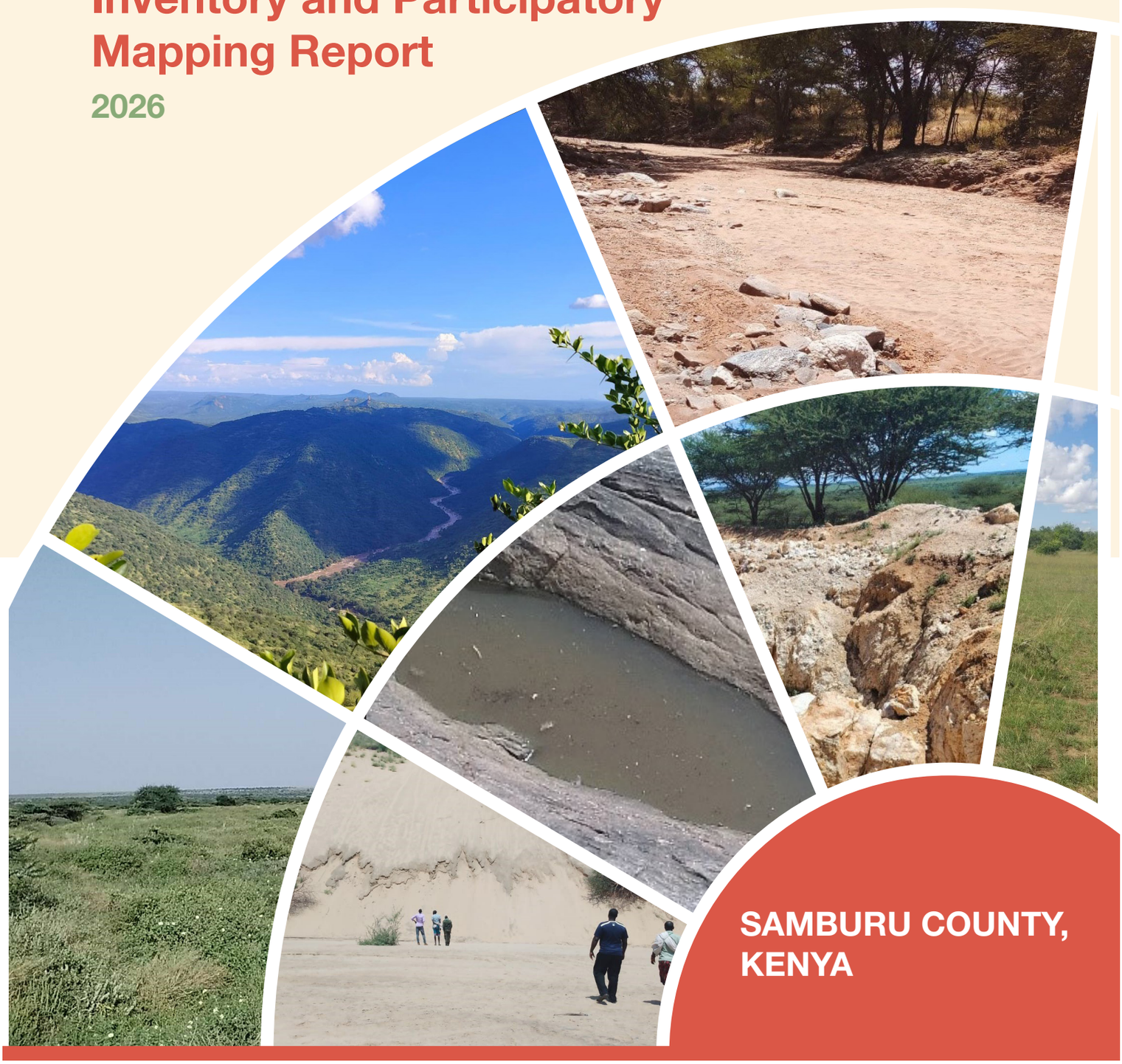
Dryland Natural Assets Inventory and Participatory Mapping Report

2026



SAMBURU COUNTY, KENYA

NATIONAL MUSEUMS OF KENYA
WHERE HERITAGE LIVES ON

KENYA WILDLIFE SERVICE

KENYA Forest Service

WYSS ACADEMY FOR NATURE

CETRAD
Centre for Training and Integrated Research in ASAL Development

SAVE THE ELEPHANTS

NRT
NORTHERN RANGELANDS TRUST

Dryland Natural Assets Inventory and Participatory Mapping Report

2026

SAMBURU COUNTY,
KENYA

Foreword

Samburu County, situated in Kenya's arid and semi-arid lands (ASALs), is endowed with a rich mosaic of dryland natural assets that are central to the livelihoods, culture, and resilience of local communities and associated landscapes. These assets, consisting of seasonal rivers, laggas, water pans, wetlands, salt licks, and islands of dense vegetation, pasture, rock catchments and springs, wildlife, biodiversity and genetic resources, support rural livelihoods, pastoralism, agro-pastoralism, wildlife conservation, and the broader ecological balance of these landscapes.

In the face of increasing climate variability and changes, land pressure from competing developmental needs, and resource-based conflicts, it has become essential to understand, document, and protect these critical resources through locally grounded, evidence-based, participatory and multi-stakeholder inclusive assessments, planning and policy development. This **Dryland Natural Assets Inventory and Participatory Mapping Report, the first of its kind in Kenya** and perhaps the continent, represents a significant step in this direction that not only provides the evidence but also establishes the urgent need to secure and protect the vital assets for posterity and sustainable development.

Through participatory and multi-stakeholder approaches, this report documents over 200 dryland natural assets across the county. Community elders, conservancy leaders, youth, women and men as well as spiritual and political leaders and technical officers came together to share knowledge and experiences, validate the assets and their locations, assessed the status and management priorities and concerns of the key assets in the county. The insights captured here are not only spatially accurate but deeply embedded in the lived experiences, indigenous knowledge and socio-cultural connectivity of Samburu people and their landscape resources.

The report further provides a clear picture of management arrangements—highlighting areas of strong community and natural resources stewardship as well as the inherent gaps and threats affecting the natural resources under unprotected and with weak governance systems. It lays the groundwork for informed decision-making by the Governments both at the county and national levels, communities, development partners, conservancies owners, and independent commissions to support collaborative and multi-stakeholder inclusive processes, efforts and mechanisms for the sustained management and conservation of vital natural assets in these natural-capital rich areas.

Consequently, this report serves as a vital tool for baselining and for enhancing **natural resource planning, climate adaptation and resilience building, conflict mitigation, and sustainable land use management practices through landscape connectivity and protection of natural assets**. It aligns with Samburu County's commitment to inclusive development, devolution, and the recognition of communities as custodians of their landscapes and the resources therein. Let this report be a steppingstone towards better stewardship of Samburu's dryland ecosystems for current and future generations.

Dr. Abdillahi Saggaf Alawy
Chairman
National Land Commission

Acknowledgments

This report is a culmination of a highly consultative, inclusive and collaborative process that brought together local communities, their leaders, technical experts, and development partners to identify, map and assess Samburu County's dryland natural assets for purposes of informing their sustainable conservation, use, planning and decision-making. Its completion would not have been possible without the commitment, dedication, sound technical knowledge and financial support, and contributions of many individuals and institutions.

As a Commission, we cherish partnership and leverage strategic opportunities and collaborations to discharge our mandate which is enlisted under the Constitution and relevant land statutes. We extend our sincere appreciation to the **people of Samburu County**—particularly the elders, youth, women, political leaders, and conservancy representatives—whose deep understanding of the landscape provided the foundation for this mapping exercise. In addition, the National Government, through the relevant ministries, departments, and agencies (MDAs), provided immense support in sharing knowledge, data and expertise that guided the Commission in delivering this critical output. Your willingness to share insights, guide field teams, validate data and information, is highly appreciated

We are particularly grateful to **WYSS Academy for Nature** whose financial and technical support became handy in documenting these assets in the face of the on-going community land registration processes and climatic changes; and this report will help the land adjudication team the County and National Governments to secure the assets in the community land registers, spatial plans and institute development control ventures towards their protection and sustainable use.

Special thanks go to the **County Government of Samburu**, represented by both the executive and legislature for their invaluable support, availability and providing policy guidance, technical support/guidance, community mobilization and field participation exercises throughout the process. Your leadership ensured that the findings of this report informs the ongoing county spatial planning, community land registration/adjudication and development priorities of the County.

We also acknowledge the valuable input of **national agencies**, including the County Commissioner of Samburu whose support in mobilizing the national administration, local communities and their elders, helped ensure technical accuracy, embedment of local knowledge and relevance of this project.

We recognize and thank the **technical team that was coordinated by the Commission and included** GIS specialists and field mapping teams for their dedication and rich tapestry of expertise that guided and mid-wifed the entire mapping exercise and the report hereto. Your commitment to this participatory and community-centred processes has helped ground this report in both science and local knowledge.

Finally, we thank CETRAD for the technical support and all those who worked behind the scenes—data collectors, report writers, GIS analysts and communication teams from both Wyss Academy and the Commission, ans well as administrative staff—who ensured the success of this initiative.

This report is not only a record of Samburu's rich natural endowments but also a testament to the power of collaboration and local stewardship in managing and protecting our dryland resources. The methodology and approaches adopted in this project is highly scalable and will be used to inform other dryland counties natural assets mapping, going forward. I invite everyone to pay keen attention to the findings of this report and ensure the protection and security of dryland assets in this County is guaranteed under various existing legal regimes and that there is a proper balance of rights between nature and people.

Kabale Tache Arereo, MBS
Secretary/Chief Executive Officer
National Land Commission

Production Teams

The National Land Commission

1. Benard Opaa - Technical Lead and Convener
2. Esterina Dokhe
3. Abdulahi Jillo

WYSS Academy For Nature

4. Dr. Benson Okita
5. Antony Wandera

Centre for Training and Integrated Research in ASAL Development (CETRAD)

6. Dr. Boniface Kiteme
7. Grace Wambugu
8. Lee Muthuri

Save The Elephants (STE)

9. Benjamin Loloju

Northern Rangelands Trust

10. Kasaine Letiktik

State Department for Lands & Physical Planning

11. Peter Naibei

Kenyatta University

12. Dr. Ben Osukuku

Preface

The arid and semi-arid lands (ASALs) of Kenya, including Samburu County, are uniquely endowed with natural resources that are central to the survival, resilience, and identity of pastoralist communities. Despite harsh climatic conditions and recurring droughts, the people of Samburu have for long time, sustained their livelihoods through deep ecological knowledge, mobility, and strong customary resource governance systems.

Over time, however, these natural assets which include seasonal rivers, water pans, wetlands, salt licks, vegetation islands, springs, and rock catchment, have come under immense threat and pressure from climate change, land use change, population growth, and competing demands. In many cases, the absence of formal data, maps, or recognition of community-managed resources has further hindered planning, protection, and investment. The on-going community land registration process is likely to compound the challenges further by placing the vital community and public assets into private hands/entities. It is therefore important to exercise caution and be proactive, rather than reactive, in the conservation, sustainable use and development of dryland assets and the landscapes in order to prevent current and future natural resource-related conflicts and bad governance, occasioned by unplanned and unsustainable resource use and exploitation.

The Samburu *Dryland Natural Assets Inventory and Participatory Mapping Report* was developed in response to this gap. It seeks to document and spatially map key dryland resources while also capturing the diverse management structures, governance gaps and challenges, and opportunities for their sustainable use and conservation. The process was designed to be fully participator and community-centric, informed by indigenous and traditional knowledge systems, and supported by county, national government and technical actors.

This report reflects the outcomes of a rigorous and extensive fieldwork, stakeholder dialogues, GIS mapping, and local and national stakeholder validation exercises. It is intended to serve as a **planning and policy tool** for the County and National Government, a **resource management guide** for conservancies and traditional land governance and a **learning resource** for development partners and researchers interested in dryland resilience and community-based natural resource management and governance.

We hope that the information and insights contained in this report will help bridge the gap between local knowledge and formal systems, enabling better protection, planning, and restoration of Samburu's dryland ecosystems.

Executive Summary

The arid and semi-arid lands (ASALs) of Kenya, including Samburu County, are uniquely endowed with natural resources that are central to the survival, resilience, and identity of pastoralist communities. Despite harsh climatic conditions and recurring droughts, the people of Samburu o have for long time, sustained their livelihoods through deep ecological knowledge, mobility, and strong customary resource governance systems.

Over time, however, these natural assets—including seasonal rivers, water pans, wetlands, salt licks, vegetation islands, springs, and rock catchments—have come under increasing pressure from climate change, land use change, population growth, and competing demands. In many cases, the absence of formal data, maps, or recognition of community-managed resources has further hindered planning, protection, and investment. The on-going community land registration process is likely to compound the challenges further by placing the vital community and public assets into private hands/entities. It is therefore important to exercise caution and be proactive, rather than reactive, in the conservation, sustainable use and development of dryland assets and the landscapes in order to prevent current and future natural resource-related conflicts and bad governance, occasioned by unplanned and unsustainable resource use and exploitation.

The Samburu Dryland Natural Assets Inventory and Participatory Mapping Report was developed in response to this gap. It seeks to document and spatially map key dryland resources while also capturing the diverse management structures, governance gaps and challenges, and opportunities for sustainable use and conservation. The process was designed to be fully participator y and community-centric, informed by indigenous and traditional knowledge systems, and supported by county, national government and technical actors.

This report reflects the outcomes of rigorous and extensive fieldwork, stakeholder dialogues, GIS mapping, and local and national stakeholder validation exercises. It is intended to serve as a **planning and policy tool** for the County Government, a **resource management guide** for conservancies and traditional land governance system, and a **learning resource** for development partners and researchers interested in dryland resilience and community-based natural resource management and governance.

We hope that the information and insights contained in this report will help bridge the gap between local knowledge and formal systems, enabling better protection, planning, and restoration of Samburu's dryland ecosystems.

Definition of Terms

Laggas are natural dry riverbed or seasonal stream, or water courses /channel found in arid and semi-arid regions

Ponds is a small, shallow water body, either natural or man-made, that collects and stores surface water, primarily rainwater, and serves as a critical water source for livestock, wildlife, and local communities.

Rock catchment is a water harvesting structure that collects and stores rainwater runoff from natural rock surfaces.

Sand dam is a low-cost, low-maintenance rainwater harvesting structure built across the bed of a seasonal sandy river (often called a sand river).

Spring is traditionally defined as a natural source of fresh water that emerges from the ground, often considered a sacred and vital resource.

Island of dense vegetation refers to an area with a high concentration of plants such as trees, shrubs, and other flora within a specific location

Wildlife Breeding sites refers to the natural reproduction process of animals within their natural habitats.

Wildlife migratory corridors are essential pathways that connect core habitats, enabling animals to move across landscapes to access vital resources such as pasture, water, and breeding grounds, reduce predation risk.

Livestock routes are the traditional or established pathways used by pastoralist communities to move their herds in search of pasture, water, and other resources.

A wildlife corridor is a designated area or natural link of habitat that connects two or more larger patches of similar wildlife habitat, which have been fragmented or separated by human activities such as development, roads, or land clearing

Table of Contents

List of Figures

List of Tables

List of Plates

List of Abbreviations

ASALs	Arid and Semi-Arid Lands
CSP	County Spatial Plans
LAPSSET	Lamu Port and Lamu-Southern Sudan-Ethiopia Transport
HoAGDP	Horn of Africa Gateway Development Project
MDACs	Ministries, Departments, Agencies and Counties
CETRAD	Centre for Training and Integrated Research in ASAL Development
ESRI	Environmental Systems Research Institute
GIS	Geographic Information Systems
STE	Save the Elephants
NLC	National Land Commission
CIDP	County Integrated Development Plan
MTP	Medium Term Plan
NLIMS	National Land Information Management System
STA	Storytelling Approach
KFS	Kenya Forest Service

1. BACKGROUND

1.1 Global Outlook of Drylands

According to UNCCD, drylands cover approximately 40% of the world's land area, and support two billion people, 90% of whom live in developing countries.

Found on all continents, but being most prevalent in Africa and Asia, drylands are the foundation for both rural and urban communities. Around one billion people rely directly on dryland ecosystem services for their daily survival, whether through rain-fed or irrigated farming, or through widespread pastoralism. Table 1 summarizes the global statistics for the four types of dryland.

Table 1: Global figures for the four types of drylands

Dryland sub-habitat	Aridity index*	Share of global area (%)	Share of global population	% rangeland	% cultivated	% other (including urban)
Hyper-arid	<0.05	6.6	1.7	97	0.6	3
Arid	0.05 - 0.20	10.6	4.1	87	7	6
Semi-arid	0.20 - 0.50	15.2	14.4	54	35	10
Sub-humid	0.50 - 0.65	8.7	15.3	34	47	20
Total		**41.3**	**35.5**	**65**	**25**	**10**

** The ratio of precipitation to potential evapotranspiration.*
Source: Safriel et al. 2005

Dryland degradation costs developing countries an estimated

4–8%

of their GDP each year.

Unsustainable land and water use and the impacts of climate change are the major drivers of degradation of drylands. Approximately 6 million km2 of drylands (about 10%) bear a legacy of land degradation. Such degradation – sometimes also referred to as 'desertification' – can take the form of soil erosion, nutrient depletion, water scarcity, altered salinity or the disruption of biological cycles. Degradation reduces biological productivity and can impact the ability of ecosystems to absorb and use rainwater. Combined with poor crop and soil management, and the use of poorly adapted varieties of crop, this can lead to 'agricultural droughts'.

Dryland degradation costs developing countries an estimated 4–8% of their national gross domestic product (GDP) each year. It is estimated that about 1–6% of dryland human populations live in desertified areas (UNEP, 2011), while a much larger number is under threat from further desertification. Land degradation and poverty are mutually reinforcing, but the former has low political visibility. It is hard to deal with the problem due to cyclical swings in rainfall, land tenure which is not well adjusted to environmental conditions, and regional and global forces driving local management. Inaction would mean a cumulative addition to a long, historical legacy of degradation, from which recovery has already previously proven difficult.

Drylands offer opportunities for local populations and provide regional and global benefits. The biodiversity of drylands provides ecosystem services benefit local communities. Dryland forests and woodlands provide shade and moisture, are home to pollinators, protect nutrients, are fire resistant, and reduce water runoff, erosion and flooding. Life in drylands has evolved with the variable and extreme climatic conditions that present here, and includes a relatively high number of endemic species. These species represent genetic resources of importance, in particular, for adaptation to future climate change. Unique ecosystems, such as deserts (e.g. Sinai, Namib and Chihuahua deserts), steppes (e.g. Mongolia), savannas (e.g. East Africa) and drylands wetlands (e.g. Nile Delta and Okavango Delta), represent opportunities for ecotourism.

Drylands can have major global climate benefits: dryland carbon storage (mainly in the form of soil carbon) accounts for more than one third of the global stock. Drylands also have the potential to sequester more carbon than they currently store as they are far from saturated. Yet despite these potential benefits, current projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol are limited to methane capture, waste management and renewable energy. Dryland forests in México store carbon at roughly the same rate as evergreen forests. Thus, the establishment of dryland forests, coupled with dune stabilization, savannization and rain-fed dryland agroforestry, can increase carbon storage. However, the capacity to store carbon depends on many factors including climate, history, past land use, and opportunity for management change.

The potential local, regional and global benefits of drylands have not been fully utilized because of myths, market failures, a lack of public goods such as adequate infrastructure, weak incentives, high investment costs and gender inequalities. Dryland ecosystems and populations face a number of risks and costs including tenure insecurity, conflict, variable weather, scarcity of human capital and high transaction costs. In many areas, often the women (UNEP, 2011) manage the natural resources and hold knowledge of indigenous production methods, plant species and their various uses (including medicinal uses). However, women rarely own the land that they manage and, without assets, cannot access agricultural credit or extension services. On the other hand, the participation of women in often profitable trade counters this situation to some extent.

Opportunities for increased investments in drylands are coupled with global and regional trends; and include:

- Fulfilling food security commitments (at least US$20 billion2), in part, through the rehabilitation of the drylands resource base.
- Targeting private investment – which is often transnational – in food security, natural products, key infrastructure and services towards dryland resources.
- Targeting renewable energy opportunities within drylands.
- Utilizing funds for conflict prevention and post-conflict rehabilitation to restore dryland resources.
- Supporting access for women to productive assets.
- Using climate change instruments designed for mitigation (soil carbon, bioenergy) and adaptation (small business development and home gardens and sheep) in vulnerable dryland areas.
- Encouraging research into adaptation.
- Conserving high value dryland biodiversity, such as drought resistant or heat tolerant crop and livestock varieties.
- Targeting cultural and eco-tourism opportunities within drylands as well as mining and the whole potential for 'secondary' (e.g. transformation and conservation industries) and tertiary (e.g. micro-credit and banking, telecommunication, market, etc.) sectors.

Opportunities for investment in drylands exist for the public sector, the private large-scale commercial sector, the community sector, and the household or small-scale private sector. As regards to the degradation of drylands, the result of failure to prevent dryland degradation is often the need for relief and aid; this is costly in economic terms, but even more so in terms of human suffering. This cost can be reduced by engaging dryland communities in the development process. Investments can be directed towards areas such as communications; renewable energy;

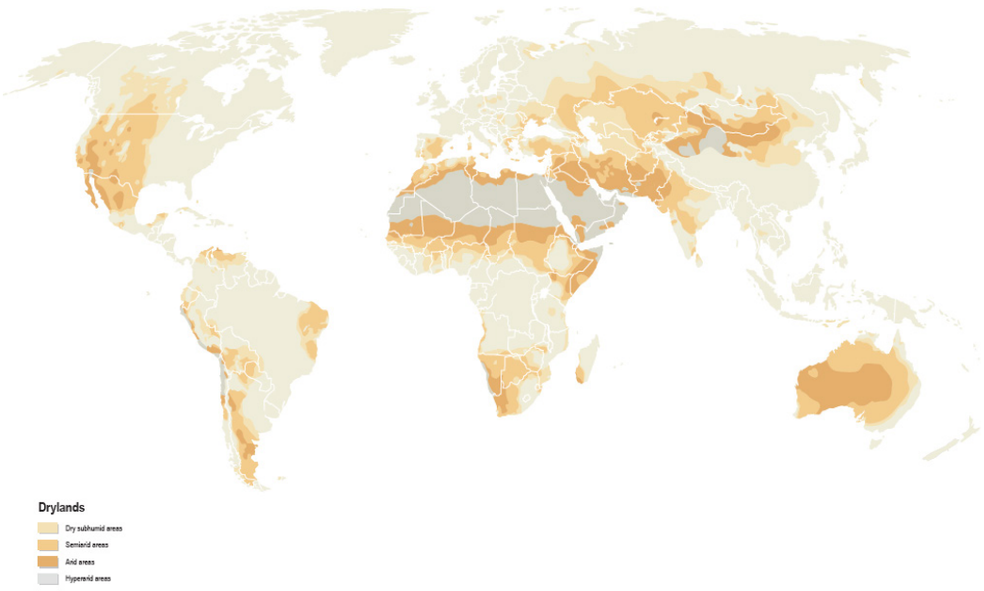


Figure 1: Distribution of global drylands (Source: UNEP World Conservation Monitoring Centre, 2010)

1.2 Regional Outlook

According to the Global centre for Adaptation (GCA), nearly a third of global drylands occur in Africa, where they cover 19.6 million square kilometres (km2), and nearly two thirds of southern, western, eastern and northern Africa (Figure 2). This area is home to over 525 million people in Africa (40 percent of the population), growing by about 3% per year (faster than the African average of around 2.5 percent), with a demography firmly skewed toward the young (GCA, 2021).

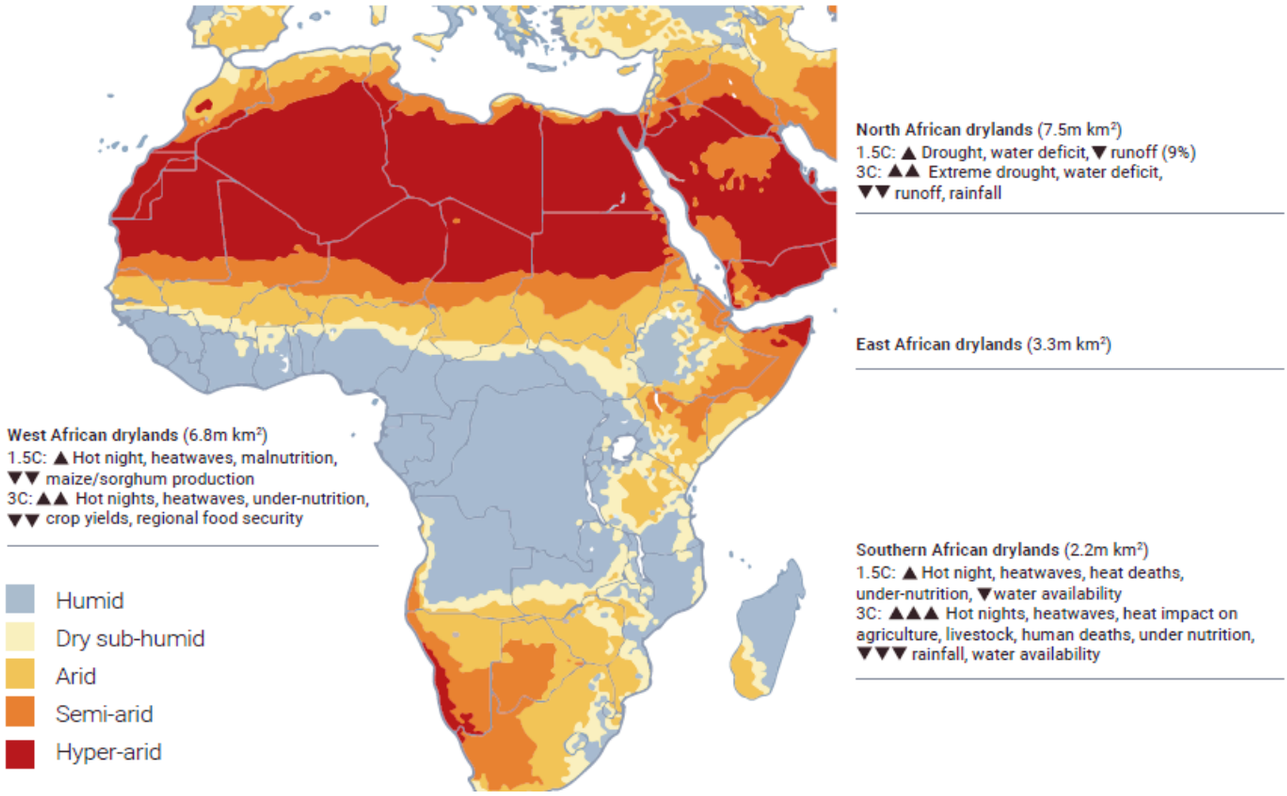


Figure 2: Africa Drylands Cover (Source: IPCC, 2019).

Biophysically and socially, the drylands are diverse (Table 2). Biomes range from woodlands and savannas on either side of central Africa's equatorial forests, to Mediterranean shrublands in the north and south, and enclosing the hyper-arid Sahara in northern Africa and the smaller Namib in the south. This diversity means that the details of livelihoods are very context specific, but land use is broadly dominated by nomadic, transhumant or sedentary pastoralism, rainfed cropping and agroforestry, and localized areas of irrigated farming; the livelihoods of over 200 million people in Sub-Saharan drylands depend on cropping.

