POLICY, LEGISLATIVE AND INSTITUTIONAL GAPS IN THE MANAGEMENT, HARVESTING, PROCESSING, UTILIZATION, AND MARKETING OF NELTUMA JULIFLORA PRODUCTS

Consultant report under KEFRI ILO project on Management of *Neltuma juliflora* (formerly known as Prosopis juliflora) through decent green jobs

Neltuma juliflora management for decent green jobs and livelihood support for the host communities and refugees in Garissa and Tana River Counties.

PROJECT DONOR: ILO Prospect Project with Support from Royal Kingdom of Netherlands
Project Partners: County Governments of Garissa and Tana River, Garissa University , KIRDI and CBO's.

CONSULTANT: Dr. Alphayo Inyende Lutta

PROJECT SUPERVISION: Dr. Joram Kagombe, Dr. Jane Njuguna, Elyas Hassan, Amina A. Maalim, Patrick Mwenja, Lilyanne V.N

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BACKGROUND

Kenya Forestry Research Institute (KEFRI) is a State Corporation established in 1986 under the Science and Technology Act (Cap 250) which has since been replaced by the Science, Technology and Innovation Act No. 28 of 2013 to undertake research in forestry and allied natural resources, generate, promote and improve technologies for sustainable developed.

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ABBREVIATIONS

ASALs	Arid and Semi-Arid Lands
CIDP	County Integrated Development Plan
CFAs	Community Forest Associations
DAWE	Department of Agriculture, Water and the Environment (Australia)
DFFE	Department of Forestry, Fisheries and the Environment (South Africa)
EMCA	Environmental Management and Coordination Act
FGDs	Focus Group Discussions
JFM	Joint Forest Management
KEBS	Kenya Bureau of Standards
KEFRI	Kenya Forestry Research Institute
KFS	Kenya Forest Service
KIIs	Key Informant Interviews
KIRDI	Kenya Industrial Research and Development Institute
MoU	Memorandum of Understanding
NEMA	National Environment Management Authority
NEMBA	National Environmental Management: Biodiversity Act (South Africa)
NGOs	Non-Governmental Organizations
NRMCs	Natural Resource Management Committees
NTFP	Non-Timber Forest Product
R&D	Research and Development
SANBI	South African National Biodiversity Institute
SHG	Self-Help Group
WfW	Working for Water (South Africa)
WoNS	Weeds of National Significance

EXECUTIVE SUMMARY

Neltuma juliflora formerly known as Prosopis juliflora, a fast-growing invasive species introduced to Kenya's arid and semi-arid lands (ASALs) for afforestation and erosion control, has spread extensively across 22 counties of Kenya. Its aggressive encroachment has caused widespread disruption to ecosystems, land use systems and rural livelihoods. Yet, beyond its ecological burden, N. juliflora also presents significant social and economic opportunities for biomass energy, livestock feed, fencing materials, briquettes and biochar. Despite this dual potential, its governance in Kenya remains fragmented, under-regulated, and disconnected from local realities and formal policy systems.

This report, commissioned by the Kenya Forestry Research Institute (KEFRI) with support from the ILO-PROSPECTS programme and in collaboration with the counties of Turkana, Garissa, and Tana River, provides a comprehensive analysis of the legal, policy, institutional, market, and local-level dimensions shaping the management and utilization of N. juliflora. Drawing on extensive stakeholder consultations, national policy reviews, field visits, and comparative case studies from India, South Africa, and Australia, the report highlights systemic barriers and proposes a roadmap for transforming N. juliflora governance into a coherent, inclusive, and opportunity-driven process.

Kenya has developed a comprehensive National Strategy and Action Plan for the Management and Control of N. juliflora (2023–2032), which provides a unified framework to guide counties in responding to the invasive species. Developed through a consultative process, the strategy focuses on a three-pronged approach: control and containment of N. juliflora in critical hotspots using mechanical, chemical, and biological methods; restoration of degraded ecosystems through reforestation and indigenous species reintroduction; and sustainable utilization to create livelihood and economic

opportunities from N. juliflora biomass, including charcoal, briquettes, animal feed, and wood products. The strategy emphasizes early detection and rapid response (EDRR), participatory engagement with local communities and cross-sectoral coordination among national and county governments. Although formally adopted by Cabinet in 2024, the strategy's effectiveness now depends on the timely development of implementation regulations, domestication with county-level plans, and dedicated financing mechanisms to scale its action points across the most affected counties.

At the county level, strategic planning for the utilization of N. juliflora remains limited and uneven. While some counties, such as Tana River and Turkana, have initiated management plans and piloted value-addition enterprises, formalized strategies for utilization are either nascent or not yet operationalized. References to N. juliflora in County Integrated Development Plans (CIDPs) tend to be reactive, often framed as responses to its invasiveness rather than opportunities for economic transformation. This policy vacuum is further exacerbated by institutional fragmentation, where key departments, forestry, environment, agriculture, and trade, operate in silos, with no shared vision, integrated planning, or clear coordination mechanism for N. juliflora interventions.

In Tana River County, efforts to manage N. juliflora have evolved from eradication campaigns to a more integrated approach that emphasizes value addition, institutional coordination, and community-based enterprises. The county has domesticated the draft National N. juliflora Management Strategy (2023–2032) while also implementing its own N. juliflora Management Plan supported by a County Implementation Group (CIG). Strategic investments have been made in briquette and charcoal production technologies, with ongoing efforts to formalize producer groups into cooperatives. Legislative progress is evident through the draft Tana River Forest Bill and the Tana River County Sustainable Charcoal Production Act (2024), although the absence of enabling regulations remains a bottleneck. The CIG continues to champion institutionalization, with allocated funding and stakeholder engagement paving the way for a more organized and sustainable N. juliflora utilization model. However, challenges persist, including the need for regulatory clarity, market access structures and a comprehensive business case to unlock investment and scale.

Turkana County is making concerted efforts to address the widespread invasion of N. juliflora (locally known as Eterae) through a planning-driven, partnership-enriched, and utilization-focused approach. The county has initiated the development of a N. juliflora Management Plan aimed at promoting sustainable utilization, ecological restoration, and inclusive community engagement. This includes piloting value-added enterprises such as charcoal, wood products and fodder production, led by organized community groups. Supported by partnerships, the county has begun translating strategic intent into practical value-chain interventions. However, critical gaps persist, including the absence of a finalized management plan, lack of enabling regulations, weak enterprise and cooperative support systems, and uncertainties around long-term financing and institutional anchoring. To consolidate gains and ensure resilience, further efforts are needed to formalize governance frameworks, strengthen enterprise ecosystems and embed N. juliflora management into county budgets and development plans.

Garissa County is in a transition stage, from recognizing the threat of N. juliflora to piloting pathways for its sustainable use. While academic mapping and early community interventions provide a solid foundation, the county still lacks formal governance frameworks, enabling regulations and structured enterprise systems. Bridging these gaps through policy development, institutional support and market-oriented cooperative formation will be key to converting N. juliflora from a liability into a livelihood asset in Garissa County.

Stakeholder consultations across the three counties show that local communities don't depend on policy in managing and utilizing N. juliflora through informal harvesting, charcoal production, briquette-making, animal feed processing, and communal land clearance. Women's groups, youth collectives, and traditional leaders are driving these efforts with limited tools and no legal or institutional support. However, the absence of licensing systems, product standards, market infrastructure, and technical assistance makes it difficult to scale or sustain these

grassroots initiatives. Producers face regulatory uncertainty, lack of access to finance, and exclusion from formal markets, resulting in widespread underutilization of the species' economic value.

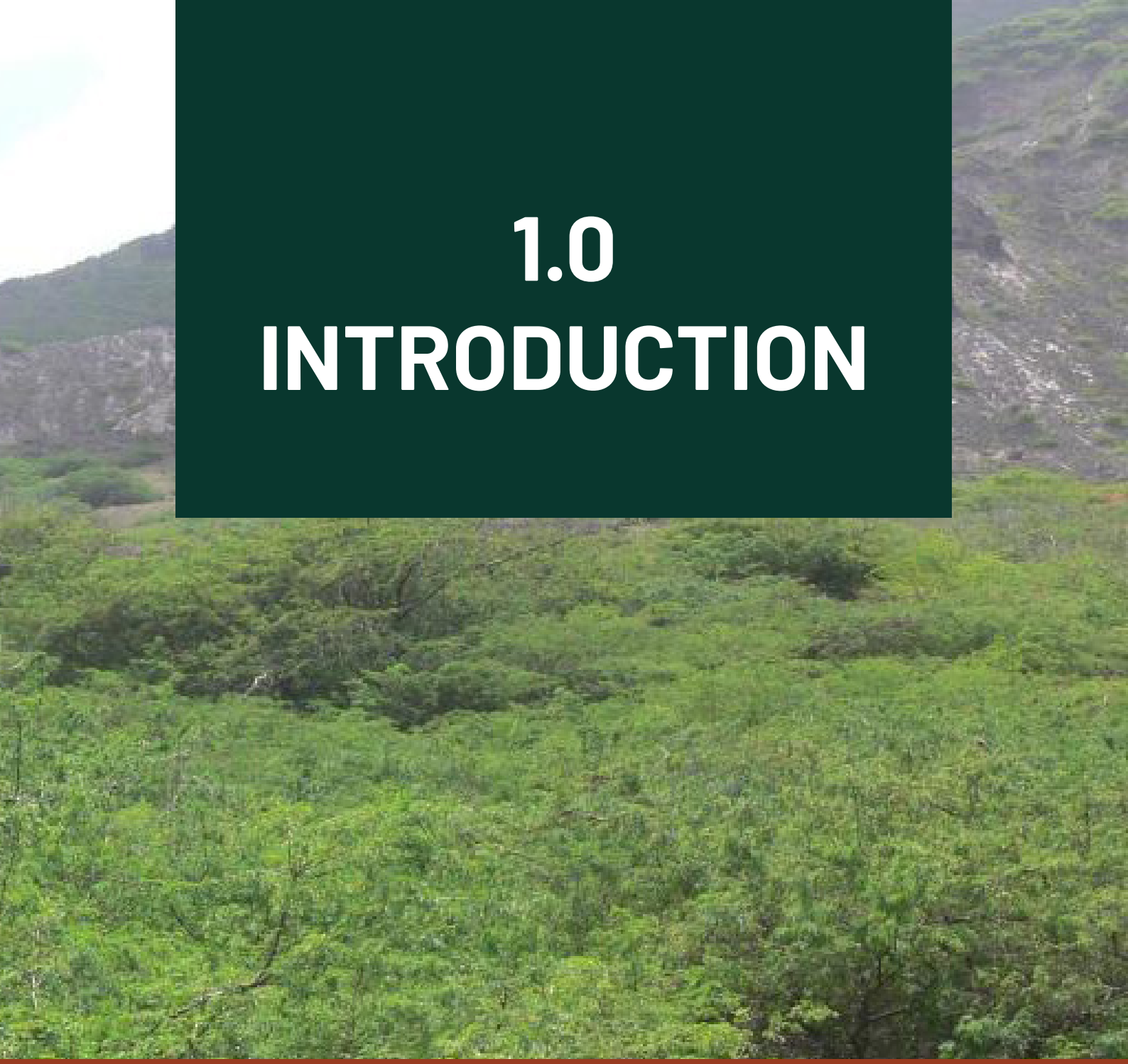
The report also established that Kenya is foregoing a significant economic opportunity. N. juliflora -based products such as fuelwood, briquettes, feed supplements, and biomass-based materials have growing demand in both rural and urban areas, but value chains remain underdeveloped. Innovations in biochar, woodchips, and green building materials are largely unexplored. Public procurement programs that could provide demand stability such as for school energy, refugee camps, or county facilities are absent. Without structured support, community-based enterprises remain informal, isolated, and vulnerable.

Importantly, international case studies show that effective N. juliflora governance is achievable. India has embraced a utilization-based strategy supported by legal reforms, incentives, public procurement, and strong engagement with self-help groups. South Africa has integrated N. juliflora control into a public employment and ecological restoration program through its Working for Water initiative. Australia's approach, while more containment-focused, demonstrates the value of biosecurity legislation, coordinated planning, and shared accountability. These models underscore the importance of regulatory clarity, community incentives, cross-sectoral coordination, and data-driven decision-making.

Based on this synthesis, this report recommends a comprehensive pathway forward for Kenya. To unlock the full potential of N. juliflora as a livelihood asset rather than an ecological burden, counties must prioritize bridging existing gaps through robust policy development, institutional strengthening, and the formation of market-oriented cooperatives. It is critical to develop and widely disseminate a comprehensive business case for N. juliflora utilization that clearly demonstrates its economic viability, scalability, and sustainability to attract enterprise support institutions and investors. Counties should also work towards achieving legal and policy coherence with national frameworks, particularly in areas related to harvesting, transport, processing, and taxation. Institutionalizing N. juliflora management as a formal county function, with dedicated staff, budget allocations, and measurable performance frameworks, is essential for sustained action. Additionally, the formalization and adoption of county N. juliflora management plans should be expedited, alongside the development of enabling legal frameworks to support value chain governance. Strengthening enterprise ecosystems including cooperative development, market linkages, quality assurance mechanisms, and access to financing, will be critical for scaling commercial utilization efforts. Finally, counties must secure long-term and predictable financing through county budget lines and partnerships to ensure sustainability beyond donor-led pilot initiatives.

In conclusion, N. juliflora presents both a challenge and an opportunity. If ignored, it will continue to degrade landscapes, strain pastoral systems, and undermine resilience in Kenya's ASALs. But if embraced through coordinated governance, legal clarity, and community empowerment, it can become a driver of inclusive green growth, rural livelihoods, and ecological restoration. The time to act is now before informal systems collapse under institutional neglect, or economic potential is lost to inaction. This can be done as follows:

Short-Term (0–12 months)	Medium-Term (1–3 years)	Long-Term (3–5+ years)
Finalize and approve county N. juliflora management plans	Develop and enact county-specific regulations aligned with national laws (such sustainable charcoal Act)	Institutionalize N. juliflora management in CIDPs, climate strategies and forest/land-use programs
Establish county and sub-county N. juliflora Coordination Committees (CIGs)	Support cooperative formation and formalization of community led bio-enterprises	Promote landscape restoration and transition to alternative livelihoods in N. juliflora -cleared zones
Conduct inclusive public participation and stakeholder sensitization forums	Facilitate market linkages and buyer engagement for N. juliflora -based products	Strengthen MEL frameworks using digital tools and community-based monitoring systems
Develop and disseminate harvesting and utilization protocols in collaboration with key stakeholders	Distribute equipment and promote technology transfer (e.g., improved kilns, milling units)	Mobilize long-term climate and private sector financing; promote PPPs for value chain investment
Pilot alternative fuel use (such briquettes) in Kakuma and Dadaab refugee camps	Gazette regulated harvesting and utilization zones through participatory land-use planning	Embed budget lines and staff positions in county structures for sustained N. juliflora governance
Train community groups and producer associations on safe and efficient processing	Implement incentive schemes (e.g., tax relief, guaranteed markets, cash-for-work) for N. juliflora clearance	Establish decentralized processing hubs or mobile units to enhance rural reach and efficiency



1.0 INTRODUCTION

1.1 Background information

Kenya's rangelands, comprising approximately 80% of the country's land area, are ecologically and economically significant landscapes that support over 70% of the national livestock herd and a substantial proportion of the country's pastoral and agro-pastoral populations (GoK, 2016; FAO, 2021). These arid and semi-arid lands (ASALs) are critical for dryland biodiversity conservation, cultural heritage, and climate resilience, serving as carbon sinks and buffers against climatic extremes. However, they face escalating threats from land degradation, unsustainable land use, invasive species proliferation, erratic rainfall patterns, and socio-economic marginalization (Nyariki & Amwata, 2019; GoK, 2022).

Among the most invasive and ecologically disruptive species in Kenya's rangelands is *Neltuma juliflora* (formerly *Prosopis juliflora*), a fast-growing, drought-tolerant tree originally introduced in the 1970s and 1980s under government-led afforestation and desertification control programmes (Choge et al., 2007; Mwangi & Swallow, 2008). While the species initially met expectations for combating soil erosion and providing fuelwood, it has since become highly invasive, spreading across large swathes of northern and eastern Kenya, including Garissa, Tana River, Turkana, Baringo, Isiolo, and Marsabit counties, often at the expense of native vegetation and grazing resources (Mbaabu et al., 2019).

The impacts of *N. juliflora* are deeply ambivalent. On the positive side, the species has created new economic opportunities, particularly in charcoal production, fencing material, furniture, biomass fuel, animal feed supplements and, more recently, biochar and briquette production (Choge & Ngujiri, 2019). These products present potential value chains for job creation, especially among youth and refugees in ASAL counties. On the negative side, however, the species is associated with widespread ecological degradation: it aggressively outcompetes native flora, reduces pasture productivity, alters soil chemistry, and impedes access to water resources (Muturi et al., 2021). Additionally, its thorny branches cause physical injury to both humans and livestock, contributing to health-related costs in affected communities (Shiferaw et al., 2022).

The unchecked spread of *N. juliflora* has disrupted traditional grazing patterns, restricted pastoral mobility, and intensified conflict over natural resources, particularly in areas already grappling with climate-induced stress and socio-political vulnerability (Kariuki et al., 2020; Gichuki et al., 2023). Various control strategies have been piloted including mechanical clearing, biological suppression, controlled burning, and utilization-based harvesting but with limited and uneven success. Many efforts suffer from lack of coordination, weak enforcement, limited financing, and policy ambiguity (Orwa et al., 2022).

Despite the challenges, *N. juliflora* offers an untapped social and economic opportunity if framed within a strategic governance approach. Transforming the species from liability to an asset will require a clear and harmonized policy and legislative framework that encourages sustainable harvesting, incentivizes local utilization, regulates processing and trade, and integrates community-driven control initiatives. Currently, fragmented mandates across forestry, environment, livestock, energy, and trade sectors hinder coherent action, while county-level policies and by-laws remain uneven or absent (GoK, 2022; KEFRI, 2023).

In this context, a robust understanding of existing legal and institutional frameworks, both at national and county levels, is critical to enabling sustainable *N. juliflora* management. Realizing the full potential of its products for livelihoods, climate resilience, and dryland restoration will depend on coordinated governance, policy innovation, and investment in inclusive value chains. This report provides a comprehensive review and analysis of policy, legislative, and institutional frameworks at both national and county levels (specifically in Garissa, Tana River, and Turkana counties) that influence the management, harvesting, processing, utilization, and marketing of *N. juliflora*. The report identifies regulatory gaps, overlaps, and opportunities to promote sustainable management and value addition that supports livelihoods and ecological integrity.

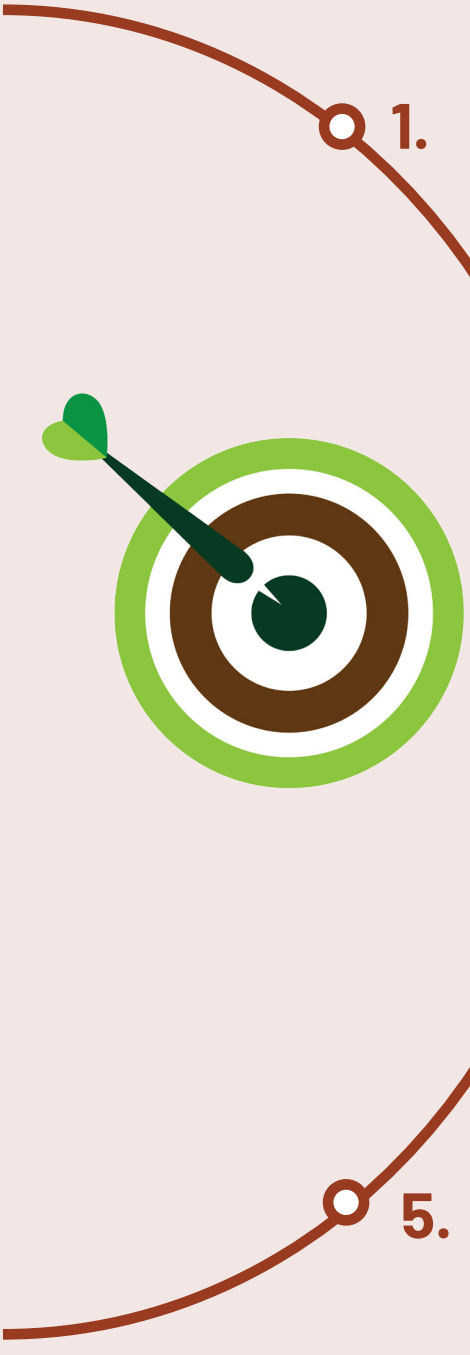
This analysis was commissioned by the Kenya Forestry Research Institute (KEFRI) as part of a broader effort to strengthen policy and legal frameworks for managing *N. juliflora* in Garissa, Tana River, and Turkana Counties. The assignment focused on reviewing national and county-level frameworks, engaging stakeholders, assessing international best practices, and generating actionable recommendations to support sustainable management, utilization, and value-chain development. The scope reflects KEFRI's objective of providing evidence that informs coherent governance, enhances livelihoods, and promotes environmentally sound utilization of *N. juliflora*.

1.2 Objectives

The overall objective of this policy and regulatory analysis is to support evidence-based reforms for the sustainable management, harvesting, processing, utilization, and marketing of N. juliflora in Kenya, with a focus on the counties of Garissa, Tana River and Turkana. This aims to enhance the enabling environment for transforming N. juliflora from an invasive burden into an economically viable resource that supports community livelihoods, generates decent green jobs, and contributes to dryland ecosystem restoration.

