000 is assumed to weigh 25 kg.
4. A flash door is assumed to weigh 10 kg.
5. A standard stool is assumed to weigh 5 kg.
6. A table stool with a bamboo frame and a glass top is assumed to weigh 8 kg.
7. A shoe rack valued at approximately KES 300 is assumed to weigh 3 kg.
8. A hardwood stool valued at KES 1,000 is assumed to weigh 5 kg.
9. A walking stick is assumed to weigh 0.5 kg per unit.
10. A standard timber piece with dimensions of 6 × 1 × 12 ft is assumed to weigh 12 kg per piece.
11. Beds valued between KES 3,000 and KES 7,000 are assumed to weigh 12 kg.
12. Beds valued between KES 20,000 and KES 30,000 are assumed to weigh 30 kg.
13. Conversion factor from TerraJoules (TJ) to Tonnes: 1 TJ = 69.4 tonnes of wood fuel
14. To estimate domestic furniture production under the physical supply approach, data from the 2018 Census of Industrial Production (CIP)[19] were utilised. The value of furniture from the formal sector was reported at KES 11,865,900,000. Assuming a market value of KES 30,000 per

[19] Kenya National Bureau of Statistics. (2018). *Census of Industrial Production and Construction Report 2018*. Kenya National Bureau of Statistics. https://statistics.knbs.or.ke/nada/index.php/catalog/126 (Report PDF download)

m^3 of furniture, the corresponding volume was derived. Given that the formal sector accounts for approximately 30% of total production, the full-sector volume was scaled to 100% and subsequently converted to kilograms using a density conversion factor of 1 m^3 = 725 kg.

15. Kenya predominantly exports softwoods, which are assigned an assumed density of 650 kg/m^3. Hardwoods, which are mostly imported, are assigned an assumed density of 800 kg/m^3.

16. A harmonised wood density for firewood and charcoal estimation was derived from the median of the hardwood and softwood densities [MEDIAN(800,650)]. The source of the wood density came from Carsan et al, 2012[20] and a publication from FAO on Forest product conversion factors[21]. The median wood density across these five species — 725 kg/m^3 — was adopted as the standard conversion factor, such that 1 m^3 of wood is equivalent to 725kg.

	WOOD DENSITY ANALYSIS	
	Wood Density	**Basic Wood Density [kgs]**
1	Hardwood	800
2	Softwood	650
	Total	**1,450**
	Mean	**290**
	Median	**725**

Supply-Side Assumptions

- It is assumed that 65% of gross fellings remain in the forest as felling residues (not removed), based on findings from a World Bank (2005) study in Central Africa.
- Approximately 13% of total stem volume is attributed to bark, representing a mid-range estimate derived from the 2019 IPCC Guidelines, which indicate a range of 8–20%.
- Of the total removals under bark, 28% is assumed to be converted into roundwood, reflecting typical recovery rates.
- Estimates of roundwood (under bark) are derived from the MSIP dataset.
- Imports incorporate both formal trade data from the Kenya Revenue Authority (KRA) and informal cross-border trade (ICBT), ensuring comprehensive coverage of external supply.

[20] Carsan, S., Orwa, C., Harwood, C. E., Kindt, R., Stroebel, A., Neufeldt, H., & Jamnadass, R. (2012). African Wood Density Database. World Agroforestry Centre, Nairobi, Kenya. Retrieved from https://apps.worldagroforestry.org/treesandmarkets/wood/

[21] Food and Agriculture Organization of the United Nations. (2020). *Forest product conversion factors* (FAO document). FAO. https://openknowledge.fao.org/handle/20.500.14283/ca7952en

Use-Side Assumptions

- Industrial roundwood allocation reflects the structure of Kenya's wood-processing sector. Sawmilling, which accounts for approximately 44% of industrial wood consumption, dominates the industry, supported by an estimated 450 sawmills and panel mills. Consequently, 70–85% of industrial roundwood is assumed to be used as sawlogs in wood products manufacturing, furniture production, and construction.
- Pulpwood and panel-related uses remain limited due to the relatively underdeveloped pulp and paper industry. Plywood and panel mills account for roughly 15% of industrial wood use, with pulpwood shares estimated at 5–20%, concentrated mainly in other manufacturing activities such as panels and composite products.
- Energy use dominates overall wood consumption, with biomass (fuelwood and charcoal) accounting for a substantial share of total demand. It is assumed that about half of harvested biomass is used for energy, justifying a 90–100% allocation of wood fuel within the energy sector, as well as significant shares in food processing and informal industries.
- Low processing efficiency in the wood sector, with sawmilling recovery rates estimated at approximately 25%, implies that a large proportion of wood is diverted to residues, fuel, and other low-grade uses.
- Construction demand is a key driver of industrial wood use, supporting the assumption of a high sawlog share (80–90%) within this sector.

Notes:

1. For modelled food crop coverage outside designated PELIS areas, the following apportionment was applied: maize 10%, potatoes 20%, and cabbage 20%.
2. Informal sector figures require an upward adjustment to ensure they are representative of the broader population.
3. For items recorded in units of pieces rather than mass, weight was estimated by computing the unit price per kilogram of a comparable item for which mass data were available. This unit price per kilogram was then applied in reverse to derive the mass of the unknown item from its monetary value.
4. Plantation area data are only available for the year 2021; stock figures for all other years were derived through extrapolation.
5. A total of 326 grazing licences are currently active, with charges set at KES 100 per head of livestock. Total income was estimated by calculating the daily number of livestock within the forest, multiplied by a factor of three to account for instances where licence holders may bring in more animals than formally declared.
6. The category "Other Products" is to be included in the relevant table.

These assumptions provide a consistent and contextually appropriate basis for estimating forest product flows in the absence of complete primary data, while remaining aligned with international standards and regional industry characteristics.



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