Economically, About 69% of the rangelands in developing countries are used for livestock production and contributes 10% of global meat production. Livestock production in rangelands accounts for between 50% and 80% of agricultural gross domestic product (GDP) in developing countries. Besides supporting most of the livestock population that contribute 10% – 50 % of the individual countries' agricultural GDP in the Horn of Africa, these areas provide various plant and animal resources, minerals and oil. Because of their global extent and diversity of ecosystem goods and services they supply, often beyond their boundaries, rangelands condition and trends are linked closely to the economic well-being of many communities and hence their sustainable management and conversely their degradation are of critical importance to mankind.

Table 2: Key characteristics differentiating drylands in Africa (FAO, 2019).

North African drylands	
Area: 7.5 million km² (4.6 million hyper-arid), 99% of region	
Major land uses: Grassland 9%, Wooded 3%, Crops 7%, 'Barren land' 77%, Urban <1%	
Out migration 1970s/2000s: 140,000/319,000 people per year	
West African drylands	**East African drylands**
Area: 6.8 million km² (2.1 million arid), 53% of region	**Area:** 3.3 million km² (1.1 million dry sub-humid), 47% of region
Major land uses: Grassland 12%, Wooded 24%, Crops 8%, 'Barren land' 51%, Urban <1%	**Major land uses:** Grassland 25%, Wooded 44%, Crops 6%, 'Barren land' 12%, Urban 1%
Out migration 1970s/2000s: 224,000/508,000 people per year	**Out migration 1970s/2000s:** 152,000/241,000 people per year
Southern African drylands	
Area: 2.2 million km² (1.4 million semi-arid), 84% of region	
Major land uses: Grassland 28%, Wooded 59%, Crops 4%, 'Barren land' 7%, Urban 1%	
Out migration 1970s/2000s: 5,000/17,000 people per year	

Further to be above, rangelands in Africa have become the new frontiers for development; as Africa's population grows, rangelands serve as sinks for the immigrant population from the agriculturally high potential areas. In addition, with infrastructure development, and expansion of urbanization, towns located in the rangelands now act as business hubs that link the frontiers to the rest of the countries. Given their immense contribution to local, national and regional economies, achievement of food security and climate change mitigation and adaptation, squarely depend on how best we manage the vast drylands. Despite their economic and ecological importance, rangelands are under constant threat from among other factors, land use and land tenure changes that result in injudicious use and subsequent range degradation, as well as lack of appropriate policies or weak implementation where they exist. Climate change adds another layer of challenges to the problems already facing rangelands.

Economically, About **69%** of the rangelands in developing countries are used for **livestock production** and contributes **10% of global meat production.**

1.3 The National Outlook

Kenya has an area of approximately 582,646 sq. km. comprising

97.8%
dry lands/ASALs and
2.2%
water surface

The Republic of Kenya comprises the territory and territorial waters. It has an area of approximately 582,646 sq. km. comprising 97.8% dry lands/ASALs (Figure 3) and 2.2% water surface (National Atlas, 2024). It is estimated that 20% of the land of the dry land area is medium to high potential land and the rest (80%) of the land is mainly drylands-arid and semi-arid lands (GoK, 2012). The widespread and deeply rooted misconception that drylands are "wastelands" neglects the magnitude of existing social, economic activity and related environmental benefits. Contrary to this misconception, these are some of the region's untapped potential according to the Vision 2030 Development Strategy for Northern Kenya and other Arid Lands, justified by the following:

1. **Strategic position:** The region's geographical location and its social and cultural attributes make it well-positioned to benefit from surplus capital in the Gulf, one of the fastest-growing parts of the world. It is also the bridgehead to a regional economy of more than 100 million people. Countries such as Ethiopia, Sudan and Somalia need outlets for their products, imports of manufactured goods and, in the case of South Sudan and Somalia, materials for reconstruction.
2. **Domestic trade:** The economies of the lowlands and highlands are complementary. Opening up the north will generate greater demand for Kenyan products. There is already significant movement of capital between parts of the north and Nairobi, which is set to grow.
3. **Livestock trade:** As populations increase, urbanize and become richer they create more demand for meat and other livestock products. The ASAL regions host 70% of the National Livestock herd with an estimated value of Ksh.70 billion.

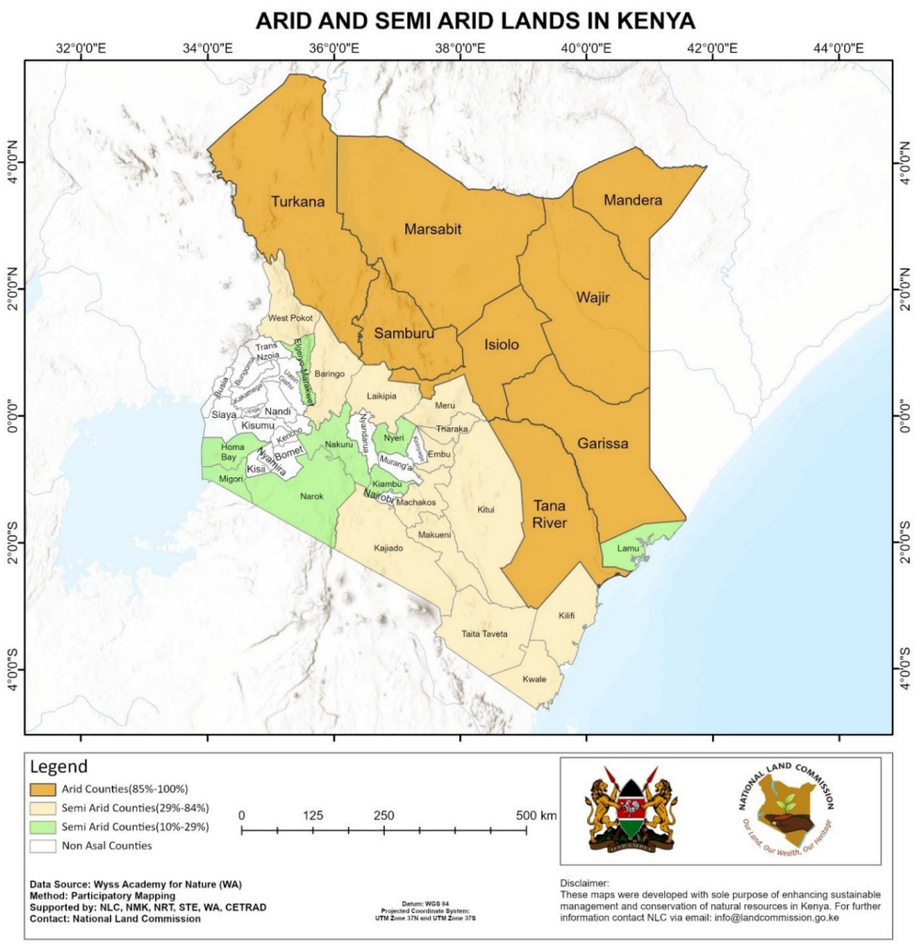


Figure 3: Kenya ASAL Counties

4. **Tourism:** Most protected areas such as game reserves and national parks are found in the ASALs. This gives the region a comparative advantage in tourism, an industry that is usually Kenya's highest foreign exchange earner and contributes approximately 12% to Kenya's GDP. Pastoralism, conservation and bio-diversity are intimately linked.
5. **Natural wealth:** if Kenya has commercial deposits of oil and natural gas they are likely to be found in the ASALs, particularly in the north and east. Other natural resources include sand and gravel for construction, a wide range of precious minerals, soda ash, gums, resins, and medicinal plants. Dryland soils and vegetation store carbon, suggesting that the ASALs have the potential to generate payments for environmental services such as carbon sequestration.
6. **Urban development:** Carefully planned and strategic urban development in the ASALs will benefit the region, particularly in terms of employment creation, while also opening up new economic and investment opportunities for the country as a whole, reducing population pressure in high-density areas and strengthening national cohesion through the inter-mingling of social groups.
7. **Climate change:** Pastoralists have to a large extent successfully managed climate variability for centuries. Their skills and knowledge will become more valuable as the impact of global climate change becomes more pressing.

1.4 Natural Assets Definition

Natural assets, as defined by the Organisation for Economic Co-operation and Development (OECD), comprise the biophysical components of the environment, including biological resources, land and water ecosystems, subsoil resources, and the atmosphere (OECD, 2008). This definition captures the tangible, ecological dimensions of natural systems that support human and non-human life. However, natural resources become assets when people have rights to access their benefits (Boyce, 2001).

In light of decolonial critique, natural assets are understood not merely as biophysical resources with economic value, but as relational entities embedded within Indigenous and local worldviews, cosmologies, and territorial rights (Escobar, 2020). This perspective challenges the colonial and anthropocentric conception of a natural asset as a repository of resources to be owned, extracted, and monetized. When viewed through a cultural lens, however, natural assets embody meanings that go beyond their physical or economic utility. They encompass ecological entities and landscapes—such as land, wetlands, water, biodiversity, forests and minerals —that are valued not merely for their instrumental function, but for their cultural, spiritual, historical, and relational significance, as articulated within indigenous and local knowledge systems (Whyte, 2018). In this context, a natural asset is understood as something that holds value due to its role in sustaining community livelihoods, knowledge systems, cultural identity, and collective wellbeing (Green, 2015; McPherson et al., 2020).

The boundaries between natural resources and culture are often indistinct. Scholars have emphasized that natural and cultural heritage are inextricably linked, co-producing landscapes and meanings that foster a shared sense of place (Cheng et al., 2003; King & Willow, 2011; Speed et al., 2012). Lockwood and colleagues go further to argue that the interdependence of cultural and natural dimensions is so profound that they are best managed as a unified whole (Lockwood et al., 2006). Doing so not only reflects the dynamic interplay between people and their environments but also enhances the efficacy and sustainability of development interventions (Hossen, 2016; Mere-Roncal et al., 2021).

Categorisation of natural assets in participatory approaches often mirrors the cultural landscapes and socioecological realities of the communities involved. In northern Kenya, for instance, participatory mapping exercises conducted with pastoral communities revealed classifications of natural assets that closely reflected the intimate local pastoralist practices and wildlife conservation, and embodied their knowledge systems, mobility patterns, and livelihood strategies.

1.5 The Need to Map Drylands Natural Assets

In Kenya,

80%+

of the land surface including the ASALs is fragile and has a population of

16 Million+

people

The annual cost of land degradation in this areas is estimated to be about

1.5 Billion USD,

which is equal to the Country's 5% GDP

1.5.1 Securing Natural Assets for Poverty Reduction & Socio-Economic Development

In Kenya, over 80% of the land surface including the ASALs is fragile and has a population of over 16 million people, categorized as poor (living below line) and suffer effects of widespread aridity, acute food and water shortage, as well as general insecurity (Mulinge et al. 2016; Range Management and Pastoralism Strategy 2021-2031). The annual cost of land degradation in these areas is estimated to be about 1.5 Billion USD, which is equal to the Country's 5% GDP (Nkonya et al, 2016; UNSD 2016).

Dryland natural assets are intimately linked to poverty. Local communities depend on these assets for their livelihoods and survival. Despite the rich assets hosted in the dryland landscapes and the fact that they constitute important natural assets that spur socio-economic development, these areas continue to face ecological 'marginalization' and neglect from mainstream ecosystems. First, the true worth and full potential of dryland natural assets have not been explored and documented to provide tangible evidence for policy, planning, sustainable management and decision-making. Further, the skewed interpretation of the contribution of natural assets in Kenya's economy is partly attributable to lack of adequate data and research on their economic value and hence their lack of placement in economic and social planning instruments.

This dryland natural assets inventory and participatory mapping report (2026) for the Kenya's drylands, is the first of its kind in Africa that authoritatively documents and inventories dryland natural assets. Kenya´ s drylands are endowed with vast and diverse natural resources including biodiversity and genetic, land and unique ecosystems. These vital assets (hills and mountains, valleys, rivers, lakes, forests and wildlife, varied weather and climatic regimes) are indeed key pillars of socio-economic development in the Country. They are the suppliers of ecosystem services such as water, energy, biomass, medicine, food, income and revenue both at the household and community- level.

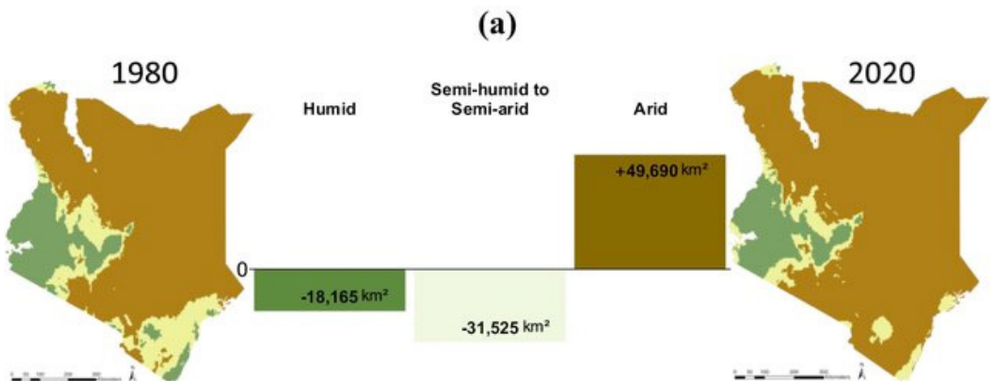
Mapping and inventorizing dryland natural assets is the first step towards securing them and achieving posterity by influencing the envisaged land cadastres', plans and policies at county and national level and enhance their protection and survival for continued accruing benefits and creation of wealth and green jobs. In this regard therefore, the National Land Commission (hereinafter referred to as the Commission) with support from her partners - WYSS Academy for Nature and CETRAD alongside other government agencies and non-state actors, embarked on county-based mapping and inventory of natural assets of dryland areas in Kenya, with Isiolo, Laikipia and Samburu being pilot counties. The mapping project aimed to provide evidence for instituting measures for their protection and conservation; and advancing the development of transformative policy changes for natural resources governance, conservation and sustainable use. Therefore, this report presents the outcomes of Natural Assets mapping in Samburu County.

Box 1: Role of Various Actors

- **National Land Commission (NLC):** Coordination and technical guidance role on the process as well as linking with relevant government institutions for necessary access approvals. The commission is the lead institution with the legal and constitutional mandate regarding land management including asset mapping and inventorization.
- **Wyss Academy for Nature – East Africa and CETRAD:** Provided technical support, facilitated participatory mapping, digitization, and coordinated multi-stakeholder engagement. It also provided the central repository/server for data.
- **County Government:** Played critical roles in local coordination, stakeholder mobilization, data collection assistance and validation.
- **Community Members and Local Leaders:** Participated in asset identification, knowledge sharing, mapping activities, validation and political good will

1.5.2 Shifting Climate Zones in Kenya (1980–2020)

Kenya's climatic zones are significantly changing due to many factors, but majorly, human driven. Human-induced climate change significantly alters the spatio-temporal characteristics of climate zones, which drives agricultural land use and ecosystem change. However, the detectability of shifting climate zones and the rate and time of the changes is yet to be adequately addressed at the regional and local scale. Studies by Ted et al. , 2023 on the shifting climate zones and expanding tropical and arid climate regions across Kenya (1980–2020) observed an approximate 1 °C increase in average annual temperature over the 40-year period (Figure 4). Consequently, a total of 76,346 km2 shifted from cooler to hotter zones, while 1298 km2 shifted from hotter to cooler zones. These dramatic changes are largely experienced in the drylands, increasing their fragility and inability to provide resources and benefits therefrom; and negatively impacting socio-economic and ecological development in these areas.



Precipitation Zones	Average Precipitation (mm)	Climate Region Designation	1980 (km²)	2000 (km²)	2020 (km²)	Change (1980-2020)	% Change (1980-2020)
1	>103	Humid	26,654	23,029	12,285	-14,368	-54%
2	80-103	Sub-humid	25,034	23,757	25,640	606	2%
3	65-80	Semi-humid	28,941	20,190	24,537	-4,404	-15%
4	48-65	Semi-humid to Semi-arid	78,493	53,342	46,968	-31,525	-40%
5	36-48	Semi-arid	49,894	52,885	65,509	15,615	31%
6	25-36	Sub-arid	70,832	56,230	101,497	30,665	43%
7	<25	Arid	293,966	344,378	297,376	3,410	1%

Figure 4: Shifting climate zones and expanding tropical and arid climate regions across Kenya- 1980–2020 (Ted et al., 2023)

1.5.3 Strengthening Natural Resource Governance and Legal Compliance

Kenya's dryland natural resources are governed through overlapping statutory and customary institutions, including county governments, national agencies (e.g., NEMA, WRA, KFS, KWS), community conservancies, WRUAs, and grazing committees. In practice, mandate ambiguities, weak enforcement capacity, and the absence of authoritative spatial baselines frequently undermine effective stewardship and accountability (Lockwood, Worboys, & Kothari, 2006). A comprehensive, geo referenced inventory addresses these gaps by operationalizing constitutional and statutory obligations—explicitly locating ecologically sensitive areas, clarifying tenure and access regimes, and identifying sites eligible for reservation and gazettement under existing law.

Asset mapping directly supports implementation of key legal instruments, including Articles 40, 42, 60, 61, 62, 66, 68 and 69 of the Constitution of Kenya on sustainable land use and environmental protection (Republic of Kenya, 2010); Sections 8 and 15–16 of the Land Act 2012 on inventories and reservation of public land (Republic of Kenya, 2012); EMCA provisions on wetlands and protected environments (Republic of Kenya, 1999); the Wildlife Conservation and Management Act on corridors, conservancies, and endangered ecosystems (Republic of Kenya, 2013); the Water Act 2016 on protected catchments (Republic of Kenya, 2016); and PLUPA on County Spatial Planning and Special Planning Areas (Republic of Kenya, 2019). By linking assets to clear spatial extents, tenure classes, and legal pathways, mapping enables enforceable decisions, inter agency coordination, and measurable accountability for dryland governance (GoK, 2009; Lockwood et al., 2006).

1.5.4 Preventing and Managing Resource Based Conflicts

Arid and semi arid counties experience recurrent conflict cycles driven by acute water scarcity, limited pasture , livestock mobility, fencing, and the conversion of rangelands to cropland or settlements (FAO, 2019; Whyte, 2018). Climate extremes intensify these pressures by increasing temporal and spatial variability in access to water and forage (IPCC, 2019). Spatial inventories that explicitly map grazing reserves, livestock corridors, dry season water points, wildlife routes, and salt licks transform implicit and contested claims into visible planning inputs.

Such baselines support conflict sensitive land use planning by avoiding infrastructure placement across seasonal routes, enabling negotiated access and drought contingency grazing agreements, identifying hotspots where user overlaps are acute, and guiding human–wildlife coexistence zoning near riparian areas and dry season refugia. Evidence from Horn of Africa rangelands shows that formal recognition of mobility corridors and refuge areas reduces conflict incidence and losses, while improving rangeland condition and livestock productivity (FAO, 2019; GCA, 2021).

1.5.5 Unlocking Green Economy Opportunities, Natural Capital Accounting, and Climate Finance

Drylands underpin economies based on livestock production, wildlife tourism, biodiversity assets, renewable energy, and nature based solutions. Rangelands in developing countries support approximately 10% of global meat production and contribute an estimated 50–80% of agricultural GDP in many Sub Saharan African states (FAO, 2019). In Kenya, ASALs host about 70% of the national livestock herd, while ecosystems spanning Laikipia and Samburu sustain some of the highest wildlife densities outside protected areas (GCA, 2021).

Robust spatial mapping enables counties to integrate natural capital values into budgeting and National Land Information Management System (NLIM), design Payment for Ecosystem Services (PES) and wildlife lease schemes, and assemble bankable portfolios for climate finance—such as riparian restoration, wetland rehabilitation, rangeland regeneration, and soil and grassland carbon projects grounded in verifiable baselines and Monitoring Reporting and Verification frameworks (IPCC, 2019; Escobar, 2020). Where credible spatial baselines exist, counties are better positioned to articulate investment ready pipelines aligned with Vision 2030, the National Spatial Plan, and Agenda 2063 (GoK, 2015; African Union, 2015).

1.5.6 Protecting Community Rights, Cultural Landscapes, and Indigenous Knowledge

Pastoral and Indigenous communities possess rich and sophisticated Traditional Ecological Knowledge (TEK) related to seasonal grazing, drought refugia, salt lick nutrition, and wildlife coexistence. Yet many cultural sites, sacred groves, migration corridors, and communal water points remain undocumented and are therefore vulnerable to privatization or incompatible land uses (Berkes, 2012; King & Willow, 2011).

Participatory mapping documents TEK identified assets and embeds them within formal spatial plans, safeguards communal tenure and customary access under the Community Land Act (2016), aligns cultural heritage protection with biodiversity and water security outcomes, and elevates women's and youth knowledge—enhancing inclusivity and decision legitimacy (Chan et al., 2012; McPherson et al., 2020). By situating cultural landscapes within official land information systems, counties reduce dispossession risks while preserving place based governance systems that have historically sustained dryland resilience.

1.6 Purpose and Objectives

The overall purpose of the mapping initiative is to inventorize all land-based resources in Kenya's drylands and strengthen their governance. Specifically in Laikipia County, the project aimed to:

1. Take a stock of the county's dryland natural assets.
2. Identify the threats, challenges and opportunities for sustainable management, use, conservation and development of drylands natural capital.
3. Determine the efficacy of the various legal pathways for securing dryland natural assets and resources for posterity and climate resilience.
4. To develop locally and scientifically grounded context specific recommendations for the sustainable management, protection, and restoration of dryland natural assets that support long term ecological integrity and community resilience.

1.7 Scope and Limitations

The mapping scope for this initiative covered five assets (Table 3) including water related resources such as ponds, streams, rivers, swamps etc.; wildlife corridors, areas of dense vegetation and salt licks among others.

Table 3: Asset Mapping Scope

Natural Asset category	Elements/variables
Water Resources	Rivers/laggas, rock catchment, sand dam, springs and wetland (swamps and marshes)
Wildlife	Corridors and dispersal areas, Wildlife concentration areas/ breeding areas
Island of dense vegetation	Islands of dense vegetation
Livestock	Dry season grazing areas, Livestock Routes
Natural Salt lick areas	Salt Licks areas

1.7.1 Spatial Scope

Samburu County (0030' – 2045'N and 36015' – 38010'E) is within the northern parts of Great Rift Valley in Kenya (Figure 5). The County lies within ASAL region covering an area of 21,090 square kilometers and is bordered by the following Counties Turkana (Northwest), Baringo (Southwest), Marsabit (Northeast), Isiolo (East) and Laikipia (South).

Samburu County covers an area of approximately 21,090 km^2. It is divided into three sub-counties: Samburu East, which is the largest and accounts for about 48% of the county's area; Samburu North, covering around 36%; and Samburu West, which makes up about 19% of the total area. Thus, Samburu East is the largest sub-county in terms of land size, followed by Samburu North and Samburu West (Table 4). Spatially, the mapping exercise was carried out in the Sub counties, wards and locations in Samburu County (Table 4). According to Kenya National Bureau of Statistics (2019), the human population of Samburu County is distributed as follows: Samburu West has approximately 164,942 people (53%), Samburu East has about 77,994 people (25%), and Samburu North has around 67,391 people (22%).

Table 4: Consolidated administrative units and land sizes for Samburu County's sub-counties and their respective wards and locations and human population.

Sub-County	Wards (No. & Names)	Locations (No.)	Land Size (Km^2)	Population
Samburu North	6 Wards: Angata Nayokie, Baawa, ElBarta, Nachola, Ndoto, Nyiro	14 (Baragoi 7, Nyiro 6, Angata Nayokie 1 approx.)	7,681 (Baragoi 4,670.4 + Nyiro 3,010.7)	67, 391
Samburu West	5Wards: Lodokejek, Loosuk, Maralal, Marmar (Suguta Marmar), Poro	14 (Lorroki 6, Kirisia 5, Malasso 3)	~3,937 (Lorroki 1,399.3 + Kirisia 1,237.7 + Malasso 1,300.3)	164, 942
Samburu East	4 wards: Waso, Wamba West, Wamba East, Wamba North	12 (Wamba 8, Waso 4)	10,049 (Wamba 4,670.8 + Waso 5,378.	77, 994
Total				310,327

Source: 2018-2022 County Integrated Development Plan. 2019 KNBS Census

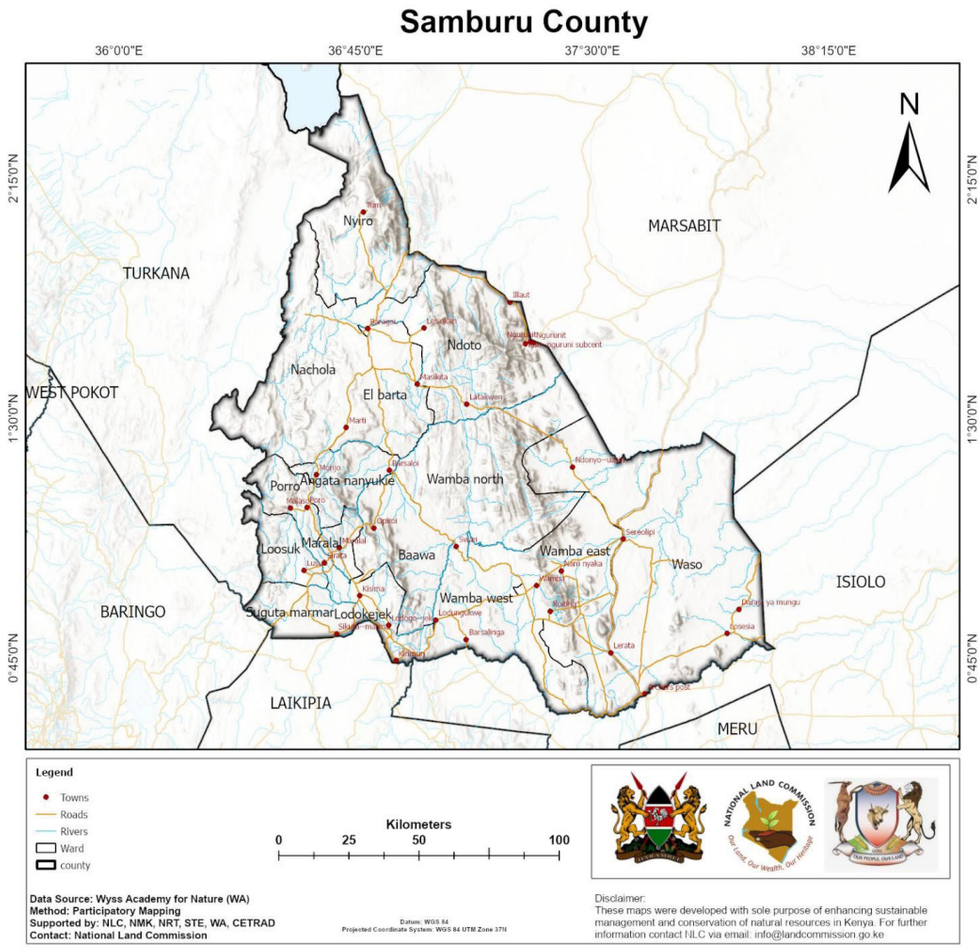


Figure 5: Samburu County Map

Limitations

The mapping exercise was implemented in complex social and physical conditions, and a set of practical constraints shaped field access, data capture, and data consistency during ground truthing and validation. These limitations are summarized below as experienced in the Samburu exercise.