1.2.1 Specific Objectives

To achieve the above goal, the study:



1. Conducted a comprehensive review of national and county-level policies, legislation, and regulations related to invasive species, forest products, dryland forestry, and natural resource utilization that influence N. juliflora management.

2. Analyzed the institutional frameworks, mandates and coordination mechanisms that govern the management and utilization of N. juliflora across national, county and community levels.

3. Identified gaps, overlaps and inconsistencies in current legal, policy and institutional frameworks that hinder effective and sustainable N. juliflora control and utilization.

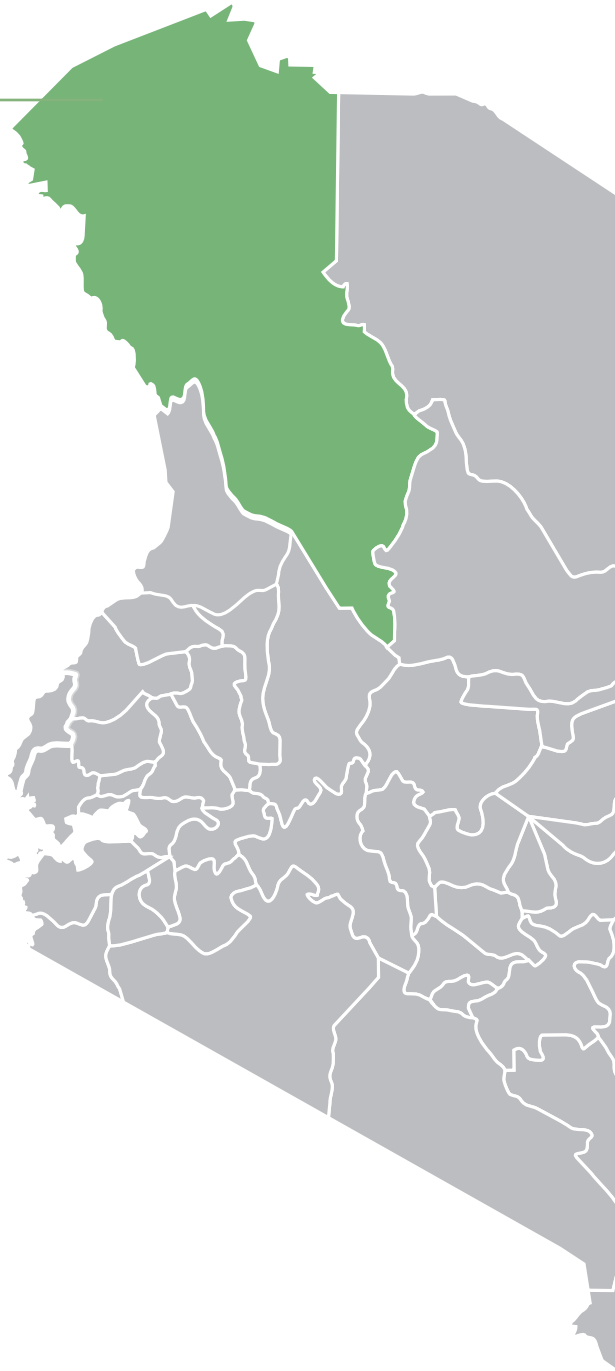
4. Reviewed and analyzed successful international and regional policy models for invasive species management and extracted lessons and best practices that could inform Kenyan policy and legal reform.

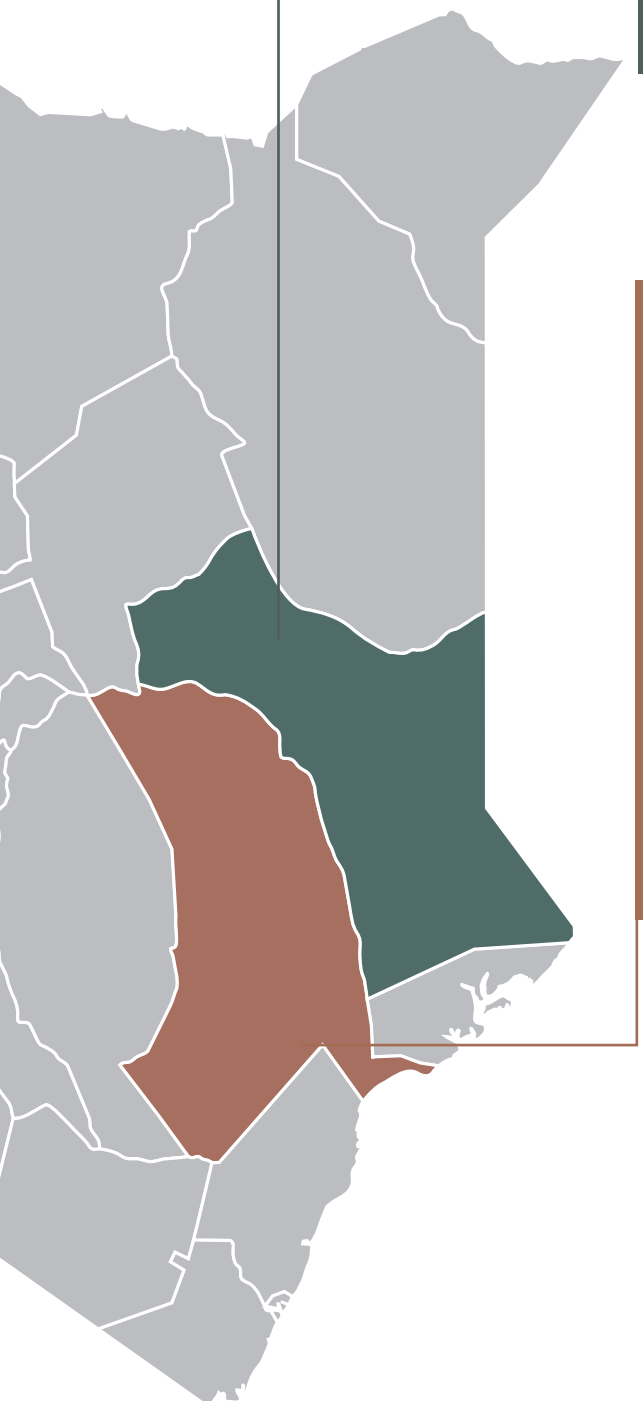
5. Developed actionable and evidence-informed recommendations for policy, legislative and institutional reforms that could unlock trade, investment and livelihood opportunities linked to N. juliflora while enhancing environmental sustainability.

1.3 Geographic Scope

This report focused on three arid and semi-arid counties in northern and eastern Kenya namely Garissa, Tana River and Turkana which are among the areas most affected by the spread of N. juliflora. These counties are situated within the broader ASAL belt that is characterized by low and erratic rainfall, high poverty levels and recurrent climate-related shocks. The rampant spread of N. juliflora in these areas has led to severe ecological disruption but also presents emerging opportunities for economic utilization. The three counties are also direct beneficiaries of the ILO-PROSPECTS project, which seeks to improve livelihoods for both host and refugee populations through sustainable land management and resource-based enterprises. A county-level analysis allows for a nuanced understanding of how differing socio-ecological and institutional dynamics shape the challenges and opportunities around N. juliflora management.

Turkana County, in the northwest, is Kenya's largest county by land area and among the most climate vulnerable. It hosts significant deposits of N. juliflora, particularly around Lake Turkana, Lodwar, and Kakuma refugee-hosting areas. Despite the high biomass availability, utilization of the species remains minimal due to infrastructural barriers, limited investment and an unclear policy environment. N. juliflora continues to degrade rangelands that are critical for pastoral livelihoods, exacerbating water stress and reducing livestock mobility. There is a growing push to explore commercial uses of the species particularly in the form of bioenergy and animal feed, but this requires coordinated policy action and private sector engagement. The county's experience will be vital in understanding how to bridge the gap between biomass potential and economic utilization.





Garissa County lies in northeastern Kenya and shares borders with Somalia. It is home to a large refugee population hosted in Dadaab refugee camps, alongside significant pastoralist and agro-pastoral communities. The spread of N. juliflora has been particularly severe in this county, invading both grazing lands and areas around settlements. Communities have increasingly turned to charcoal production, firewood harvesting and briquette-making from N. juliflora as alternative livelihood source. However, the lack of formalized market systems, regulatory clarity and environmental safeguards raises sustainability concerns. County authorities and development partners have shown growing interest in formalizing value chains and linking N. juliflora utilization to job creation, especially for youth and refugees, but policy frameworks remain weak and enforcement mechanisms limited.

Tana River County, located along the lower Tana River basin, features a fragile coexistence between pastoralist and farming communities. N. juliflora has aggressively colonized riparian zones, farmlands and grazing corridors, leading to growing resource-based tensions and land use conflicts. Its presence has undermined smallholder agriculture by reducing access to arable land and choking irrigation infrastructure. At the same time, its abundant biomass presents opportunities for energy production, fencing material and animal feed. The county has initiated sporadic efforts to regulate charcoal burning and promote alternative uses of N. juliflora, but lack of regulations for coordination and competing land use interests have slowed progress. Understanding the governance dynamics in Tana River will be crucial to designing appropriate policy interventions.

Comparing these three counties uncovers diverse policies, institutional and socio-economic contexts within which N. juliflora management occurs. This helps to shape practical, context-sensitive recommendations for sub-national governance improvements and national-level harmonization.

1.4 Thematic focus areas

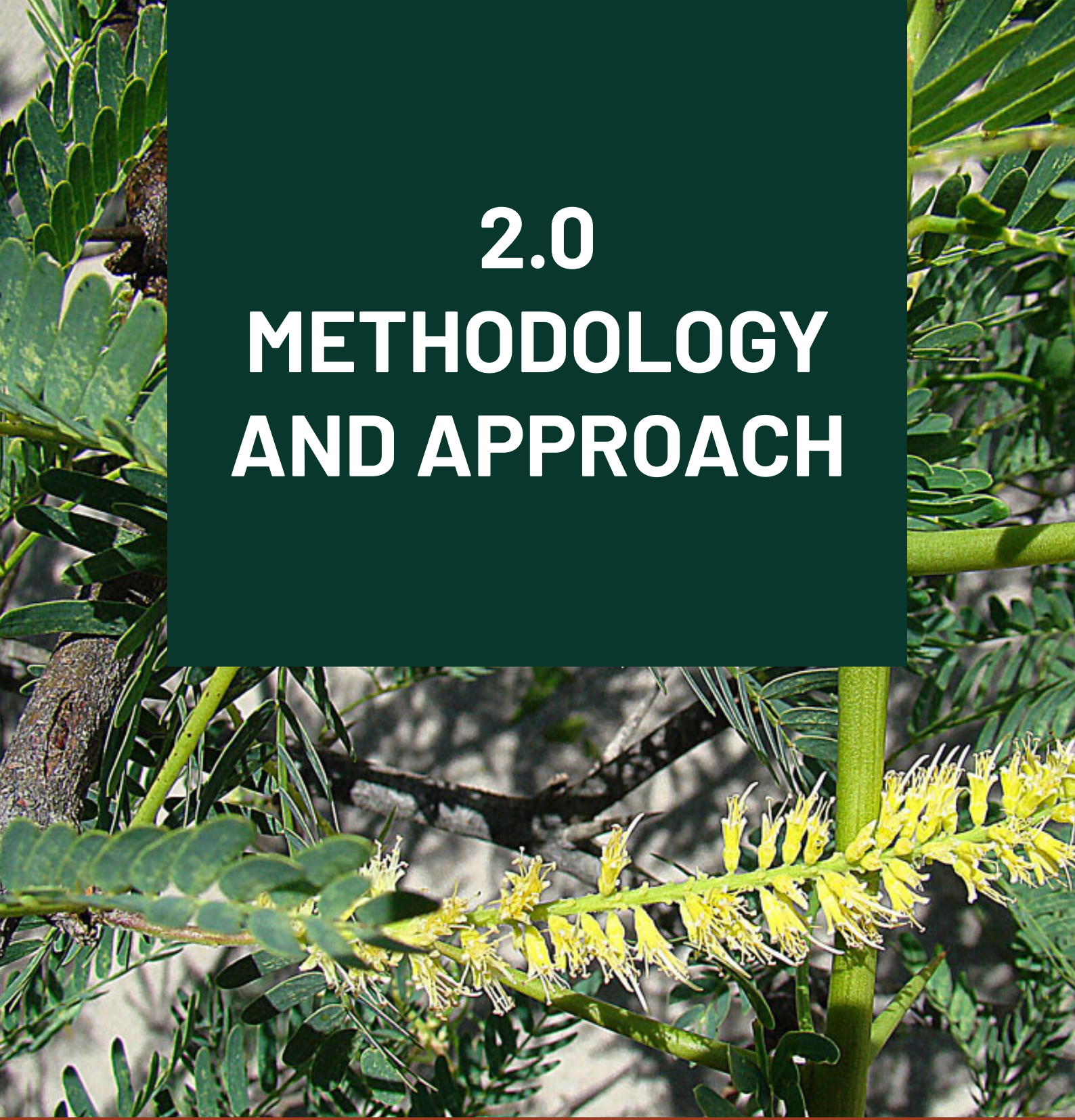
The study was structured around four interrelated thematic areas, each representing a critical dimension of N. juliflora management in Kenya's arid and semi-arid counties. These thematic areas served as analytical pillars through which the legal, institutional, stakeholder and comparative dimensions of governance were examined. Together, they provided a comprehensive framework for identifying policy gaps, institutional bottlenecks and opportunities for sustainable utilization and reform.

The first thematic area focused on the policy and legal frameworks that govern the management, harvesting, processing and trade of N. juliflora. The study analyzed relevant national and county-level laws, regulations and strategies, including those addressing invasive species, dryland forestry, charcoal production, land use and renewable energy. The analysis assessed the coherence of these instruments across governance levels, their enforceability and the extent to which they recognize N. juliflora as both a threat and an economic resource. Particular attention was given to the presence or absence of enabling provisions, such as product standards, licensing regimes, or incentives for private sector engagement.

The second thematic area centered on institutional architecture including the mandates, roles, and coordination mechanisms of relevant institutions at national, county, and community levels. These included agencies such as KEFRI, KFS, NEMA and KIRDI as well as county departments responsible for forestry, agriculture, trade, environment, and energy. The analysis explored whether institutional mandates were clear and complementary or overlapping and fragmented. It also examined the existence and functionality of coordination mechanisms and the extent to which accountability and reporting structures supported effective implementation of N. juliflora -related responsibilities.

The third area focused on stakeholder perspectives and implementation realities, with an emphasis on how different actors including policymakers, regulatory agencies, producer groups, private enterprises, refugee and host communities and civil society experience and interpret existing governance arrangements. The study examined challenges related to regulatory ambiguity, market access, licensing procedures and institutional responsiveness. It also explored disparities in participation and influence, especially among marginalized groups such as women, youth, and displaced populations, in decision-making related to N. juliflora control and utilization.

The fourth thematic area applied a comparative and utilization-based lens to benchmark Kenya's governance frameworks against international experiences in managing invasive species. The analysis drew on case studies from India, South Africa, and Australia countries with notable success in balancing ecological control with economic utilization. Lessons were synthesized in relation to policy design, institutional arrangements, incentive structures and community-based models, with consideration of how such approaches could be adapted to Kenya's devolved governance system, dryland context and socio-political landscape.



2.0 METHODOLOGY AND APPROACH

This study applied a mixed-methods approach to develop a comprehensive understanding of the policy, legal, and institutional environment influencing the management and utilization of N. juliflora in Kenya. The methodology combined a desk-based literature and policy review, stakeholder engagement across multiple sectors and levels of governance and a comparative analysis of international best practices. This triangulation allowed for the identification of gaps, bottlenecks and opportunities, grounded in both national frameworks and localized community realities.

2.1 Literature and policy review

A desk review was conducted to examine both national and county-level policy and legal instruments relevant to N. juliflora management. At the national level, key documents reviewed included the Forest Conservation and Management Act (2016), the Environmental Management and Coordination Act (amended 2015), the Livestock Act (2023), the Energy Act (2019), the Climate Change Act (2016), Migratory and Invasive Pest and Weed Management Strategy 2022 -2027 and the Draft National Strategy for the Management of Invasive Alien Species (2022–2032). At the county level, County Integrated Development Plans (CIDPs), sectoral strategies, environmental by-laws and forestry policies were reviewed for Garissa, Tana River and Turkana counties.

This review was supplemented by grey literature, including technical reports and policy briefs from KEFRI, FAO, UNEP, ICRAF, World Vision and other development partners working on dryland restoration and invasive species control. These sources were instrumental in contextualizing the policy environment and highlighting ground-level dynamics not captured in formal legislation.

The review focused on four key analytical dimensions: policy coherence, assessing horizontal and vertical alignment across sectors and levels of government; enforceability, evaluating the presence and clarity of implementation mandates and mechanisms; consistency, identifying contradictions or overlaps in mandates and policies; and livelihood impact, analyzing whether existing frameworks support or hinder local economic engagement in N. juliflora value chains. Findings were synthesized using a policy mapping matrix to identify regulatory gaps, weak institutional linkages and potential entry points for reform.

2.2 Stakeholder mapping and engagement

Extensive stakeholder engagement was undertaken to capture diverse perspectives and implementation realities. Stakeholders were mapped and categorized into five groups:

1. Public sector institutions, including KEFRI, KFS, NEMA, KIRDI, the Ministry of Environment and Forestry and relevant departments from the county governments of Garissa, Tana River and Turkana.
2. Private sector actors, particularly those involved in harvesting, transporting and processing N. juliflora products such as charcoal producers, briquette makers and animal feed processors.
3. Community-based organizations and local institutions including Community Forest Associations (CFAs), Natural Resource Management Committees (NRMCs) and women and youth groups in host and refugee communities.
4. Civil society organizations and NGOs, especially those working on natural resource governance, dryland livelihoods and energy access such as FAO, MercyCorps, Trocaire, and World Vision.
5. Academic and research institutions including think tanks such as SEI and ICRAF, University of Turkana and Garissa University.

2.3 Sampling

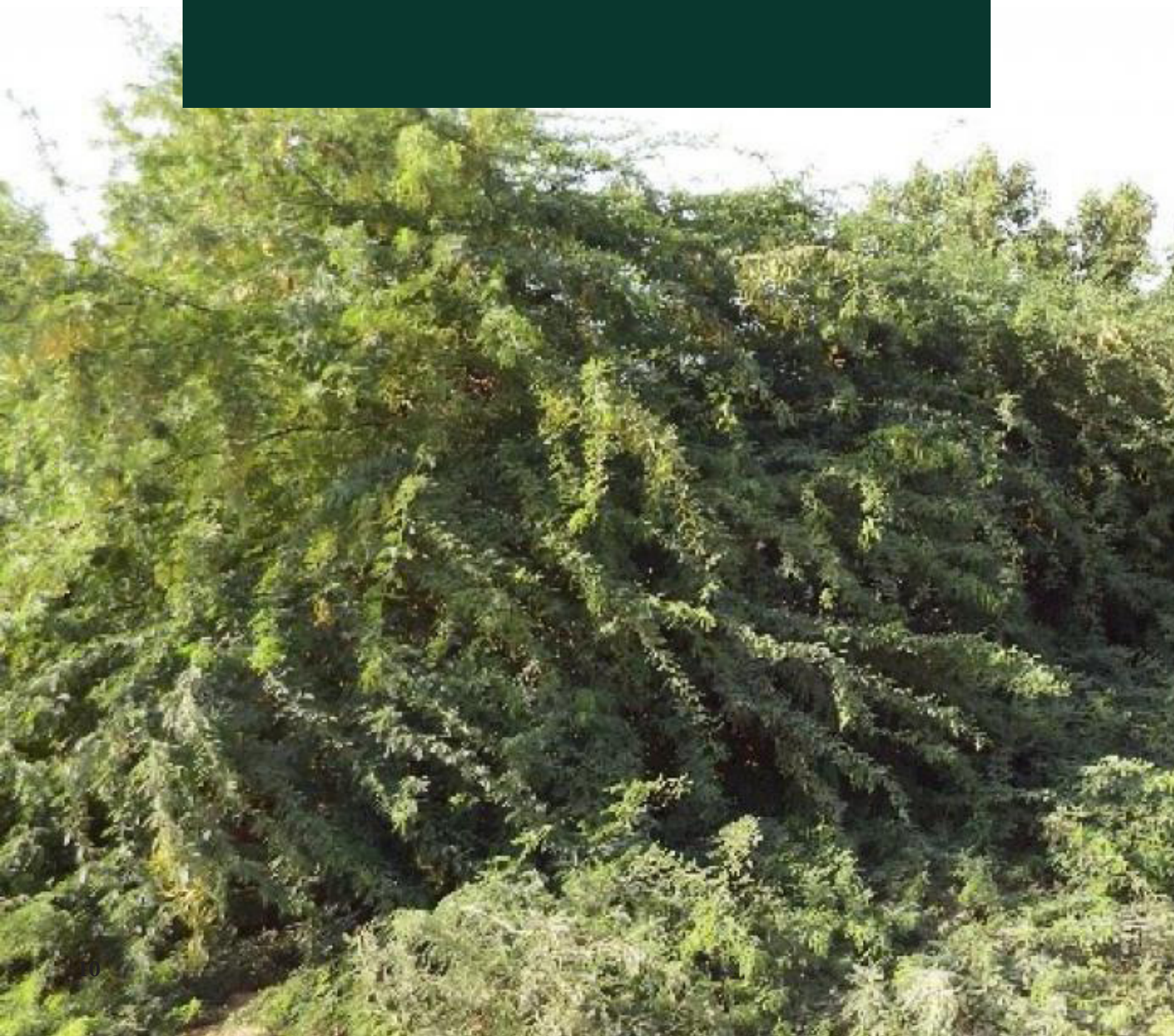
To ensure a representative understanding of perspectives on N. juliflora management, a purposive sampling strategy was adopted across Garissa, Tana River, and Turkana Counties. Respondents were selected to capture a balance between government institutions, community-based organizations, private sector actors, NGOs, and academic representatives directly involved in or affected by N. juliflora management and utilization. Data collection relied on a combination of Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). In total, 15 KIIs and 9 FGDs were conducted across the three counties, engaging approximately 105 respondents. FGDs were composed of 8–12 participants each, structured to capture a diversity of views while remaining manageable for in-depth discussion. KIIs were carried out with a cross-section of stakeholders, including county executives, technical officers, NGO representatives, private sector actors, traditional leaders, and researchers. This sampling framework balanced breadth and depth, ensuring that the study captured both community-level perceptions through FGDs and policy/institutional perspectives through KIIs. Semi-structured interview guides were used to explore stakeholder experiences with policy implementation, institutional effectiveness and barriers to sustainable utilization. Ethical standards were observed throughout the data collection process. Verbal or written consent was obtained from all participants. Confidentiality was upheld and identifying information was excluded from the reporting unless permission was explicitly granted.