1. **Community fear of losing land.** In some areas, the start of mapping triggered anxiety that documenting natural assets could translate into land loss or external claims, which initially reduced openness and slowed cooperation until trust and legal clarity were established.
2. **High expectations of immediate benefits.** The involvement of multiple institutions created expectations of quick, tangible benefits among some community members, and this diverted attention from the mapping objective and required repeated clarification of roles and realistic outcomes.
3. **Language barriers during ground truthing.** Communication constraints arose in the field where language differences affected interviews, explanations, and verification of mapped features, making interpretation support essential for accurate capture of attributes and narratives.
4. **Administrative boundary conflicts and weak boundary precision.** Because of the expansive nature of the county landscape, communities sometimes struggled to delineate boundaries with the specificity and precision needed for clean spatial attribution, creating boundary ambiguity that complicated mapping and validation in some contexts.
5. **Vastness, ruggedness, and remoteness of landscapes.** Large distances, difficult terrain, and hard to reach sites constrained field coverage and efficiency, increasing travel time and limiting how quickly teams could access and verify all points across remote areas.

6. **Security-related constraints in conflict prone settings.** Parts of the operational environment were described as conflict prone, with pressures linked to political dynamics and climate stress (including prolonged drought), which restricted movement, increased risk management demands, and constrained fieldwork in some areas.
7. **Technical setbacks: geolocation failures and weather/internet disruption.** The team experienced inability to geolocate some asset points and faced weather and internet challenges that interfered with transmitting data to the repository, affecting the smooth flow of near real time data handling and completeness of some records.
8. **Differing interpretations and terminologies for assets and place names.** Variations in local naming, meanings, and classification of asset locations created inconsistencies across records, requiring reconciliation through joint validation processes and oral histories to harmonize entries.

Despite these constraints, the Samburu mapping exercise remained credible and usable because field teams applied daily verification/cleaning routines, transmitted datasets to the central repository, and subjected outputs to structured stakeholder validation processes that helped reconcile naming differences, address gaps, and strengthen legitimacy and data integrity.

1.8 Justification

1.8.1 Constitutional & Legal Underpinnings

The promulgation of Kenya's Constitution in 2010 brought a paradigm shift in the governance, including reform-oriented policies and laws for land and land-based resources management. Both land and natural resources are broadly defined under Article 260 of the Constitution; definitions that clearly depict mutual reinforcement rather than depicting land and natural resources as separate and distinct isolated ecotones. Notably, Chapter 5 of the Constitution demonstrates the close and intimate connectivity between land and environmental resources and hence the need to weave and manage these together as connected variables via a landscape connectivity lens.

Consequently, the National Land Commission (NLC) was birthed by the Constitution of Kenya 2010 and established under Article 67 of the Constitution to perform various functions, including the management and administration of public land on behalf of National and County Government and exercising oversight responsibility over land use planning in the country. Land is broadly defined in Article 260 of the Constitution to include all water bodies, marine waters and natural resources (such as forests, wildlife, minerals, fossil fuels, sunlight and genetic resources), most of which are further categorized as public lands under Article 62 of the Constitution. To effectuate the Constitution in the management of public land, **Section 15(3) of the Land Act 2012**, empowers the Commission with the responsibility of undertaking an **inventory of ALL land-based resources in the Country**. In addition, Section 8 of Land Act tasks the Commission with the following responsibilities:

a. **Identifying public land, prepare and keep a database of all public land,** which shall be geo-referenced and authenticated by the statutory body responsible for survey.
b. **Evaluating all parcels of public land based on land resources mapping and overall potential for use.**
c. **Sharing data with the public and relevant institutions** in order to discharge their respective functions and powers under this Act; and that the Commission may require the land to be used for specified purposes and subject to such conditions, covenants, encumbrances or reservations as are specified in the relevant order or other instrument.

Furthermore, Sections 11 (1, 2 &3) of Land Act 2012 regarding Conservation of ecologically sensitive public land, requires the Commission to:

a. **Take appropriate action to maintain public land** that has endangered or endemic species of flora and fauna, critical habitats or protected areas.

b. **Identify ecologically sensitive areas** that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation and climate change.

c. **Consult existing institutions** dealing with conservation.

Apart from these legislative frameworks, other sectoral laws such as EMCA (199), Wildlife Conservation and Management Act (2013), Water Act 2016, Forest Conservation and Management Act 2016, among others provide vital frameworks for natural resources conservation, sustainable use and management in the Country.

The constitutional, policy and legal contexts provided herein, form the main beacons for the Commission to undertake dryland natural assets inventory and mapping for Laikipia County. This aims to cure an existing lacuna relating to lack of proper land-based natural resources inventory and databases especially in the Kenya's ASALs. This is also consistent with the National Spatial Plan (2015-2045) and the principles of National Land Policy, 2009 that are both geared towards ensuring that land in Kenya is held, used and managed in a manner that is optimal, equitable, efficient, productive and sustainable.

1.8.2 Practical Context

Dryland ecosystems including wetlands (springs and oases, lakes, rivers) and critical habitats such as forests and wildlife parks constitute important natural assets that spur socio-economic development in drylands (Arid and Semi-Arid Land- ASALs). They are not only food, water, and medicine that are consumed by local communities, but equally, play a significant role in supporting livestock production and thus improving human well-being in these dynamic and fragile landscapes. Importantly, drylands are known for playing host to huge biodiversity resources such as wildlife that also contribute immensely to ecological and socio-economic development through tourism and other ventures. Yet these areas continue to face ecological 'marginalization' and neglected from mainstream ecosystems. In fact, very few tourists visit these areas because of historical marginalization, insecurity and poor infrastructure.

The perception and mindset that drylands in Northern Kenya are unproductive often stems from a narrow focus on traditional agriculture, particularly crop farming, that relies on consistent rainfall. However, dryland ecosystems are endowed with natural capital that is unique but are not given much recognition and attention. Thus, recognizing and sustainably utilizing the diverse range of natural resources present is crucial in attaining the socio-economic vision and agenda of the Country.

The natural capital ranges from livestock adapted to arid conditions to renewable energy (wind and solar energy) potential and unique biodiversity. In addition, the diverse land formation and water resources (swamps, springs, rivers) supports flora and fauna as well as livelihood of the communities. The region can indeed unlock significant economic and social development.

The true worth and full potential of dryland natural assets have not been explored and documented to provide tangible evidence for policy, sustainable management and decision-making. Their existence is therefore highly threatened, given that the economy of Kenya has shifted to the North, following discoveries of important assets such as Petroleum, Minerals, wind Power and large-scale infrastructural projects including the LAPSSET Corridor, Horn of Africa Gateway Development Project (HoAGDP) etc. Further, the survival of these critical ecosystems and natural assets is more threatened by the on-going Community Land Registration, within the ambit of Community Land Act 2016, which is led by the State Department for Lands and Physical Planning (SDLPP). If these resources are not properly captured and documented, reserved in the National and County/community land Cadastres/registers, and attendant County Spatial Plans (CSPs), as well as gazzetted, they will be wiped away and important ecosystem goods and services will be lost.

This report therefore makes a significant contribution in improving the understanding and appreciation of dryland natural assets, for policy alignments and related potential reforms that will favour improved and sustainable natural assets conservation and governance. Similarly, the report provides evidence for situating dryland assets as the heartbeat for livelihoods and community resilience in these fragile landscapes.

1.8.3 Significance

Mapping of drylands ecosystem and natural assets is critical in ensuring that appropriate inventories of natural resources in the country are created to support decisions and actions relating to their management and to streamline their governance. Managing what is known is imperative to the commission as an oversight body on land and natural resources. In addition, natural resources management is a concurrent jurisdiction between National and County Governments in line with Article 186 as read with Schedule 4 of the Constitution relating to distribution of functions and separation of powers.

The inventory will be translated into Atlas of drylands natural assets which provides a synthesized data and information hub on drylands natural capital in a visually orienting format that is easily understandable by the government, private sector, development partners, civil society, researchers and the general public. The atlas will further provide the what, whose, the where and how of the entire natural capital; the distribution and their contribution to socio-economic development in the country as well as any changing patterns and socio-economic linkages; the need and the mechanics for their protection and sustainable use.

At the strategic policy level, mapping these assets and resources is meant to facilitate and make them public through reservations in the land cadastres and gazzette notices for their enhanced and continued protection, conservation, access and use by various local communities among other stakeholders. Thus, this mapping initiative is significant given that it provides:

a. Reliable information and data for decision and policy makers on the status, trends and contribution and sector linkages of the resources and socio-economic development

b. Baseline information for research and education framework for advancing in- depth research and progress tracking of the various elements of the country's dry land-based resources within the academia and education portfolios.

c. Salient information for civic and advocacy programmes for the various population segments and stakeholders at different levels especially the local communities, who are the primary stakeholders and custodians of the assets, that are directly or indirectly affected by decisions regarding natural resources. It visually paints the picture of the state of the natural resources, the threats and opportunities through intersection analysis, for advancing the sustainable development agenda.

d. As a policy tool and oversight framework, it will inform evidence based transformative policy development and set the pace for important advisories to relevant authorities, Ministries, Departments, Agencies and Counties (MDACs) regarding sustainable management and development of the natural resources including county spatial planning (CSP). In addition, the atlas and inventory data/report provide succinct policy recommendations for various actors. And lastly,

e. Land and land use data to the National Land Information Management System (NLIMS). Such data will be valuable to inform preparation of physical and land use plans, land use policies, standards and guidelines as well as control and regulation of land and property use in respect of all categories of land.

1.9 Alignment with Government Policies, Priorities and Strategies

The inventory and mapping of critical natural assets in the dryland areas of the Republic of Kenya is in harmony with the County Integrated Development Plans (CIDPs), Medium Term Plan (MTP) of Vision 2030, sectoral strategies and policies. The National Land Policy (2009) and National Land Use Policy (2017), emphasize the importance of mapping natural resources. Specifically, it highlights the need to identify and map trans-boundary natural resources, unified mechanisms for natural resource information and enhancing preparation of strategic spatial development plans. These initiatives aim to improve the management and conservation of natural resources in Kenya by ensuring their sustainable use and protection.

Therefore, intervention (mapping of natural capital) is in line with the Fourth Medium Term Plan (MTP IV) of vision 2030. Kenya prioritizes the management and development of natural resource in the fourth priority sector. The Key focus areas include: Water Harvesting and Conservation, Environmental Protection, Sustainable Waste Management, Infrastructure Development and Natural Resource Management. Thus, the plan acknowledges the importance of natural resources in Kenya's economy and provides anchorage for the sustainable use and management of these resources. The plan is also aligned to international commitments such as the UN Agenda 2030 and Africa Agenda 2063, which emphasize on sustainable development and environmental protection. Further, the mapping and inventory initiative demonstrate the government's commitment to sustainable development and the responsible management of natural resources in Kenya.

Equally, the Samburu County Integrated Development Plan shows a detailed strategy on how the sector on Water; Sanitation, Energy, Environment, Natural Resources, and Climate Sector will put strategies for the sustainable management of these resources. The plan provides an overview assessment of the major natural resources found within the County. These resources include water and wetland, extractive resources, biodiversity as well as Development of County Spatial Plan to guide in use and management. To enhance data driven development in the county, this mapping and inventory initiative provides the much-needed information and data for informed decision-making, planning and sustainable management of the assets.

1.10 Target Users

The report targets the following users:

1. General public
2. National Land Commission
3. Government Ministries, Departments and Agencies
4. County Governments
5. Researchers and Academic institutions
6. Non-Governmental, Community based Organizations and Civil Societies
7. Media

2. APPROACHES & METHODOLOGY

2.1 Overview

This report is a product of extensive data gathering and rigorous community participation in mapping dryland natural assets within Samburu County. This section details the approaches, and the methodological processes adopted to deliver this mapping initiative.

2.2 Approaches

The mapping of the county assets adopted the following approaches:

1. **Collaboration**- The initiative is a product of intensive collaboration and partnership between the various state agencies at national, subnational and local level; primarily consisting of NLC, county government of Samburu, NMK, KWS, KFS, CETRAD, Save the Elephants, NRT, WYSS Academy for Nature and the Ministry of Interior (County Commissioner and Chiefs) and local communities.
2. **Community Centred Participatory GIS Mapping**–The mapping initiative involved local community members in identifying, mapping and profiling of all their assets. By consulting the community, a wealth of information on known and previously unknown assets were gathered, including personal experiences, knowledge and values attached to them.
3. **Technology Integration–**The mapping initiative adopted the use of ESRI's ArcGIS Survey123 application to capture data regarding the identified assets.
4. **Gendered Participation** - The mapping process ensured gender, cultural, social sensitivities and inclusion to enhance diversity in the perspectives of various players.
5. **Capacity Strengthening and Creation of Green Jobs**- The exercise created a number of green jobs through recruitment, training and involvement of youths (GenZs) in mapping of assets. The youths were trained and participated in this project and are now equipped with the skills and knowledge to conduct similar assignment when need arises.
6. **Adaptability**- The mapping team for this initiative did not remain static in their thinking and methodology but rather adjusted it to fit the prevailing circumstances, based on new information and unexpected challenges in different communities and landscapes. This was imperative for effective management of uncertainties and maintenance of validity and integrity of the work processes and outputs.

7. The Storytelling Approach (STA)

Storytelling is increasingly recognized as a powerful participatory method in mapping by allowing communities to share place-based knowledge that might otherwise be invisible in traditional GIS or ecological surveys. The approach uses the power of narrative to reveal and highlight the hidden assets of a community, particularly those relating to natural resources and environmental features.

Why STA in Natural Asset Mapping?

- **Participatory Knowledge Creation:** STA is a tool for surfacing "multiple truths" in mapping—especially those rooted in cultural memory or marginalized voices.
- **Natural Assets Beyond Ecology:** Conventional natural asset mapping often relies on scientific assessments of biophysical features (e.g., wetlands, forests). However, narrative-based approaches recognize that natural assets carry emotional, historical, and cultural significance (Chan et al., 2012).
- **Indigenous and Local Knowledge Systems:** In many pastoral communities, stories are the primary mode of ecological knowledge transmission. Storytelling captures Traditional Ecological Knowledge (TEK), enabling planners to better understand land stewardship practices and sacred ecological relationships (Berkes, 2012).
- **Story Mapping Tools and Case Studies:** Digital platforms like ArcGIS StoryMaps and analog techniques like community sketch mapping are increasingly used to document spatial stories. Case studies show how narrative mapping improves environmental justice, conservation planning, and urban greenspace design (Cunsolo & Ellis, 2018).

In this mapping initiative, STA was adopted to tease out the respondents knowledge, understanding and perception on assets that may be hidden. Two (2) main Techniques were adopted during the mapping exercise including:

1. **Story Circles:** Through small group sessions, participants were able to share memories or experiences with natural resources (Plate 1). This method encouraged deep listening, mutual respect, and emotional connection — surfacing place-based knowledge that technical tools such as Arch GIS often miss. Other benefits included: building community cohesion, amplifying marginalized voices, producing emotionally rich spatial data and enhancing trust in planning processes.

Plate 1: Use of Story Circles as Storytelling Technique in the Asset Mapping

2. **Participatory Mapping:** Community members were invited to interact with printed or digital topographic (topo) maps to identify the natural assets. As stories were shared, pin locations annotated with quotes, photos, or drawings (Plate 2) were captured. This method was a practical and powerful way to blend scientific geography with local knowledge. It allowed participants to locate, annotate, and interpret real-world terrain while layering on personal, cultural, and natural assets insights. Other benefits included: making complex terrain that is understandable and relatable, encouraging people to connect place with memory and identity and supporting evidence-based but locally rooted decision-making.

Plate 2: Use of Topo Maps as Storytelling Technique in the Asset Mapping

Overally, the STA enriched the mapped data with meaning, memory, and identity—producing more inclusive, resilient, and place-sensitive planning outcomes. It aligns with calls for decolonizing planning, advancing social-ecological integration, and valuing non-expert knowledge in natural resources governance.

2.3 Methodological Process

The mapping of dryland assets within Samburu County commenced in March 2022 and progressed in phases until 2025 through an iterative process as detailed hereunder:

2.3.1 Inception Phase

Step 1: Consultations

This phase mainly involved community penetration through courtesy calls and engagements with the County Commissioner and local administration (the chiefs and assistant chiefs at location level). The facilitation through formal communication from the County Commissioner and local administration provided a clear road map and impetus for the exercise and formed the basis for the next phases.

Step 2: Preliminary Assets Identification:

The second step involved the production of a community asset map of the important resources for their livelihood system. This map was prepared in a community setting to enable the participation and validation from a large group of people. With the aid of google aerial imagery, several maps were produced by smaller sub-groups (women, youth, and elders) and then amalgamated (Plate 3). The final map was then used to develop a preliminary checklist of all ecological assets available in the areas where they operate. It is important to note that the use of Google Earth was only for orientation to enable participants navigate the imagery and cross-reference their key resources against the satellite imagery.

Step 3: Developing the Survey123 Data Collection Digital Forms

Using the preliminary assets identification checklist and information from secondary sources, a data collection platform was developed online through the Arch GIS 123 connect. Multiple forms were created for the various requirements depending on the asset category. For a given inspection form, fields were specified for completion in form of radio buttons, drop-down selections, checkboxes, or text entry fields. Some of the information that were captured included among others: details of the interviewer, location/place name, asset's location, management and governance, main users, land tenure, threats and opportunities. The information that was to be collected was thereafter loaded in an Android tablet and smart phones. Figure 6 illustrates the Survey123 interface showing the data collection digital form.

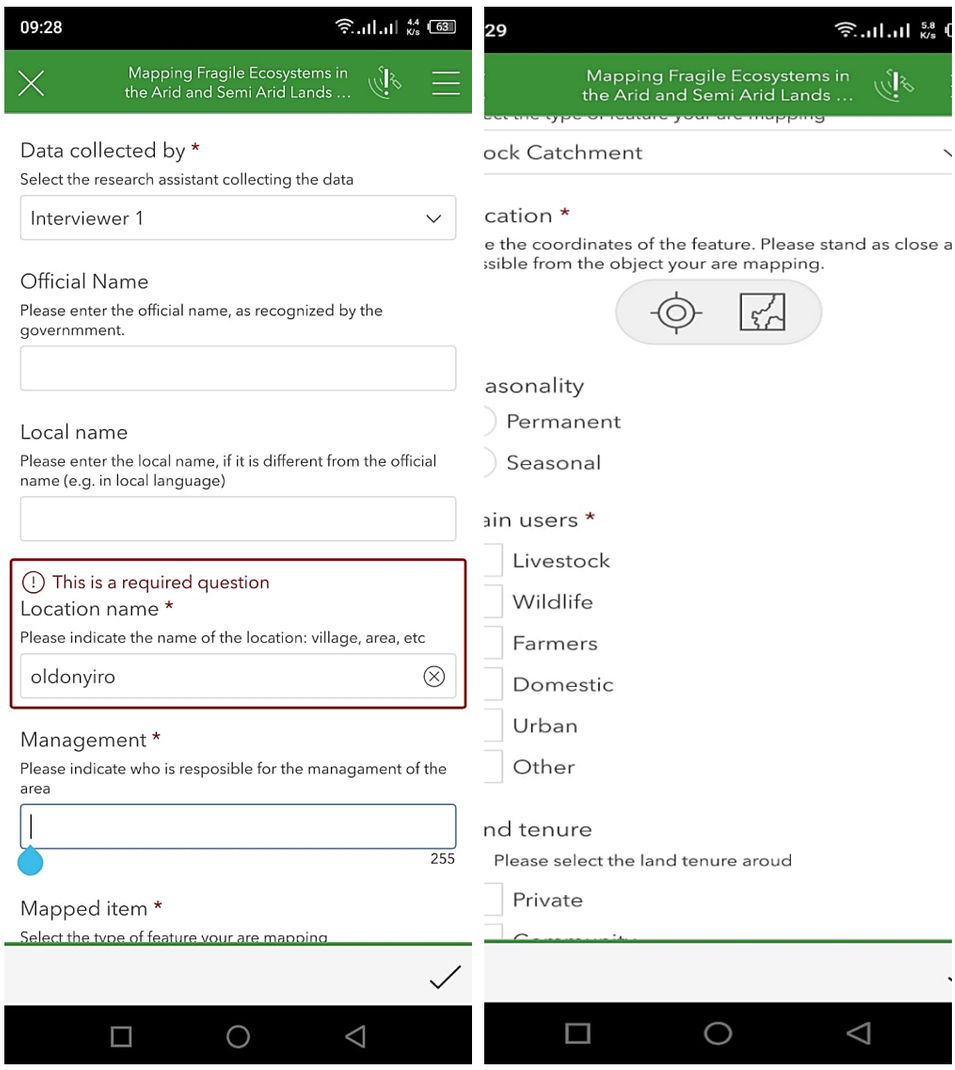


Figure 6: Survey123 interface showing the data collection digital form

Step 4: Recruitment and Training of Data Collection Assistants:

A team of 15 research / data collection assistants were identified, recruited and taken through a 3-day training on the use of ESRI's ArcGIS Survey123 application before they were sent to the field (Plate 3). The Data collection assistants who were recruited had atleast past experience in similar exercise and were all graduates in various fields including statistics, rangeland development, Ecology and environmental studies, rural development, GIS and ICT.

Plate 3: Training of Data Collection Assistants

2.3.2 Phase 2: Data Collection

Step 5: Sampling:

The sampling procedure adopted was both stratified and purposive. The stratification was executed at the wards, locations, sub locations, up to the village level. On the other hand, purposive sampling was based on the community's intrinsic knowledge and understanding about the available assets in their localities **where they deliberately took the mapping team to pick points and capture data**. Further, additional data was also collected through observations to provide a better understanding on the nature and state of these assets including any threats. The data collection team equally compiled field notes describing what was observed based on an observation matrix. Photography was deployed to capture the key phenomenon of interest.

Step 6: Field Survey

Using the preliminary assets identification checklist and printed satellite imagery, the team proceeded to the field. The data collection team included a mix of the local communities (mainly the data collection team), local level opinion shapers, key resource persons and the technical team alongside government administration officials at the local level. The blend in team composition ensured social security and eliminated anxiety about the field mission.

With the data collection tablets and smart phones already installed with ArcGIS Survey 123 application, the field assistants proceeded to the field to pick the assets and the attendant points (Plate 4). Additionally, the attributes as per the data collection digital form included GPS coordinates and a minimum of three geo-tagged photos per asset. This information was then saved in the digital device's outbox.

Plate 4: Data Collection Team during the Field Survey

2.3.3 Phase 3: Data Mining & Analysis

Step 7: Verification of Facts and Data from the Field:

For purposes of quality control, the team held an end of each day debriefing session for data verification and cleaning as well as address any potential challenges encountered during the day. The data was then transmitted to the WYSS academy's cloud based Arch GIS online server.

Step 8: Data Analysis and Interpretation

In the entire process, the team constantly engaged each other through brainstorming and norming facets to improve their mutual understanding for each other, align their thoughts and ideas as well as maintain the focus required to deliver the intended outputs. This ensured that the team properly gelled and that there was clarity of purpose and uniformity in terms of the goal achievement (Plate 5).

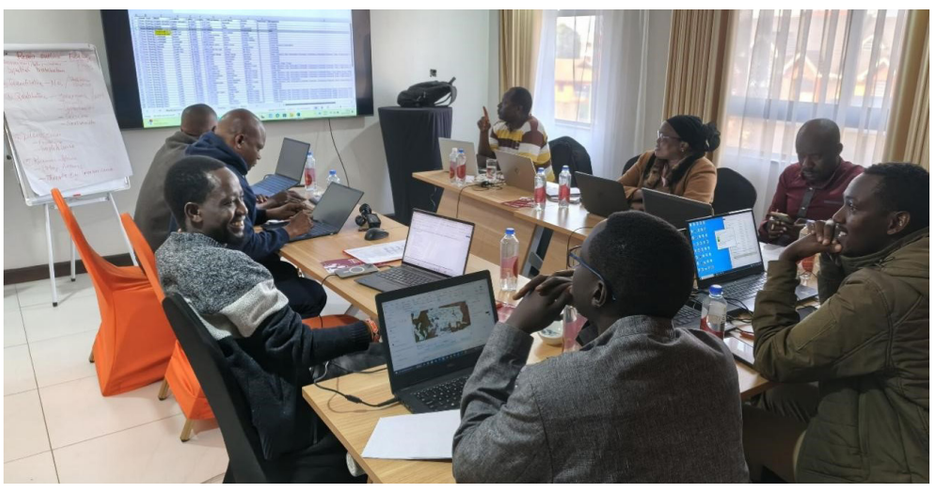


Plate 5: Brainstorming and Norming Session

2.3.4 Phase 4: Public Participation and Validation of the Report

Article 10 of the Constitution, 2010 has already provided for public participation as a fundamental principle in governance. Further Article 232 (1) (d) emphasizes peoples involvement in policy making processes as a fundamental principle and value in public service. The Supreme Court of Kenya's judgement regarding Petition 5 of 2017) [2019] KESC 15 (KLR) provided clear public participation standards and guidelines under paragraph 95. Further, this judgement emphasized on Justice Odunga's judgement (par.75) in *Robert N. Gakuru & others v Governor Kiambu County & 3 others*[2014] eKLR, that public participation ought to be real and not illusory and ought not to be treated as a mere formality for the purposes of fulfillment of the Constitutional dictates.

Equally, validation forms a critical step in ensuring legitimacy, ownership and obedience to the rule of law; and in particular, the democratic principle governing people's participation in governance processes. In addition, the step provides the opportunity to improve the capacity and awareness of the various stakeholders and interested parties to critique and ventilate on the outcome of the mapping process. In this regard, structured engagements and validation sessions were convened with different stakeholders and interested parties. Additionally, validations provide spaces for corroboration, addition or deletions, as the case may be.

For the dryland asset mapping, a rigorous public participation and consultation with various stakeholders was conducted not just to comply with the legal requirements but to promote ownership and social legitimacy of the entire project. Consequently, a total of 67 participants (53 men and 14 women) were consulted and participated in the two rounds of public participation exercises that were convened by the Commission at Samburu Guest Hotel, Maralal. Participants for the public participation exercises were drawn from MCAs, CECMs, Chief officers for lands and wildlife; Directors, land adjudication, registrar, KFS, KWS and WRA (Table 5 and Plate 4, 7 & 8). The stakeholder inputs are consolidated in Appendix 1.

Stakeholders Engagement Schedule

In line with Article 10 and 118 of the constitution of Kenya 2010, public and stakeholder participation is an essential part of democracy and good governance, as it strengthens the state actions and legitimizes governmental actions. In line with this provision, the Commission with support of WYSS Academy For Nature engaged various stakeholders in Samburu, Isiolo and Laikipia counties to validate and input into the dry lands natural assets inventory and participatory mapping reports as per the schedules hereunder:

Table 5: Stakeholders Engagement Schedule

Stakeholders Category	Engagement Date		No. of Attendants by Gender		TOTAL
National Government/Policy makers	Friday 8th November 2024	Lemaiyan Suites, Naivasha	MEN	WOMEN	
			21	8	29
County Government of Samburu	Tuesday, 25th February 2025	Samburu Guest House, Maralal	45	14	59
County Government of Isiolo	Thursday, 27th February 2025	Saala Hotel, Isiolo	33	5	38
MCAs County Government of Isiolo	Wednesday 2nd April 2025	Saala Hotel, Isiolo	20	9	29
MCAs County Government of Samburu	Thursday, 3rd April 2025	Samburu Guest House, Maralal	20	7	27
TOTAL			39	43	182

The engagement and validation sessions were robust and provided immense inputs as well as concerns affecting the various stakeholders and parties (Plate 3 and Plate 4). The sessions also provided the opportunity for the technical team to clarify issues based on the mapping findings, the law and material facts. Where need be, referrals were made for participants to the various government and state agencies for further support, advice and guidance. The stakeholder inputs are consolidated in Appendix 1. A schematic diagram of the methodology adopted is as illustrated (Figure 7).

Plate 6: Ms. Peters (CETRAD) making a presentation during a validation session with the National Government/Policy makers

Figure 7: Methodology Adopted in the Assets Mapping Process

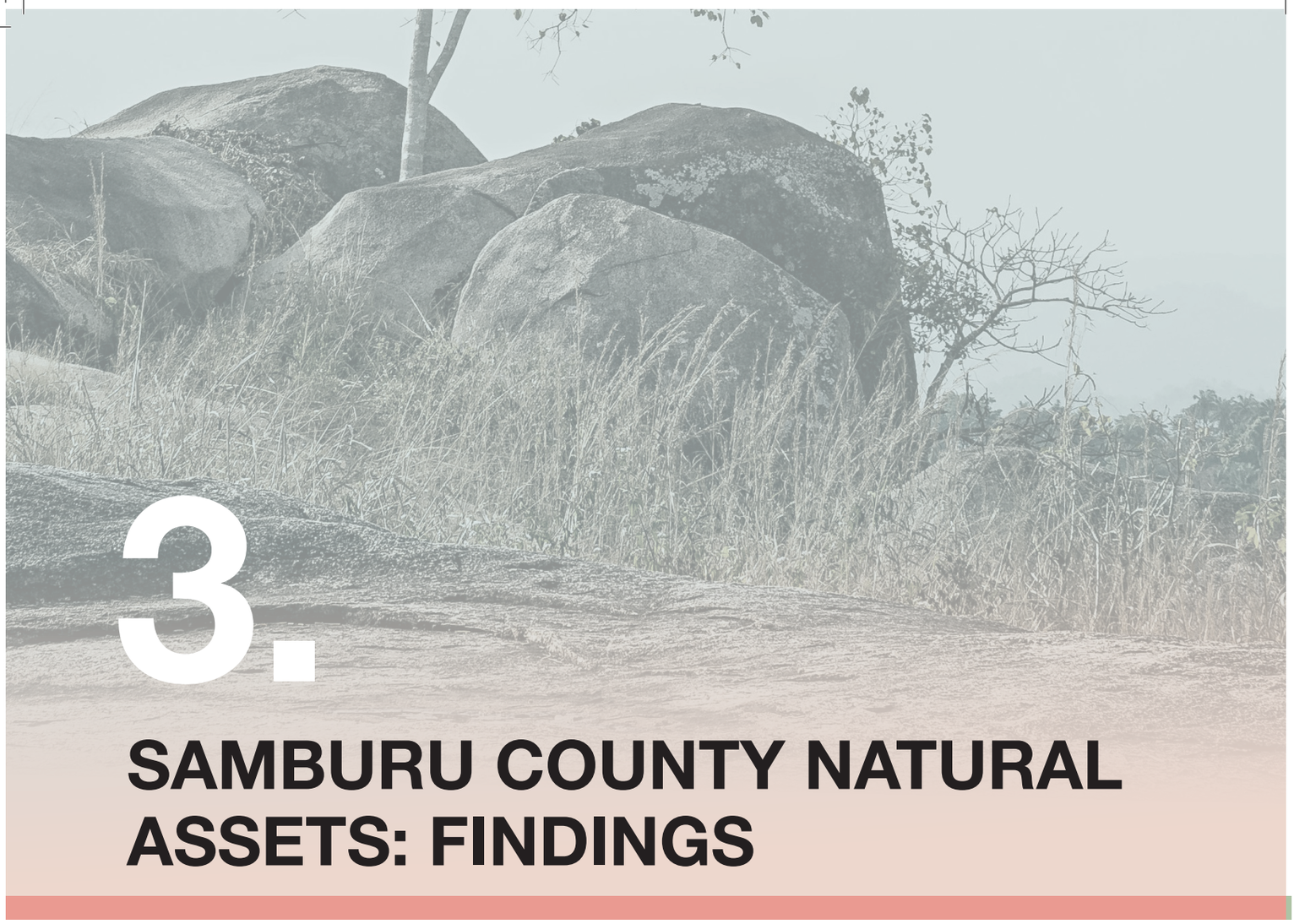
2.4 Summary of Challenges Encountered and Mitigation Measures

While thus community participatory asset mapping was a powerful approach to identify local resources, skills, and capacities, it did not without challenges. Table 6 summarised the Challenges Encountered and Mitigation Measures applied during the exercise.

Table 6: Summary of Challenges Encountered and Mitigation Measures

Challenge	Mitigation strategy
Communities had fear of losing land when they heard of natural assets mapping.	Leveraging on NLC as the driver of the process to gain trust and provide clarity on land issues based on the law and constitutional provisions. The commission was able to manage expectations and demystify, underlying controversies around land and ownership issues.
Higher expectation from the community around short-term benefits when organizations involved are mentioned	Clarifications made on roles and responsibilities alongside the anticipated benefits for the various parties involved in the exercise. This helped to cure the challenge relating to wild expectations from the various stakeholder groups
Language barrier during ground truthing exercise	Involvement of the local administration, village and clan elders, data gatherers drawn from local areas who speak local language
Administrative boundary conflict due to the expansive nature of this kind of counties therefore making it difficult for the local communities to delineate their boundaries with some degree of specificity and precision	This provides an opportunity for the national government to collaborate with local elders to establish and demarcate local context boundaries for the purpose of achieving peace and sustainable development. This was also an important take away by the NLC and other relevant stakeholders to advance effective land administration including land delineation
Vastness, ruggedness and remoteness of the landscapes	This was cured through procuring 4WD vehicles at a capable of managing and enduring such terrain and distances. In addition, the use of motorbikes by data assistants to penetrate and reach some of the hard-to-reach remote areas helped in enhancing maneuverability and access. Utilization of local communities who understand the terrain and are able to avoid where necessary and navigate such terrains.
Inadequate Resources- Manifested in both adequacy and timeliness. This caused delay in execution of project implementation	Heightened resource mobilization through fundraising including development of bankable project proposals alongside partnerships and collaborations. In addition, increased networking and pitching of concept idea notes and

Security related challenges. The project areas are generally conflict prone, triggered by both political and natural induced pressures including changing climatic regimes as occasioned by extreme and prolonged drought	Land use planning and strengthening land tenure security. There is need to strengthen local level natural resource governance such as committees to manage and regulate access and usage of resources and bolster security through national government including disarmament operations in those regions. Integration of local communities in initiatives and projects e.g. Police reservists and clan elders in field missions
Failure to geolocate some asset locations, weather and internet issues to transmit data to the repository.	Survey 123 issues were reported, solutions provided and adopted.
Differing interpretations and terminologies of various asset locations and names.	This was reconciled through joint validation meetings and oral histories.



3.

SAMBURU COUNTY NATURAL ASSETS: FINDINGS

3.1 Overview

Natural assets are the myriad forms of wealth created by nature forming that constitute an integral part of the society due to their vital significance as foundations for communities' identity, economic standing and creation of wealth. This section provides the inventory of the existing natural assets as identified and mapped in Samburu County.

3.2 County Asset Outlook

3.2.1 Assets Richness per Sub County

The mapping exercise identified 14 different asset types in the entire County, consisting of 545 laggas, 221 ponds, 237 springs, 156 sand dams, 110 rock catchments, 90 swamps, 168 areas of dense vegetation, 71 dry season grazing areas, 65 wildlife concentration areas, 108 wildlife corridors, 169 livestock routes, 181 salt licks and 32 shrines, all totaling to 2153, excluding the rivers as they traverse several counties (Table 7, Figure 8)

Table 7: Assets distribution per Sub-County

Water Resources	Samburu E	Samburu N	Samburu W	Total
Ponds	46	46	129	221
Rock catchment	26	26	58	110
Sand dams	48	100	8	156
Spring	83	82	72	237
Laggas	231	243	71	545
Swamps	16	27	27	90
Dense Vegetation	38	93	37	168
Dry season grazing	19	46	6	71
Wildlife concentration	15	39	11	65
Wildlife corridors	34	48	26	108
Livestock Routes	40	94	35	169
Salt licks	69	89	23	181
Shrines	0	29	3	32

3.2.2 Natural Assets Richness and Distribution per Ward

The team found that Nyiro ward had the highest number of water resources, totaling 203, followed by Wamba North and Ndoto ward at 177 and 133 assets respectively. Conversely, Angata Nanyokie and Loosuk ward recorded the lowest asset count at 32 and 35 assets respectively (Table 8). The study observed that Loosuk Ward's topography is a mix of flat, rolling, and hilly terrain within the diverse physiographic setting, marked by shallow soils, variable rainfall, and a landscape shaped by Rift Valley geological feature.

3.3 Water Resources

Water Resources per Ward

Each ward depicted differences and diversity of water resources and assets in the county (Table 8; Fig 8)

Table 8: Water resource per ward

Wards	Pond	Rock Catchment	Sand Dams	Springs	Laggas	Swamps	Total
Wamba East	9	12	11	15	39	4	90
Wamba North	7	2	22	48	88	10	177
Wamba West	7	3	15	8	63	2	98
Waso	23	9	0	12	41	0	85
Angata Nanyokie	6	1	6	8	10	4	35
Baawa	18	14	16	10	29	6	93
El barta	4	6	12	1	18	7	48
Nachola	1	2	12	0	17	0	32
Ndoto	16	2	21	13	58	3	113
Nyiro	1	1	33	50	111	7	203
Suguta Marmar	2	7	0	22	10	10	51
Lodokejek	12	8	5	24	24	10	83
Loosuk	26	14	0	6	5	3	54
Maralal	48	17	3	12	20	9	109
Poro	41	12	0	8	12	15	88
Total Mapped	221	110	304	402	545	15	
Assets Listed (not mapped)	13	17	14	41	37	22	

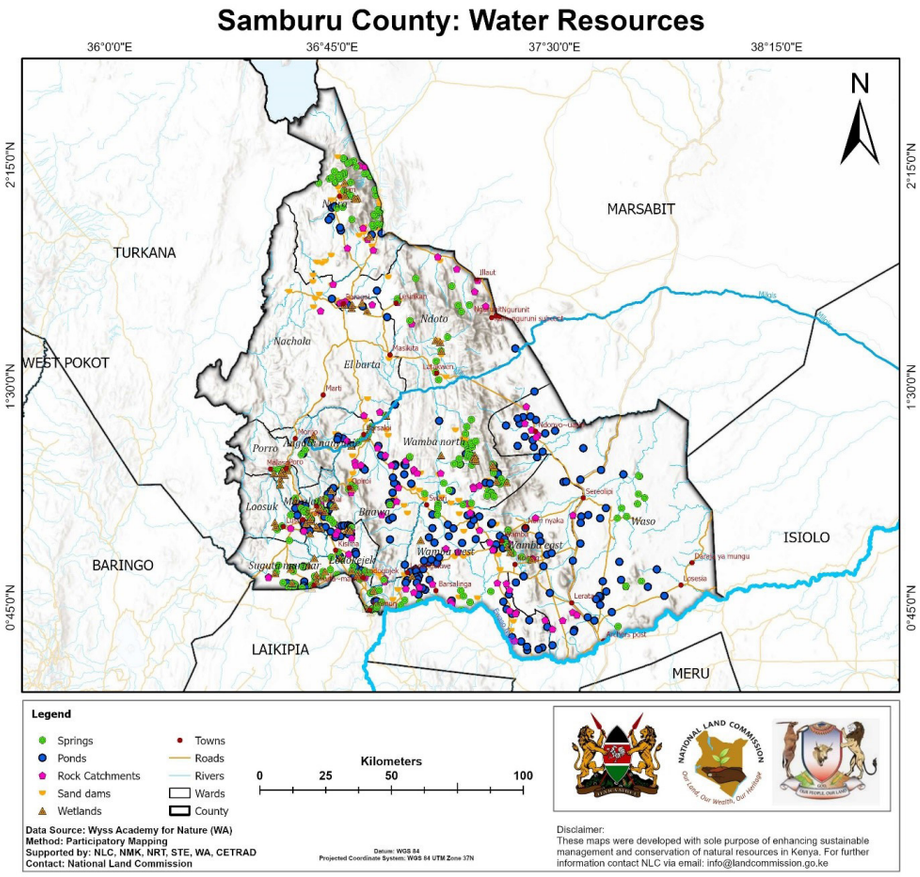


Figure 8: Spatial Distribution of Water Resources in Samburu County

3.4 Rivers, Streams and Laggas

It was established that Ewaso Nyiro is the only permanent river in the county, originating from the western slopes of Mount Kenya and the Aberdare Ranges, the rivers traverses through seven semi-arid counties: Meru, Laikipia, Samburu, Isiolo, Wajir, and Garissa). This suggests that the river serves as an important water catchment for people and biodiversity.

Most of the streams and laggas join Malgis which further connects Ewaso Nyiro at Isiolo, then feeds Lorian Swamp. The team also found out that small rivers and streams from Mathew Ranges drain into Waso Nyiro river which is the boundary between Samburu and Isiolo counties. Similarly, we found that except for Ewaso Nyiro whose source is Aberdare Ranges, the rest of the small rivers, laggas and streams have their sources or catchments situated at Kirisia forest, Mathew ranges, Ndoto ranges or Nyiro ranges (Figure 9; Plate 8)

Plate 8: Ewaso Nyiro River

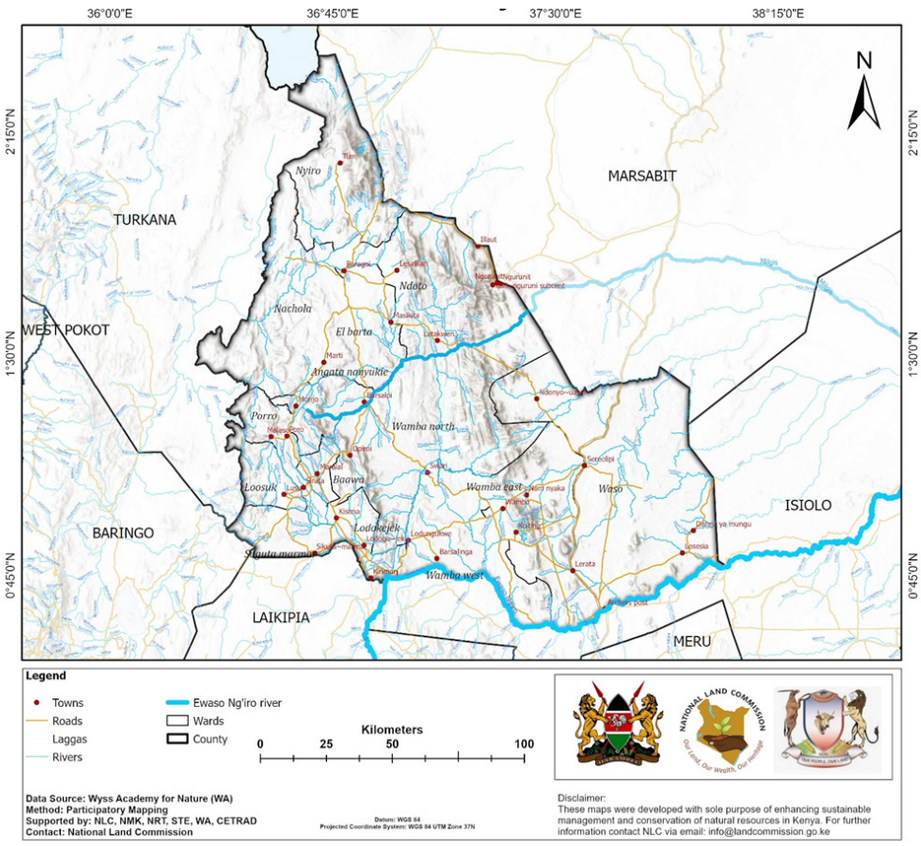


Figure 9: Spatial Distribution of Rivers and Laggas in Samburu County

Laggas.

There are 243 Laggas in the Samburu North, 231 in Samburu east and the lowest counts at 71 in the west. (Table 7). Nyiro ward had the highest concentration of laggas at 111, followed by Wamba North at 88. Porro and Suguta Marmar, and Loosuk have the lowest concentrations at 10 and 5 respectively (Table 8)

3.5 Ponds

221
ponds recorded

We recorded a total of 221 ponds, with the majority (129) situated in Samburu West while Samburu east and Samburu north accounts for 46 Ponds each. Maralal and Porro in Samburu west had the highest at 48 and 41 respectively whereas Nachola and Nyiro had only 1 each (Table 8; Figure 10, Plate 11). The team found that most of pond 206 are seasonal ponds, while pond 208 contains fresh water, findings that correspond well with the general characteristics of seasonal ponds (Table 9). Additionally, the Samburu community holds a myth about a particular pond known as Lenaasakalai, which is tied to the legendary warrior Lenaasakalai, remembered for his strength, courage, and humility in defending his people;

They believe that Lenaasakalai pond was formed by the death of the Samburu giant Lenasaakala (Plate.9). This Implies that the pond has a cultural significant to the community.

Table 9: Pond water quantity, quality and seasonality, Samburu County

County	Permanent	Seasonal	Fresh	Salinity	V
Samburu East	1	137	134	2	2
Samburu North	6	34	34	4	2
Samburu West	8	35	40	3	0
Grand Total	15	206	208	9	4

Plate 9: Lenaasakalai – mysterious pond in Opiroi Location

Plate 10: Lturoto Pond, Ngilai central location

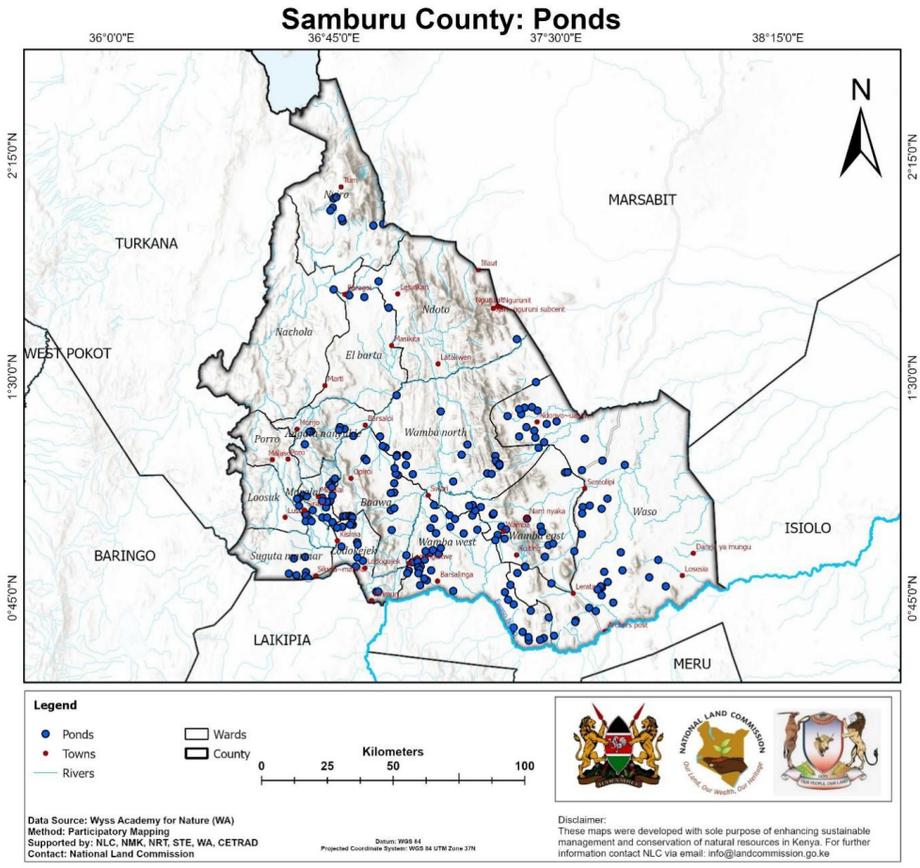


Figure 10: Spatial distribution of ponds

Management

The team found out that a total of 152 (69%) ponds in the county are managed by the communities and 15% fall within Community Conservancy and the remaining (26%) are co-managed (Table 10).

Table 10: Ponds Management

Management	No.
Communities	152
Community Conservancy	35
Communities & Community Conservancy	17
Community, Community Conservancy & Kenya Forest Service	1
Community, Community Conservancy, Water Resource Authority, Kenya Forest Service & Kenya Wildlife Service	1
Community, Community Forest Association	1
Communities, Private & Kenya Wildlife Service	1
Community Conservancy, Kenya Forest Service & Kenya Wildlife Service	1
Community Forest Association, Kenya Forest Service & Kenya Wildlife Service	1
Community Water Project	1
Kenya Forest Service	1
Kenya Forest Service & Kenya Wildlife Service	1
None	7
Private	1
Grand Total	229
Grand Total	309

110

Rock Catchment Areas recorded

Rock catchments

A total of 110 rock catchment areas were recorded, predominantly located in Samburu West which accounts for 58; while Samburu East and Samburu North stood at 26 each (Table 7; plate 11). Similarly, it was established that Maralal (17), Baawa (14) and Loosuk (14) wards have the highest concentrations of rock catchments. Compared to Angata Nanyokie and Nyiro wards with the lowest rock catchments at 1 each (Table 8 Table 8 Figure 11). This suggests that Samburu west sub county have favorable geological characteristics—such as extensive bare rock surfaces—that enhance runoff collection and water harvesting potential. This also indicate that the natural terrain in these Maralal, Baawa and Loosuk wards supports the effective implementation and functionality of rock catchments, which are vital for water storage in arid and semi-arid environments. This may also reflect less suitable geological conditions or possibly lower levels of investment and development in water infrastructure within these areas.

Plate 11: Murua enkai Rock Catchment, Lbukoi location

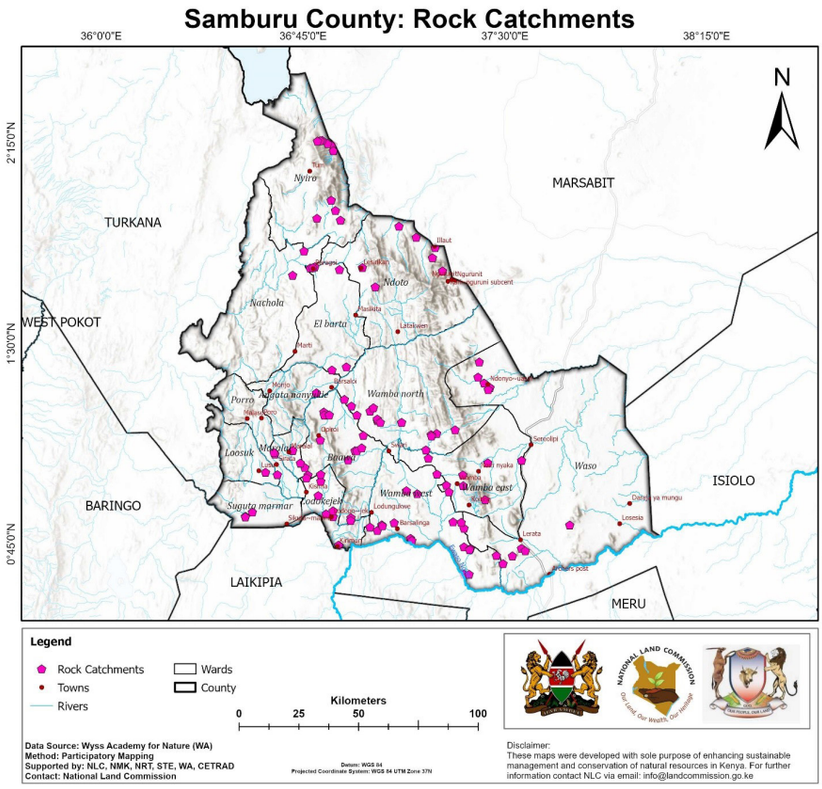


Figure 11: Spatial distribution of Rock catchments

Seasonality

Out of the 110 rock catchments in the county, 101 are seasonal. Samburu East has the highest concentration with 49 seasonal catchments, followed by Samburu North with 39, and 13 in Samburu West (Table 11).

Table 11: Seasonality of Rock catchments

County	Permanent	Seasonal
Samburu East	3	49
Samburu North	2	39
Samburu West	4	13
Grand Total	9	101

Land Tenure of Rock catchment

Further, in term of tenure, it was established that a majority (109) of the Rock catchment areas are owned by communities and only 1% is co-owned by the community and private individuals. Samburu east had the highest number of rock catchments 52 of catchment that are owned by communities, with 41 found in Samburu north and Samburu West 16 (Table 12).

Table 12 Land Tenure and seasonality of Rock catchment

Sub-County	Permanent	Seasonality	Community owned	Community and private co-owned
S.East	0	52	52	0
S.North	0	43	41	0
S.West	0	17	16	1
Grand Total	0	112	109	1

Management of Rock Catchments

The highest number of the Rock catchments standing at 62 were managed by the community, 23 are managed by the Community Conservancies and others co-managed by the Community (Table 13).

Table 13: Management of the Rock catchments

Sn	Management	Sum of No
1	Communities	62
2	Community Conservancy	23
3	Communities & Community Conservancy	13
4	Community and Ccommunity Water Pproject	1
5	Community and Private	1
6	Community, Kenya Forest Service & Kenya Wildlife Service	2
7	Community Water Project	2
8	None	6
9	Community, Community Conservancy & Kenya Forest Service	1

156

Sand dams mapped

Sand dams

A total of 156 sand dams were mapped across the County, primarily dug on impervious sandy streambeds within dry land areas that is characterized by sporadic, high-intensity rainfall events (Plate 12; Figure 12). The distribution of sand dams is uneven across the sub-counties, with Samburu North accounting for the majority at 100 of the county's total; while Samburu East had 48. In contrast, Samburu West exhibits the lowest concentration of 8 sand dam (Table 7). In terms of wards, Nyiro was ranked the highest with 33, Wamba North 22, waso, Loosuk and Porro had none (Table 8).