2.4 Comparative analysis

A comparative review of international experiences in managing invasive woody species was conducted to draw out lessons applicable to the Kenyan context. The study focused on three countries with relevant ecological, institutional and policy experiences: India, South Africa, and Australia. These countries were selected based on their ecological relevance (presence of N. juliflora or similar species), their demonstrated success in harmonizing control and utilization strategies and the diversity of their institutional models, ranging from decentralized (India) to biosecurity-led (Australia).

The comparative analysis focused on three dimensions: policy instruments such as legal classifications, product standards and licensing systems; incentive structures, including tax reliefs, public works programs and community-based procurement models; and institutional arrangements, with emphasis on coordination platforms, enforcement mechanisms and community participation. Findings from the international review were analyzed for their relevance and adaptability to Kenya's devolved governance structure and dryland socio-ecological contexts. These insights informed the development of strategic recommendations aimed at improving both environmental outcomes and economic inclusion in N. juliflora management.

3.0 MAJOR FINDINGS



3.1 Ecological, economic and social dimensions of N. juliflora

The spread of N. juliflora across Kenya's arid and semi-arid counties has generated complex and often contradictory impacts disrupting ecosystems and livelihoods in some areas, while offering untapped economic opportunities in others. Originally introduced to combat desertification and provide fuelwood, N. juliflora has become one of the most aggressive invasive species in the region. It now dominates vast rangeland areas in Turkana, Garissa and Tana River counties, with ecological, social and economic consequences that are deeply interconnected.

This section presents an overview of the key ecological challenges posed by the species, the emerging but underdeveloped economic potential of its products and the varied social responses at community level. Drawing on stakeholder consultations, field observations and literature, the findings highlight how N. juliflora is perceived and managed differently across counties shaped by local land use systems, governance structures and the presence (or absence) of market and policy incentives. Understanding these intersecting dimensions is critical to framing viable governance, utilization, and restoration strategies.

N. juliflora has become one of the most ecologically disruptive invasive species in Kenya's drylands, spreading rapidly across rangelands, riparian areas and settlement zones. Originally introduced to combat desertification and provide fuelwood, the species has since expanded far beyond its intended range. It now covers an estimated 1.6 million hectares nationally, with significant concentration in Turkana, Garissa and Tana River counties (Choge et al., 2007; Mbaabu et al., 2019).

The species' aggressive expansion is facilitated by its deep taproot system, high seed production, allelopathic effects on native plants and tolerance to arid conditions (Muturi et al., 2021). It forms dense thickets that choke out indigenous vegetation, alter soil chemistry and reduce biodiversity. In Turkana, particularly in areas surrounding Lodwar, Lombokat, Katilu, Kakuma and parts of Kalokol, N. juliflora has colonized grazing corridors and riparian zones, reducing access to pasture and water for livestock. According to county environmental officers and pastoralist communities, the encroachment of N. juliflora has contributed to the loss of seasonal grazing areas, disruption of migratory patterns and increased pressure on already stressed ecosystems.

In Garissa, the spread of N. juliflora is particularly prominent around Dadaab and Balambala, where it invades both communal rangelands and peri-urban areas. Its presence around refugee camps has altered the ecological landscape significantly. Stakeholders reported that the species has consumed riparian belts and obstructed access to water points, while also outcompeting fodder species such as Cenchrus ciliaris and Chloris roxburghiana (Githae et al., 2021). As in Turkana, the ecological pressure exacerbates conflict over land and resources, especially during dry season.

In Tana River, the species thrives along the Tana Delta and floodplains, where it disrupts both wildlife corridors and agricultural activities. Farmers and pastoralists interviewed during the study noted that N. juliflora has taken over farmlands and riverbanks, reducing arable land and increasing human–wildlife conflict. Its expansion into protected and community conservation areas also undermines the ecological integrity of ecosystems vital for both biodiversity and local livelihoods.

Across all three counties, local ecosystems show signs of degradation due to N. juliflora encroachment. Native tree and shrub species such as Vachellia tortilis, Balanites aegyptiaca and Grewia bicolor are being displaced. The dense canopy of N. juliflora suppresses understory growth and limits light penetration, further reducing plant diversity. Its invasive spread has also altered fire regimes and increased the prevalence of thorn-related injuries among livestock and humans (Shiferaw et al., 2022). The ecological impact is compounded by the limited capacity of local institutions and communities to control the species' expansion. Most control efforts, where they exist, are reactive and small-scale, often focused on clearing rather than containment or ecological restoration. Without coordinated intervention, the unchecked spread of N. juliflora is likely to lead to further rangeland degradation, biodiversity loss and ecological imbalance across Kenya's ASAL counties.

3.1.1 Economic potential and utilization trends

While N. juliflora is widely recognized for its negative ecological impacts, it also holds significant, but underexploited, economic potential for dryland communities. Its fast growth rate, high biomass yield and suitability for marginal environments make it a viable source of raw material for multiple value chains including charcoal, firewood, briquettes, animal feed, fencing poles and emerging uses such as biochar and chipboard (Choge & Ngujiri, 2019; Orwa et al., 2022).

In Turkana County, N. juliflora has become a central biomass resource in areas such as Lodwar, Kakuma and Kalokol. Informal groups and individual harvesters extract wood for charcoal production, which is sold both locally and in urban markets such as Eldoret and Kitale. However, the charcoal trade remains largely informal, lacking licensing, standardization, or quality control. Youth and refugee groups have been particularly active in N. juliflora harvesting, often as a coping strategy amid limited employment opportunities. Despite high biomass availability, the lack of value addition infrastructure, such as briquetting machines or chippers, constrains enterprise development and limits the economic multiplier effect.

In Garissa, N. juliflora utilization is most active in areas around Dadaab and Bura, where communities have organized themselves into small cooperatives or informal networks for charcoal and firewood production. Some NGOs have supported briquette-making initiatives, particularly targeting refugee women's groups. However, the absence of standardized production methods and marketing support implies that most products remain of low quality and are not competitive in broader markets. Local traders reported that transport costs and lack of processing equipment were major barriers to scaling up. Additionally, no formal pricing systems or aggregation mechanisms exist, limiting the bargaining power of producers.

In Tana River County, the utilization of N. juliflora is gaining structured momentum, transitioning from ad hoc use to a more strategic and coordinated model. While traditional uses such as firewood and fencing remain widespread among communities, the county has moved beyond these basic applications by investing in briquette-making machines and improved charcoal kilns to support value addition. These efforts are part of a broader shift from eradication campaigns to economic recovery and circular economy approaches, aligned with both the National N. juliflora Management Strategy (2023–2032) and the county's own N. juliflora Management Plan. A county implementation group has been established to oversee multi-stakeholder coordination and guide institutional action. While environmental sensitivities remain, especially around harvesting in riverine and conservation areas, the county is actively working to balance ecological safeguards with livelihood generation. Plans are underway to formalize producer groups into cooperatives, thereby anchoring community-based enterprises in a more organized and regulated system. However, the absence of enabling regulations and limited market infrastructure continue to constrain the full realization of N. juliflora' s commercial potential.

Across all three counties, the commercialization of N. juliflora is constrained by several systemic barriers. These include the lack of formal product standards, unclear licensing frameworks, limited access to technology and finance and absence of aggregation or

marketing infrastructure. Despite these challenges, stakeholders expressed strong interest in formalizing the sector, especially where communities have already begun to organize around charcoal or briquette production.

Beyond energy products, emerging utilization options such as animal feed and biochar remain largely unexplored, despite promising trials by various development organizations and other research institutions in Tana River and Turkana Counties. In arid counties where livestock production is a primary livelihood, the use of N. juliflora pods as supplemental feed could support feed security, particularly during drought periods (Muturi et al., 2021). The milled N. juliflora feeds are compressed to form pellets that are easier to store and transport. However, the high sugar content in its pods has been reported to negatively affect livestock teeth. Concerns over toxicity, lack of processing knowledge and absence of feed standards have therefore slowed uptake.

The economic potential of N. juliflora is therefore evident but unrealized. Unlocking this potential will require strategic investments in product development, quality control, market systems and enabling policy reforms. There is a clear opportunity to shift from viewing N. juliflora solely as an invasive threat to leveraging it as a driver of green jobs, energy access and climate-resilient livelihoods, particularly for youth, women and displaced populations in Kenya's ASAL regions.

3.1.2 Social dimensions and community perceptions

The social dimensions of N. juliflora are deeply intertwined with issues of livelihood security, access to natural resources, social inclusion and community-level governance. While N. juliflora presents economic opportunities, it has also introduced new social tensions, altered traditional land-use practices and disproportionately affected marginalized groups. Community perceptions of the species vary widely, shaped by experiences of benefit, harm and exclusion in both its management and utilization.

In Turkana County, communities have largely come to view N. juliflora as both a coping resource and a burden. Among youth and refugee populations, especially in Kakuma and Kalobeyei, the species offers an accessible source of income through charcoal, briquettes, pellets and firewood sales. However, elders and pastoralist groups expressed concern that N. juliflora has encroached on communal grazing lands, disrupted seasonal livestock movement and increased the labor burden on women tasked with collecting fuelwood. The spread of the species was also linked to growing incidences of livestock injuries and reduced mobility due to thickets blocking paths to water points and pastures. In focused group discussions, several participants described N. juliflora as "a tree that eats land," reflecting its invasive nature and perceived threat to pastoral systems.

In Garissa, perceptions of N. juliflora are more polarized. Among some host communities and refugee groups particularly women engaged in briquette-making initiatives, the species is seen as a livelihood opportunity. However, local leaders, elders and natural resource committees voiced concerns about the erosion of communal land governance, with disputes emerging over who has the right to harvest, sell, or process the resource. Several respondents emphasized that decisions around N. juliflora use were often externally driven by non-governmental organizations (NGOs) or project implementers, without adequate involvement of traditional leadership or community governance structures. This has led to perceptions of exclusion, particularly among older men and youth not directly engaged in donor-supported interventions.

In Tana River, N. juliflora is widely viewed as an encroacher and disruptor of local livelihoods. The species' spread into farming areas, riverine forests and conservation zones has heightened tensions between farming and pastoralist communities, especially in contested areas along the Tana Delta. Farmers reported losing productive land to N. juliflora thickets and facing increased labor costs in land clearing. Meanwhile, pastoralists described diminished pasture availability and blocked access to riverine grazing. Notably, the presence of N. juliflora in or near conservation areas has led to new forms of conflict, particularly where community conservancies overlap with N. juliflora -infested zones.

Across all three counties, gender and generational dimensions shape experiences and perceptions over N. juliflora . Women, while disproportionately burdened by firewood collection and land clearing, are also emerging as leaders in small-scale processing and marketing of N. juliflora -based products, particularly in areas where NGOs have provided equipment and training. However, women's participation in governance and decision-making remains limited. Most of the women interviewed expressed frustration about being sidelined in community planning meetings or lacking the authority to influence harvesting rights or benefit-sharing mechanisms. Similarly, youth see N. juliflora as a potential economic lifeline in regions with limited formal employment, but often lack support systems, capital, or formal recognition of their initiatives.

The study also found that community-level governance and traditional knowledge systems have not been meaningfully integrated into formal or donor-led N. juliflora management efforts. In many areas, customary institutions that historically governed rangeland access and natural resource use have been weakened or bypassed. This has created regulatory vacuums and fragmented accountability, where no single actor, be it community, county, or NGO, assumes long-term responsibility for N. juliflora control or benefit management. As a result, there is limited local ownership, weak collective action and inconsistent enforcement of harvesting rules.

Despite these challenges, there is growing community interest in structured utilization of N. juliflora particularly when linked to income generation, food security (such as livestock feed), and restoration of degraded lands. What is lacking, however, is a clear framework for inclusive participation, rights recognition and benefit-sharing. Addressing the social dimensions of N. juliflora management will require not only policy reform and institutional coordination, but also deliberate efforts to empower local voices, bridge community knowledge with technical expertise, and build trust among stakeholders.

	 Ecological impacts	 Economic use and potential	 Social perceptions and impacts
Turkana	Encroachment on grazing corridors and riparian zones; reduced pasture and water access; displacement of native species	Charcoal and firewood production by youth and refugees; informal trade; limited value addition infrastructure	Seen as both a coping resource and a threat; loss of mobility and pasture; youth dependent on harvesting
Garissa	Invasion of communal rangelands and peri-urban areas; blockage of water points; competition with fodder species	Charcoal, briquettes, and firewood; women's groups active in processing; poor product quality and weak market systems	Polarized views; some see opportunity, others report exclusion; weak integration of local governance structures
Tana River	Spread into floodplains and riverine forests; reduction in arable land; disruption of conservation areas	Minimal utilization; some domestic use and fencing; low awareness and lack of enterprise models	Viewed negatively due to farmland and grazing loss; rising conflict between farmers and pastoralists; weak institutional response

3.2 Policy and legal framework

3.2.1 National policies, laws, and strategies

The national policy and legal landscape governing N. juliflora in Kenya is broad but fragmented. Several legal instruments and strategic frameworks reference invasive species management or related sectors such as forestry, land use, renewable energy and dryland development. However, N. juliflora is rarely addressed directly and when it is, its dual identity, as both an ecological threat and a resource, remains insufficiently articulated.

The most relevant legislation includes the Forest Conservation and Management Act (2016), which assigns the Kenya Forest Service (KFS) the mandate to manage forest resources, including invasive species. However, the Act lacks specific provisions on N. juliflora control or utilization, and its emphasis remains on gazetted forests, with limited guidance for community or county-level actors managing invasions on communal or trust lands.

The Environmental Management and Coordination Act (EMCA, 2015 revised) empowers the National Environment Management Authority (NEMA) to oversee the control of invasive species. While it provides a basis for environmental regulation, it does not offer operational guidance for managing N. juliflora . Notably, the Draft National Strategy for the Management of Invasive Alien Species (2022–2032), developed under EMCA, identifies N. juliflora as a high-priority invasive species. However, the strategy is yet to be formally adopted and thus lacks the merits of law or dedicated funding mechanisms.

Additional national frameworks relevant to N. juliflora include the Climate Change Act (2016), which mandates ecosystem-based adaptation in drylands; the Energy Act (2019), which encourages biomass-based energy but does not recognize N. juliflora as a viable feedstock; and the Livestock Policy and Rangeland Management Guidelines, which reference invasive species only tangentially. None of these frameworks provide standards, incentives, or procedural clarity for the utilization of N. juliflora as a resource.

Key informant interviews with national government agencies confirmed that while awareness of N. juliflora is high, its governance remains dispersed. Agencies such as KEFRI and KIRDI are leading applied research and innovation on value addition but lack the regulatory mandate to operationalize findings. KFS and NEMA recognize the problem but are constrained by competing priorities and limited coordination with other agencies, particularly in ASALs. Respondents noted that without a legally binding national strategy or inter-agency platform, implementation remains piecemeal.

These national-level gaps were echoed in the counties. For instance, officials in Garissa reported uncertainty over which agency is responsible for issuing permits to harvest N. juliflora or monitor its utilization. In Turkana, where N. juliflora is abundant and increasingly commercialized, stakeholders expressed frustration that national laws offer no support for enterprise development or product certification. In Tana River, where N. juliflora is perceived primarily as a threat to agricultural land and riparian ecosystems, county staff noted the absence of national guidance on integrating invasive species into county planning or budgeting. Overall, national laws and policies provide a fragmented and inconsistent basis for N. juliflora governance. While they establish general principles for forest management, biodiversity protection and environmental regulation, they do not sufficiently address the unique challenges posed by N. juliflora in Kenya's drylands, nor do they enable or regulate its potential as an economic resource. This has created a governance vacuum that leaves counties and communities without clear legal backing or support for control or value addition efforts.

3.2.2 County-level legislation and gaps

Despite the constitutional mandate provided under Kenya's devolved system of governance, county governments in ASALs have made limited legislative or policy progress in addressing N. juliflora management. While all three counties, Turkana, Garissa, and Tana River, have acknowledged N. juliflora as a growing environmental and socio-economic challenge, this recognition has not yet translated into substantive legal or regulatory frameworks at the county level.

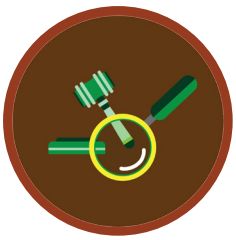
In Turkana County, there have been some preliminary steps toward addressing N. juliflora within county-specific regulations. Notably, the county has developed a Draft Charcoal Regulations Bill, which, though not yet enacted, includes specific reference to N. juliflora as a viable biomass source for energy. Key informants in the trade and environment departments indicated that the county views N. juliflora as both a threat to rangelands and a potential income generator. However, they noted that without a formal legal framework, implementation and enforcement remain ad hoc. The draft regulation has also not been accompanied by supporting mechanisms such as harvesting permits, product certification guidelines, or community benefit-sharing rules. Turkana County Government also initiated the development of a N. juliflora Management Plan, which aims to control, manage and sustainably utilize the species for restoration and livelihood support. The plan is however still a draft.

In contrast, Garissa County has no formal legislation or by-laws that specifically target N. juliflora . The species is mentioned in general terms in the County Integrated Development Plan (CIDP) and in project reports from development partners, but there is no standalone policy or legislative instrument guiding its management. Interviews with officials from the county departments of forestry, agriculture and trade revealed confusion over institutional roles and responsibilities. While KEFRI and NGOs have supported some utilization efforts, the absence of legal structures has made it difficult

to formalize value chains or regulate harvesting practices. County officials noted that even when they wish to support community groups engaged in N. juliflora -based enterprises, they lack the legal tools to do so.

Tana River County has made significant strides in the management and utilization of N. juliflora , moving beyond control toward value-added enterprises, institutional frameworks and community organization. The county aligns its actions with the draft national N. juliflora Management Strategy (2023–2032) and has also initiated localized plans and policy processes aimed at long-term sustainability. Tana River County N. juliflora Management Plan is under implementation, with support from partners and a County Implementation Group (CIG). The Tana River County Sustainable Charcoal Production Act (2024) was enacted, providing a critical legal foundation for controlled harvesting and commercialization of N. juliflora -based charcoal. However, the supporting regulations are still pending, creating a key bottleneck in operationalizing the law. The county has also drafted the Tana River Forest Bill and is currently undergoing public participation. The bill, once passed, will institutionalize forest governance, including the management of invasive species like N. juliflora . The County Implementation Group (CIG) has been instrumental in lobbying for a dedicated N. juliflora Department, signalling institutional commitment. Budgetary support has followed, with KES 10 million allocated, of which KES 6 million was disbursed in the current financial year (2025). Key informants from the agriculture and environment departments indicated that N. juliflora is however still seen as a low-priority issue in the absence of external funding and that no by-laws or ward-level action plans have been enacted to guide control efforts. This has left affected communities to rely on self-help initiatives or wait for sporadic NGO-led clearing projects.

Across all three counties, a common pattern emerges: N. juliflora juliflora is recognized as a problem and in some cases, as a resource, but counties lack the legal instruments to act on either. Most county-level references to N. juliflora exist in high-level strategy documents such as CIDPs or sector plans, rather than in enforceable laws or by-laws. Moreover, none of the counties have developed a regulatory framework to govern benefit-sharing, licensing, environmental safeguards, or land use rights related to N. juliflora harvesting and processing. This legal vacuum at the county level limits the ability of local governments to regulate trade, attract investment, or coordinate community-based control and utilization. It also results in reliance on project-based or donor-driven interventions, which are often unsustainable and poorly aligned with county priorities. Without clear legal backing, even well-meaning county officials are constrained in their ability to scale or institutionalize effective N. juliflora management strategies.



3.2.3 Assessment of policy coherence, enforceability and relevance

The review of national and county-level policies and laws revealed significant gaps in coherence, enforceability and contextual relevance in the governance of N. juliflora . While multiple legal and strategic instruments exist, they are often fragmented, inconsistently applied and poorly aligned with the realities of *N. juliflora* management in Kenya's ASAL counties. These challenges have been consistently echoed across the literature and reinforced by stakeholder interviews conducted in Turkana, Garissa and Tana River.

Policy coherence, both horizontal (across sectors) and vertical (across levels of government), remains weak. National instruments such as the Forest Conservation and Management Act (2016), EMCA (2015), and the Energy Act (2019) operate in isolation, with limited integration of invasive species control across forestry, energy, agriculture, and land management sectors. For example, while the Energy Act promotes biomass energy, it does not reference *N. juliflora* as a viable source despite its widespread availability. Similarly, the Draft National Strategy for Invasive Species is yet to be mainstreamed into sectoral laws or linked to county development priorities. At the county level, the absence of formal policies or by-laws further weakens vertical coherence. Counties rely on ad hoc project documents or donor frameworks rather than harmonized county-specific regulations.

In **Turkana,** stakeholders highlighted inconsistencies between national charcoal regulations and local practices. While N. juliflora is informally harvested and sold widely, national licensing systems are either unknown or perceived as burdensome. County departments are also unclear on whether to promote or restrict *N. juliflora* -based charcoal enterprises, given the lack of integrated national guidance. This has resulted in regulatory grey areas where enforcement is selective or absent.

In **Garissa,** interviews revealed tension between forestry and energy departments over jurisdictional authority for biomass utilization. The lack of clear guidance from national frameworks has led to uncertainty over which department should license harvesting or support producer groups. Respondents noted that the lack of coordination often leads to duplication or delays, particularly when NGOs initiate *N. juliflora* -related projects without engaging relevant county departments.

In **Tana River,** the mismatch between national policy emphasis on environmental restoration and local priorities around agricultural land protection was evident. County officials expressed concern that national strategies did not adequately consider the ecological and livelihood impacts of N. juliflora in floodplain systems. Furthermore, the absence of enforceable regulations means that efforts to control N. juliflora are sporadic and largely driven by donor projects or community self-organization. The biggest gap remains the lack of finalized regulations to support the implementation of the Sustainable Charcoal Production Act (2024) and county-specific plans. This regulatory vacuum hinders licensing, enforcement, monitoring, and investment. There is also a need to develop and disseminate the full business case for N. juliflora utilization, addressing viability, scalability and sustainability to attract partners, investors and enterprise support institutions. Legal and policy coherence across county and national levels remains critical, particularly on mandates around harvesting, transport, processing and taxation. Additional support is needed to institutionalize N. juliflora management as a county function, with dedicated staffing, budget lines, and performance frameworks

Enforceability of existing policies is also limited due to unclear mandates, lack of operational guidelines and insufficient institutional capacity. While KFS and NEMA are legally mandated to oversee forest and environmental protection, they lack the resources or localized procedures to monitor N. juliflora harvesting, enforce licensing requirements, or support community-based control. County governments, meanwhile, lack the legal tools or budgets to implement control programs or regulate trade. In all three counties, enforcement was described as "nonexistent" or "reactive at best" by key informants.

Finally, **policy relevance to local needs and contexts** is limited. Most national policies are designed without significant input from ASAL counties or communities affected by N. juliflora . They do not reflect the complex duality of the species, as both a nuisance and a resource, nor do they address the economic, social and environmental trade-offs faced by local actors. In Turkana, Garissa and Tana River, community members expressed frustration that existing policies do not support their efforts to derive livelihoods from N. juliflora , nor do they provide support for local control or restoration. Women and youth groups, in particular, noted that policies fail to address their roles in informal harvesting, processing, and marketing of N. juliflora -based products. The fragmented, unenforced and poorly localized policy landscape undermines efforts to manage N. juliflora sustainably. Without reforms that align national and county frameworks, clarify enforcement responsibilities and respond to ground-level realities, governance interventions will remain ineffective or short-lived.

3.2.4 Identified regulatory gaps and contradictions

The analysis of existing policies and legal instruments at both national and county levels revealed multiple regulatory gaps and contradictions that collectively hinder effective management and utilization of *N. juliflora* . These gaps undermine coordination, limit enforcement and prevent local communities and private actors from participating meaningfully in control or value addition efforts. The findings, drawn from document review and key informant interviews, reflect both systemic weaknesses in Kenya's policy architecture and the absence of supportive frameworks at the county level.

One of the most significant gaps is the **lack of a unified legal status for N. juliflora**. The species is widely recognized as an invasive alien species in scientific and policy discourse, yet it is not formally classified under the Forest Conservation and Management Act or the Energy Act. As a result, there is no dedicated provision guiding its control, utilization, or commercialization. The Draft National Strategy for Invasive Alien Species (2022–2032) does prioritize N. juliflora , but since it has not been formally adopted or operationalized, it has no legal standing. This absence of legal definition creates confusion among enforcement agencies, county governments, and development actors about whether N. juliflora should be eradicated, harvested, commercialized, or regulated and under what terms.

Another regulatory contradiction concerns **licensing and product standardization.** While N. juliflora is widely harvested for charcoal and briquettes, there are no formal standards or classifications under the Kenya Bureau of Standards (KEBS) for N. juliflora -based products. Producers in Turkana and Garissa noted that they operate without licenses or quality certifications yet are still subject to occasional crackdowns or fines. County officers in Garissa expressed concern that they are unable to support community producer groups due to the lack of enabling licensing frameworks or clear criteria for sustainable harvesting. This regulatory limbo discourages private sector investment, perpetuates informality and undermines enforcement credibility.

The review also highlighted **conflicting institutional mandates,** especially between national and county authorities. For instance, KFS is legally mandated to regulate forest products, but in many ASAL counties, including Turkana and Tana River, *N. juliflora* occurs on trust land or community land, where KFS has limited presence. At the same time, county departments of environment and trade lack the legal tools to issue permits or enforce harvesting guidelines. In practice, this leads to overlapping roles, weak accountability and institutional paralysis. In Turkana, county officers acknowledged that they have neither the mandate nor budget to control *N. juliflora* , despite recognizing its economic and ecological impacts.

Further contradictions arise in **policy messaging and priorities.** National environmental and restoration policies often treat *N. juliflora* solely as a threat, calling for eradication or control. Meanwhile, energy and livelihood strategies, particularly those supported by NGOs and donor projects, promote its utilization as a biomass resource. These mixed messages are confusing for communities, many of whom expressed uncertainty about whether they are permitted to harvest or sell *N. juliflora* -based products. In Tana River, for example, farmers reported conflicting guidance from different agencies: one promoting clearance for agricultural use, another warning against removal due to soil erosion risks in riparian zones.

Finally, there is a widespread absence of benefit-sharing frameworks. Communities harvesting *N. juliflora* , often at great physical and labor cost, are not protected or rewarded through formal mechanisms. There are no county-level rules defining who can benefit from harvesting, what share of revenue goes to community organizations, or how conflicts over access are to be resolved. This lack of legal protection fosters disputes, exclusion, and elite capture, particularly in areas where commercial utilization is emerging without clear governance structures.

The regulatory landscape for *N. juliflora* in Kenya is marked by gaps in legal classification, licensing, institutional mandates, enforcement tools and benefit-sharing. Without targeted reforms to clarify and align these frameworks, N. juliflora will continue to fall between institutional cracks, managed neither as a threat nor as an opportunity, but instead as a policy orphan with growing ecological and socio-economic consequences.

The analysis therefore reveals that P. juliflora governance in Kenya suffers from significant policy fragmentation, weak legal anchoring and a lack of coordinated implementation. At the national level, while several laws and strategies touch on invasive species, forestry, energy and land use, none provide comprehensive guidance specific to *N. juliflora* . County governments, despite their constitutional mandate, have made little progress in developing enforceable by-laws or localized strategies, leaving implementation to project-based interventions. Across all three counties, Turkana, Garissa and Tana River, key informants highlighted confusion over institutional responsibilities, inconsistent enforcement and limited support for community-led utilization. Licensing regimes, product standards and benefit-sharing mechanisms are either absent or unclear, further compounding regulatory ambiguity. Contradictions between national policy messaging and local priorities, especially regarding whether to control, eradicate, or commercialize *N. juliflora* , reflect deeper misalignments in Kenya's environmental governance system. Addressing these challenges requires a harmonized legal framework that clearly defines the species' status, enables sustainable use and empowers counties and communities with the tools and mandates to act effectively.

3.3 Institutional landscape and governance

The effective management of N. juliflora in Kenya depends not only on sound legal frameworks, but also on the clarity, coordination and capacity of institutions mandated to act. This thematic section examines the structure and performance of institutions across three levels, national, county, and community, focusing on how their mandates, relationships and operational capacities influence the governance of N. juliflora . Drawing on key informant interviews, document review and field insights from Turkana, Garissa and Tana River counties, the analysis explores how overlapping responsibilities, weak coordination and capacity limitations affect the implementation of policies and control measures. It also assesses the role of community-level governance structures and customary systems in responding to N. juliflora invasion and the extent to which they are integrated into formal governance processes. The findings point to persistent institutional fragmentation, uneven authority across levelsand the critical need for integrated approaches that align institutional mandates with local realities.

3.3.1 Mandates of national, county, and community-level institutions

The institutional landscape governing *N. juliflora* in Kenya is defined by a web of actors with overlapping, under-defined and sometimes conflicting mandates. While national agencies retain key responsibilities for policy formulation and technical oversight, implementation increasingly falls to county governments under Kenya's devolved system. However, many counties lack clear legal mandates or operational structures to address *N. juliflora* , while community-level institutions, though active, remain informally recognized and poorly supported.

At the national level, key institutions include the Kenya Forestry Research Institute (KEFRI), Kenya Forest Service (KFS), National Environment Management Authority (NEMA), and the Kenya Industrial Research and Development Institute (KIRDI). KEFRI leads research and innovation on *N. juliflora* utilization and has developed technologies for charcoal, briquettes and animal feed. However, KEFRI has no regulatory or enforcement authority and must rely on partnerships with counties and development agencies for uptake of its recommendations. Kenya Forestry Service, under the Forest Conservation and Management Act (2016), holds a broad mandate over forest resources, but its presence in ASAL counties, particularly in communal or trust lands where *N. juliflora* dominates, is minimal. NEMA is responsible for environmental regulation, including invasive species control under EMCA, but lacks an operational presence at the ward level and has limited involvement in N. juliflora -related interventions. KIRDI's role in supporting industrial development and value addition remains largely untapped, with most of its innovations in *N. juliflora* processing not yet scaled in rural counties.

At the **county level,** mandates over natural resources are constitutionally devolved. County governments are therefore expected to lead implementation, enforcement and community support related to N. juliflora management. However, interviews across Turkana, Garissa and Tana River revealed widespread confusion and weak institutional ownership. In Turkana, the Department of Trade is actively engaged in discussions around charcoal and bioenergy, while the Departments of Environment and Agriculture recognize N. juliflora as a threat but do not coordinate responses. In Garissa, responsibilities appear fragmented between the energy, environment and forestry units, none of which have developed a formal strategy or designated focal point for N. juliflora . County officials expressed uncertainty over whether they are permitted to issue harvesting licenses, regulate trade, or fund control measures. In Tana River, departments acknowledged the impact of N. juliflora on farmlands and floodplains but indicated that no single office has been tasked with leading or coordinating management efforts.

At the community level, institutions such as Community Forest Associations (CFAs), Natural Resource Management Committees (NRMCs) and customary leadership structures play a critical but under-recognized role in the day-to-day governance of N. juliflora . These institutions are often the first responders to local conflicts over access, harvesting, or clearing activities. In Turkana, youth groups and elders have informally coordinated clearing for firewood and fencing poles. In Garissa, women's groups involved in briquette production operate with little formal recognition or support. In Tana River, elders and community conservancy leaders have led informal efforts to restrict *N. juliflora* harvesting near conservation areas. However, across all counties, these local governance structures lack formal mandates, legal protection or access to county planning and budgeting processes.

Overall, the current institutional framework lacks clear leadership, effective collaboration, and formal integration of local governance systems. Mandates are either vaguely defined or poorly understood, particularly at the county level. This institutional ambiguity contributes to uncoordinated interventions, low enforcement and missed opportunities for community-based control and value chain development. A more coherent and devolved institutional approach, backed by policy clarity and operational resources, is essential for effective and inclusive *N. juliflora* governance.

3.3.2 Coordination and accountability mechanisms

Effective governance of *N. juliflora* requires clear coordination across sectors and levels of government, along with accountability systems that define who is responsible for what. However, the study found that coordination mechanisms related to *N. juliflora* , both horizontally (across national and county agencies) and vertically (between national, county, and community levels), are largely informal, project-based and inconsistent. The absence of structured coordination platforms and joint planning processes significantly undermines the coherence, efficiency and long-term sustainability of *N. juliflora* management interventions.

At the **national level,** inter-agency coordination on *N. juliflora* remains weak. Although KEFRI, KFS, NEMA, and KIRDI all interact with N. juliflora in various capacities, there is no formal coordination or technical working group specifically tasked with aligning their efforts. Key informants from these agencies acknowledged

that information sharing tends to occur on an ad hoc basis, often driven by donor-funded projects or national workshops rather than institutionalized collaboration. The Draft National Strategy for Invasive Species (2022–2032) proposes the formation of a national steering committee but at the time of this study, the mechanism was not operational. As a result, national policy guidance is often siloed, fragmented, and inconsistently interpreted by counties.

At the **county level,** coordination challenges are particularly pronounced. In **Turkana,** for example, the trade, energy, environment and agriculture departments all have some engagement with *N. juliflora* , but operate independently and with limited information exchange. Officials from different departments noted that meetings on *N. juliflora* issues were rare and when they did occur, they were typically organized by external partners rather than through county-led planning structures. In **Garissa,** departments reported receiving information about N. juliflora -related projects only after implementation had started, highlighting a disconnect between development partners and local government structures. In **Tana River,** the county implementation group formed at the county level plays a central role in implementation, coordination and advocacy, ensuring inter-agency alignment and resource mobilization. Currently, the community groups involved in *N. juliflora* harvesting, processing and utilization are being nurtured and mentored toward formal cooperative structures, initially targeting Bura areas. The key informants expressed the need to form cooperatives for the *N. juliflora* groups which was seen as essential to achieve structured market engagement, aggregation, quality assurance and traceability, core to reaching national and export markets in an organized and competitive manner. The lack of a lead department or focal point for *N. juliflora* was cited as a key barrier to coordinated response, particularly when projects spanned multiple sectors such as agriculture, water and natural resources.

There are also **limited mechanisms for coordination between counties and national agencies.** In all three counties, officials expressed a lack of clarity regarding which national agency to consult for technical support or policy alignment. For instance, while KEFRI has piloted value addition models in Turkana and Garissa, local departments were often unaware of the research findings or how to apply them to county planning. Similarly, despite NEMA's oversight role under EMCA, county officials reported minimal engagement with NEMA on invasive species monitoring or environmental permitting related to N. juliflora utilization.

In terms of **accountability,** the situation is equally weak. No national or county agency has clear performance indicators, reporting frameworks, or budgets dedicated specifically to N. juliflora management. As a result, responsibilities often fall through the cracks, with no institution held accountable for progress or lack thereof. County governments rarely report on N. juliflora -related activities in their annual plans or performance reviews and community institutions have no formal channels for holding local authorities or development actors to account.

The absence of **multi-stakeholder coordination platforms** also limits the ability to engage communities, private sector actors and NGOs in joint planning or monitoring. In all three counties, respondents noted that where coordination did occur, it was typically short-lived and tied to donor project cycles. Once external funding ended, so did the collaboration. There were no standing forums at ward, sub-county, or county levels dedicated to invasive species management or biomass-based enterprise development.

The lack of structured coordination mechanisms and accountability systems has therefore resulted in fragmented implementation, duplication of efforts and missed opportunities for synergy. Without clear leadership and integrated planning, *N. juliflora* interventions will continue to rely on short-term, uncoordinated projects rather than sustained, systems-based solutions. Strengthening coordination platforms, appointing focal institutions and embedding *N. juliflora* governance into existing planning and accountability structures will be critical for progress.

3.3.3 Community-level governance and customary systems

Community-level institutions, both formal and informal, are central to the day-to-day governance of natural resources in Kenya's arid and semi-arid lands (ASALs). In the case of *N. juliflora* , these structures are often the first point of contact for managing conflicts, organizing harvesting activities and responding to ecological change. Despite their importance, however, community-level governance systems remain weakly integrated into formal policy frameworks and receive little technical or financial support from county or national governments.

Across the three focus counties, Community Forest Associations (CFAs), Natural Resource Management Committees (NRMCs), and traditional leadership structures play a critical role in shaping local responses to *N. juliflora* . In **Turkana,** for instance, elders and youth groups have informally organized *N. juliflora* clearing campaigns, particularly where the species has blocked livestock movements routes or water access points. These efforts are often coordinated at the village or sub-location level, using customary decision-making processes. However, these groups operate without formal mandates, budgets, or links to county development planning, limiting their influence and sustainability.

In **Garissa,** NRMCs and women's groups have been active in mobilizing community members for briquette production and basic processing activities. Some have benefited from NGO-supported training or equipment, but most lack formal recognition or pathways to influence county decision-making. Traditional elders still play a significant role in land and resource governance, particularly in negotiating access to communal rangelands. Yet, there are no formal mechanisms to harmonize customary and county regulations decisions mechanismor to resolve tensions when customary practices conflict with formal environmental or energy policies. Key informants in Garissa expressed frustration that community leaders are often informed of N. juliflora -related interventions only after implementation has begun, leading to mistrust and missed opportunities for local ownership.

In **Tana River,** community conservancy leaders and elders have occasionally acted to restrict *N. juliflora* harvesting in or near conservation zones. However, the institutional landscape is complicated by overlapping land claims, tensions between farmers and pastoralists and limited support for community-based governance structures. While traditional councils continue to influence decisions at the village level, their authority over invasive species management is not formally recognized and they are rarely engaged in county-level planning or monitoring efforts.

One consistent finding across all counties is that community governance structures lack the legal recognition and technical support needed to play an effective role in *N. juliflora* management. Most operate without constitutions, by-laws, or representation in ward-level planning processes. Their role in benefit-sharing, resource allocation, or dispute resolution is often informal and varies significantly across locations.

Additionally, few community institutions have received training in natural resource governance, enterprise management, or ecological monitoring further limiting their capacity to contribute meaningfully to sustainable *N. juliflora* control or utilization.

Gender and generational dynamics also affect governance effectiveness. Women and youth are often active in N. juliflora -based livelihoods, such as firewood collection, charcoal production and briquette processing, but are underrepresented in leadership positions within CFAs or NRMCs. Where women and youth are included, their roles tend to be limited to operational tasks, with little participation in strategic planning or negotiations with government or NGOs.

Community-level governance systems therefore remain underutilized assets in the management of *N. juliflora* . While they demonstrate strong local knowledge and commitment, they lack formal mandates, capacity support and pathways to influence broader planning and policy processes. Strengthening these institutions, through legal recognition, targeted training and integration into county governance structures, will be essential for building inclusive, community-driven responses to *N. juliflora* encroachment.

3.3.4 Capacity gaps and implementation challenges

One of the most persistent barriers to effective *N. juliflora* management in Kenya's ASAL counties is the widespread lack of technical, institutional and financial capacity across all levels of governance. Despite widespread recognition of the species' ecological and socio-economic impacts, county and community actors face significant limitations in designing, implementing and sustaining management or utilization strategies. These capacity gaps manifest not only in staffing and resources, but also in knowledge systems, coordination practices and policy interpretation.

At the **county level,** departments of environment, forestry, trade and agriculture, who are often expected to coordinate *N. juliflora* interventions, are severely under-resourced. In **Turkana,** county officers reported having no dedicated budget line for *N. juliflora* activities and only one or two technical officers covering vast rangeland areas. Most departments lack vehicles, field equipment, or operational funds to support routine monitoring, community mobilization, or enforcement. Officers expressed reliance on development partners to fill these gaps, with many activities driven by donor timelines rather than county priorities.

In **Garissa,** capacity constraints are compounded by limited training and frequent staff turnover. Several county staff acknowledged that they were unfamiliar with the latest national strategies or emerging value addition technologies related to *N. juliflora* . As a result, technical staff are often unable to support community groups, respond to enterprise needs or advise policymakers. Departments lack access to updated extension materials or technical briefs from agencies like KEFRI or KIRDI, further weakening their ability to provide informed guidance or oversight.

Despite recent momentum, **Tana River** continues to face significant capacity and implementation gaps that undermine the full operationalization of its *N. juliflora* Management Plan. While the county implementation group offers a promising coordination mechanism, technical expertise in biomass processing, ecological restoration, market development and enterprise incubation remains limited across county departments. Although the environmental and agricultural sectors both recognize the impacts of *N. juliflora* , institutional roles and mandates remain blurred, particularly regarding regulation of private sector actors, harvesting in conservation areas and oversight of community-led utilization efforts. This ambiguity often results

in hesitancy to act, fragmented implementation and missed opportunities for synergies across departments. Low budgetary allocation to dryland forestry and invasive species management continues to constrain capacity-building, extension services and the deployment of scalable solutions. In areas where *N. juliflora* encroachment intersects with community disputes or land tenure claims, the lack of clear institutional leadership and technical guidance has further delayed effective responses.

At the **community level,** capacity limitations are even more pronounced. Many community groups, including CFAs, NRMCs and women's cooperatives, lack basic governance tools such as constitutions, record-keeping systems, or financial management practices. Few groups have received structured training on topics such as sustainable harvesting techniques, value chain development or market engagement. In all three counties, community members emphasized that they operate informally, learning by doing and often replicating unsafe or inefficient practices (e.g., use of traditional kilns for charcoal or unprocessed pods for animal feed). This limits their competitiveness, increases environmental risks and reduces the viability of *N. juliflora* as a sustainable livelihood option.