Plate 12: Sand dam, Nachola location

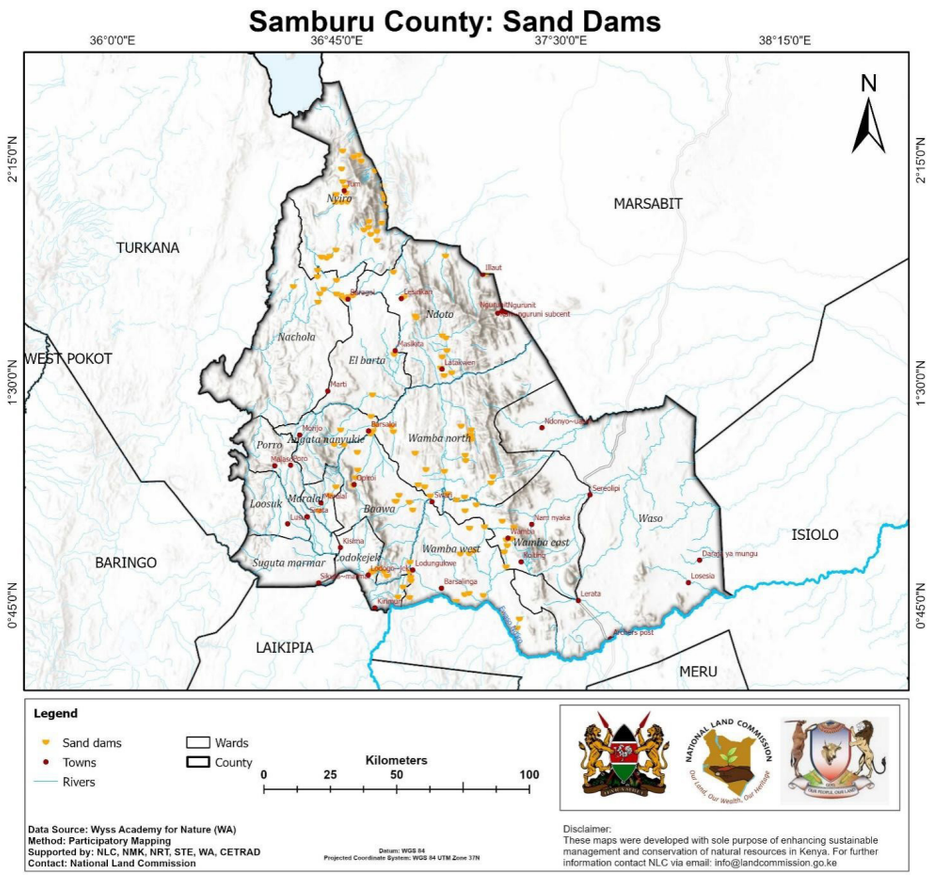


Figure 12: Spatial Distribution of Sand Dams Assets

237
Springs recorded

Springs

A total of 237 springs were recorded during the mapping exercise. the Springs are relatively evenly distributed across the County; with Samburu East having 83, while Samburu North and Samburu West had 82 and 72 of the total springs respectively (Table 8; Figure 13; plate 13). The near-equitable spatial distribution suggests a balanced availability of spring water resources across the three sub-counties. This underscores their critical role as reliable sources of fresh water, particularly in the dryland areas that receive limited rainfall. Springs were recorded in all wards except Nachola, which had no springs (Fig 13).

Plate 13: Leserai Spring, Kisima Location

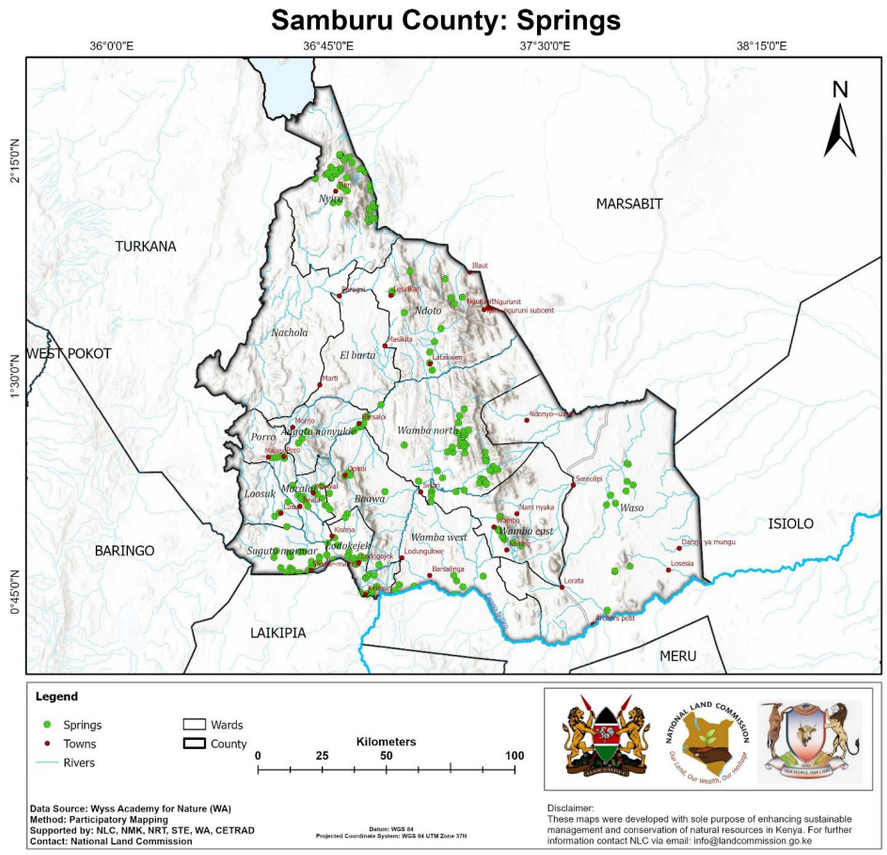


Figure 13: Spatial Distribution of Springs Assets

90
Wetlands (Swamps/ Marshes) mapped

3.5.1 Wetlands (Swamps/Marshes)

Wetlands (swamps/marshes) are natural areas characterized by the presence of water either permanently or seasonally, supporting distinct vegetation and wildlife adapted to these moist conditions. The team identified a total 90 swamps and marshes, with Samburu West accounting for 47 of the total swamps, while Samburu North has 27, and 16 swamp are in Samburu East (Table 7). This spatial distribution indicates a significant concentration of wetland ecosystems in Samburu West compared to the other sub-counties (Figure 14)

Porro Ward recorded the highest number of wetlands standing at 15 while Lodokejek, Suguta Marmar and Wamba North wards had 10 each. In contrast, Waso and Nachola ward reported none (Table 8). This distribution reveals a pronounced disparity in the spatial occurrence of wetlands across the county's wards, indicating uneven ecological and hydrological conditions that influence wetland presence.

Seasonality and water quality of Wetlands

Samburu West has the highest number of permanent swamps at 16, followed closely by Samburu North with 14, while Samburu East had only 8. Similarly, Samburu West had 39 swamps that are fresh; while Samburu North had 19 and Samburu East had 13. However, the water quality of 5 swamps depend on the seasonality (Table 14).

Table 14: Seasonality and water quality of Wetlands

County	Permanent	Seasonal	Fresh	Salinity	Dependent on the seasonality
S.East	8	8	13	3	0
S.North	14	13	19	4	4
S.West	16	31	39	7	1
Grand Total	38	52	71	14	5

Management of Swamps

Majority (67) of the Swamps Were Managed by community, while others were managed by Community and Community Conservancy and others co-managed by government agencies and Community and Community Conservancy (Table 15).

Table 15 Management of Swamps

Management	Sum of No
Community	67
Community and Community Conservancy	5
Community Conservancy	3
Community, Water Resource Authority, Kenya Forest Service & Kenya Wildlife Service	2
Community Conservancy, Kenya Forest Service and Kenya Wildlife Service	2
Community Conservancy and Ccommunity Water project	1
Community Forest Association, Kenya Forest service and Kenya wildlife Service	1
Community, Community Conservancy, Water Resource Authority , Community Forest Association , Kenya Forest Service and Kenya Wildlife service	1
Community water Project	1
Kenya Forest Service	1
Community conservancy and Community water Project	1
None	5

Users of water resources

In Samburu County, water is used for multiple essential purposes that support both human and livestock needs in this semi-arid region:

- Domestic Use.
- Livestock
- Crop production
- Wildlife

Threats and Challenges for Water Resources

The threats and challenges from water resources in Samburu are largely encroachment and conflict (Table 16).

Table 16 Threats and Challenges for Water Resources

Water Asset	Threats (based on encroachment and conflict questions) and observations
Ewaso Nyiro and other seasonal rivers	• The rivers in Samburu County, especially Ewaso Nyiro, are under severe pressure from a combination of environmental degradation, unsustainable human activities, and climate change. These challenges threaten the water security of pastoralist communities, wildlife, and the overall ecosystem health • Seasonality due to climate change variation
Ponds	• Seasonality due to climate change variation • Water extraction through water distribution systems and pumping • Conflict over the resource between humans and wildlife • Conflict over the resource between communities • Human Encroachment of the riparian for built-up and agriculture, resource extraction • Major conflicts arise mainly between pastoralists and wildlife over pond usage.
Springs	• Climate change affects water yield • Water extraction through water distribution systems and pumping • Conflict over the resource between people and wildlife • Human Encroachment of the riparian for built-up and agriculture, resource extraction
Wetland/ Swamp/Pond	• Private land tenure • Water extraction through water distribution systems and pumping • Conflict over the resource between humans and wildlife • Conflict over the resource between communities • Human Encroachment of the riparian for built-up and agriculture, resource extraction
Laggas	• **Seasonal Variability:** Prolonged dry spells, irregular water flow, and drying of laggas. • **Loss of Forest Cover:** Increased soil erosion, decreased groundwater recharge, sedimentation, and more frequent flash floods. • **Climate Variability and Change:** Increased frequency of droughts, unpredictable rainfall patterns, elevated evaporation rates, and reduced river discharge.
Rock catchment	Rock catchments in Samburu County are threatened mainly by soil erosion, vegetation loss due to overgrazing and deforestation, climate variability, and unsustainable human activities such as illegal logging and sand harvesting. These factors degrade the catchment areas, reducing their effectiveness in water harvesting and storage, thus impacting water security for communities and ecosystems.
Sand dam	climate variability, and maintenance needs.

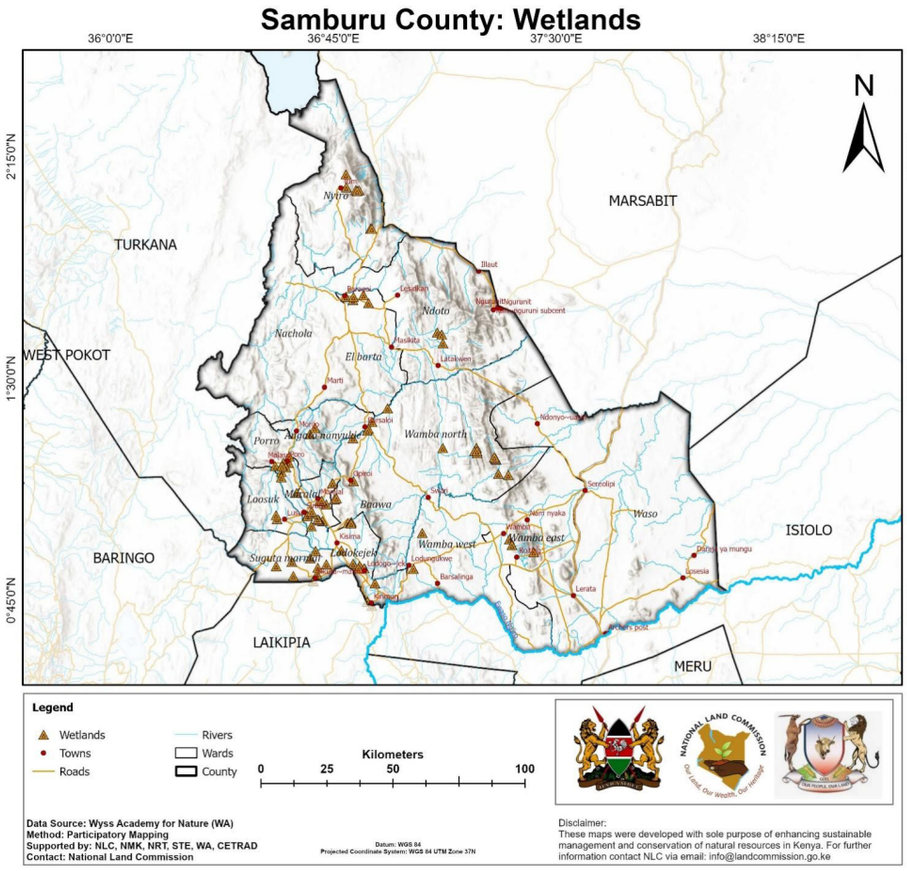


Figure 14: Spatial Distribution of Wetlands (Swamps/Marshes)

3.6 Water Availability

Water availability and seasonality in the county are presented by month, with different water resource types mapped spatially and color-coded throughout the region (Table 17; Figure 15). Each map corresponds to a specific month from January to December, providing a clear monthly overview of the distribution and availability of various water sources. This section provides a monthly overview of water source availability and activity in Samburu County, highlighting general observations and emerging trends (Table 17).

- **Ponds:** Present year-round, with increased numbers from March to May and again from October to December, aligning with the rainy seasons. Activity dips slightly during dry months like July and August, indicating seasonal drying.
- **Rock Catchments:** Found consistently throughout the year, especially in northern and central Samburu. Their stable distribution reflects their status as more permanent water infrastructure, less influenced by rainfall variability.
- **Springs:** More active during April, May, October, and November, corresponding to the long and short rainy seasons. Springs tend to emerge or increase flow following rainfall, showing strong seasonal dependence
- **Wetlands/Swamps:** Mainly appear in April, May, November, and partly in October, coinciding with rainy periods. Mostly concentrated in southern and central Samburu and these are linked to low-lying or flood-prone areas. They are scarce or absent during dry months (January–March, June–August), highlighting their reliance on rainfall.

Table 17: Overview of Water Source Availability and Activity in Samburu County

Month	Key Water Source Activity
January	Sparse water activity; mainly ponds and a few springs; dry conditions prevail.
February	Similar to January but with a slight increase in spring and pond activity.
March	Start of long rains; slight rise in springs and wetlands.
April	Peak of long rains; highest density of all water sources, especially wetlands and springs.
May	Continued rainfall sustains high activity across all water sources.
June	Post-rain period: many sources remain active, notably ponds and springs.
July	The drying phase begins; wetlands decline; ponds and rock catchments persist.
August	Very dry; wetlands and springs minimal; ponds reduce in number.
September	Similar to August, possibly the driest month with minimal surface water.
October	Start of short rains; wetlands and springs reappear.
November	High water activity; second peak for all water source types.
December	Post-short rains; many sources remain active, especially ponds and springs.

Thematic Insights:

- **Hydrological Dependence:** Wetlands and springs show clear seasonal patterns, heavily influenced by rainfall, while ponds and rock catchments provide more stable or managed water availability.
- **Water Resource Distribution:** Water sources, particularly wetlands and springs, are more concentrated in southern Samburu, indicating favorable terrain and catchment conditions there.
- **Drought Vulnerability:** Northern and northeastern Samburu exhibit fewer diverse water sources, making these areas more vulnerable during dry seasons.

This table reflects the seasonal fluctuations of water sources in Samburu County, showing how ponds and rock catchments offer more stable water supply, while springs and wetlands are highly dependent on rainfall patterns. It highlights critical periods for water availability and potential vulnerability during extended dry months.

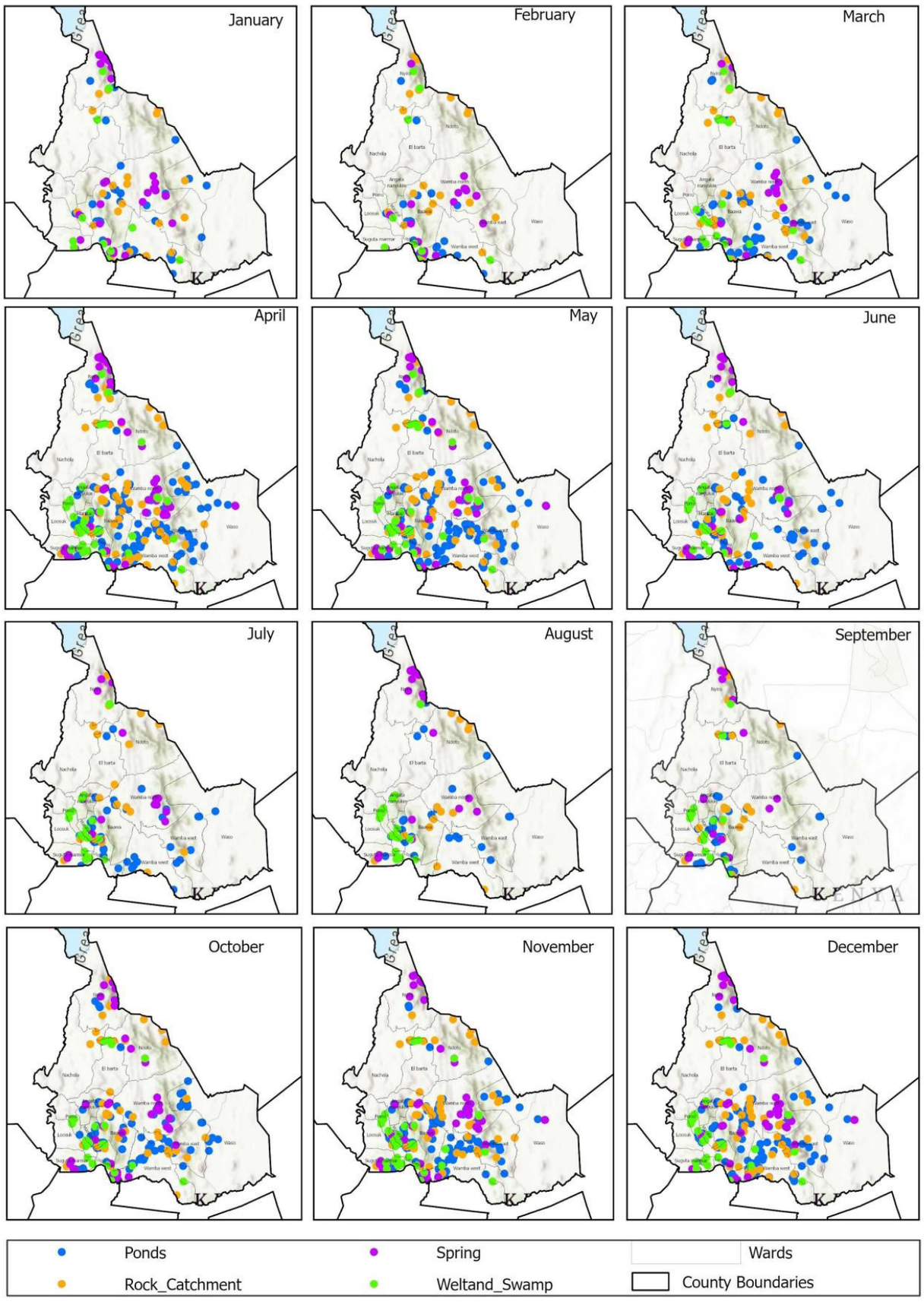


Figure 15 Water resources seasonality maps

3.7 Dense Vegetation Resources

168

Dense Vegetation Resources recorded

Local communities refer to "islands of dense vegetation" as forests. Across the county, a total of 168 such islands were identified. Samburu North recorded the highest number with 93 islands, followed by Samburu East with 38, and Samburu Central with 37 (Table 18; Figure 16; Plate 14). Within Samburu North, Nyiro Ward had the greatest concentration, with 53 islands of dense vegetation. In contrast, Loosuk and Angata Nanyokie wards each recorded only 2 islands, the lowest numbers in the county (Table 19).

Table 18: Island of Dense Vegetation in Sub-Counties

Sub County	Vegetation
Samburu east	38
Samburu north	93
Samburu west	37
Total	168

Table 19: Island of Dense Vegetation per ward

Sub county	Wards	Vegetation
East	Wamba East	5
East	Wamba North	4
East	Wamba West	14
East	Waso	15
North	Angata Nanyokie	2
North	Baawa	3
North	El barta	14
North	Nachola	9
North	Ndoto	12
North	Nyiro	53
West	Suguta Marmar	11
West	Lodokejek	7
West	Loosuk	2
West	Maralal	3
West	Porro	14
TOTAL		
	168	

Plate 14: Nontoto Island of Dense Vegetation, Sirata Oirobi location

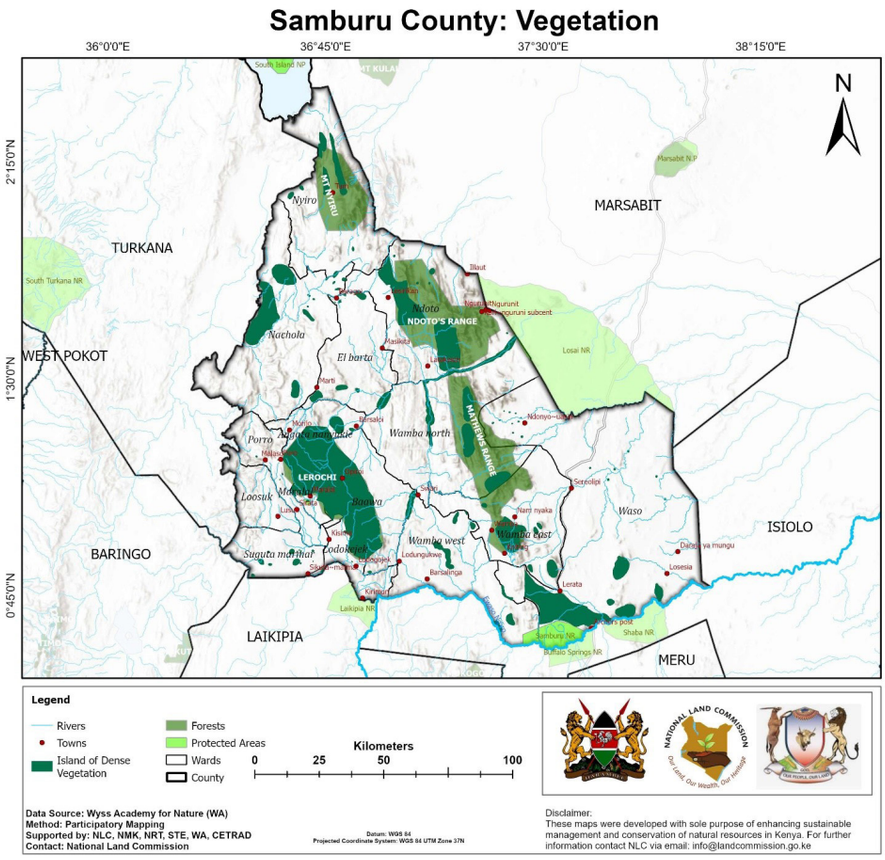


Figure 16: Spatial Distribution of Island of Dense Vegetation Resources

Management of island of dense vegetation

The team found that island of dense vegetation is also referred to as forest by the local communities. A total of 168 islands of dense vegetation mapped are managed by the Community. Community Conservancy manages about 22 and the remaining are co-managed by the community, Community Conservancy and government agencies (Table 20)

Table 20: Management of islands of dense vegetation

Management	Sum of No
Community	123
Communityy and Community Conservancy	10
Community and Kenya Forest Service	1
Community Conservancy	22
Forest Resources Association	1
Kenya Forest Service	2
Private	2
Private, community and Community Conservancy	1
Water Resource User Association, Community Conservancy, Community, Kenya Wildlife Service and Kenya forest Service	3
water Resource User Association, Community Conservancy, Community water project, Community Kenya Wildlife Service and Kenya forest Service	1
None	1
Other	1

Land tenure for Island of dense vegetation

We found that 159 (95%) of Island of dense vegetation is under community land tenure whereas 5% is owned by private. Additionally, the 5% island of dense vegetation that are co-owned might attract conflict in future (Table 21).

Table 21: Land tenure of the Island of dense vegetation

Sub County	Community	Community and private
Samburu East	37	1
Samburu North	92	1
Samburu West	30	7
Grand Total	159	9

3.8 Wildlife Resources

The County's wildlife resources are diverse and unique, supported by varied habitats. The wildlife distribution and concentrations show clustering around protected forests, reserves, and riparian zones, highlighting the importance of these habitats for biodiversity conservation and tourism development in Samburu County (Figure 17)

3.8.1 Wildlife Breeding sites/ Concentration Areas

65
wildlife breeding sites recorded

The team identified a total of 65 wildlife breeding sites or concentration areas distributed across the County, with a majority located in Samburu North having 39, followed by Samburu East at 15 and Samburu West had 11. This distribution reflects the ecological and geographical variations across the sub-counties. At the ward level, spatial assessment revealed that Nyiro, Baawa and Suguta Marmar had 7 breeding areas each. However, Wamba north, Wamba west and Nachola rcorded 3 each while Loosuk , Maralal and Porro exhibited none (Table 22, 23, Figure 17).

Table22: Number of wildlife and livestock resources per sub county

Sub County	Concentration	Corridors	Routes	Grazing	Saltlick	Shrine
Samburu east	10	34	40	19	69	0
Samburu north	44	48	95	46	89	29
Samburu west	11	26	34	6	23	3
Total	65	108	169	71	181	32

Table 23: Number of wildlife and livestock resources per ward

Sub county	Wards	Concen-tration	Corridors	Routes	Grazing	Saltlick	Shrine
East	Wamba East	4	7	7	2	9	0
East	Wamba North	3	9	8	5	27	0
East	Wamba West	3	8	15	8	18	0
East	Waso	5	10	10	4	15	0
North	Angata Nanyokie	4	2	3	0	6	1
North	Baawa	7	9	5	4	7	2
North	El barta	6	3	21	6	6	2
North	Nachola	3	6	13	6	7	2
North	Ndoto	6	20	29	7	17	5
North	Nyiro	13	8	23	23	46	17
West	Suguta Marmar	7	4	5	1	7	0
West	Lodokejek	4	8	4	4	6	2
West	Loosuk	0	2	1	0	7	0
West	Maralal	0	5	17	0	3	1
West	Porro	0	7	8	1	0	0
		65	108	169	71	181	32

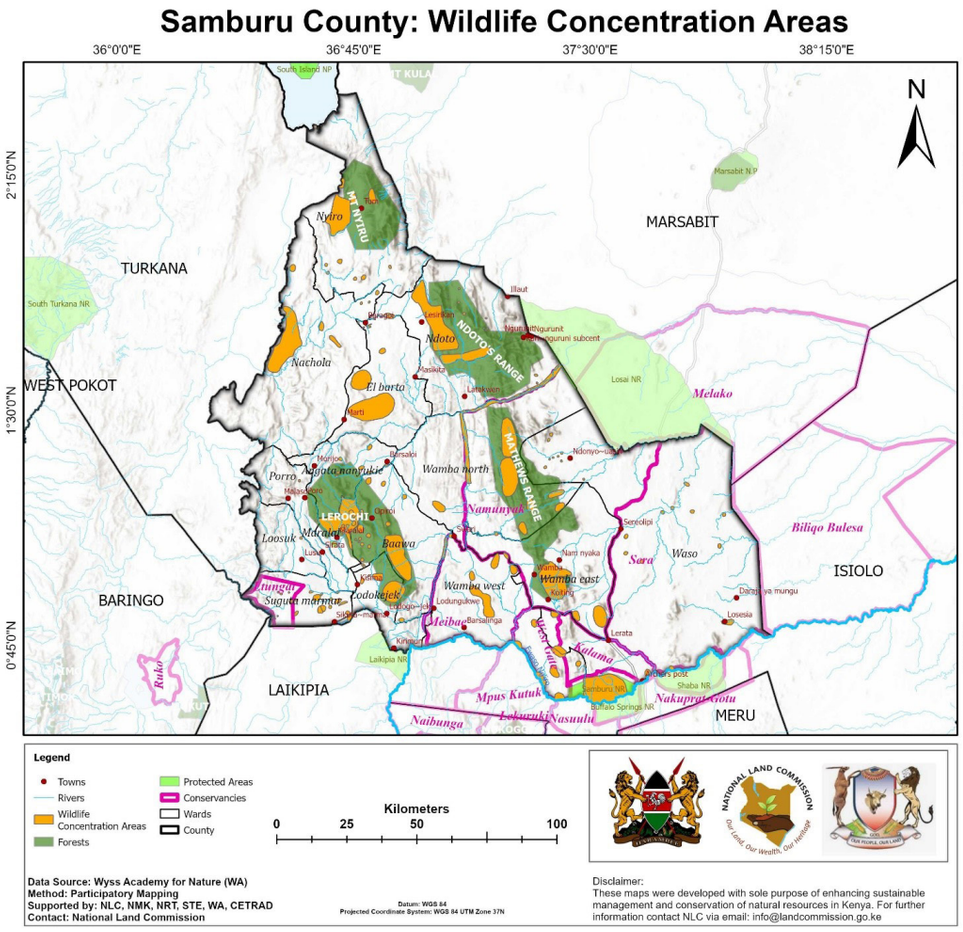


Figure 17: Spatial Distribution of Wildlife Concentration Areas

120

wildlife corridors recorded

4.8.2 Wildlife Corridors

A total of about 120 wildlife corridors were identified and mapped; which consisted of12 major corridors and 108 minor corridors. The data for the major wildlife corridors, highlighted in pink, is sourced from the 2008 Wildlife Corridors and Dispersal Areas Report for Kenya (Table 24 and Figure 18). The minor wildlife corridors, shown in red, were mapped and digitized using GIS following participatory mapping exercises with local communities.