Another key challenge is the disconnect between technical research and field-level application. While KEFRI, KIRDI and some universities have developed models for *N. juliflora* utilization, including briquetting technologies, feed trials and biochar production, these innovations are not widely disseminated or scaled. County officers and community groups in all three counties noted that they were unaware of recent research findings or lacked the resources to adopt new technologies. The absence of demonstration sites, extension services, or local training centers further widens the gap between innovation and implementation.

Lastly, governance capacity is undermined by institutional instability and weak planning systems. In many cases, county departments operate without clear strategies, annual workplans, or monitoring frameworks specific to *N. juliflora* . Performance is rarely tracked and data on biomass stocks, trade volumes, or restoration progress are almost entirely absent. This limits evidence-based decision-making and makes it difficult for counties to prioritize or advocate for resource allocation at national or donor levels. Capacity gaps, both human and systemic, are a major constraint to effective *N. juliflora* governance in Turkana, Garissa and Tana River. These gaps not only affect policy implementation and enforcement but also limit the ability of local actors to transition from reactive control to strategic utilization. Addressing these challenges will require sustained investment in training, institutional development, knowledge transfer and operational resourcing across all levels.

The institutional analysis reveals a fragmented and under-resourced governance system for *N. juliflora* in Kenya's ASAL counties. While multiple institutions at the national, county and community levels engage with *N. juliflora* , mandates are often unclear, overlapping, or weakly implemented. Coordination among government departments is ad hoc and largely project-driven, with no formal platforms for joint planning or accountability. At the county level, departments operate with limited technical capacity, financial resources and strategic guidance, hampering enforcement, community support and enterprise development. Community-level governance structures such as CFAs and NRMCs remain active but are excluded from formal planning processes and lack the legal recognition or support needed to scale their efforts. Across all counties, there is a clear disconnect between research, policy and practice, with innovations and lessons from national institutions failing to reach local implementers. Bridging these institutional gaps will require stronger inter-agency coordination, county-led leadership, legal empowerment of community actors and targeted capacity-building investments.

3.4. Stakeholder perspectives and implementation realities

Understanding the governance and utilization of N. juliflora requires not only a review of policies and institutional mandates, but also close attention to the experiences, perceptions and constraints faced by those directly involved in its management and use. This section presents findings from extensive stakeholder consultations, including key informant interviews (KIIs) and focus group discussions (FGDs), conducted with government officials, community representatives, private sector actors, civil society organizations, and development partners across Turkana, Garissa and Tana River counties. The analysis explores how these stakeholders interpret existing policies, interact with regulatory systems and navigate practical challenges in harvesting, processing and commercializing N. juliflora . It also highlights barriers to market access, inclusion and institutional responsiveness. The findings provide important insights into the social and operational dynamics shaping N. juliflora governance on the ground and offer a reality check on the effectiveness and equity of current approaches.

3.4.1 Perceptions of policy effectiveness and participation

Stakeholder perspectives gathered during key informant interviews and focus group discussions revealed a widespread perception that existing policies on *N. juliflora* are either ineffective, poorly communicated or disconnected from local realities. While many stakeholders were aware of general laws and policies on forestry, environmental protection, or natural resource management, few could point to any specific policy or regulation that actively supports or governs *N. juliflora* control or utilization.

Across all three counties, stakeholders described a policy environment that is ambiguous, inaccessible and often externally imposed. In **Turkana,** for example, community members including youth engaged in charcoal production, reported having no knowledge of whether harvesting *N. juliflora* was legal, encouraged, or prohibited. County officials themselves admitted uncertainty about which national policies apply, or whether the county is allowed to regulate harvesting independently. This policy ambiguity leads to informal and sometimes illegal harvesting practices, undermining both environmental goals and community safety.

In **Garissa,** county officers and local leaders noted that while *N. juliflora* is frequently mentioned in donor project documents, it is absent from formal county policy instruments such as by-laws or CIDPs. Several respondents emphasized that most community members see N. juliflora management as the domain of NGOs or external partners, not of local government or citizens. This perception has eroded local participation and ownership, making it difficult to implement sustainable control strategies. Women's groups involved in briquette-making also felt marginalized in decision-making processes, despite their active role in utilization.

In **Tana River,** where *N. juliflora* is perceived as a major threat to agricultural land and ecosystem health, stakeholders were particularly critical of the government's passive stance. Farmers and pastoralists alike expressed frustration that despite repeated requests, no formal response had been made by the county or national authorities. Community leaders described past awareness-raising meetings led by NGOs but said these had little follow-through or policy support. The absence of clear county leadership or regulatory frameworks has left communities feeling abandoned, with no avenue to participate in planning or enforcement.

Across all counties, community members expressed a strong sense of exclusion from policy formulation and implementation. They reported that most N. juliflora -related policies are written in technical language, developed in Nairobi and delivered through project workshops that rarely include community representatives. Where policies do exist, they are often not translated into local languages or disseminated at the ward or village level. In many areas, even county staff had not received training or briefing on relevant national strategies, such as the Draft National Strategy on Invasive Species.

Stakeholders also questioned the accountability and transparency of existing policy implementation. In some cases, permits were reportedly issued for large-scale charcoal operations without community consultation or benefit-sharing agreements. In other cases, community members were unsure whether NGOs or government departments were responsible for regulating utilization or overseeing restoration efforts. This has created a trust gap, with many stakeholders perceiving government institutions as distant, inconsistent, or absent.

Nevertheless, the consultations revealed a strong desire among communities to be more involved in decision-making and policy implementation, particularly when linked to income generation and ecological restoration. Youth groups in Turkana, women's cooperatives in Garissa and pastoral networks in Tana River all indicated readiness to support *N. juliflora* governance, but only if policies are clearly communicated, locally adapted and equitably implemented.

Therefore, while *N. juliflora* is a visible and pressing issue in all three counties, policies intended to address it are perceived as distant, ineffective and poorly aligned with community needs. Enhancing the clarity, accessibility and inclusiveness of policy processes will be critical to building trust, fostering local ownership and enabling coordinated, multi-level responses to *N. juliflora* management.

3.4.2 Market and access barriers

Despite growing awareness of the economic potential of *N. juliflora* , communities and enterprises in Turkana, Garissa and Tana River face persistent and interrelated barriers to accessing and participating in formal *N. juliflora* markets. These challenges limit the development of value chains for charcoal, briquettes, animal feed, fencing poles and biochar, and have kept most utilization efforts small-scale, informal and unsustainable.

One of the most widely cited barriers across all three counties is the lack of formal product standards and certification mechanisms. Stakeholders in Turkana and Garissa noted that N. juliflora -based products, especially briquettes and animal feed, are not recognized under Kenya Bureau of Standards (KEBS) classifications, making it difficult for producers to access commercial markets, government tenders, or institutional buyers. Without certification, products are perceived as low quality and are priced accordingly, which discourages investment in improved processing and packaging.

Licensing and regulatory ambiguity further complicates market access. In Garissa and Turkana, producers involved in charcoal and firewood trade reported operating without permits, often due to unclear or inaccessible licensing processes. In some cases, county officers were uncertain about which departments were authorized to issue harvesting or transport permits for N. juliflora -derived products. This regulatory vacuum not only exposes producers to harassment and fines but also reinforces informality and discourages private sector engagement. In Tana River, the absence of any legal or policy framework governing N. juliflora utilization has left communities in a limbo where they are unable to trade legally or scale their activities beyond household use.

Limited access to processing equipment and finance was a common concern, especially among women's groups and youth cooperatives. In Garissa, for example, several groups had received briquetting machines through donor-funded projects but lacked the capital to maintain them, purchase inputs, or market their products. In Turkana, stakeholders expressed frustration over the lack of repair services or replacement parts for charcoal kilns and briquette presses. Without sustained technical and financial support, most equipment falls into disuse and groups return to traditional, low-efficiency production methods.

Transport and logistical challenges also restrict market growth. In all three counties, poor road infrastructure and high transport costs make it difficult for producers to reach buyers or aggregate products at scale. This is particularly problematic for bulky products like firewood and briquettes, where economies of scale are essential to profitability. In Turkana, producers rely heavily on local markets and refugee settlements; in Garissa, most briquettes are sold informally within sub-counties; and in Tana River, the lack of organized producer networks means that market linkages are virtually nonexistent.

Stakeholders also highlighted **information asymmetry and weak market systems.** Many producers, especially in rural and remote areas, have limited knowledge of current market prices, buyer requirements, or demand trends. There are few platforms—physical or digital—for sharing market information, matching buyers with sellers, or coordinating logistics. In some cases, middlemen take advantage of this knowledge gap, buying from producers at very low prices and selling at a significant markup in urban centers.

Finally, there is a general **lack of investment and support for private sector participation** in the *N. juliflora* value chain. While donor-funded projects have provided sporadic support for community-level utilization, there has been little focus on building sustainable business models, facilitating access to finance or developing enabling environments for entrepreneurship. Private investors are deterred by policy uncertainty, informal markets and the absence of reliable supply chains.

Therefore, while *N. juliflora* holds promise as a resource for green jobs and rural enterprise, market participation remains hindered by regulatory, technical, infrastructural and institutional barriers. Addressing these challenges will require a holistic approach that combines regulatory reform, enterprise development, infrastructure investment and targeted support to producers, particularly women and youth, at the base of the value chain.

3.4.3 Inclusion and equity considerations

The management and utilization of *N. juliflora* intersect with multiple dimensions of equity, particularly related to gender, youth, displacement and access to decision-making processes. Across Turkana, Garissa and Tana River counties, stakeholder consultations revealed that while *N. juliflora* affects all community members, its social and economic impacts are not experienced equally. Women, youth, refugees and marginalized pastoralist groups often bear the brunt of the ecological burden while having limited influence over policy, planning and benefit-sharing mechanisms.

In **Turkana,** youth groups, especially in and around Kakuma and Kalobeyei, are at the forefront of informal *N. juliflora* utilization. Many engage in charcoal production and firewood harvesting as a survival strategy, often in unsafe conditions and without regulatory protection. Despite their role in supplying local energy markets, they are largely excluded from county-level planning processes, licensing frameworks, or enterprise development programs. Refugee youth in particular reported facing discrimination and legal ambiguity, as their activities are not formally recognized or supported by government or humanitarian actors.

Women across all three counties are significantly involved in *N. juliflora* utilization, particularly in firewood collection, briquette production and, in some cases, feeding livestock with pods. In **Garissa,** women's groups supported by NGOs have shown strong interest in turning *N. juliflora* into a sustainable livelihood, but they consistently face barriers to accessing financing, equipment maintenance and decision-making platforms. Many women reported that they are consulted only at the implementation stage of projects, not during design or policy formulation. Moreover, cultural and structural barriers often limit their leadership roles in community forest associations (CFAs) or natural resource management committees (NRMCs).

In **Tana River County,** efforts to promote the utilization of *N. juliflora* are beginning to incorporate principles of inclusion and equity, though significant gaps remain. Community involvement has largely focused on mobilizing local groups for charcoal and briquette production, with emerging plans to formalize these groups into cooperatives. While the potential for N. juliflora value chains to generate alternative livelihoods is recognized, targeted support to build the capacity of vulnerable groups, enhance their access to processing technologies and integrate them into market systems is still limited. There is also a need to address land and resource access inequalities, particularly for communities living near conservation and riverine zones where harvesting restrictions are more pronounced. Embedding equity-focused mechanisms

in policy implementation, benefit-sharing and cooperative formation will be essential to ensure that *N. juliflora* management contributes to broader goals of social inclusion and environmental justice in the county.

Across all counties, key informants **observed that formal policies and project frameworks rarely include targeted equity measures**. For example, none of the counties have developed gender-sensitive regulations or support mechanisms for women- and youth-led *N. juliflora* enterprises. Refugee and host communities, though actively involved in *N. juliflora* control and use, are also missing from most county strategies, with no formal mechanisms to ensure their inclusion in benefit-sharing or planning processes.

Importantly, many communities perceive *N. juliflora* interventions as externally driven and technocratic, rather than people-centered or participatory. This has led to a lack of ownership, particularly among groups who already face socio-economic exclusion. In some cases, women and youth reported being asked to contribute labor without receiving equitable compensation, training, or decision-making authority. Nonetheless, the consultations revealed strong interest and capability among marginalized groups to take on more prominent roles in *N. juliflora* management. Women's cooperatives in Garissa, youth networks in Turkana and farmer associations in Tana River all expressed a desire to be more actively engaged, not just as laborers or beneficiaries, but as leaders, innovators and partners. To foster more equitable outcomes, *N. juliflora* interventions must move beyond technical solutions and adopt inclusion-sensitive approaches. This includes gender-responsive policies, youth-friendly enterprise support mechanisms, equitable benefit-sharing arrangements and the formal integration of displaced and minority populations into planning and governance structures.

Stakeholder feedback from Turkana, Garissa and Tana River counties paints a clear picture of both the promise and the persistent gaps in *N. juliflora* management and utilization. Communities, government officials and private actors alike recognize the dual nature of *N. juliflora* , as both a threat and a potential resource, but consistently described a policy and implementation environment that is fragmented, unclear and largely disconnected from local realities. There is widespread confusion about legal frameworks, limited support for emerging enterprises and a near-total absence of formal mechanisms for inclusion, equity and benefit-sharing. Market access remains constrained by regulatory ambiguity, inadequate infrastructure, and lack of technical support, while community-level initiatives often falter due to underfunding and weak institutional backing. Women, youth and displaced groups play a critical role in informal value chains but remain excluded from leadership, planning and policy influence. Despite these challenges, there is a strong desire among stakeholders to engage more meaningfully—if given the right tools, recognition and resources. Building trust, ensuring inclusive participation and bridging the gap between policy and practice are essential steps toward enabling sustainable and equitable *N. juliflora* governance.

3.5 Local practices and control measures

While national policies and formal institutional frameworks for N. juliflora remain fragmented and underdeveloped, communities in Kenya's ASAL regions, particularly in Turkana, Garissa and Tana River, have developed a range of local practices to manage, control and utilize the invasive species. These practices are shaped by ecological conditions, livelihood needs, market access and prior exposure to NGO or government interventions. Fieldwork conducted through key informant interviews and focus group discussions revealed that local actors, especially community-based organizations, women's groups, youth collectives and traditional leaders, are actively engaged in diverse N. juliflora -related activities, often in the absence of formal policy guidance or technical support. This section documents these community-led initiatives and responses, drawing out examples of adaptive strategies and localized innovations. It also assesses their effectiveness, sustainability and potential for integration into county or national frameworks. Where appropriate, the findings are supported by existing literature on community-based invasive species management and biomass utilization.

3.5.1 Local-Level N. juliflora management and utilization strategies

Across Turkana, Garissa and Tana River counties, local communities have devised a range of informal but active strategies to cope with and benefit from the spread of *N. juliflora* . These practices reflect both the pressures posed by the species and the opportunities it offers for energy, income and fodder, especially in contexts where formal state support is weak or absent. Field interviews and focus group discussions revealed that community members are not passive victims of *N. juliflora* invasion; rather, they are engaging the species through a spectrum of adaptive responses shaped by local knowledge, resource availability and market dynamics.

In **Turkana,** particularly in the peri-urban areas of Lodwar, Kalokol and Kakuma, *N. juliflora* is widely harvested for firewood and charcoal, which form a key component of household energy consumption and informal income generation. Youth groups, including both host and refugee populations, have organized themselves into loosely structured harvesting collectives. These groups identify accessible thickets of *N. juliflora* , often on communal or roadside reserves and use rudimentary tools such as axes and traditional kilns to convert the biomass into charcoal. In some areas, particularly around Kakuma, charcoal cooperatives have emerged, coordinating sales to local traders and distributing earnings among members. These initiatives are often supported by NGOs that have introduced improved kilns or facilitated training in sustainable harvesting practices.

In **Garissa,** local-level strategies are more diverse due to stronger NGO presence and slightly better infrastructure. In addition to firewood and charcoal production, several women's groups in Balambala and Lagdera sub-counties have received training and basic equipment for briquette-making from *N. juliflora* biomass. These briquettes are marketed to households and small institutions as a cleaner-burning alternative to traditional charcoal. The groups operate informally and rely heavily on donor support for inputs, maintenance and packaging. Other community members use *N. juliflora* for fencing materials, construction poles and in some cases, as a supplementary livestock feed, particularly the pods, which are fed to goats and camels during dry seasons. Some pastoralist groups have developed rotational clearing systems, where *N. juliflora* is harvested in strips to allow for regrowth of grasses and fodder shrubs.

In **Tana River,** community-level *N. juliflora* management is more limited in scope and largely reactive. Along the floodplains near Garsen and parts of the Tana Delta, farmers routinely clear *N. juliflora* from their croplands using manual labor or communal workdays. The cleared biomass is typically burned or left to rot, with little effort toward value addition or reuse. In some villages, traditional elders and conservancy leaders have attempted to organize communal removal campaigns, especially where *N. juliflora* is encroaching on water points or wildlife corridors. However, these efforts are constrained by lack of tools, funding and technical support. Unlike Turkana and Garissa, no structured utilization models (such as briquetting or cooperative-based harvesting) were reported in Tana River during the fieldwork period.

Despite differences in organization and maturity, all three counties exhibit signs of **local innovation and adaptive governance.** Communities often rely on indigenous knowledge to determine which *N. juliflora* stands are most accessible or suitable for harvesting, how to mitigate regrowth and how to manage resource access among different user groups. These practices operate outside formal policy structures but demonstrate high levels of community ownership and responsiveness to local needs.

The field findings are consistent with broader literature on community-led management of invasive species, which highlights the potential for **local knowledge and informal institutions** to contribute to sustainable control and utilization, particularly when supported by external actors (Shackleton et al., 2007; Mbaabu et al., 2019). However, without integration into broader legal, technical, or market systems, these grassroots efforts remain fragmented, under-resourced and vulnerable to collapse once external support is withdrawn.

3.5.2 Effectiveness, sustainability, scalability and integration with formal systems

The local-level strategies identified in Turkana, Garissa and Tana River counties reflect practical responses to the pressures and opportunities presented by *N. juliflora* . While these community-based approaches demonstrate adaptability, low-cost mobilization and grassroots innovation, their **effectiveness, long-term sustainability and potential for scaling** remain constrained by a lack of formal support, regulatory clarity and integration with broader governance systems.

In terms of **effectiveness,** most of the local strategies have succeeded in delivering short-term outcomes. In Turkana, the informal youth-led charcoal groups and refugee cooperatives have helped reduce *N. juliflora* thicket density in some areas, particularly along access roads, water points, and peri-urban settlements. Similarly, in Garissa, women's briquette-making groups have created alternative income sources for vulnerable groups while offering a cleaner energy substitute to traditional charcoal.

However, effectiveness has often been limited to localized zones, with little ecological monitoring or data to assess the overall impact on biomass density, regeneration rates, or ecosystem recovery. In Tana River, where efforts have largely focused on manual clearing for farming and access, interventions tend to be reactive, sporadic and labor-intensive, without long-term planning or ecological safeguards.

On **sustainability,** the findings are mixed. Where local initiatives have benefited from sustained NGO support, such as technical training, equipment and financial facilitation, they have remained operational for longer periods. In Garissa, for example, briquette groups supported by Trocaire and World Vision have continued to function for multiple seasons, particularly where community savings schemes or women's groups were already well organized. In contrast, in Turkana and Tana River, many groups rely on temporary funding or volunteerism, making them vulnerable to collapse once external incentives are withdrawn. The lack of local government support, legal recognition, or access to maintenance services for machinery further weakens long-term viability.

Scalability is another major constraint. The majority of local models remain small in scale, geographically isolated and poorly networked. Stakeholders in all three counties reported a lack of access to finance, transport, markets and business development services needed to grow their initiatives. For example, briquette producers in Garissa noted that they could increase production tenfold if linked to institutional buyers, such as schools or relief agencies, but such procurement frameworks do not yet exist. Similarly, charcoal cooperatives in Turkana operate without aggregation centers or formal marketing channels, which limits their reach to local markets. In Tana River, the absence of any structured utilization model means that even promising clearing efforts do not transition into enterprise opportunities. In essence, while many grassroots efforts are effective at the micro-level, **they lack the enabling environment: technical, financial, regulatory to grow into viable county-wide or regional solutions.**

When it comes to **integration with formal systems,** the disconnect is stark. Very few of the local practices documented are anchored in county policies, supported through legal instruments, or linked to national strategies. CFAs and NRMCs, where they exist, have no mandates over N. juliflora management, and county officers interviewed across all three counties acknowledged that there are no structured programs to institutionalize or scale community efforts. As a result, local initiatives operate in a policy vacuum, often invisible to government planning and excluded from resource allocation processes. This has also led to inconsistencies: some community groups have been harassed for illegal harvesting, while others operate under informal agreements with NGOs or sympathetic local administrators.

Literature from other dryland contexts confirms that local-level initiatives are most successful when they are embedded in multi-scalar governance frameworks, with clearly defined roles for communities, formal institutions and intermediary actors (Shackleton et al., 2007; Mbaabu et al., 2019; Chikowo et al., 2021). Without such frameworks, community innovations risk stagnation or collapse under regulatory, market, or logistical pressure. In Kenya's ASAL regions, the challenge is not the absence of community engagement, but the failure to recognize and invest in community-led systems as legitimate and strategic partners in *N. juliflora* governance.

While local practices have demonstrated effectiveness and innovation in controlling and utilizing *N. juliflora* , their sustainability and scalability are limited by structural barriers. Integration with formal systems remains weak, underscoring the need for policy reform, capacity-building, and targeted investment to bridge the gap between informal success and institutional impact.

3.5.3 Social, financial, and technical barriers to upscaling promising models

Despite the emergence of promising community-based practices for *N. juliflora* control and utilization in Kenya's ASAL counties, efforts to expand and institutionalize these models face significant social, financial and technical barriers. These challenges limit the ability of local groups to transition from small-scale initiatives to sustainable enterprises or integrated natural resource management systems. Evidence from stakeholder consultations and supporting literature points to a complex landscape of constraints that require targeted, multi-level interventions to overcome.

On the **social front,** a key barrier is the lack of inclusive participation and collective ownership in *N. juliflora* management. In all three counties, decision-making structures remain heavily centralized within traditional leadership or external actors such as NGOs, often sidelining women, youth and minority groups. While women's and youth groups are active in N. juliflora utilization particularly in Garissa and Turkana, they are rarely involved in planning or resource governance processes. This exclusion weakens accountability and often results in low community buy-in for control efforts. Additionally, cultural norms and local power dynamics can inhibit cooperation across clans or communities, particularly in Tana River where land and resource conflicts are more pronounced. In areas near refugee settlements (e.g., Kakuma in Turkana and Dadaab in Garissa), perceptions of inequity between host and refugee groups further complicate cooperation and scaling.

Financially, most community-led *N. juliflora* initiatives operate on **shoestring budgets** or with one-time donor grants. Groups interviewed across the counties consistently cited lack of startup capital, working funds and access to credit as major bottlenecks. Few had experience with business planning, cooperative finance, or formal savings groups. In Garissa, briquette-making groups indicated that even when they received equipment from NGOs, they were unable to sustain operations due to rising costs of raw material transport and machinery maintenance. In Turkana, youth groups producing charcoal lacked funds to purchase protective gear or scale production beyond immediate local markets. There are virtually no dedicated county funds or microfinance products tailored to *N. juliflora* enterprises and existing financial institutions often view them as high-risk due to informal operations and lack of market guarantees.

The **technical barriers** are equally limiting. Most community groups lack access to modern tools and technology for efficient harvesting, processing and packaging of N. juliflora -based products. For instance, briquetting machines, where provided, often fall into disrepair due to absence of spare parts or local technicians. Charcoal producers still rely on traditional earth kilns, which are inefficient and environmentally damaging. In Tana River, where utilization is still minimal, community members expressed interest in exploring animal feed production or biomass briquettes but lacked exposure to successful models or technical demonstrations. Extension services from county departments are minimal or nonexistent in most areas and there is little evidence of systematic training programs in sustainable harvesting, post-harvest handling, product development or quality control.

Market-related knowledge gaps also constitute a technical barrier. Many producer groups have limited understanding of product standards, pricing mechanisms, or market segmentation. In some cases, producers sell *N. juliflora* -based products at very low prices due to lack of bargaining power or information asymmetry with traders. Without access to aggregation centers or cooperatives, producers are also unable to

meet volume requirements for institutional buyers such as schools or humanitarian agencies. Literature from other dryland regions suggests that without deliberate investment in value chain coordination and producer aggregation, community-based natural resource enterprises are unlikely to achieve scale or competitiveness (Shackleton et al., 2007; Chikowo et al., 2021).

Another systemic barrier is the **regulatory uncertainty** surrounding *N. juliflora* . Stakeholders across all counties reported confusion about whether harvesting is legal, who can issue permits, and what taxes or licenses apply. In the absence of clear and accessible regulatory frameworks, many groups choose to operate informally limiting their eligibility for funding, public procurement opportunities, or participation in policy dialogues. This uncertainty also discourages potential private sector partners who may otherwise invest in scaling up processing or distribution.

The potential for scaling up community-based *N. juliflora* management and utilization strategies exists, but is hindered by a web of social exclusion, financial fragility, technical capacity gaps and policy ambiguity. Addressing these barriers will require a coordinated response that includes gender-responsive governance, access to inclusive finance, investment in technology and training, and the creation of an enabling policy and market environment. Without these, promising models risk remaining small-scale, donor-dependent and isolated from formal systems of support.

Across Turkana, Garissa and Tana River counties, communities have developed diverse and often innovative local practices for managing and utilizing *N. juliflora* . These range from informal youth-led charcoal cooperatives and women's briquette-making groups to communal clearing for farmland and livestock corridors. While many of these initiatives have demonstrated effectiveness in the short term and reflect strong local ownership, their sustainability and scalability remain limited. Most operate in isolation, with minimal support from county governments or alignment with formal legal and policy frameworks. Key barriers, including exclusion of women and youth from planning processes, lack of access to capital, limited technical capacity and regulatory ambiguity, have prevented promising models from evolving into viable enterprises or community-managed resource systems. Despite these constraints, the presence of local knowledge, community willingness and emergent value chains provides a foundation upon which more structured, inclusive and policy-supported *N. juliflora* interventions can be built. Unlocking this potential will require targeted investment, institutional recognition and multi-level collaboration that bridges the gap between informal practice and formal governance.

3.6. Comparative insights

While *N. juliflora* presents a unique set of challenges in Kenya, other countries with similar ecological and socio-economic contexts have made significant progress in managing invasive species through integrated control and utilization strategies. This section draws on international experiences from India, South Africa, and Australia, countries that have grappled with large-scale invasions of *N. juliflora* or comparable species. Through a review of global literature and policy analyses, the study identifies practical innovations in governance structures, incentive mechanisms and community engagement approaches that have contributed to more effective and sustainable outcomes. The purpose of this comparative analysis is not to prescribe one-size-fits-all solutions, but to extract adaptable lessons that can inform Kenya's evolving approach to *N. juliflora* management, particularly within the context of devolved governance, dryland ecology and rural livelihoods. The findings emphasize how policy clarity, market-based incentives and inclusive institutional arrangements can enable the transition from reactive control to proactive, community-led utilization.

3.6.1 Case studies from India, South Africa, and Australia

Several countries with long-standing experience in managing invasive woody species particularly *N. juliflora* offer valuable case studies that illustrate different policy, institutional and market approaches. The cases of **India, South Africa** and **Australia** provide distinct yet relevant lessons for Kenya's context, especially with regard to integrating ecological control with economic utilization, while ensuring inclusive governance.

India: Community-led utilization and state support: India has one of the oldest experiences with N. juliflora , having introduced it widely across arid and semi-arid regions for afforestation and fuelwood in the early 20th century. Over time, *N. juliflora* spread aggressively, especially in the states of Gujarat, Rajasthan and Tamil Nadu. Rather than pursuing complete eradication, Indian states have gradually moved toward **controlled utilization**. In Gujarat, for example, *N. juliflora* is legally classified as a **non-timber forest product (NTFP)**, allowing local communities to harvest and trade it without restrictive licensing requirements. The state actively supports community-based enterprises through training, subsidized equipment (e.g., briquette presses) and marketing cooperatives. NGOs and forest departments work closely with panchayats (village councils) to manage harvesting quotas, replanting schedules and firewood sales. Importantly, some state governments have included *N. juliflora* products such as biomass briquettes in public procurement schemes, creating stable markets for rural producers.

South Africa: Ecological restoration with public employment models: South Africa has taken a more restoration-focused approach through its nationally funded **Working for Water (WfW)** program, established in 1995. The program targets

invasive alien species, N. juliflora among them using a dual mandate of **ecological rehabilitation and poverty alleviation**. The state invests in large-scale manual and mechanical clearing of invasives while employing thousands of people, particularly from poor and marginalized communities. *N. juliflora* management is coordinated across multiple government departments (Environment, Water and Forestry), with strong emphasis on science-based prioritization, monitoring and impact assessment. While utilization is not the primary focus, WfW has experimented with charcoal production and bioenergy models, particularly in Northern Cape Province. However, some challenges remain regarding long-term sustainability and private sector uptake, given the program's reliance on state funding.

Australia: Biosecurity governance and risk-based regulation: Australia's approach to invasive species, including *N. juliflora* , is grounded in a national biosecurity framework that emphasizes prevention, risk assessment and intergovernmental coordination. *N. juliflora* species are listed as **Weeds of National Significance (WoNS)** and are subject to both federal and state-level control measures. The emphasis is on **containment and prevention of spread,** with strict quarantine and eradication protocols in place, particularly in the Northern Territory and Western Australia. Community involvement is facilitated through catchment-level invasive species plans and landholders are legally responsible for managing invasives on their property. However, unlike India or South Africa, Australia does not actively promote N. juliflora utilization due to ecological risk and lack of perceived economic viability. Nonetheless, its experience in integrated planning, regulatory consistency and long-term coordination across jurisdictions provides important lessons for Kenya's fragmented institutional landscape.

These three case studies illustrate diverse models, utilization-led, restoration-focused, and prevention-driven, all of which offer relevant components that could inform Kenya's N. juliflora strategy. The next subsection will distill the key innovations emerging from these models.

3.6.2 Key innovations – Incentives, governance models, and utilization approaches

The international case studies reviewed in this study demonstrate that sustainable invasive species management, particularly for N. juliflora , requires a blend of policy clarity, economic incentives, institutional coordination and community engagement. While each country operates within its unique ecological, political and economic context, several innovations stand out as potentially adaptable to the Kenyan ASAL environment.

3.6.2.1 Incentive structures to promote community engagement and market development

A key takeaway from India and South Africa is the role that structured incentives play in aligning ecological objectives with community livelihoods, stimulating local enterprise and transitioning invasive species like N. juliflora from unmanaged threats to productive assets (Sharma et al., 2014; van Wilgen & Wannenburgh, 2016). A utilization-led incentive model in India: India's success with N. juliflora especially in arid and semi-arid states like Gujarat, Rajasthan, and Tamil Nadu has been shaped

by a deliberate strategy to lower regulatory barriers and incentivize community-based enterprise. Central to this approach is the legal classification of N. juliflora as a non-timber forest product (NTFP) in many states. This legal shift removed restrictive permitting processes that previously treated N. juliflora as a protected or state-owned species. As a result, community members and private actors are allowed to freely harvest, process and sell N. juliflora products, subject to basic environmental safeguards (Patel et al., 2017).

This deregulatory framework has been complemented by financial and technical incentives, including:

- Direct subsidies and capital support for the purchase of briquetting equipment, improved charcoal kilns, drying racks and mechanical chippers, often routed through rural development programs and cooperatives (Singh & Singh, 2021).
- Linkages to microfinance and self-help group (SHG) schemes, enabling women and youth groups to access small loans for working capital and processing upgrades (Jha et al., 2020).
- Capacity-building programs delivered by forest departments, research institutions and NGOs, focused on efficient harvesting, post-harvest handling, product standardization and marketing strategies (Sharma et al., 2014).

Perhaps most innovative is the use of public procurement as a market anchor. In several Indian states, local governments procure N. juliflora -based briquettes and firewood to fuel biomass cookstoves in schools, hospitals and public institutions, under the Ministry of Rural Development and state renewable energy agencies (Patel & Patel, 2016). This guarantees a minimum demand and provides a steady income stream to producer groups. These incentives have catalyzed community organization, formalized local enterprises, reduced reliance on inefficient traditional charcoal production and contributed to landscape management by encouraging the removal of N. juliflora from degraded lands.

Ecological restoration through employment guarantees in South Africa: In contrast to India's market-led model, South Africa uses an employment-based incentive framework that links invasive species control with national poverty reduction goals. The flagship Working for Water (WfW) program, established in 1995, hires local residents, particularly women, youth and people with disabilities, to clear N. juliflora and other invasive species from ecologically sensitive areas (van Wilgen & Wannenburgh, 2016). Participants are employed under short-term contracts and receive on-the-job training, personal protective equipment and social services such as childcare or health referrals. The program provides a minimum income guarantee, with wages funded directly by the national government and administered through the Department of Forestry, Fisheries and the Environment.

While the emphasis is on manual and mechanical control rather than commercialization, some WfW branches have piloted productive use of cleared biomass, including charcoal, firewood bundling and composting for community gardens (Shackleton et al., 2007). However, uptake remains limited due to bureaucratic constraints and environmental risk assessments. Notably, the targeting of employment incentives toward marginalized groups has generated substantial co-benefits in terms of social cohesion, local stewardship and community awareness of invasive species. Although replication in Kenya would require adaptation, the model shows how N. juliflora control can be integrated into broader social protection frameworks.

Together, the Indian and South African models offer complementary insights: India's approach shows how deregulation and enterprise incentives can unlock local value chains, while South Africa demonstrates the role of public works programs in mobilizing labor and achieving landscape-scale restoration goals. A hybrid approach that combines the economic dynamism of India with the social inclusion ethos of South Africa could offer a compelling pathway for Kenya's ASAL counties.

3.6.2.2 Integrated governance platforms

One of the most instructive lessons from these countries in managing N. juliflora and other invasive species is the importance of establishing integrated governance platforms that enable coordination across multiple levels of government and sectors. In South Africa, Australia, and India, such platforms have played a foundational role in ensuring clarity of mandates, alignment of planning and budgeting and inclusive engagement of both public institutions and local communities. While the structure of these platforms varies by country, their effectiveness lies in promoting institutional coherence, participatory decision-making and sustained accountability areas that remain significant gaps in the Kenyan context.

South Africa has adopted a cross-sectoral coordination approach anchored in the National Environmental Management: Biodiversity Act (NEMBA, 2004), which mandates collaboration among departments responsible for water, forestry, environment and agriculture. Within this framework, *P. glandulosa* is classified as an invasive species and its management is integrated into the national strategy for biological invasions. The well-established Working for Water (WfW) programme, under the Department of Forestry, Fisheries and the Environment, is executed in partnership with provincial and municipal agencies through structured interagency steering committees. These committees facilitate joint planning, aligned budgeting, shared performance monitoring, and regular evaluation (van Wilgen et al., 2020). They also support the development of invasive species management plans at both provincial and municipal levels, ensuring that national priorities are grounded in local contexts and that responsibilities are distributed across relevant institutions. South Africa's legal and institutional coherence enables resource sharing, accountability and long-term investment in ecosystem restoration and social inclusion, particularly in rural communities.

Australia, by contrast, anchors its invasive species governance within a national biosecurity framework defined by the Intergovernmental Agreement on Biosecurity (IGAB). This formal agreement delineates the roles and responsibilities of federal, state and territory governments in managing priority invasive species, including certain *N. juliflora* species designated as Weeds of National Significance (DAWE, 2021). What distinguishes Australia's model is its emphasis on local and regional-level implementation through catchment-based natural resource management (NRM) bodies. These multi-stakeholder platforms include landowners, Indigenous communities, local councils and state agencies working together to develop and implement regional weed management strategies. Compliance is supported by both federal and state laws, with landowners legally obligated to manage invasive species on their property. This framework ensures not only technical coherence and enforcement but also bottom-up engagement and local accountability (Thorp & Lynch, 2000; Wilson et al., 2013).

India's governance model for *N. juliflora* is more decentralized, with decision-making power resting largely with village-level institutions such as Gram Panchayats and Joint Forest Management (JFM) committees. In several states, these local bodies are

authorized to develop harvesting protocols, organize collective clearing efforts and manage revenues from *N. juliflora* -based products. Forest departments often partner with these committees and with NGOs to deliver technical training and monitor ecological outcomes. The participatory approach promotes social legitimacy, as communities themselves identify priorities, set harvesting rules and oversee benefit distribution (Sarin et al., 2003). This form of devolved governance aligns closely with local livelihood needs and strengthens accountability through proximity and community oversight. It also allows for flexibility and innovation in how N. juliflora is managed, particularly in areas where state capacity is limited.

Together, these three models illustrate how institutional coordination, whether led by the state, shared through biosecurity councils, or rooted in community governance, can improve the effectiveness, legitimacy, and sustainability of invasive species management. Kenya's experience with *N. juliflora* has been marked by institutional fragmentation, weak interdepartmental coordination and minimal community involvement in planning and implementation. Drawing lessons from these models, Kenya could explore the establishment of county-level invasive species coordination platforms, supported by national policy alignment and community engagement mechanisms. Such structures would not only clarify institutional responsibilities but also embed *N. juliflora* governance within a broader framework of environmental management, economic opportunity and social inclusion.

3.6.2.3. Utilization-driven control strategies

Among the three countries examined, India offers the most developed model of utilization-driven invasive species management, having successfully transformed *N. juliflora* from an ecological burden into a community-level economic resource. This approach is rooted in the belief that creating sustainable livelihood opportunities through biomass-based enterprises can incentivize the voluntary removal and management of invasive species, thereby aligning economic interests with environmental outcomes. In regions such as Gujarat, Tamil Nadu and Rajasthan, N. juliflora is widely harvested for charcoal, firewood, briquettes and animal feed, with a substantial portion of the activity organized through self-help groups (SHGs) and forest user cooperatives (Patel et al., 2017; Jha et al., 2020).

The success of this model depends heavily on a combination of policy support, technical training, and community organization. Forest departments and rural development agencies not only provide legal permissions to harvest *N. juliflora* but also facilitate the formation of village-level groups that are trained in improved harvesting techniques, processing technologies and enterprise management (Sharma et al., 2014). Training often accompanies the distribution of subsidized or donated equipment, such as briquette presses, improved charcoal kilns or pod grinders, ensuring that communities are equipped not just with assets but also with the skills to use them productively. These interventions are supported by rural innovation programs under India's National Rural Livelihood Mission (NRLM), which promotes biomass enterprises among marginalized groups, especially women and landless youth (Singh & Singh, 2021).

Importantly, India's legal and institutional frameworks are designed to enable rather than restrict *N. juliflora* utilization. In many states, N. juliflora has been explicitly classified as a non-timber forest product (NTFP), freeing it from the stringent licensing requirements that govern the harvesting and transport of timber species. This has greatly reduced bureaucratic barriers and encouraged both informal and formal markets to emerge around *N. juliflora* -based products. In Gujarat, for example, *N. juliflora* briquettes have been successfully integrated into public procurement systems for schools and rural health clinics, thereby creating guaranteed demand and reliable revenue streams for producer groups (Patel & Patel, 2016).

Even in countries where utilization is not the primary strategy, such as South Africa and Australia, there is growing interest in exploring the productive use of cleared biomass. In South Africa, while the focus remains on ecological restoration through manual and mechanical removal under the Working for Water (WfW) program, several local pilot projects have tested the conversion of *N. juliflora* biomass into charcoal, biochar and firewood bundles, especially in the Northern and Western Cape provinces. These initiatives have been undertaken with technical support from local NGOs and research institutions, often targeting unemployed youth and former WfW workers (Shackleton et al., 2007; van Wilgen & Wannenburgh, 2016).

Similarly, in Australia, the use of *N. juliflora* for economic purposes remains limited due to its designation as a Weed of National Significance. However, in remote areas where N. juliflora is abundant and land access is easier, experimental efforts have been made to evaluate the potential of using harvested biomass for woodchips, bioenergy or carbonized materials, particularly as part of larger integrated land management and fire prevention programs (DAWE, 2021). While these initiatives are not yet mainstreamed, they demonstrate the potential to link invasive species control with economic value creation, especially in regions where full eradication is not feasible.

Across all three contexts, a consistent finding is that utilization strategies are most effective when integrated into broader land restoration, energy access and rural development plans. Without this integration, utilization risks being extractive or unsustainable, with limited contribution to long-term ecological health. But when combined with environmental safeguards, benefit-sharing mechanisms and institutional coordination, utilization-based control offers a promising pathway to reduce the spread of *N. juliflora* , improve community livelihoods and lower the cost burden of manual or chemical eradication. For Kenya, where *N. juliflora* is both widespread and controversial, these examples underscore the need for a structured, legally supported and community-driven model of biomass utilization that simultaneously serve ecological, economic and social objectives.

3.6.2.4. Monitoring, data and evaluation systems

A critical innovation underpinning the effectiveness of invasive species management in Australia, South Africa and to a lesser extent India, is the development and use of robust data and monitoring systems. These systems serve multiple purposes: they provide evidence for decision-making, support accountability for public and donor investments, facilitate adaptive management and strengthen coordination among implementing agencies and stakeholders. By institutionalizing data collection and reporting mechanisms, these countries have improved their capacity to track the spread and ecological impact of *N. juliflora* (and comparable species), evaluate intervention outcomes and allocate resources more efficiently.

In Australia, invasive species monitoring is embedded within the national biosecurity system, coordinated through the Department of Agriculture, Water and the Environment (DAWE). The management of Weeds of National Significance (WoNS), which includes several *N. juliflora* species, is supported by a combination of federal and state-level data platforms that capture distribution patterns, treatment efforts and risk assessments (DAWE, 2021). Tools such as the Weed Risk Assessment system, GIS-enabled mapping platforms and the Australian Weeds Strategy are used to generate species profiles, assess threat levels and evaluate cost-effectiveness of control options (Thorp & Lynch, 2000). Data are shared among landholders, biosecurity officers and environmental planners through integrated dashboards and regional reporting structures. Importantly, these tools are linked to enforcement and compliance mechanisms that ensure landowners meet their legal obligations for invasive species control.

South Africa has similarly invested in national and regional monitoring frameworks to support its biological invasions program. Under the National Status Report on Biological Invasions and their Management, the South African National Biodiversity Institute (SANBI) collects and analyzes data on species distributions, control costs, ecological recovery and institutional performance (van Wilgen et al., 2020). The Working for Water (WfW) program maintains detailed operational records of area cleared, number of workdays generated, biomass removed and follow-up interventions. These data are collected using standardized field forms, digitized into a central clearinghouse and regularly used to evaluate program effectiveness (Wilson et al., 2013). The availability of high-quality, time-series data has enabled South Africa to conduct national-level impact evaluations, compare cost-effectiveness across provinces and justify ongoing public investment in invasive species management.