Among the 108 minor corridors documented, Samburu North recorded the highest number with 48 corridors, followed by Samburu East with 34, and Samburu West with the lowest count of 26. At the ward level, Ndoto ward had the greatest concentration with 20 corridors, while Angata Nanyoike and Loosuk wards had the fewest, having 2 corridors each.

The corridors, facilitate the movement of animals between key ecosystems, especially forests, conservancies, and protected areas, ensuring ecological balance, biodiversity conservation, and climate resilience (Table 23). Key Interconnectivity Highlights of Corridors reveal:

- **Marsabit Connection:** Corridors such as Ndoto–Marsabit and Murit–Merille connect Samburu with the vast rangelands of Marsabit, supporting migratory wildlife.
- **Laikipia Link:** Several corridors (such as Ol ari nyiro–Kirisia, Ltungai–Maralal) link Laikipia's conservancies with Samburu's protected forest zones.
- **Isiolo & Meru Integration:** Southern corridors (e.g., Barsilinga–Kirisia) enable movement between Samburu, Isiolo, and Meru, especially along river systems and seasonal grazing routes.

Wildlife Corridors & Interconnectivity

Table 24: Number of wildlife and livestock resources per ward

No.	Corridor Name	Connectivity (From → To)
1	Lerata	Kirisia Forest → Namunyak Conservancy / Mathews Range
2	Nonogishu–Arririn	Kirisia → Mathews Range
3	Lolngereed and Lgweita	Leroghi Plateau → Kirisia
4	Nenyirao	Mt. Nyiro → South Horr / Ndoto Range
5	Lolkeresire	Ndoto Range → Northern Samburu Conservancies
6	Naisunyai	Mathews Range → Ndoto Range
7	Ndoto–Marsabit	Ndoto Range → Melako Conservancy / Marsabit Ecosystem
8	Barsilinga–Kirisia	Buffalo Springs / Isiolo East → Kirisia Forest
9	Ol ari nyiro – Kirisia	Laikipia Nature Conservancy → Kirisia Forest
10	Murit–Merille	Merille → Melako (Marsabit)
11	Ltungai–Maralal	Ltungai Conservancy / Laikipia Border → Maralal
12	Nkoteiya – Kirisia	Near Rumuruti (Laikipia) → Kirisia Forest

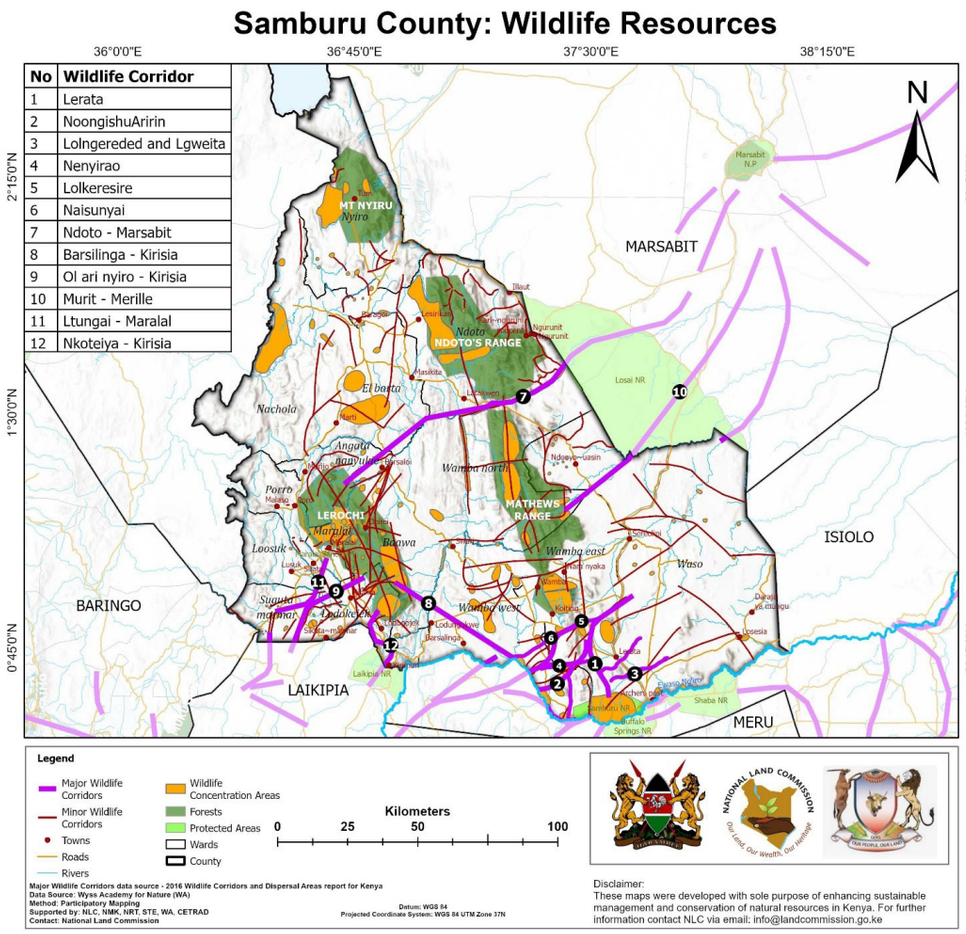


Figure 18: Samburu County Wildlife Corridors

3.8.2 Namuyak Conservancy and Priority Corridors

Namunyak Conservancy, along with associated corridors such as Lolkeresire, plays a crucial role in sustaining wildlife migrations and supporting biodiversity. These areas help balance the needs of wildlife with those of local communities by promoting community-based conservation and effective land management efforts. A brief of the priority wildlife corridors is provided hereunder.

(a) Lolkeresire Livestock and Wildlife Corridor

Lolkeresire Livestock and Wildlife Corridor is a critical migratory pathway linking Westgate and Namunyak conservancies, extending eastwards through Sera and Kom, and connecting the Samburu region to Laikipia. This corridor supports the movement of both livestock and wildlife, enabling access to pasture, water, and breeding grounds; and essential for their survival and genetic health. Its protection is vital for maintaining ecological connectivity and sustaining livelihoods in the region (Table 24; Plate 16-17; Figure 19).

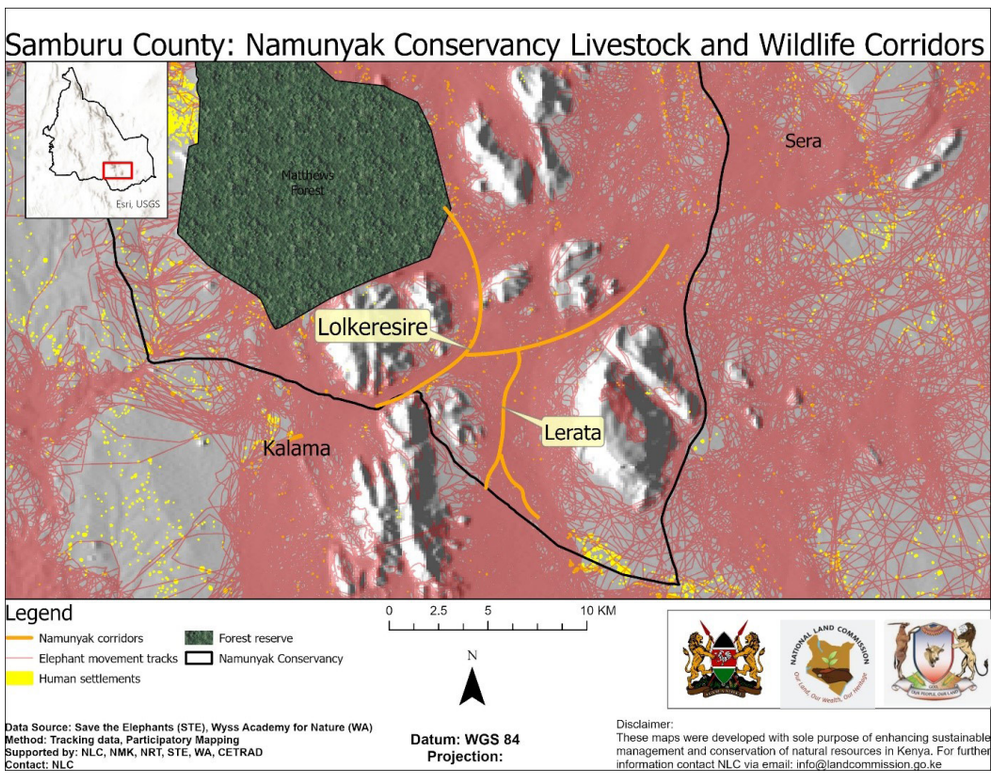


Figure 19: Namuyak Conservancy and Priority Corridors

Plate 16: Livestock corridor in Lerata area

Plate 17: Livestock Routes

3.8.3 West Gate Community Conservancy and Priority Corridors

There are two major livestock and wildlife corridors that are in Westgate conservancy. The Northern corridor that arises from the Wamba gap in Namunyak through Naisunyai community and the southern corridor which passes south of Ngutuk Engiron and North of the Westgate headquarters. The two major corridors are crucial in the connectivity of the Samburu-Laikipia ecosystem. of the two, the north of Ngutuk Engiron corridor is the one that is under major threat.

There are human settlements and continuous development in Ngutuk Engiron with schools and hospital amenities bringing up an upwelling of expansion. Thus the urgency to switch focus and engage the community for its protection (Figure 19). The Save the Elephants (STE) community meetings and agreements have put measures of protection to ensure these corridors are preserved.

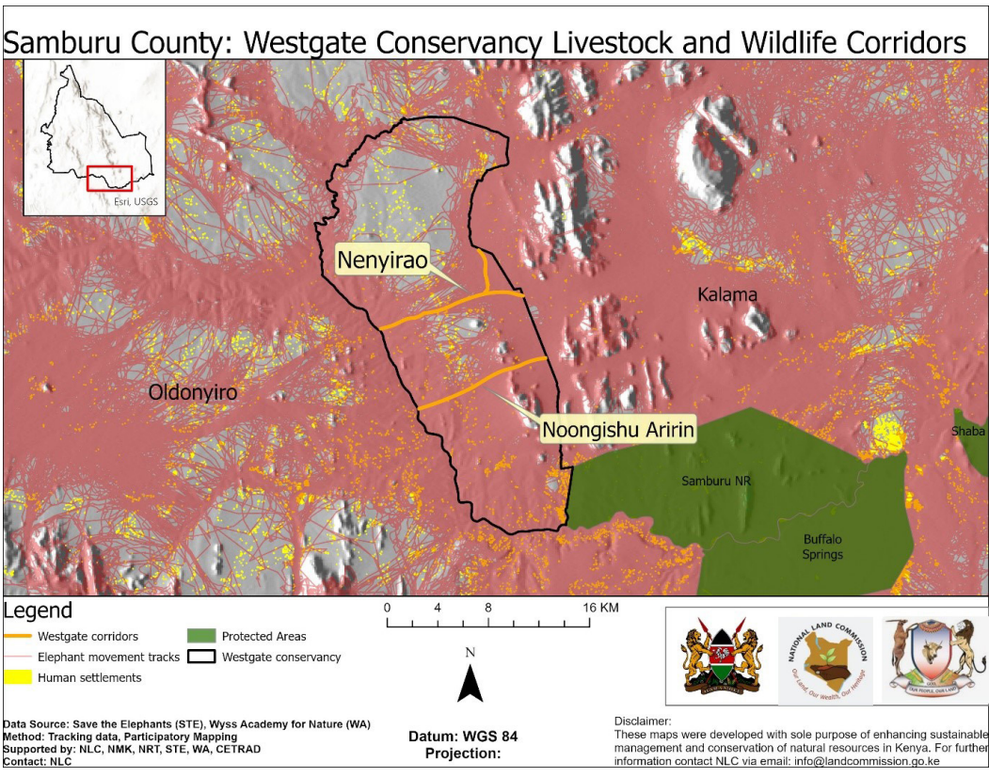


Figure 19: West Gate Community Conservancy and Priority Corridors

(a) Noongishu Aririn corridor

The corridor connecting the Lerata corridor at Loijuk area extends through community lands east of Loijuk and south of Ngutuk Engiron, entering the core conservation zone of Westgate Conservancy, then following the Waso River towards Oldonyiro. This linkage is critically important as it integrates the Loijuk area and Westgate's conservation core into the broader Samburu-Laikipia migratory corridor, facilitating the movement of wildlife and livestock across a large landscape (Plate 18).

Plate 18: Noongishu Aririn corridor, Westgate Conservancy

(b) Nenyirao corridor

This is the corridor that passes north of Ngutuk Engiron area. It also connects to the Lerata and Naisunyai corridors. It is an active corridor that has drinking spots at Loijuk and Waso river joints. A few kilometres after crossing the Waso towards Oldonyiro, at Naapu conservancy, this corridor connects and joins the Noongishu Aririn corridor to become one. Throughout the survey along the Westgate corridors, it was interesting to note the active status of these corridors, which adds to their significance in connectivity along the conservancy. The night movements shown by elephant tracks indicated movement to only one direction, Eastwards.

3.8.4 Kalama Wildlife Conservancy and Priority Corridors

There are four major elephant corridors in Kalama conservancy. These are the Lolng'erded, Lgweita, Lerata and Naisunyai corridors (Figure 20).

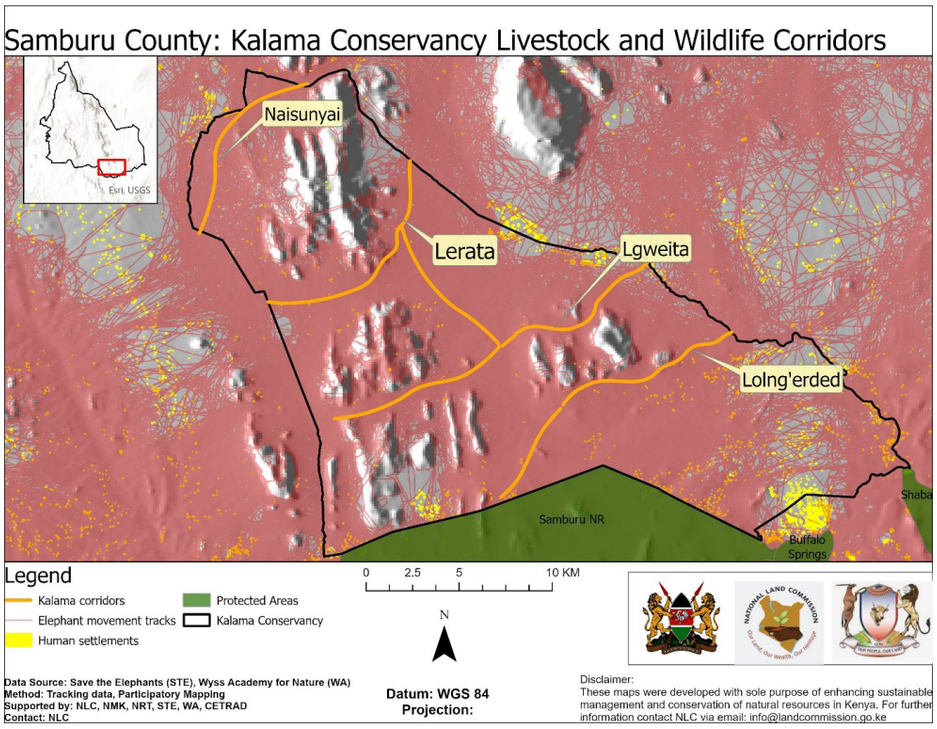


Figure 20: Kalama Wildlife Conservancy and Priority Corridors

Kalama conservancy, Wyss Academy for Nature (WA) and Save the Elephants (STE) have already made progress with the local community to have an agreement to protect and secure these corridors. These corridors have been demarcated with concrete pillars and are being monitored on aweekly basus by Mama Tembos, an organized women group supported by STE. The Mama Tembos collect data on the usage of these corridors by both livestock and wildlife. These corridors need to be fully secured as the settlements from Archers Post and Kalama are expanding along the highway at an alarming rate.

The Naisunyai and Lerata corridors are faced by threats of the road to Wamba, that is tarmacked and the increasing human settlements. The Naisunyai corridor has a solar-powered water facility that is being a major attraction to the area and pulling human habitation close to the corridor.

(a) Lolng'ereded and Lgweita Livestock and Wildlife Corridors

Lolng'ereded and Lgweita are two crucial corridors that connect the Kalama conservancy and the protected areas of Samburu national reserve and Shaba national reserve. The two corridors are cut by the Marsabit-Isiolo Highway. The threats are human settlements along the highway and the expanding Laresoro and Lolng'erded villages (Plate 19). The corridors are vital for both wildlife and livestock in search of food and water. The two corridors are in Kalama conservancy and already agreed by the community to protect them. The corridors are demarcated with concrete pillars in a width of 300 meters

Plate 19: Lolng'erded Wildlife and Livestock corridor, Kalama Conservancy

(b) Lerata Wildlife and Livestock Corridor

The Lerata corridor is a vital movement corridor that connects Samburu protected areas to the wider Matthews Forest through Kalama and Namunyak conservancies and also connects to Westgate to the west all through to Laikipia. The corridor to the east connects to the greater eastern region of Kom and northeast to Sera. It's important for people, livestock and wildlife movements in the area during different seasons for food and water needs.

The corridor is close to the iconic Samburu sacred mountain Ololokwe and the beautiful surroundings are super attractions to the recent developments of camps, settlements and tourism facilities that are driving rise of human population growth in the area. The Marsabit-Isiolo highway that is tarmacked is also a huge contributor to the surge of interest in land in this area and business developments. The Archers Post-Wamba road goes through Lerata and future plans of tarmacking this road could be detrimental to this critical corridor.

The two choke points that are under major threat are the west of Lerata centre that is expanding at an alarming rate and the Ndikir Eldama. The gap connects to Westgate conservancy and through to Isiolo-Oldonyiro. This gap is critical as it's used by people and livestock to access the Archers Post and Lerata town centres and livestock markets. This gap is also used by wildlife to access the different sides of the Westgate, Namunyak and Kalama conservancies for survival during dry and wet seasons.

(c) Naisunyai Wildlife and Livestock Corridor

The Naisunyai livestock and wildlife corridor connects the Westgate conservancy and the Matthews Forest. It is also a dry season migratory corridor by the nomadic pastoralist groups to the mountains and the Waso river to the west.

This corridor is under major threat, likely to be blocked by human settlements and infrastructural developments. A power line (KETRACO) and the solar-pump system are already built along this critical Wamba-gap and with the mountainous surroundings, livestock and wildlife movements could be cut off in this area. The Wamba-Archers C79 road could be tarmacked in the near future that could result in the surge of developments in Naisunyai and Lolkeresire. The communities could sometimes be swayed in to settle along the proposed lines or corridors in the knowledge that they could be compensated to move out. In the past, during the construction of the KETRACO power line, huge settlements gathered in the Lolkeresire village anticipating payment by the government. Figure 21 shows the spatial distribution of wildlife corridors and dispersal areas in Samburu County

“

The Naisunyai livestock and wildlife corridor is **under major threat, likely to be blocked by human settlements and infrastructural developments.** A power line (KETRACO) and the solar-pump system are already built along this critical Wamba-gap and with the mountainous surroundings, livestock and wildlife movements could be cut off in this area

3.9 Livestock Resources

3.9.1 Livestock Routes

169
mapped livestock routes recorded

The analysis of the 169 mapped livestock routes in Samburu County reveals spatial variation across wards. Samburu north had 94, Samburu east and west sub-counties had 35(). Ndoto, Nyiro and Elbarta wards recorded the highest number of routes at 29, 23 and 21 respectively, indicating these areas are key nodes for pastoral mobility. Loosuk ward had only 1livestock route mapped during the recent exercise. This aligns with their relatively better vegetation cover and access to dry season grazing, making them critical for sustaining livestock during periods of forage (Figure 20).

Plate 20: Kibashataa to Lomerr Livestock route, Lodungokwe location

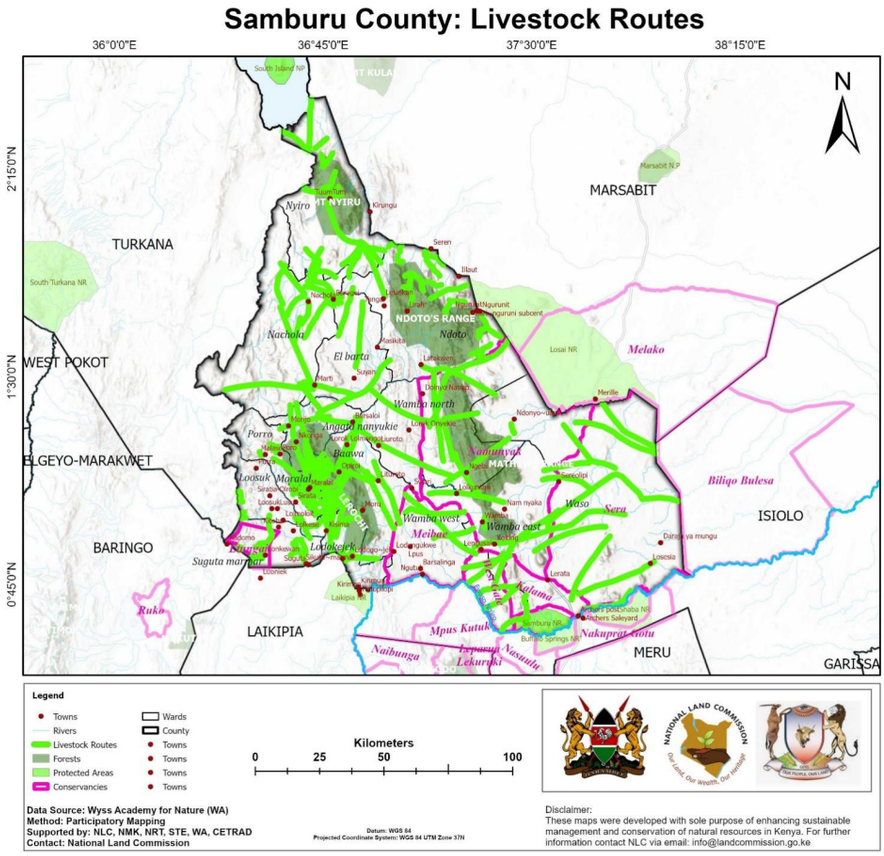


Figure 21: Spatial Distribution of Livestock Routes

71
grazing areas recorded

3.9.2 Livestock Dry Season Grazing Areas

A total of 71 grazing areas were identified with Samburu North accounting for the highest numbers at 46, while Samburu east stood at 19 and Samburu West had the lowest at 6 (Table 22). Nyiro ward had had the highest at ward level standing at 23 while the lowest as Porro and Suguta Marmar at 1 each (Table 23). Moreover, Angata Nanyoike, Loosuk and Maralal had none. This spatial distribution highlights Samburu North as a critical zone for pastoral mobility and grazing resource availability, reflecting its semi-arid rangeland character and reliance on extensive livestock movement to cope with variable pasture and water resources (Figure 22).

Management of dry seasonal grazing areas

The largest portion of 45 dry season grazing areas is managed solely by the community, highlighting strong local community involvement in resource management. Several dry season grazing areas units are managed through partnerships involving community groups, conservancies, government agencies (Kenya Wildlife Service, Kenya Forest Service), and water user associations. For example, 7 units are managed jointly by the community and community conservancies while 9 units involve multiple stakeholders, including community, conservancies, water resource user associations, and government agencies. Private Sector Involvement: Only 1 unit is co-managed by private entities along with community and conservancies. There are 2 units with no management, which could indicate areas needing urgent attention for protection or sustainable use (Table 25).

Table 25 Management of dry season grazing areas

No.	Management	Sum of No
1	Community	45
2	Community and Community Conservancy	7
3	Community and Kenya Wildlife Service	1
4	Community, Kenya Wildlife Service, Kenya forest Service	1
5	Community Conservancy	4
6	Community water project	1
7	Private, community and Community Conservancy	1
8	Water Resource User Association , Community Conservancy , Community , Kenya Wildlife Service and Kenya forest Service	9
9	None	2
10	Grand Total	71

The data indicates that community-based management is the predominant approach, often complemented by collaborations with conservancies and government agencies. Such multi-stakeholder partnerships are vital for effective conservation and resource management. However, the presence of unmanaged units suggests gaps that need to be addressed to ensure comprehensive stewardship.