India's data systems are comparatively less centralized, but in some states, particularly Gujarat and Rajasthan, district forest offices and rural development departments maintain basic records on *N. juliflora* harvesting volumes, equipment distribution and enterprise performance. These data are typically gathered as part of broader forest inventory processes or rural livelihoods monitoring efforts. Although not standardized at the national level, some states have developed community-based monitoring tools, including logbooks and cooperative registries maintained by self-help groups or panchayats (Sharma et al., 2014; Bhattacharya & Basnyat, 2005). These localized systems support bottom-up accountability and help forest departments track the social and economic outcomes of utilization programs.

Across all three countries, the availability of reliable, disaggregated data has enhanced the transparency and responsiveness of invasive species programs. Monitoring and evaluation systems support adaptive management, allowing practitioners to shift strategies based on observed outcomes and create institutional memory for what works and what doesn't in different ecological and governance contexts. They also strengthen inter-agency coordination, as shared databases provide a common reference point for planning, budgeting, and reporting. For Kenya, where data on *N. juliflora* distribution, utilization or control costs is largely fragmented or absent, investing in integrated monitoring systems would be a foundational step toward evidence-based policy and sustainable management.

4.0 SYNTHESIS OF FINDINGS

This section brings together insights from the various thematic areas explored in this study, including policy and legal frameworks, institutional arrangements, stakeholder experiences, market dynamics and local practices, to identify overarching patterns, systemic challenges and strategic opportunities for reform. By synthesizing evidence from national reviews, county-level fieldwork in Turkana, Garissa and Tana River and international comparative cases, the analysis highlights the interrelated drivers of ineffective N. juliflora governance and underutilization. It also underscores the need for integrated, multi-level responses that go beyond isolated technical fixes to address deeper policy, institutional and socio-economic constraints. The findings presented here form the foundation for actionable recommendations to support legal reforms, institutional innovations and inclusive value chain development.

4.1 Summary of cross-cutting gaps and opportunities

The assessment of *N. juliflora* management across Turkana, Garissa and Tana River counties, supplemented by national policy review and international comparative analysis, reveals a landscape marked by overlapping institutional mandates, fragmented policy responses, limited local empowerment and unrealized economic potential. These challenges are not isolated, but interdependent and mutually reinforcing, cutting across all levels of governance, from community practice to national strategy. At the same time, the study identifies a number of promising entry points and opportunities for reform that can inform the development of more coherent, inclusive, and productive *N. juliflora* governance.

A central gap is the lack of a unified and coherent legal framework for managing *N. juliflora* as both an invasive species and a resource. While national policies touch on relevant issues, such as forestry, energy, rangeland management and invasive species control, none directly address the unique dual nature of *N. juliflora* . This has left communities and counties operating in a policy vacuum, unsure whether to promote utilization, enforce restrictions or prioritize ecological control. In the absence of legal clarity, enforcement is inconsistent and market development is stunted.

Closely linked is the issue of **institutional fragmentation.** At the national level, agencies such as KEFRI, KFS, NEMA and KIRDI relate with *N. juliflora* in different ways, yet without a shared coordination platform or unified mandate. At the county level, departments of environment, forestry, energy and agriculture often work in silos, leading to duplication, confusion and weak service delivery. Community governance institutions, while active, remain disconnected from these formal systems, further limiting integration and coherence.

Another critical gap is the **under-recognition and underutilization of local practices.** As shown in the fieldwork, communities are already managing and using *N. juliflora* through a variety of adaptive strategies, from charcoal production and briquette-making to fodder utilization and communal clearing. However, these efforts are largely informal, poorly supported and excluded from county planning and investment frameworks. The failure to document, validate and scale these models represents a missed opportunity to build on existing capacities and innovations.

The study also reveals widespread **missed economic opportunities.** *N. juliflora* products such as charcoal, briquettes, firewood, animal feed and potentially biochar and woodchips are in

demand in both rural and urban markets. Yet, value chains remain underdeveloped due to lack of technical support, financial investment, product standards and formal market access. Regulatory ambiguity further deters private sector investment, while communities lack the tools and support needed to scale production or improve quality.

Despite these challenges, there are **clear opportunities for reform and coordination.** Community interest in utilization is high and promising models, though small, already exist. Comparative case studies from India and South Africa offer tested models for incentive structures, integrated governance platforms and utilization-based control. Counties are well-placed to lead localized interventions, especially under Kenya's devolved governance framework, provided they are supported with enabling policies, institutional clarity and financial resources.

In short, the cross-cutting analysis points to an urgent need for **coordinated, multi-scalar solutions** that bridge the gap between community action and institutional systems; between policy intent and field realities; and between ecological risk and economic opportunity. These insights are further developed in the following subsections to inform concrete legal, policy and institutional recommendations.

4.2 Institutional fragmentation

Institutional fragmentation emerged as one of the most persistent and cross-cutting challenges undermining effective *N. juliflora* governance in Kenya. This fragmentation manifests in unclear mandates, weak coordination, overlapping responsibilities and an absence of structured platforms for joint planning or implementation, across national, county and community levels.

At the national level, several agencies have partial jurisdiction over issues linked to N. juliflora , but none holds a clearly designated leadership or coordination role. The Kenya Forestry Research Institute (KEFRI) leads research on utilization technologies and ecological control but lacks regulatory authority. The Kenya Forest Service (KFS) oversees forest products and licenses, yet its presence in communal rangelands where *N. juliflora* is most prevalent is limited. The National Environment Management Authority (NEMA) has a mandate under EMCA to coordinate invasive species responses, yet remains under-resourced and largely absent from county-level N. juliflora initiatives. The Kenya Industrial Research and Development Institute (KIRDI) has piloted product innovations but operates in isolation from land and forest regulators. This institutional patchwork has led to conflicting interpretations of how *N. juliflora* should be managed as a threat or a resource or both.

At the county level, the fragmentation is equally pronounced. Departments responsible for environment, trade, forestry, energy and agriculture each relate to *N. juliflora* differently, often without shared strategies or communication channels. In Turkana, for example, the Department of Trade promotes charcoal and briquette production, while the Department of Environment views *N. juliflora* as a restoration priority to be cleared. In Garissa, energy and forestry departments have both engaged in N. juliflora -related initiatives without any mechanism for joint planning or resource sharing. The result is duplication of effort, inconsistent messaging to communities and limited alignment between county investments and long-term management objectives.

Community-level institutions such as Community Forest Associations (CFAs), Natural Resource Management Committees (NRMCs) and traditional leadership structures remain disconnected from county or national governance systems. Despite their active roles in organizing clearing campaigns, managing informal value chains and resolving access conflicts, these institutions lack formal mandates, technical support and access to decision-making platforms. The absence of institutional linkages means that grassroots efforts operate in isolation, with limited prospects for recognition, replication, or integration into county development plans.

The situation is further compounded by the absence of multi-stakeholder coordination platforms. In none of the three study counties of Turkana, Garissa or Tana River did stakeholders report the existence of a regular forum dedicated to *N. juliflora* planning, monitoring or resource mobilization. Most coordination happens around donor-funded projects and dissolves when funding ends. There are no standing working groups, interdepartmental task forces or formal policy guidelines that bring actors together around shared goals or harmonized implementation.

This fragmentation leads to institutional inertia. No single actor feels fully responsible and each assumes that another department or level of government should take the lead. As a result, potentially promising interventions such as community-led utilization or private sector investment fall through the cracks. Donor support becomes projectized and short-term, with little policy anchoring or government uptake.

Resolving institutional fragmentation will require strong political leadership, a clarified division of responsibilities and formalized coordination structures. At the national level, a designated lead agency or task force could anchor *N. juliflora* management under a unified strategy. At the county level, integrated natural resource governance committees could be established to align sectoral plans, coordinate implementation and link with community institutions. Without such institutional coherence, interventions are likely to remain piecemeal and unsustainable despite the growing urgency and scale of the *N. juliflora* challenge.

4.3 Policy incoherence

Policy incoherence is a major structural barrier to effective *N. juliflora* governance in Kenya. It stems from the fragmented development of laws and strategies across multiple sectors, forestry, environment, agriculture, energy, trade and land, none of which fully address *N. juliflora* as both an invasive species and a potential economic resource. This results in conflicting mandates, contradictory guidance to communities and a regulatory vacuum that leaves both control efforts and utilization initiatives in limbo.

At the national level, key policies touch on *N. juliflora* -related themes but rarely in a coordinated or integrated manner. The Forest Conservation and Management Act (2016) governs forest resources but does not clearly define N. juliflora 's legal status, whether it is a protected species, a weed, or an economic resource. The Environmental Management and Coordination Act (EMCA, 2015) mandates NEMA to coordinate the management of invasive species but lacks operational guidance or financial instruments to implement this mandate at the county level. The Energy Act (2019) promotes renewable biomass energy but does not recognize *N. juliflora* as a strategic feedstock despite its widespread use in charcoal and briquette production. The Draft National Strategy for Invasive Alien Species (2022–2032) acknowledges N. juliflora as a priority species, yet remains unadopted and unenforced, further limiting its impact.

In practice, this patchwork of unaligned policies creates regulatory contradictions. For instance, while energy departments and NGOs in Turkana and Garissa promote *N. juliflora* for charcoal and briquettes, environmental and forestry officers often view such activities as illegal or ecologically harmful. In some cases, community groups have been warned or penalized for harvesting *N. juliflora* without formal permits, even though there are no clear licensing procedures or guidance on what constitutes legal utilization. In Tana River, where N. juliflora is perceived primarily as a threat to farmlands and wetlands, there is no clear policy support for turning cleared biomass into useful products, resulting in lost value and unmanaged waste.

Policy incoherence is also evident in county-level planning instruments, such as County Integrated Development Plans (CIDPs) and sectoral strategies. Most CIDPs reference *N. juliflora* only in passing, often under environmental or land degradation sections, without any detailed plan for its management or use. No county examined had a dedicated *N. juliflora* policy or by-law and interdepartmental strategies for integrating environmental management with livelihood generation were lacking. This undermines efforts to mobilize budgetary resources, coordinate across departments or align with national frameworks.

For communities and producer groups, policy incoherence translates into confusion, mistrust and informal operation. Stakeholders in all three counties reported that they often do not know which government office to approach for support, licensing, or technical guidance. The lack of a consistent policy message also discourages private sector actors, who see *N. juliflora* as a risky investment due to unclear rules and regulatory unpredictability. This incoherence extends to donor-supported projects, which often introduce interventions based on their own frameworks rather than aligning with national or county policy. As a result, some projects promote utilization while others emphasize eradication and few are sustained beyond the life of the funding cycle. This inconsistency contributes to fragmentation and undermines community trust in government and development actors alike.

Addressing policy incoherence requires a deliberate harmonization of laws, strategies and regulatory instruments. *N. juliflora* should be formally classified through legislation and clear guidelines issued on how it can be harvested, processed and commercialized. County governments need to develop localized policies and by-laws that are aligned with national priorities but responsive to specific local contexts. Importantly, policies must be made accessible, translated into local languages, simplified for community use and communicated through inclusive public processes. Without this coherence, even the most innovative local practices and promising value chain models will struggle to gain legitimacy or scale.

4.4 Undervalued local practices

Local communities in Kenya's ASALs have developed a range of context-specific practices to manage, utilize and adapt to the spread of *N. juliflora* . These practices, rooted in indigenous knowledge, lived experience and necessity, represent a vital but under-recognized dimension of *N. juliflora* governance. Despite their effectiveness in certain contexts and their alignment with community needs, these grassroots innovations remain undervalued, unintegrated and unsupported by formal policy, institutional structures, or market systems.

Across Turkana, Garissa and Tana River counties, community members have independently initiated charcoal production, briquette-making, livestock feed trials, fencing applications and communal clearing schemes to control *N. juliflora* encroachment. In Turkana, informal youth groups and refugee cooperatives organize themselves to harvest and convert *N. juliflora* into charcoal, often using traditional kilns. In Garissa, women's groups have pioneered small-scale briquette production for household and local market use, demonstrating technical creativity and strong group cohesion. In Tana River, despite the lack of formal support, farmers have collectively organized clearing campaigns to reclaim cropland from *N. juliflora* invasion, evidence of local-level initiative in the absence of top-down planning.

These practices are often **highly adaptive and cost-effective.** They utilize local labor, make use of freely available biomass with minimal external inputs to function. Many are rooted in existing social institutions such as women's groups, CFAs or traditional leadership systems. They also reflect a clear understanding of the risks and benefits of *N. juliflora* , balancing short-term livelihood needs with long-term ecological concerns. Yet, as fieldwork revealed, these practices are rarely documented, evaluated, or scaled by government institutions or development partners.

The undervaluation of local practices is partly due to **institutional bias toward top-down, technocratic solutions,** which favor large-scale clearing operations, externally developed technologies, or formal enterprise models. This has led to the marginalization of community voices and the underutilization of local innovations. For example, while NGOs have introduced improved kilns or briquetting equipment in some areas, these interventions often fail when they are not adapted to local preferences or do not build on existing community structures. Similarly, policies designed without community input often overlook informal practices that are already contributing to *N. juliflora* control and utilization.

There is also a **lack of mechanisms to validate and elevate grassroots knowledge** within formal governance systems. Local experiences are rarely captured in government reports, planning documents, or monitoring systems. County governments do not systematically engage with CFAs, NRMCs or informal producer groups when designing *N. juliflora* -related interventions. As a result, promising models remain isolated and unsupported and opportunities for peer learning and replication are lost. Moreover, the invisibility of these practices means that communities often operate without legal protection, technical support or access to public resources. This not only limits the impact of their efforts but exposes them to risks such as fines, confiscation of products, or exclusion from formal markets due to their informal status. It also reinforces community perceptions that government institutions are unresponsive or unaware of local realities.

Literature from other dryland contexts community-led resource management systems can be highly effective when empowered with legal recognition, financial and technical facilitation support (Shackleton et al., 2007; Mbaabu et al., 2019). In Kenya, unlocking the full potential of *N. juliflora* governance will require greater appreciation of these local practices, not as informal stopgaps, but as foundational components of a broader strategy. Elevating these practices means creating platforms for community voices, embedding local knowledge into policy frameworks and supporting grassroots innovations through funding, training and technical partnerships. It also requires a shift in narrative, from viewing communities as passive beneficiaries to recognizing them as active agents in landscape restoration and biomass utilization.

4.5 Missed economic opportunities

Despite widespread recognition of N. juliflora as a problematic invasive species, there is a growing body of evidence, both from Kenya and globally, that it also holds significant untapped economic value. However, the current policy, market and institutional environment in Kenya has largely failed to harness this potential. Across Turkana, Garissa and Tana River counties, community groups, youth, and women's cooperatives are actively harvesting and processing N. juliflora for fuel and fodder, yet their efforts remain informal, under-capitalized and disconnected from larger value chains. The result is a landscape of missed opportunities, for income generation, enterprise development, employment creation and green economy transition.

The primary missed opportunity lies in the energy sector. N. juliflora is already a major source of firewood and charcoal in many dryland counties, especially among poor and off-grid households. In Turkana and Garissa, youth and refugee groups are producing N. juliflora -based charcoal at scale, but without formal licensing, quality control or access to urban or institutional markets. There is strong potential to formalize and expand this trade by introducing improved kilns, establishing local cooperatives, supporting aggregation centers and linking producers to county or humanitarian procurement schemes. The fact that N. juliflora -based briquettes burn hotter and cleaner than traditional firewood further strengthens their case for school feeding programs, refugee camps and low-income energy markets.

A second missed opportunity is in livestock feed production. In dry seasons, N. juliflora pods are often used informally by pastoralists to feed goats and camels, especially in Garissa and parts of Tana River. However, concerns over toxicity, lack of proper drying and milling techniques and absence of nutritional standards limit the scaling of this practice. Yet, research by KEFRI and other regional institutions shows that properly processed N. juliflora pods can provide a high-protein supplement for ruminants and even poultry when mixed appropriately (Muturi et al., 2021). The development of community-based feed enterprises, linked to veterinary extension, producer cooperatives and animal health safeguards, offers an opportunity to enhance resilience in pastoral economies while reducing N. juliflora biomass.

Third, there are missed opportunities in value-added processing and circular economy innovations. Very few county governments have explored the potential of N. juliflora in producing biochar, woodchips, compost, or compressed building blocks, despite successful pilots in countries like India and Ethiopia. The absence of investment in research and development, demonstration centers, or enterprise incubation has stifled innovation. Private sector actors are hesitant to invest due to regulatory uncertainty, unclear land access rules and perceived instability in supply chains. Meanwhile, donor-funded projects often stop at basic briquetting or firewood production, without exploring higher-value product development or market diversification.

Another overlooked area is public procurement and institutional demand. In India, as highlighted in the comparative analysis, state governments have used public procurement frameworks to support N. juliflora -based energy in rural schools and clinics. No such mechanism currently exists in Kenya, where school feeding programs, county facilities, or humanitarian operations could become anchor buyers for locally produced charcoal or briquettes. Establishing such systems would not only stimulate local economies but also contribute to Kenya's clean energy and climate goals under the SDG and NDC frameworks.

Finally, the failure to develop a coordinated market system, including product certification, quality assurance, transport logistics and digital market linkages, means that producers remain vulnerable to exploitation by middlemen and limited in their ability to scale. In interviews across the three counties, producers frequently cited price volatility, lack of buyer access and transportation bottlenecks as major constraints to profitability.

These missed opportunities are not a result of lack of demand or community interest, they are the product of policy neglect, weak investment ecosystems and institutional disconnects. Kenya's ASAL counties sit on thousands of hectares of N. juliflora biomass, yet lack the enabling environment to convert this burden into a sustainable livelihood asset. With rising demand for renewable energy, climate-smart livestock systems and local resource-based enterprises, N. juliflora , if well-managed, could become a cornerstone of Kenya's dryland green economy.

5.0 INTEGRATION OF FINDINGS

The thematic findings presented throughout this report, ranging from policy and institutional analysis to market dynamics, community practices and comparative international models, reveal a deeply interconnected set of challenges and opportunities surrounding *N. juliflora* governance in Kenya's ASAL counties. These findings do not exist in isolation; rather, they reinforce one another in ways that highlight the need for holistic, coordinated and context-sensitive responses.

At the core is a **fundamental policy and institutional disconnect.** National laws and strategies acknowledge the threat of *N. juliflora* but offer little clarity on how to balance its control with its economic potential. This ambiguity cascades down to county governments, which lack specific mandates, budget lines, or cross-departmental coordination mechanisms to respond effectively. As a result, interventions at the local level, whether led by communities, NGOs, or county departments, are fragmented, short-term and often contradictory.

This institutional weakness is compounded by **policy incoherence and regulatory uncertainty,** which have created a grey zone for community actors and the private sector. Local producer groups operate informally due to the absence of clear harvesting rights, licensing procedures, or product standards. Donor-funded projects and NGO interventions vary widely in their approaches, some promote utilization while others focus on eradication, reflecting the lack of an overarching national or county strategy.

Yet despite these constraints, **local innovation is flourishing.** Communities in Turkana, Garissa and Tana River are actively using *N. juliflora* for charcoal, briquettes, fodder, fencing and land clearance. These practices are cost-effective, rooted in local knowledge and demonstrate high levels of ownership. However, they remain undervalued and unsupported, with little opportunity for replication or scaling due to exclusion from formal systems, absence of technical support and limited market integration.

The lack of investment in **value chains and enterprise development** further hampers progress. While community groups have shown readiness to expand their activities, they are held back by poor access to finance, unreliable equipment, limited processing knowledge and weak links to stable markets. The absence of structured procurement mechanisms, aggregation centers or business incubation services prevents the emergence of sustainable *N. juliflora* -based enterprises.

Importantly, the comparative case studies from India, South Africa and Australia demonstrate that successful *N. juliflora* management, whether through control, utilization, or restoration, relies on clear policy direction, strong institutional coordination, strategic incentives and community inclusion. In India, targeted policy reform, public procurement and support for self-help groups have allowed N. juliflora to become a driver of rural energy and employment. In South Africa, state-led ecological restoration and poverty alleviation programs have integrated control into national development planning. Australia's model emphasizes regulatory clarity, risk assessment and shared responsibility across government levels.

For Kenya, the key lesson is that **no single intervention, whether policy reform, enterprise development, or community mobilization, will succeed in isolation.** A comprehensive response must align legal frameworks, institutional mandates, community practices and economic incentives. It must be multi-scalar, anchored in national strategy, operationalized by county governments and owned by communities. And it must prioritize long-term systems-building over short-term projects, ensuring that promising initiatives are not only piloted but sustained, scaled and institutionalized. The final subsection proposes concrete and actionable recommendations, grounded in these integrated findings, to guide legal, policy and institutional reforms for more inclusive, effective and sustainable *N. juliflora* governance in Kenya.

5.1 Proposed legal, policy and institutional innovations reforms

Drawing from the synthesized findings across this study, this subsection outlines a set of actionable proposals aimed at transforming *N. juliflora* management in Kenya from a fragmented and reactive process into a coherent, inclusive and opportunity-driven system. These proposals are designed to address the underlying legal, policy and institutional shortcomings identified in Turkana, Garissa and Tana River counties and align Kenya's approach with international best practices adapted to local contexts.