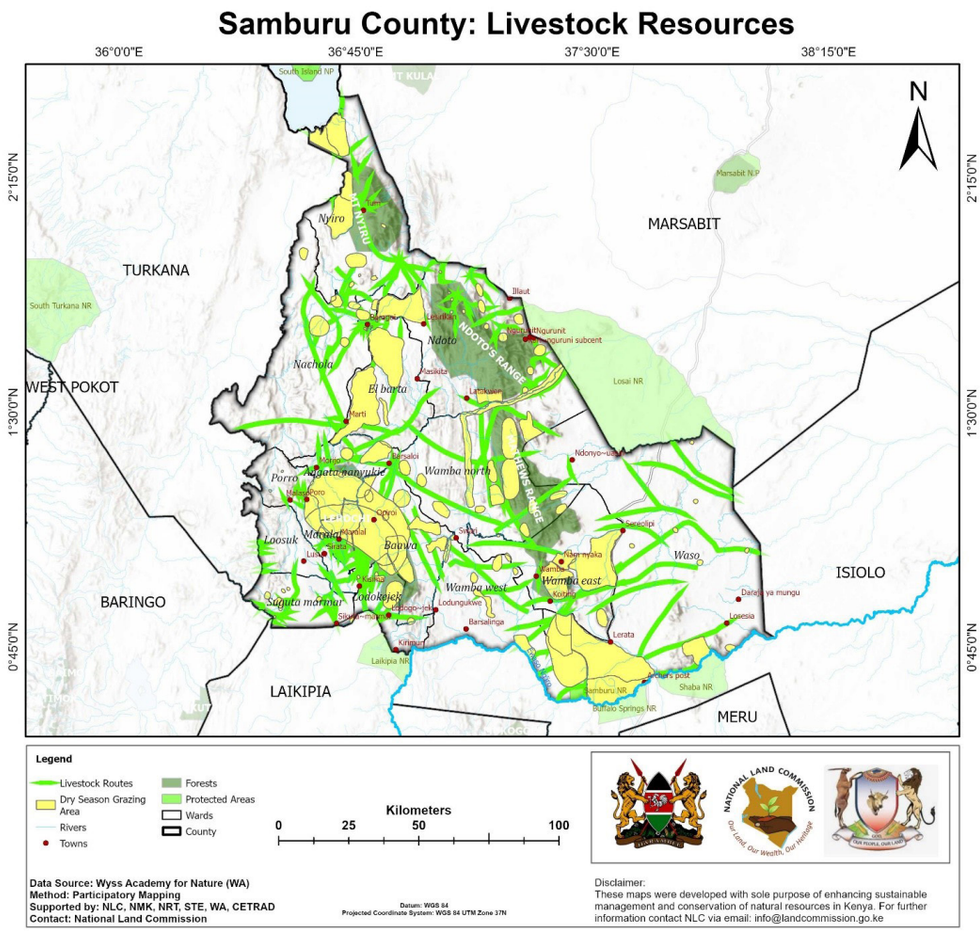


Figure 22: Spatial Distribution of Livestock Resources

Plate 21: Lekuru Dry season grazing area, Waso Rongai Location

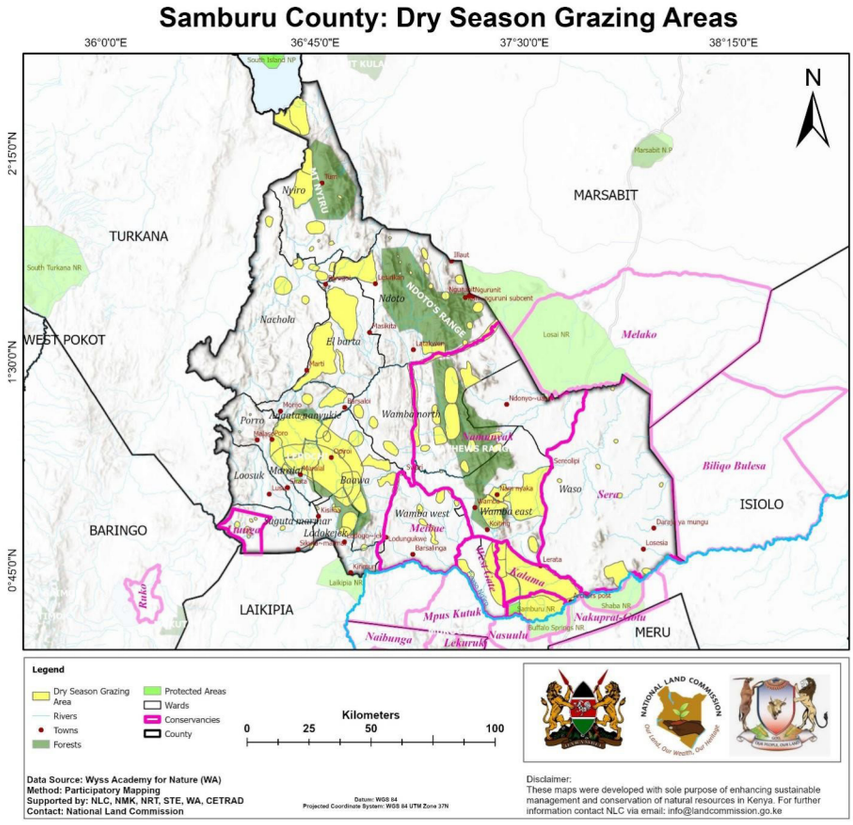


Figure 22: Spatial Distribution of Livestock Dry season Grazing Areas

Major Livestock Routes:

Most livestock move through the Maralal region into Leroghi (Kirisia) Forest, which also serves as a critical dry season grazing area. Routes extend from Maralal to Barsaloi region, then to Mount Nyiro and Ndoto Ranges, providing access to upland grazing. From Matthew Range, livestock migrate toward Losai National Reserve in Marsabit, linking

cross-county grazing areas. Additional routes exist near Samburu National Reserve and along the Ewaso Nyiro River, supporting livestock access to water and pasture.

Seasonal Patterns and Use:

During dry seasons (roughly June to October), livestock follow established trekking routes to access water points, salt licks, and grazing areas such as Laresero, Leseria, Lowash Ngare, and Losesian zones. Wet season movements are more localized, with herds often grazing near homesteads or within sub-counties due to pasture availability. Some livestock also move to neighboring counties like Laikipia and Isiolo during dry spells, reflecting broader regional mobility.

Market Connectivity:

Livestock routes connect to major markets such as Maralal, Isiolo, Archers Post, and Merille, where cattle, camels, goats, and sheep are traded. Routes often follow water points and trading centers, facilitating the movement of animals on foot or via tracks. Seasonal market routes support livestock sales aligned with pastoralists' migration and grazing patterns.

Minor and Non-functional Routes:

Numerous minor routes link smaller grazing areas and local markets, with some becoming non-functional due to insecurity or environmental degradation. Samburu's livestock routes form an interconnected network that supports pastoral livelihoods by enabling access to critical grazing, water resources, and markets, while adapting to seasonal and climatic variability. These routes are vital for sustaining livestock health and productivity in the semi-arid rangelands of the county.

3.9.3 Threats and challenges affecting livestock production in Samburu

The main challenges to the livestock resources in the county include the prevalence of livestock disease outbreaks, inadequate grazing resources, a low level of value addition, insufficient early warning information, a lack of cooling facilities, disorganized markets, frequent droughts, conflicts over water and communal grazing areas, and cattle rustling. Most of grazing areas in the county are in gazetted forests, reducing pastoralists' access to pasture, especially during periods of extreme climatic conditions. The main barriers include poor governance of the rangelands—largely due to the absence of an appropriate legal framework for land tenure, a weak framework for disaster response, and inappropriate or inadequate social and financial service systems.

3.10 Minerals (Salt Lick)

181
salt licks recorded

A total of 181 salt licks were documented across the county. Samburu North recorded the highest number with 89, followed by Samburu East with 69, and Samburu West with 23 (Table 22). At the ward level, Nyiro had 46 salt licks, Maralal had 3, while Porro recorded none. This spatial distribution highlights the varying availability of salt licks across the region (Figure 22).

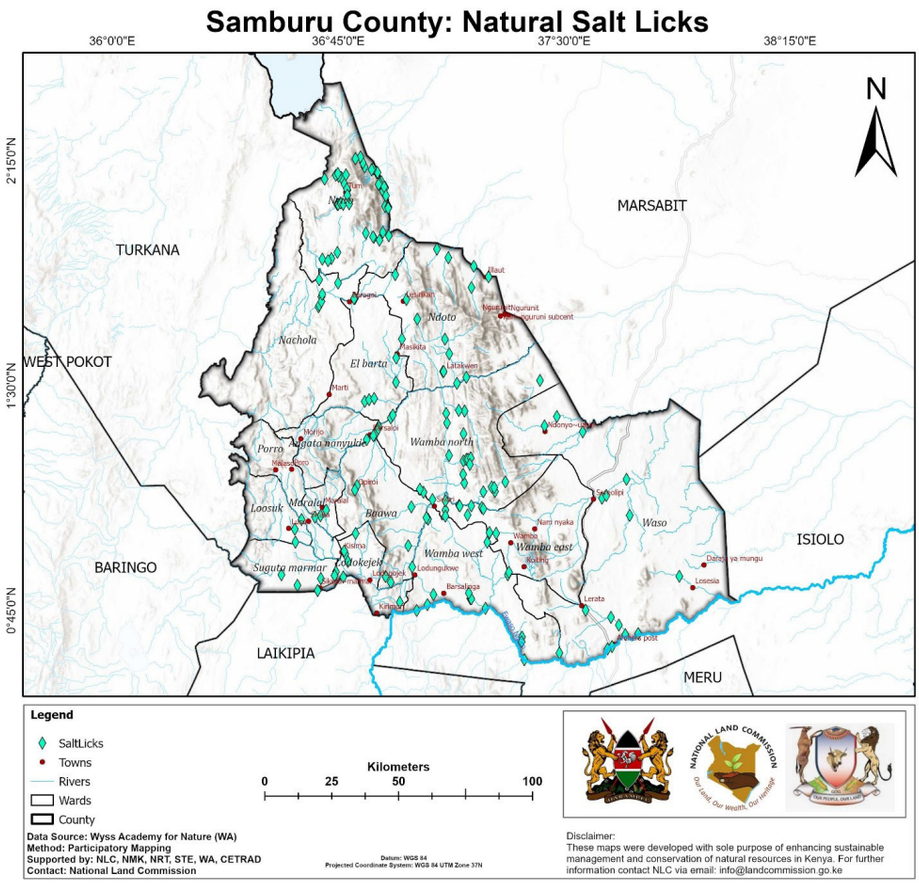


Figure 24: Spatial Distribution of Salt licks

3.11 Other Natural Assets-Shrines

32
shrines mapped

A total of 32 shrines were mapped with Nyiro ward recording the highest number of shrines at 17 (Table 21 Plate 22) while the lowest were recorded in Angata Nanyoike, Lodokejek and Maralal wards at 1 each (Table 22). This distribution highlights Nyiro Ward as a key cultural and spiritual hub within Samburu County (Fig 26).

3.11.1 Key Issues on Shrines

Rapid urbanization and globalization with their accompanying detribalization of cultural systems have, to a large extent, been observed to have disintegrated African social life. Consequently, religious values and sanctions of tribal life seem to have been fast giving way and this has hitherto, poses a serious enigma to the once enjoyed sustainable development in African.

Plate 22: Morungoketh shrine, Kawop location

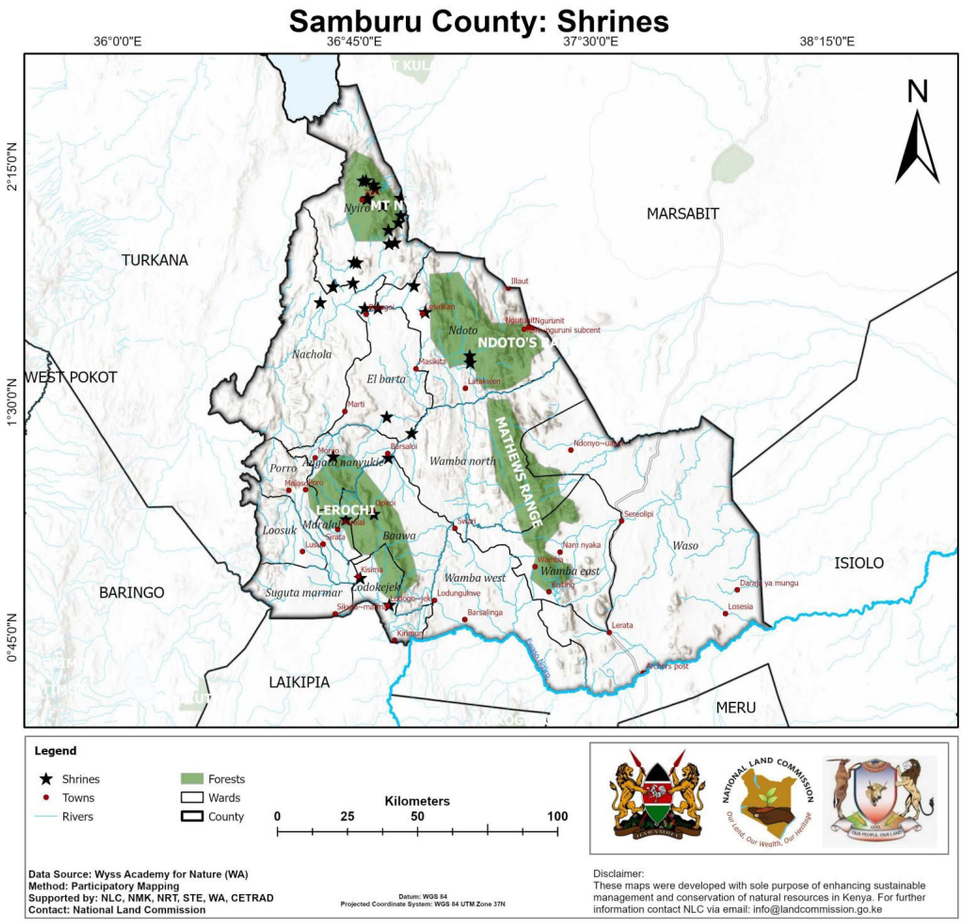


Figure 26: Spatial Distribution of Shrines in Samburu County

4. LEGAL FRAMEWORKS FOR DRYLAND NATURAL ASSETS IN KENYA

4.1 Overview

Kenya's legal frameworks for dryland natural assets focuses on sustainable management and community participation, recognizing that drylands are vital for livelihoods and biodiversity. This framework includes national policies, integrated land use planning, and the recognition of collective land rights. This section provides the applicable legal frameworks for the protection and conservation of dryland natural assets in Kenya.

4.2 Applicable Legal Frameworks for the Protection and Conservation of Dryland Natural Assets

Kenya's legal framework for protecting and conserving dryland natural assets are all anchored in the Constitution of Kenya, 2010, which mandates environmental protection and sustainable resource management. Table 26 summarises these laws including their specific provisions and relevance to this mapping exercise initiative.

Table 26: Applicable Legal Frameworks for the Protection and Conservation of Dryland Natural Assets

Legal Framework	Article	% of Total (57)	Key Implications
Constitution	1	Sovereignty of the people.	Land and natural resources belong to Kenyans. Need for their involvement in their utilization and conservation.
	2 (5) and (6)	General rules of international law, treaties or convention ratified by Kenya form part of Kenya's laws.	There are many Multi lateral Environment (MEAs) related to natural resources including those in the drylands that requires sustainable use, conservation and development
	10	Principles of governance including democracy, rule of law, public participation	Provides anchorage on peoples participation in democtratic esource governance. Need for their involvement in their utilization and conservation.
	35	Access to information.	Citizen are informed by facts data on their natural resources and why their involvement in their meaningful participation, conservation and governance.
1. Constitution of Kenya, 2010	40	Protection of right to property	Guarantees the right of individuals to acquire and own property, either individually or in association with others.
	42	Right to a clean and healthy environment	Right to have the environment protected for present and future generations. Natural assets are also environmental resources
	60 (1)	Principles of land policy.	Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable. Sound conservation and protection of ecologically sensitive areas including dryland assets.
	61	Classification of land.	All land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals. Land in Kenya is classified as public, community or private. Natural assets occupy all the three land categories.
	67	National Land Commission mandate	The Commission role to: manage public land including dryland resources on behalf of the national and county governments; recommend a national land policy to the national government and to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;

	69	Obligations in respect of the environment	The state to ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; encourage public participation in the management, protection and conservation of the environment and to utilize the environment and natural resources for the benefit of the people of Kenya.
	70	Enforcement of environmental rights.	Protection of the right to lean and healthy environment recognised and protected under Article 42 if it has been, is being or is likely to be, denied, violated, infringed or threatened.
	71	Agreements relating to natural resource.	Parliament role in the grant of a right or concession by or on behalf of any person, including the national government, to another person for the exploitation of any natural resource of Kenya
	186	Respective functions and powers of national and county governments.	Role of the national government in natural resource management.
	260	Definition of land	"land" includes— (a) the surface of the earth and the subsurface rock; (b) any body of water on or under the surface; (c) marine waters in the territorial sea and exclusive economic zone; (d) natural resources completely contained on or under the surface; and (e) the air space above the surface;
2. Wildlife Conservation and Management Act, 2013	31 (1)	Declaration of protected areas	The CS by notice in the gazette can publish areas zoned to have wildlife conservation and management as their land use priority:
	33 (1)	Conservation and management of wetlands	The CS on recommendation of the KWS, in consultation with the National Land Commission, by notice in the Gazette can declare a wetland that is an important habitat or ecosystem for wildlife conservation a protected wetland.
	39	Establishment of conservancy or sanctuary.	Any person or community who own land on which wildlife inhabits may individually or collectively establish a wildlife conservancy or sanctuary.

	46	Protection of endangered and threatened ecosystems.	The CS may, on the advice of the Service and in consultation with the National Land Commission, by notice in the Gazette, publish a national list of wildlife ecosystems and habitats that are endangered and threatened and are in need of protection.
	74	Migration of wildlife.	Landowners requirement to facilitate the ease of movement of wildlife from one area to the other considering their migratory nature that attaches to the resource.
3. Land Act, 2012	8	Unbundles the role of the Commission in public land management	In the management of public land, NLC: • shall identify public land, prepare and keep a database of all public land, which shall be geo-referenced and authenticated by the statutory body responsible for survey • shall evaluate all parcels of public land based on land resources mapping and overall potential for use. • shall share data with the public and relevant institutions in order to discharge their respective functions and powers under this Act; • may require the land to be used for specified purposes and subject to such conditions, covenants, encumbrances or reservations as are specified in the relevant order or other instrument.
	15 (1)	Unbundles the role of the Commission in natural resource protection through reservations	(1) Subject to Article 66 (1) of the Constitution, the Commission may, in consultation with the national government and the county governments, by order in the gazette, reserve public land located within **(d) natural resources completely contained on or under the surface;** for one or more purposes in the public interest.
	15 (3)	Commission jurisdiction in undertaking an inventory of all land based natural resources.	Dry land assets constitute land based natural resources that must be mapped and inventoried by NLC
	16 (1)	Commission jurisdiction in placing of care, control and management of reserved public land.	Commission's role to vest the care, control, conditions and management of any reserved dryland assets with a statutory body, public corporation or a public agency.

4. The Physical and Land Use Act, 219	29(1)	Inter County Planning	Two or more Counties may, by mutual agreement or out of compelling necessity, formulate an inter-county physical and land use development plan for KOM resources. Natural resources are mostly transboundary in nature.
	37	Objects of County Spatial Planning	A county physical and land use development plan seeks to among others (a) to provide an overall physical and land use development framework for the county; (d) to guide the use and management of natural resources and to (e) to enhance environmental protection and conservation;
	52	Declaration of a Special Planning area.	An area that has unique development, natural resource, environmental potential or challenges can be declared as a special planning area.
	56	Power to undertake development control	County role to (b) control or prohibit the subdivision of land; and to (f) reserve and maintain all the land planned for open spaces, parks, urban forests and green belts in accordance with the approved physical and land use development plans.
The Physical And Land Use Planning Development Permission And Control) (General) Regulations, 2021	Part V—Easements, Wayleaves And Riparian Reserves Reg. 14	Measurement of the extent of riparian reserves.	Establishes the standards for riparian reserves
5. Water Act, 2016	5	Ownership of water resources.	Every water resource is vested in and held by the national government in trust for the people of Kenya.
	11	Water Resources Authority (WRA)	Establishes WRA an agent of the National Government responsible for regulating the management and use of water resources. Water resources are
	22	Protection of catchment areas.	WRA role to conserve a vulnerable water resource including catchment areas to be a protected area.

6. Environmental Management and Coordination Act (EMCA), 1999	3	Entitlement to a clean and healthy environment	Every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment including natural resources
	7	Establishment of the National Environment Management Authority (NEMA)	NEMA role (b) take stock of the natural resources in Kenya and their utilisation and conservation;
	42	42. Protection of rivers, lakes and wet lands	The CS to provide for the development of an overall environmental management plan for a lake, river, wetland or coastal area, taking into account the relevant sectoral interest;
	43	Protection of traditional interests	The role to declare the traditional interests of local communities customarily resident within or around a lake shore, wetland, coastal zone or river bank or forest to be protected interests.
	50	Conservation of biological diversity	NEMA to ensure the conservation of biological diversity in Kenya including dryland assets.
	54	Protection of environmentally significant areas	The CS role to declare any area of land, sea, lake or river to be a protected natural environment for the purpose of promoting and preserving specific ecological processes, natural environment systems, natural beauty or species of indigenous wildlife or the preservation of biological diversity in general.
	58	Environmental Impact Assessment	EIA as a crucial tool crucial for protecting dryland assets as it evaluates the environmental, social, and economic impacts of projects, including those that might affect drylands.
	68	Environmental audit	Dryland assets, including land, water resources, and biodiversity, are particularly vulnerable to environmental degradation, making environmental audits crucial for sustainable development.

4.3 Legal Critique of the Applicable Frameworks in Relation to the Mapping

4.3.1 Fragmented Mandates and Overlapping Jurisdictions

Although Kenya's constitutional architecture anchors sustainable land use, environmental protection, and public trusteeship of key natural resources, the mapping exercise demonstrated that institutional mandates remain fragmented and operational responsibilities diffuse, particularly for water-related assets and landscape connectivity resources. The report's scope explicitly covered water resources (rivers/laggas, springs, wetlands), wildlife corridors and dispersal areas, livestock routes and dry-season grazing areas, islands of dense vegetation, and salt licks, yet these categories fall under multiple agencies and levels of government with no single custodian consistently accountable for day to day protection.

This fragmentation was not theoretical—it manifested as an implementation vacuum: assets were identified and mapped, but the governance arrangements needed to translate mapping into enforceable management (designation, reservation, by laws, custodianship, monitoring mandates) were not coherently triggered. Similar coordination gaps were acknowledged in the pilot processes across counties, where the same mapping approach had to rely heavily on institutional legitimacy and multi agency collaboration to gain trust and harmonize actions.

4.3.2 Weak Operationalization of Strong Legal Provisions

The mapping process confirmed a persistent pattern: Kenya's statutes provide tools that are strong on paper but weakly activated in practice. The project was designed to generate geo referenced evidence for protection and conservation decisions, including guiding reservations, gazettement, and development control, but the report also shows that—despite the availability of legal pathways—the practical conversion of mapped assets into legally secured spaces remains limited.

A key gap observed is that procedural steps (who initiates designation, what documentation threshold is required, which agency becomes custodian, what enforcement instruments follow, and how county plans must reflect the designation) are rarely standardized or consistently applied across asset categories. In effect, mapping improves visibility and legitimacy, but without routine legal activation, mapped assets remain vulnerable to encroachment and land-use change.

4.3.3 Insufficient Recognition of Dryland Socio Ecological Systems in Law

A central lesson from the mapping scope itself is that ASAL functionality depends on mobility, seasonality, and landscape connectivity, not on static "sites" alone. Yet legal recognition and protection mechanisms are still more developed for conventional categories (e.g., forests, protected areas, riparian reserves) than for ASAL specific assets such as livestock routes, dry season grazing areas, salt licks, and "islands of dense vegetation" outside formally gazetted forests. The Samburu inventory deliberately included these categories—highlighting their ecological and livelihood role—yet their legal pathways for secure recognition remain comparatively thin or inconsistently applied.

The risk is practical: where legal categories are weak or absent, ASAL assets become easier to fragment through fencing, subdivision, settlement expansion, and infrastructure siting—precisely the land use pressures - the mapping was meant to anticipate and manage through spatial baselines and planning controls.

4.3.4 Enforcement Deficits and Limited Institutional Capacity

The mapping approach relied on field verification, community guidance, and daily data quality checks, underscoring that effective governance requires consistent field presence, monitoring routines, and enforceable controls, not just laws.

However, the broader pilot experience (including Samburu's documented challenges) illustrates how capacity constraints, terrain/remoteness, language barriers, and community expectations complicate enforcement and compliance in drylands—even when rules exist.

In the dryland counties context, this enforcement gap is especially consequential because these counties sit within wider rangeland systems and connectivity corridors. Where enforcement is sporadic, the cumulative effect is incremental encroachment—often becoming "normal" land use before regulators respond.

4.3.5 Weak Integration of National Laws into County Level Instruments

Devolution places counties at the center of spatial planning and development control, yet the mapping findings point to a recurring structural weakness: national legal intentions are not consistently translated into county planning instruments, zoning, and enforceable by laws. The mapping initiative explicitly aimed to influence county and national plans, support reservations/gazettement, and strengthen governance through evidence-based spatial baselines.

Where county spatial plans and development control do not explicitly recognize mapped assets as planning constraints and protected zones, the legal framework remains abstract. This was particularly critical for ecologically sensitive features that require site-specific controls (buffer rules, regulated access, seasonal restrictions, corridor protection measures, and prohibition of incompatible subdivisions).

4.3.6 Limited Use of Community Land Mechanisms to Protect Communal Assets

The mapping rationale explicitly recognizes that community knowledge and participation are fundamental to identifying and validating assets, and the methodology relied on participatory approaches and indigenous knowledge integration. Yet the practical protection of communal assets remains constrained where community land tools (local by laws, community governance arrangements, customary access rules formalization, and integration into land registers) are not systematically linked to mapping outputs.

Experience from the pilot processes show that trust and tenure anxieties are real barriers: communities sometimes feared mapping could lead to land loss, requiring NLC-led clarification and confidence-building. This demonstrates the legal-policy paradox: community land mechanisms are among the most appropriate pathways for protecting ASAL commons, yet they are the most sensitive to deploy without strong tenure safeguards, technical support, and clear benefit narratives.

4.3.7 Procedural and Transboundary Gaps: Gazettement, Reservations, and Inter County Connectivity

A key omission in many legal critiques is that the problem is not only fragmented mandates, but also weak procedural bridging instruments. The report repeatedly frames mapping as a foundation for reservations, gazettement, and landscape connectivity management across wider systems.

Yet the operational procedures that would standardize this transition—criteria for listing an asset as "critical," documentary thresholds, roles of county vs national agencies, and how inter county assets should be handled—remain uneven.

This is especially important because rangeland resources and wildlife/livestock mobility systems are transboundary by nature; without explicit inter county instruments and shared governance structures, county-by-county protection can leave "gaps" that undermine the entire connectivity network.

4.4 Emerging Legal Issues

Dryland natural asset mapping is increasingly used to create authoritative inventories that support decision making, strengthen governance, and enable legal protection of critical resources through instruments such as reservations and gazettement, while improving public access to information through atlas-style products. However, as mapping becomes more central to land and natural resource governance, several emerging legal issues arise that Kenya's framework must address more directly to ensure that maps translate into enforceable protection and sustainable use.

1) Tenure, Mobility and Access Rights in a Mapped Landscape

A persistent issue is how mapping interacts with land tenure arrangements and resource access regimes in drylands. Mapping makes resources visible and contestable, yet dryland livelihoods depend on mobility and seasonal access rather than fixed, exclusive site control. Legal and policy frameworks therefore need clearer guidance on how mapped assets (e.g., water points, grazing reserves, routes) are secured without undermining legitimate mobility-based access, and how rights of use are recognized where tenure is layered (public/community/private) or not fully formalized. This is foundational because the mapping rationale is to strengthen governance of land-based resources nationally, yet governance outcomes depend on how tenure and access are handled after mapping.

2) From "Mapped" to "Legally Secured": Designation, Reservation and Planning Integration

A key emerging issue is the legal "conversion pathway" from mapped features to enforceable protection. Mapping is meant to inform decisions and facilitate legal protection through tools such as reservations in land cadastres and gazette notices, and to guide management actions.

Yet, in practice, many frameworks are stronger on identifying assets than on specifying:

- which authority triggers legal protection once an asset is mapped,
- what evidentiary threshold the map must meet,
- what instrument applies to each asset type (reservation, gazettement, by law, easement, special planning controls), and
- how mapped assets must be embedded into spatial plans, development control, and licensing decisions.

This gap allows mapped resources to remain "known" but not "secured," weakening the governance value of inventories that were intended to streamline management.

3) Ecological Connectivity, Transboundary Systems and Ecosystem Scale Governance

Dryland systems function through landscape connectivity (corridors, dispersal areas, routes, seasonal refugia) and often cut across administrative boundaries. Mapping makes these networks visible, but legal frameworks still tend to rely on site-based protection approaches, which are often insufficient for connectivity-dependent systems. The emerging issue is the need for enforceable governance mechanisms that recognize:

- ecological networks as governance objects (not just discrete sites), and
- coordination where assets span multiple jurisdictions.

International guidance on conserving connectivity through ecological networks illustrates the growing global recognition that corridor governance requires standards and coordinated planning, which mapping now makes practically necessary.

4) Climate Risk, Seasonality and Adaptive Legal Instruments

Dryland assets are highly dynamic under climate variability (seasonal water availability, drought cycles, shifting grazing patterns). Mapping provides a baseline, but the emerging legal issue is that static legal designations and rigid use rules can become misaligned with changing ecological conditions. Frameworks increasingly need adaptive instruments—rules that accommodate seasonality and climate shocks, support resilience-building actions, and enable periodic updating of mapped baselines without reopening tenure insecurity or conflict over access.

5) Digital Governance and the Legal Status of Spatial Data

Mapping is now fundamentally digital: inventories are designed to become data hubs that support decisions and streamline governance. This raises new legal questions about:

- **data custodianship** (who holds and maintains the authoritative dataset),
- **evidentiary status** (whether mapped layers must be considered in approvals, EIAs, subdivision decisions, and enforcement),
- **interoperability** with statutory land information systems and planning workflows, and
- **sensitive data protection**, given that some mapped assets can be conflict-sensitive or culturally sensitive.

Without clear digital governance rules, spatial evidence can remain technically strong but legally optional—limiting its effect on real decisions.

6) Enforcement, Accountability and Institutional Coordination

Even where laws exist, mapping highlights that effective protection depends on enforcement capacity and clear accountability. An emerging issue is how enforcement agencies and counties operationalize mapped evidence: who monitors, who acts on encroachment, and how compliance is verified. Because dryland natural resource governance is shared across levels of government, strengthening accountability mechanisms and coordination is critical if mapping is to move beyond documentation toward sustained protection and restoration.

5.
DISCUSSION

Natural Assets

The results show that Samburu county is richly endowed with diverse natural assets distributed unevenly across different geographical areas in sub-counties. Natural assets are grouped into six thematic areas water resources, vegetation, wildlife, livestock resources, saltlick and Shrines (Table 7). similarly, The Kenya Natural Resource Atlas (2023) also demystify drylands as unproductive, taking into account that most of the livestock production, conservation areas, extractive resources (mining, oil. wind and solar energy) are found in the dryland ecosystems.

The perception of the unproductivity of drylands often stems from a narrow focus on the traditional agriculture that relies on consistent rainfall. However, by recognizing and sustainably utilizing the diverse range of natural assets present, the ecosystems can indeed unlock significant economic and socio-cultural development. By adopting a scientific, evidence-based framework, we can move beyond simplistic crop yield metrics and embrace a richer, more sustainable definition of productivity that supports resilient agroecosystems and thriving communities. Productivity should be redefined to encompass a broader range of ecosystem services and socio-economic benefits.

The comprehensive asset inventory provides a foundation for integrated natural resource management in Samburu County, balancing ecological sustainability with socio-economic development. The accompanying distribution maps, further aid in visualizing and operationalizing these insights across the three sub-counties.

Water Resources

From the analysis, the water resources constitute 1359 of different types of resources such as rivers, Ponds, laggas, Rock Catchment, Sand dams, springs and swamps. The findings depict that Samburu North has 524 water resources compared to Samburu west with 365. The water resource variation in natural asset distribution reflects the differing availability and richness of natural resources across the sub-counties, which in turn affects land use patterns, agricultural activities, and economic livelihoods. For example, Samburu North's richer natural assets support more diverse and potentially sustainable livelihoods compared to the more resource-limited Samburu West

The Ewaso Nyiro River system is a linchpin for sustainable development, ecological integrity, and cultural heritage in the region. Its management must prioritize integrated approaches

that balance environmental conservation, community needs, and cultural preservation to enhance resilience in the face of climatic variability and increasing water demand.

This distribution highlights significant spatial variability in laggas density within the county, reflecting differences in topography, rainfall runoff patterns, and possibly land use practices. The concentration of laggas in Nyiro and Wamba North suggests these areas experience more seasonal runoff accumulation, which can impact accessibility and infrastructure during rainy seasons. Conversely, the lower numbers in Porro, Suguta Marmar, and Loosuk may indicate drier conditions or different drainage characteristics.

Understanding this distribution is crucial for planning infrastructure development, road maintenance, and water management strategies, as laggas—being seasonal water channels—can affect mobility and access during rains, influencing socio-economic activities across the county.

These distributions highlight the spatial variation in water resource infrastructure across the sub-counties, with Samburu West exhibiting the highest concentration of both rock catchments (58) and 129 ponds This distribution reflects the county's varied topography and hydrology, where surface water is scarce and groundwater sources such as springs and boreholes are crucial for domestic, livestock and wildlife use. The concentration of swamps and ponds in specific areas supports local water availability, while sand dams and rock catchments supplement groundwater recharge and storage in drier zones.

Ponds serve as vital water points for livestock, wildlife, and domestic use and localized water resource hubs that can support pastoralist livelihoods. However, the seasonal nature of most ponds requires complementary water infrastructure, such as sand dams or rock catchments, to buffer against dry spells.

The cultural importance of ponds such as Lenaasakalai, reflects the deep connection between natural water bodies and community cultural identity. Such sites may also serve as focal points for community cohesion and traditional water governance and tourist attraction sites. Recognizing and integrating cultural values into water resource management can enhance conservation efforts and community participation.

Ponds provide essential habitats for various aquatic and terrestrial species, particularly during wet seasons. The predominance of seasonal ponds may limit year-round habitat availability, affecting biodiversity and ecosystem resilience. Protecting permanent ponds and enhancing the functionality of seasonal ones can support ecological stability.

The limited number of permanent ponds highlights the need for strategic interventions to increase water storage capacity and improve water retention. This can entail rehabilitating existing ponds, constructing new water harvesting structures, and implementing catchment conservation measures to enhance groundwater recharge capabilities. while ponds are crucial water assets in Samburu County, their predominantly seasonal nature presents challenges for water security, ecosystem health, and community livelihoods. Integrated management approaches that consider hydrological, cultural, socioeconomic, and ecological dimensions are essential to optimize the benefits derived from these water bodies.

Rock catchments play a key role in harvesting rainwater, crucial in this sub-county's varied topography. The absence of swamps may reduce natural water retention, increasing reliance on constructed water harvesting systems. These findings emphasize the importance of aligning water resource development with underlying geological features to optimize water availability and support sustainable livelihoods in water-scarce regions.

Our findings show that Samburu West and Samburu North has the abundance of swamps (27) each. The uneven distribution of swamps across Samburu's sub-counties influences water security, biodiversity conservation, and community livelihoods, underscoring the importance of tailored resource management approaches in each region. It provides important surface water sources, beneficial for livestock watering and local ecosystems.

Swamps can be seasonal or sensitive to drought, making water availability variable,

especially during dry periods. The low number of sand dams in Samburu west at 8 and 26 in both Samburu North and Samburu East rock catchment suggests limited groundwater recharge and storage, potentially increasing vulnerability to water scarcity. Pastoralist communities may face water stress during dry seasons, affecting livestock health and productivity.

From the findings, Samburu North had the highest concentration of sand dams with 100 while Samburu West had the highest number of springs at 58. The prevalence of sand dams and springs indicates reliance on groundwater recharge structures, critical for water security in this drier sub-county. Sand dams help store water underground, improving resilience to dry spells and supporting pastoral livelihoods. Continued investment in sand dam maintenance and spring protection is vital to sustain water availability and fewer ponds and swamps mean less surface water, emphasizing the importance of groundwater sources.

Island Dense Vegetation Resources

The distribution of island Dense Vegetation demonstrates a marked spatial variation in the presence of vegetative islands, suggesting that certain wards, particularly Nyiro (53), provide more favourable environmental conditions for the formation and persistence of these important ecological assets. The variation in the number of dense vegetation islands across wards has important implications for biodiversity conservation, resource availability, livelihood sustainability, resilience, and environmental management. Strategic planning is needed to leverage the strengths of vegetation-rich areas while addressing the challenges in vegetation-poor wards.

Wildlife Breeding and Concentration Areas

Samburu North, particularly wards such as Ndoto (with 13), provides favorable habitats and ecological conditions supporting diverse and dense wildlife populations. The relatively lower numbers of wildlife breeding and concentration areas in Samburu East and West align with their smaller proportions of total breeding sites, indicating spatial heterogeneity in habitat suitability and wildlife distribution. The findings demonstrate a clear link between sub-county and ward-level data, emphasizing the need for targeted conservation efforts in high-density areas such as Ndoto and Waso wards within Samburu North, while also addressing habitat protection and connectivity in other parts of the county to sustain biodiversity and ecological functions.

In contrast, Loosuk, Porro and Maralal ward registered none. This distribution underscores significant heterogeneity in habitat availability, suggesting that ecological and environmental factors vary considerably across wards, thereby influencing wildlife breeding patterns and population concentrations. Large scale farming is being undertaken in the aforementioned ward. These breeding and concentration areas are critical for sustaining wildlife populations and maintaining biodiversity within these landscapes, highlighting their importance for conservation and ecosystem management efforts. The identification of 65 wildlife breeding sites or concentration areas, with significant variation across wards, has several important implications:

1. **Biodiversity Conservation Priority Areas**

   The Wards such as Ndoto, Waso, Nyiro, and Wamba West, which host the highest number of breeding sites, represent critical habitats for sustaining wildlife populations. These areas should be prioritized for conservation interventions to protect breeding grounds and ensure long-term species viability and survival.

2. **Spatial Planning and Resource Allocation**

   The uneven distribution of breeding sites suggests the need for targeted spatial planning and resource allocation. Conservation efforts and anti-poaching measures can be strategically focused on wards with higher concentrations to maximize impact.

3. **Ecological Connectivity and Wildlife Movement**

   The presence of multiple breeding sites across specific wards highlights potential wildlife corridors and habitats essential for species movement and genetic exchange. Maintaining connectivity between these sites is vital for ecosystem resilience.

4. **Community Engagement and Livelihoods**

   Given the ecological importance of these areas, centering local communities in conservation and sustainable land-use practices is crucial. This can help mitigate human-wildlife conflicts and promote peaceful coexistence.

5. **Policy and Management Implications**

   The data underscores the necessity for integrated wildlife management policies that consider the spatial distribution of breeding sites. This can inform the development of protected areas, buffer zones, and conservation incentives tailored to local ecological contexts.

6. **Ecological Importance**

   The identification of 105 wildlife breeding sites across the region highlights key ecological and conservation considerations. The Breeding sites are essential for the survival and growth of wildlife populations. Wards such as Ndoto (21 sites), Waso (17), Nyiro (14), and Wamba West (13) play a crucial role in maintaining healthy and viable animal populations. These breeding areas support diverse species, contributing to the overall biodiversity and ecological resilience of the region.

7. **Conservation Priorities**

   Wards with high concentrations of breeding sites should be prioritized for conservation efforts to safeguard critical habitats from threats such as habitat destruction, poaching, and human-wildlife conflict.

8. **Monitoring and management:**

   Regular monitoring of these breeding sites is necessary to assess wildlife health, breeding success, and emerging threats.

9. **Land Use and Development**

   Development activities in and around breeding sites need to be carefully managed to avoid disrupting wildlife reproduction and migration patterns. Local communities in wards with breeding sites can be involved in conservation initiatives, promoting coexistence and benefiting from eco-tourism opportunities.

10. **Areas with Low or No Breeding Sites**

    Loosuk, Porro and Maralal wards: The low number or absence of breeding sites may indicate habitat degradation, human disturbance, or unsuitable ecological conditions. These areas might require habitat restoration or targeted conservation interventions to enhance wildlife breeding potential.

    The spatial distribution of wildlife breeding sites underscores the need for targeted conservation strategies, sustainable land management, and community involvement to ensure the long-term survival of wildlife populations and the preservation of biodiversity in the region.

    These corridors play a crucial role in facilitating species movement and gene flow, thereby supporting the survival of wildlife populations and ensuring the long-term ecological viability of ecosystems beyond the boundaries of protected parks and reserves.

Wildlife corridors

The identification of 108 wildlife corridors and dispersal areas underscores their vital role as ecological pathways that connect core habitats, facilitating animal movement across the landscapes. These corridors enable wildlife to access essential resources such as pasture, water, and breeding grounds, while also reducing predation risks and promoting genetic diversity (tackles inbreeding) through population connectivity. The uneven distribution of corridors—with Ndoto ward having the highest number (20) and Angata Nanyokie and Loosuk wards having the fewest (2 each)—highlights spatial variability in habitat connectivity, largely atttributable to landscape ecology and topography. This suggests that some areas serve as critical hubs for wildlife movement and require focused conservation efforts to maintain and enhance corridor functionality.

The presence and protection of these corridors are crucial for sustaining healthy wildlife populations beyond the confines of protected parks and reserves. They contribute to the long-term viability of ecosystems by supporting species survival, enabling adaptation to environmental changes, and mitigating the impacts of habitat fragmentation. Safeguarding and restoring wildlife migratory corridors should be a priority in regional conservation planning to ensure ecological resilience and biodiversity preservation across the landscape.

Livestock Resources

The majority of livestock routes in Samburu North reflect its extensive rangelands and reliance on pastoralism, supported by seasonal movements to access water and pasture. These routes are critical for sustaining livestock health and productivity, enabling pastoralists to navigate seasonal variations in water and forage availability. The routes connect key grazing areas with major and minor livestock markets such as Suguta Marmar and Porro, facilitating trade and economic activity. Thus, understanding the spatial distribution of these routes aids in planning water points, grazing management, and conflict mitigation along corridors. The routes help pastoralists adapt to climatic variability by enabling mobility during dry spells (climate- induced migration or mobility), especially in drier sub-counties such as Samburu North.

The analysis asserts that 56% livestock routes ere identified in Samburu North reflecting its extensive pastoral landscapes and the critical role of livestock mobility in this sub-county compared to the other sub counties with less than 23%, reflecting either smaller pastoral populations or more localized grazing patterns.

The dominance of livestock routes in Samburu North aligns with existing research showing that pastoralists in this sub-county rely heavily on mobility to access variable pasture and water resources, especially given the semi-arid climate and seasonal variability in forage availability. The extensive network of routes facilitates seasonal migrations that are essential for maintaining livestock health and productivity, particularly during dry spells when herders move animals to areas with better grazing and water.

Moreover, the spatial concentration of routes in Ndoto and Nyiro wards corresponds with higher vegetation indices and water availability, making these areas critical nodes in the pastoral mobility network. The fewer routes in Suguta Marmar and Porro may reflect more stable grazing conditions or alternative livelihood strategies in these areas.

Understanding the distribution of livestock routes is vital for planning interventions such as water point development, pasture management, and conflict mitigation along corridors. It also informs market access strategies since these routes connect pastoralists to major livestock markets, enabling trade that supports local economies. The spatial pattern of livestock routes in Samburu County highlights the centrality of Samburu North in pastoral mobility and underscores the need for targeted resource management and local governance alongside sustainable infrastructure development to sustain pastoral livelihoods in this sub-county.

Salt licks

Samburu North had 89 salt licks, the largest share or concentration of salt licks, followed by Samburu East, and then Samburu West with the smallest share. This distribution can be influenced by the county's diverse topography and soil types, where certain areas, such as Samburu North, may have geological formations or soil conditions more conducive to the formation of salt licks. This aligns with the county's varied landscape, which includes rocky soils and lava fields in some parts and deeper soils in others, affecting natural resource distribution

The data which indicates that Samburu North had 91% of the shrines while Samburu East recorded none, reflects the distribution of cultural or sacred sites within Samburu County. This suggests that the vast majority of shrines are located in Samburu North, a smaller portion in Samburu West, and none in Samburu East.

Shrines

Shrines in Samburu County are likely significant cultural and spiritual sites for the local communities, especially the Samburu people who have strong traditional beliefs and practices. The concentration of shrines in Samburu North may be due to historical, cultural, or geographical reasons, where certain areas have been preserved or designated as sacred spaces. Samburu East having no recorded shrines could imply either a different cultural landscape or that shrines are less prominent or differently recognized there. This distribution highlights the cultural importance of Samburu North within the county and may influence social, cultural, and even tourism-related activities in the region. It also underlines the need to consider these cultural sites in county development planning and conservation efforts to respect and preserve local heritage.

Seasonality, Land Ownership, and Management of Water Resources in Samburu County

Our results indicate that there are 101 seasonal rock catchments in Samburu County. Regarding land ownership, 109 rock catchments are owned by the community, while 62 are managed by the community. The predominance of community ownership and management highlights the critical need to empower local communities with the necessary skills, resources, and institutional support to sustainably manage these vital water assets.

For ponds, the majority are community-managed, with 152 ponds under community management. Among these, 206 ponds are seasonal, and 208 are classified as fresh water resources. Regarding wetlands, there are 52 seasonal wetlands, 71 fresh wetlands, and 67 wetlands managed by the community.

6.

6. CONCLUSION & RECOMMENDATIONS

6.1 Conclusion

Samburu County is richly endowed with a diverse array of natural assets unevenly distributed across its sub-counties. These assets—grouped into six thematic areas: water resources, vegetation, wildlife, livestock resources, salt licks, and shrines—form the foundation of the county's ecological integrity, cultural heritage, and socio-economic livelihoods.

Contrary to outdated perceptions that drylands are unproductive, Samburu's dryland ecosystems support significant livestock production, conservation areas, and extractive resources such as mining, oil, wind, and solar energy. Recognizing and sustainably managing these natural assets unlocks considerable economic and socio-cultural development potential. Productivity in Samburu should thus be redefined beyond traditional crop yields to embrace a holistic understanding of ecosystem services and socio-economic benefits that sustain resilient agro-pastoralist communities.

The comprehensive inventory and spatial mapping of natural assets provide a vital foundation for integrated natural resource management that balances ecological sustainability with socio-economic development across Samburu's three sub-counties. For instance, the uneven distribution of water resources—such as the abundance of water points in Samburu North compared to Samburu West—directly influences livelihoods, land use, and economic activities. The Ewaso Nyiro River system remains a critical lifeline, demanding integrated management that harmonizes environmental conservation with community and cultural needs.

Vegetation islands, wildlife breeding sites, and corridors demonstrate significant spatial variability, highlighting priority areas for biodiversity conservation and ecosystem connectivity. Livestock routes, predominantly concentrated in Samburu North, underscore the central role of pastoral mobility in sustaining livelihoods amid climatic variability. Salt licks and shrines further enrich the county's natural and cultural heritage, with Samburu North hosting the majority of these vital resources.

The predominantly seasonal nature of water resources, combined with encroachment and social conflicts, presents ongoing challenges of water scarcity, ecosystem degradation,

and resource-based tensions. Addressing these requires strategic investments in water harvesting infrastructure, catchment conservation, and inclusive governance frameworks that integrate ecological, cultural, and socio-economic dimensions.

Critically, the community land registration processes across Samburu North, East, and West must deliberately reserve and gazette land for natural assets. This legal protection is essential to secure environmental sustainability, pastoral livelihoods, and social cohesion in the face of increasing land pressures and encroachment. By safeguarding critical water sources, grazing lands, biodiversity hotspots, and cultural sites, Samburu County can foster a balanced approach that supports both conservation and development goals. Thus, the sustainable management and protection of Samburu's natural assets are pivotal to enhancing resilience, promoting equitable development, and preserving the unique ecological and cultural landscapes that define the county's identity and future prosperity.

- Samburu County is endowed with a variety of natural resource assets ranging from rivers and sand dams, ponds, rock catchment, sand dams, springs, wetlands, dryland forest, dense vegetation, wildlife, livestock to minerals, and particular, salt lick resources. These vital assets, manifested in various forms are indeed the pillars of socioeconomic development in both the county and the Country at large.
- These natural resources/ assets are the backbone of the county's economic, social and cultural contributions of these assets in accelerating social economic development and green growth/resilience.
    - » The county has its natural wealth endowed with **over 2,398 dryland assets mapped** which include dry season grazing areas, island of dense vegetation, livestock routes, ponds, rock catchments, saltlicks, sand dams, springs, swamps, wildlife concentration, wildlife corridors, breeding areas and minerals.
    - » The county boasts of abundant land, tourist attraction sites and minerals which are held dear by the residents as major economic resources.
    - » With over 92% of the county classified as rangeland, livestock production remains the biggest economic activity and over 70% of the population depend on this subsector as their main source of livelihood.
- Despite these endowments:
    - » The true worth and full potential of these dryland natural assets have not been explored and documented to provide tangible evidence for policy, sustainable management and decision-making.
    - » There exist threats to survival of these assets including climate change, development, land use, land fragmentation/subdivision. Further, with the on-going community land registration, if these resources are not properly captured and documented as well as reserved in the National and County/community land Cadasters/registers, and attendant County Spatial Plans (CSPs), they will be wiped away and important ecosystem goods and services will be lost.
- Therefore, mapping and inventorizing these assets initiative by NLC in collaboration with WYSS Academy for Nature, NRT, STA and CETRAD forms the first step towards their security and posterity in order to influence the envisaged cadastres' at county and national level and enhance their protection and survival for continued accruing benefits and creation of wealth and green jobs.

6.2 Recommendations and Prioritization

6.2.1 Fast track County Spatial Planning (CSP) to Secure Mapped Dryland Assets

County Spatial Plans are the primary instrument for translating mapped natural assets into enforceable land use decisions. They operationalize sustainable development by guiding the optimal allocation of land and scarce resources—land, water, biodiversity and ecological systems—across economic, social and environmental functions, consistent with the County Governments Act, 2012 (Section 103).

Fast tracking CSP preparation and approval is therefore urgent because mapped dryland assets that are not formally captured, zoned and reserved in the County Spatial Plan remain exposed to subdivision, incompatible development and gradual conversion, with a corresponding loss of ecosystem goods and services. The CSP should explicitly incorporate the mapped asset layers, translate them into protected and regulated land use zones, and provide the planning basis for reservation in land cadastres and other securing measures so that the assets are protected for current and future use.

Priority actions within the CSP process:

- Integrate the mapped natural asset inventory into the CSP baseline and maps, and classify priority assets as planning constraints/sensitive zones.
- Provide for reservation/security of critical assets through the CSP zoning framework to anchor protection within land administration systems (cadastres/registers).
- Align CSP provisions with county and national policy priorities so development control decisions consistently reflect the mapped asset evidence base.

6.2.2 Bolster Security of Land Tenure to Safeguard Public (Natural) Assets

- The mapping underscores that insecure and rapidly changing tenure arrangements remain a primary risk to dryland natural assets, particularly under the ongoing community land registration process within the ambit of the Community Land Act (2016). Where natural assets are not formally recognized and secured during registration, they risk being absorbed into private or fragmented holdings, undermining the very evidence base generated for policy, sustainable management, and decision making. This is why the report emphasizes that mapped resources must be captured, documented, and reserved within land cadastres/registers and aligned planning instruments, and that community land processes should deliberately secure land for natural assets to reduce land pressures, encroachment, and loss of ecosystem goods and services while maintaining social cohesion.

Priority actions:

- Ensure the mapped public (natural) assets are explicitly recognized during community land registration and secured through reservation and/or gazettement where applicable, so they are not inadvertently converted or privatized through adjudication and subdivision processes.
- Protect equitable access and use of these public resources as registration proceeds, so tenure formalization does not extinguish legitimate community use rights and shared livelihood functions of key natural assets.
- Anchor these protections in the formal land administration record by ensuring the assets are captured, documented and reserved in the National and County/community land cadastres/registers, consistent with the report's call for safeguarding mapped assets against loss of ecosystem goods and services.

6.2.3 Gazettement of Critical and Vulnerable Assets for Public Use

Several key assets need protection and conservation prioritization. The priority list of assets that require urgent intervention through gazettement are provided in Table 27.

Table 27: Proposed Gazettement of Critical and Vulnerable Assets for Public Use

Priority Resource/Site	Issues/Threats	Proposed Conservation Measures
1. Kisima Swamp	• Lies next to Lake Kisima in the Eastern part of the Loroghi Plateau. • Supports both the pastoralist and farming communities as well as biodiversity in the vast arid and semi-arid area.	• Prepare integrated wetlands management plans for Samburu County • Reserve and gazzette as conservation area • Establish and strengthen local level governance • Ecosystem based approach and landscape scale connectivity planning
2. Namarmar spring in Opiroi location	• Supports both the pastoralist and farming communities as well as biodiversity in the vast arid and semi-arid area.	• Institute spring protection measures • Spring infrastructure development Ecosystem based approach and landscape scale connectivity planning • Riparian reserve management planning
3. Lena Saakalai –Mysterious point (where the Samburu bravest man died)	• Culture and heritage	• Institute heritage/cultural preservation measures as per National Museums And Heritage Act CAP 216

4. Lolkeresire Livestock and Wildlife Corridor	• Human and Development pressure-settlements and KETRACO power line	Secure through gazettement
5. Lerata Livestock And Wildlife Corridor	• plays a critical role in connecting Namunyak and Westgate conservancies and the bigger Samburu-Laikipia corridor. • Human settlements. • HWC. • Livestock invasion.	
6. Noongishu Aririn corridor	• connects to the Lerata corridor at Loijuk area and goes through community areas east of Loijuk and south of Ngutuk Engiron. • links the Loijuk and the conservation area to the greater Samburu-Laikipia migratory corridor. • Along this corridor, elephants and livestock can drink water at Loijuk and the Waso River.	• Secure through gazettement
7. Nenyirao corridor	• Connects to the Lerata and Naisunyai corridors. It is an active corridor that has drinking spots at Loijuk and Waso river joints. • Active status of these corridors, which adds to their significance in connectivity along westgate conservancy.	• Secure through gazettement • Prepare an ecosystem based management plan
8. Lolng'ereded And Lgweita Livestock And Wildlife Corridors	• connect the Kalama conservancy and the protected areas of Samburu national reserve and Shaba national reserve. • The threats are human settlements along the highway and the expanding Laresoro and Lolng'erded villages. • The corridors are vital for both wildife and livestock in search of food and water.	• Secure through gazettement • Prepare an ecosystem-based management plan

9. Lerata Wildlife and Livestock Corridor	• connects Samburu protected areas to the wider Matthews Forest through Kalama and Namunyak conservancies and also connects to Westgate to the west all through to Laikipia. • It's important for people, livestock and wildlife movements in the area during different seasons for food and water needs. • The corridor is close to the iconic Samburu sacred mountain Ololokwe • The Archers Post- Wamba Road goes through Lerata and future plans of tarmacking this road could be detrimental to this critical corridor.	• Secure through gazettement • Prepare an ecosystem-based management plan
10. Naisunyai Wildlife and Livestock Corridor	• Connects the Westgate conservancy and the Matthews Forest. It is also a dry season migratory corridor by the nomadic pastoralist groups to the mountains and the Waso river to the west. • This corridor is under major threat to be blocked by human settlements and infrastructural developments. The power line (KETRACO) and the solar-pump system are already built along this critical Wamba-gap and with the mountainous surroundings, livestock and wildlife movements could be cut off in this area. • The Wamba-Archers C79 road could be tarmacked in the near future that could result in the surge of developments in Naisunyai and Lolkeresire.	• Secure through gazettement • Prepare an ecosystem-based management plan

REFERENCES

APPENDICES

Appendix 1: Stakeholders Report

Appendix 2: Assets Inventory