Enact legal recognition and classification of N. juliflora: At the national level, N. juliflora should be formally classified under an approved legal framework as both an invasive species and a usable biomass resource. This dual recognition would enable a balanced policy response that integrates control, regulation and utilization. The adoption and operationalization of the Draft National Strategy for the Management of Invasive Alien Species (2022–2032) should be prioritized and supported by clear implementation mechanisms.

Develop county-level policies and by-Laws: County governments should be supported to draft and enact N. juliflora -specific policies or by-laws that reflect local ecological realities and economic potentials. These legal instruments should define roles and responsibilities of different county departments, create enabling conditions for community utilization and establish licensing, monitoring and benefit-sharing frameworks. Counties should also integrate N. juliflora management into their CIDPs, sectoral plans and climate action strategies.

Establish multi-stakeholder coordination platforms: National and county governments should establish dedicated N. juliflora coordination forums to bring together departments of forestry, environment, agriculture, energy, trade, and planning. These platforms should meet regularly to align policy implementation, pool resources, monitor outcomes and engage with civil society, private sector actors, and community institutions. At the county level, ward-based natural resource forums could serve as entry points for inclusive planning.

Institutionalize and support local community practices: Collectives the Community-based organizations, CFAs, NRMCs, women's groups and youth should be legally recognized and supported as key actors in N. juliflora management. Counties should establish mechanisms to formally engage these groups through capacity building, sub-county resource forums and performance-based grants. Legal instruments should enable community access to N. juliflora harvesting rights, protect their operations and embed them into restoration and enterprise initiatives.

Promote incentive-based utilization models: Drawing from India's model, Kenya should introduce incentives for sustainable utilization. This could include subsidized briquetting equipment, tax exemptions for start-ups using N. juliflora and performance grants for community producer groups. National and county governments should also pilot public procurement schemes that prioritize N. juliflora -based energy for schools, hospitals and refugee camps, creating stable markets and income streams.

Strengthen market systems and access to finance: Investment should be made in developing N. juliflora value chains, especially in briquettes, animal feed and charcoal, by providing technical training, supporting aggregation centers and linking producer groups to financial institutions. Kenya Bureau of Standards (KEBS) should develop formal standards for *N. juliflora* products, while counties should simplify licensing and permit systems to promote formalization.

Build monitoring, learning, and data systems: Counties, in collaboration with KEFRI, NEMA, and other agencies, should establish data systems to track N. juliflora spread, measure biomass removal, and monitor socio-economic benefits of interventions. Digital dashboards and participatory monitoring tools can enhance transparency and learning while informing adaptive management and investment planning.

Mainstream equity and inclusion in policy and practice: All legal and institutional reforms should be gender-responsive and socially inclusive. This includes requiring women and youth representation in decision-making platforms, funding women- and youth-led enterprises and ensuring that refugee and marginalized host communities are not excluded from benefit-sharing or planning processes.

Align donor projects with long-term government strategy: Development partners should be encouraged to align *N. juliflora* -related interventions with national and county frameworks. Donor-funded initiatives should support systems-building, rather than short-term pilots and embed knowledge and resources within county institutions and community networks to promote sustainability and replication.

Together, these proposals represent a shift from ad hoc interventions to a *systems-oriented approach,* anchored in law, supported by institutions, driven by community ownership and guided by long-term development goals. If implemented, they can turn *N. juliflora* from an unmanaged threat into a catalyst for green jobs, land restoration and climate-resilient enterprise in Kenya's arid and semi-arid lands.

6.0 CONCLUSION AND RECOMENDATIONS

6.1. Conclusion

The management and utilization of *N. juliflora* in Kenya's arid and semi-arid lands stands at a critical juncture. While the species continues to pose significant ecological, social and economic challenges, particularly in Turkana, Garissa and Tana River counties, it also offers untapped potential to generate livelihoods, enhance energy security and contribute to dryland restoration. However, realizing this potential will require a coordinated shift from fragmented, reactive interventions toward a strategic, inclusive and systems-oriented approach that aligns legal, institutional and market mechanisms.

This study has highlighted the urgent need for a coherent national and county-level policy framework, backed by institutional clarity and legal mandates. It emphasized the value of community-led practices and the importance of integrating local knowledge and initiatives into formal planning and investment systems. It has also identified opportunities to unlock economic value through market incentives, innovation and public procurement, while cautioning that these must be grounded in sustainability and equity. The comparative international experiences of India, South Africa, and Australia offer tangible models of how such integration can be achieved through incentive structures, multi-level governance and long-term public investment.

Going forward, national government must lead on legal classification, regulatory harmonization and high-level coordination through a designated multi-agency platform. County governments, as the frontline actors in devolved governance, must take ownership of implementation, by developing localized policies, allocating budgets and facilitating participatory planning. Communities and local institutions must be empowered as co-managers of N. juliflora resources, with secure rights, technical support and access to markets and finance. The private sector has a key role to play in scaling innovations, creating demand for biomass products and investing in value chain infrastructure. Meanwhile, NGOs and research institutions should serve as bridges, connecting communities to knowledge, technology and policy spaces while piloting scalable models for inclusive enterprise and ecological management.

The success of these efforts will depend in part on targeted, flexible and aligned donor support. Development partners can catalyze progress by investing in systems-building rather than isolated projects, supporting policy development, coordination platforms, institutional strengthening and inclusive value chains. They can also help scale up community-led innovations and facilitate regional learning partnerships. Above all, donor engagement should be aligned with national and county priorities, foster local ownership and commit to long-term transitions rather than short-term fixes. Therefore, *N. juliflora* should no longer be viewed solely as a nuisance species to be eradicated, but as a complex and dynamic resource challenge that, if approached strategically, can become a driver of green jobs, climate resilience and community empowerment in Kenya's drylands. The pathway forward lies in bridging policy with practice, science with local knowledge and short-term responses with long-term sustainability.

6.2 Recommendations

Based on the cross-cutting gaps, opportunities and lessons identified throughout this assessment, the following phased recommendations are proposed to guide coherent, inclusive and opportunity-driven management and utilization of N. juliflora in Kenya's arid and semi-arid lands (ASALs). These are targeted at national and county governments, development partners, research institutions and civil society organizations are grounded in field-level realities, policy analysis and global best practice.

6.2.1 Short-term recommendations (0–12 months)

- Finalize legal and strategic frameworks: Prioritize the adoption of the Draft National Strategy for the Management of Invasive Alien Species (2022–2032) with explicit recognition of N. juliflora as both an invasive species and a biomass resource. Counties should finalize and validate their N. juliflora management strategies and incorporate them into County Integrated Development Plans (CIDPs), dryland restoration frameworks and climate adaptation plans.
- Establish coordination structures: Form dedicated multi-agency task forces or coordination platforms at the national level including KEFRI, KFS, NEMA, KIRDI and key ministries to harmonize mandates. Counties should institutionalize County Implementation Groups (CIGs) to drive strategy implementation supported by regular joint work plans, data sharing and cross-sectoral review mechanisms.
- Strengthen county-level engagement: Support counties to assign focal persons for N. juliflora , conduct biomass inventories and allocate initial budget lines for control and utilization activities. County governments should facilitate inclusive public participation processes, co-design plans with local actors and pilot co-management arrangements.
- Launch targeted community capacity building: Provide legal recognition to informal community groups involved in N. juliflora utilization. Deliver hands-on training on sustainable harvesting, processing and safety and link these groups to financial services and markets. Pilot community-based monitoring systems to track ecological impact and governance participation.
- Accelerate product standards and market entry: Fast-track the development of product standards and certifications for N. juliflora -based goods through KEBS. Initiate public procurement pilots, for example, supplying schools or refugee camps with N. juliflora briquettes to create stable markets and demonstrate viability.

6.2.2 Medium-term recommendations (1–3 years)

- Operationalize regulatory frameworks: Develop and enact county-level legal instruments to govern harvesting, transport, processing, licensing and taxation of N. juliflora products. Ensure coherence with national charcoal and invasive species policies and streamline licensing systems to support formalization of enterprises.
- Promote enterprise and cooperative development: Facilitate the registration, training and business development of community-based enterprises and cooperatives focused on value-added N. juliflora products. Provide incentives such as tax relief, start-up capital and access to machinery and build linkages to buyers, wholesalers and off-takers.
- Enhance institutional integration: Strengthen the roles of local institutions such as Community Forest Associations (CFAs), Natural Resource Management Committees (NRMCs) and producer cooperatives within county governance frameworks. Support counties in establishing feedback and grievance mechanisms to ensure transparency and accountability.
- Advance gender and inclusion frameworks: Mainstream gender equity and inclusion across all N. juliflora programs. Include quotas for women and youth in decision-making structures, develop enterprise financing schemes tailored to marginalized groups and provide inclusive training packages. Address refugee-host dynamics to promote conflict-sensitive governance.
- Develop clear harvesting and utilization protocols: Collaborate with KFS, KEFRI, and county governments to establish and disseminate standard harvesting protocols that ensure ecological sustainability while enabling controlled biomass extraction.

6.2.3 Long-term recommendations (3–5+ years)

- Institutionalize and sustain funding mechanisms: Integrate N. juliflora management into permanent county planning and budgeting systems. Establish predictable long-term financing through county budget lines, performance-based grants and partnerships with climate and conservation funds. Advocate for inclusion of N. juliflora actions in national climate finance mechanisms.
- Foster innovation and applied research: Invest in applied research and development (R&D) for high-value N. juliflora products such as biochar, soil amendments, composite building materials and livestock feed additives. Support university, industry, community collaborations and host innovation hubs and demonstration sites in ASAL counties.
- Designate and regulate harvesting zones: Identify, map and gazette designated N. juliflora harvesting zones based on ecological and socio-economic criteria. Link these to enterprise development corridors and restoration zones for long-term landscape recovery.
- Build knowledge-sharing and south-south learning platforms: Leverage international partnerships to adapt and replicate successful N. juliflora models from countries such as India, Ethiopia and South Africa. Institutionalize learning exchanges, technical collaborations and regional innovation platforms.
- Measure impact and refine strategies: Develop comprehensive monitoring, evaluation and learning (MEL) frameworks at county and national levels to track environmental, economic and social outcomes. Use data and evidence to inform policy adaptation and ensure long-term accountability.

Recommendation Area	Short-Term (0-12 months)	Medium-Term (1-3 years)	Long-Term (3-5+ years)
Legal and Policy Reform	Finalize national and county N. juliflora strategies; integrate into CIDPs	Adopt county by-laws; align with Sustainable Charcoal Act	Fully institutionalize N. juliflora strategy in law and national planning
Institutional Coordination	Establish national task force and County Implementation Groups (CIGs)	Institutionalize joint planning, data-sharing and reviews	Sustain national-county platforms; update plans with lessons learned
County Government Engagement	Assign focal persons; conduct biomass inventories; initiate budget lines	Build county staff capacity; embed strategies in sector work plans	Allocate permanent county budget lines and monitoring mandates
Community Capacity and Ownership	Recognize community groups; launch training and monitoring pilots	Formalize cooperatives; expand training and finance access	Embed community governance in county structures; support scale-up
Market Incentives and Product Standards	Accelerate KEBS standards; pilot public procurement (e.g. schools/camps)	Provide tax incentives; support formalization of value chains	Enable export markets; harmonize standards regionally
Inclusive Models and Gender Planning	Ensure representation of women/youth in planning and pilots	Launch gender-focused enterprise support schemes	Mainstream inclusion in all county and national strategies
Innovation and Applied Research	Identify R&D gaps; initiate demonstration hubs	Pilot high-value products (e.g., biochar, feed); scale R&D links	Scale innovation hubs; document and replicate success models
International Learning and Partnerships	Plan exchange visits with India/Ethiopia; engage technical partners	Establish learning platforms; host knowledge-sharing events	Formalize partnerships with south-south innovation centers
Regulatory Frameworks	Draft county regulations aligned with national strategy	Enact regulations; create simple licensing and compliance systems	Track enforcement; adapt regulations to on-ground realities
Enterprise and Cooperative Development	Identify and train early-stage enterprises; link to local markets	Expand cooperatives; provide equipment and business incubation	Integrate value chains with national trade and SME strategies
Harvesting Protocols and Resource Zoning	Start participatory mapping of N. juliflora invasion areas	Gazette harvesting zones; link to restoration corridors	Monitor regeneration impact; update ecological baselines
Monitoring, Evaluation and Learning (MEL)	Develop initial MEL indicators and community feedback tools	Operationalize MEL tools and reporting routines	Use MEL data for adaptive management and donor reporting
Long-term Financing and Institutionalization	Map potential funding sources; propose inclusion in county budgets	Secure blended finance; launch long-term program proposals	Embed N. juliflora work in climate finance and land restoration plans

REFERENCES

Bhattacharya, P., & Basnyat, B. (2005). Sustaining joint forest management in India: Some key issues. International Forestry Review, 7(4), 301–307.

Chikowo, R., et al. (2021). Building inclusive and sustainable agricultural enterprises: Lessons from community-driven approaches in East Africa. Land Use Policy, 101, 105109.

Choge, S. K., et al. (2007). The Status and Impact of P. juliflora Species in Kenya. KEFRI Technical Report.

Department of Agriculture, Water and the Environment (DAWE). (2021). Weeds of National Significance Strategic Plans. Australian Government.

Githae, E. W., et al. (2021). Invasive plants and gendered impacts: Evidence from Kenya's drylands. African Journal of Environmental Science and Technology, 15(3), 91–102.

Jha, S., Bhattarai, M., & Sharma, S. (2020). Role of Self-Help Groups in enhancing livelihoods in arid India: Lessons from Gujarat. Journal of Rural Development, 39(2), 189–204.

Kariuki, J., et al. (2020). Land use change and pastoral vulnerability in northern Kenya. Pastoralism: Research, Policy and Practice, 10(1), 1–14.

Mbaabu, P. R., et al. (2019). Innovative approaches to controlling P. juliflora in East Africa. Biological Invasions, 21(2), 725–738.

Muturi, G. M., et al. (2021). Ecological impacts of P. juliflora a in arid rangelands of Kenya. Journal of Arid Environments, 190, 104511.

Orwa, C., et al. (2022). Policy and governance constraints to invasive species management in Kenya. KEFRI Occasional Paper.

Patel, D., Sharma, R., & Rathore, L. (2017). Policy incentives for invasive species utilization in drylands: India's P. juliflora model. International Forestry Review, 19(4), 452–461.

Patel, R., & Patel, D. (2016). Market linkage models for P. juliflora in Gujarat: A rural biomass solution. Gujarat Forestry Working Paper Series.

Sarin, M., Singh, N. M., Sundar, N., & Bhogal, R. K. (2003). Devolution as a threat to democratic decision-making in forestry? Findings from three states in India. ODI Working Paper 197.

Shackleton, C. M., McGarry, D., Fourie, S., Gambiza, J., Shackleton, S. E., & Fabricius, C. (2007). Assessing the effects of invasive alien species on rural livelihoods: Case examples and a framework from South Africa. Human Ecology, 35(1), 113–127.

Sharma, R. R., Singh, V., & Patel, D. (2014). Fuelwood and livelihood linkages in N. juliflora -invaded landscapes: Lessons from India. Energy for Sustainable Development, 23, 112–118.

Singh, R., & Singh, S. (2021). Biomass briquette promotion for climate-smart energy in rural India: Opportunities and challenges. Renewable Energy Journal, 169, 1326–1334.

Thorp, J. R., & Lynch, R. (2000). The determination of Weeds of National Significance. National Weeds Strategy Executive Committee, Launceston.

van Wilgen, B. W., & Wannenburgh, A. (2016). Co-facilitating invasive plant clearing and poverty alleviation in South Africa: Achievements and challenges. Environmental Science & Policy, 62, 70–77.

van Wilgen, B. W., Fill, J. M., Baard, J. A., Chen, H., Fowler, L., & Rejmánek, M. (2020). Historical costs and projected future scenarios for the management of invasive alien plants in protected areas in South Africa. Biological Conservation, 241, 108257.

Wilson, J. R. U., et al. (2013). The role of risk assessment in setting priorities for managing invasive alien species: A South African perspective. Bothalia, 43(1), 1–10.

APPENDICES

Appendix 1: Terms of Reference

Terms of Reference for work Assignment on Analysis of Policy and Legislative Gaps in the Management, Harvesting, Processing, Utilization, and Marketing of Prosopis juliflora Products.

1. Background

The Kenya Forestry Research Institute (KEFRI), County Governments of Garissa and Tana River, Garissa, University and Kenya Industrial Research and Development Institute (KIRDI) with support from ILO-PROSPECTS through Funding from the Government of Netherlands. These institutions are implementing a multi-stakeholder Prosopis juliflora management for decent green jobs and livelihood support to host communities and refugees in Garissa and Tana River Counties project. The project employs a multi-institutional approach to enhance livelihoods and build resilience of communities and refugees through sustainable use of forest products thereby creating decent jobs and sustainable livelihoods. The project has three (3) components that are integrated to empower communities, groups and individuals to exploit the economic benefits of P. juliflora through management, harvesting, value addition and manufacturing using pro-employment and local resource-based approaches.

Prosopis juliflora is recognized as an invasive species with notable environmental effects but also has significant economic potential through its products, such as fuel (charcoal and briquettes), animal feed, and biochar. A comprehensive understanding of the governing policies and regulations is crucial to capitalize on these opportunities effectively.

2. Objective

The aim of this project is to identify and evaluate policy and legal shortcomings both at the national and county levels affecting the management and utilization of Prosopis juliflora, while prioritizing sustainable development, jobs creation and livelihood improvement. Specifically, the Resource Person will review County legal frames at Garissa, Tana River and Turkana Counties. The assignment should provide recommendations to enhance governance frameworks in line with economic, environmental, and social goals.

3. Scope of Work

3.1 Literature Review

- Analyse existing literature on P. juliflora and examine relevant policies, legislations. Regulations and Institutional frameworks
- Policy Analysis - Assess the current policies for effectiveness, coherence, and enforcement, identifying any gaps that hinder sustainable management and utilization.
- Analyse institutional framework for management and control of P. juliflora within the community, County and national government
- Propose policy interventions required to unlock trade in prosopis-based products

3.2 Stakeholder Engagement

- Conduct interviews and discussions with key stakeholders and duty bearers to gather insights regarding regulatory challenges and community impacts.

3.3 Comparative Analysis

- Comparative Analysis - Review successful international policy frameworks for invasive species management to identify adaptable best practices.
- Document some of control measures being undertaken locally and the opportunities and challenges.
- Compare the effectiveness of different prosopis management approaches specifically interrogating opportunities and challenges in implementation for each, sustainability and their potential for upscaling.

- Review institutional frameworks for management and control of P. juliflora

3.4 Recommendations

- Formulate actionable recommendations and propose policy changes to enhance sustainable resource management and community benefit-sharing.
- Formulate policy, legal and regulations review or development.

4. Methodology

A mixed-methods approach will be utilized, integrating both qualitative and quantitative research techniques, stakeholder consultations, and policy evaluations.

5. Deliverables

- Inception report outlining the work plan, methodology, and timeline.
- Interim report presenting initial findings and stakeholder feedback.
- Draft final report featuring a comprehensive gap analysis and recommendations.
- Final report with stakeholder input and a presentation summarizing the main findings and recommendations

Appendix 2. Data collection guide.

Introduction

My name is _____. I am a consultant contracted by the Kenya Forestry Research Institute (KEFRI) to support a study on the analysis of policy, legislative, and institutional gaps in the management, harvesting, utilization, and marketing of Prosopis juliflora in Garissa, Tana River, and Turkana counties. This tool is intended to guide data collection through interviews and focus group discussions with key stakeholders across government, community, private sector, NGOs, and academia. The purpose is to gather insights on policy coherence, institutional mandates, stakeholder experiences, and opportunities for sustainable management of Prosopis juliflora. Your views are important and will help inform policy and practical recommendations. Participation is voluntary, and responses will be kept confidential and used solely for research purposes.

Section 1: Respondent Information

1.1 Name of Respondent: _____

1.2 Gender: ☐ Male ☐ Female

1.3 Position/Title: _____

1.4 Organization/Institution: _____

1.5 Type of Stakeholder: ☐ Government ☐ Private Sector ☐ NGO ☐ CBO ☐ Academia ☐ Community Member

1.6 County: ☐ Garissa ☐ Tana River ☐ Turkana

Section 2: Ecological, Economic, and Social Dimensions

2.1 What are the main ecological impacts of Prosopis juliflora in your area?

2.2 How has Prosopis affected land use, water resources, or biodiversity?

2.3 What are the key economic uses of Prosopis in your community or sector?

2.4 What social challenges or benefits have emerged from Prosopis proliferation?

2.5 Who are the main actors involved in Prosopis harvesting and processing?

Section 3: Policy and Legal Frameworks

3.1 Are there any national or county policies/laws regulating Prosopis management?

3.2 How effective are these policies in guiding control or utilization of Prosopis?

3.3 Are there inconsistencies, overlaps, or gaps in the legal framework?

3.4 Are standards or guidelines available for Prosopis-based products?

Section 4: Institutional Roles and Coordination

4.1 Which institutions are responsible for Prosopis management at the national and county level?

4.2 Are their mandates clear and well-coordinated?

4.3 Are there any coordination mechanisms or platforms across sectors?

4.4 What role do traditional or community institutions play?

Section 5: Stakeholder Experience and Implementation Challenges

5.1 What challenges do you face in enforcing or complying with policies on Prosopis?

5.2 What support mechanisms (technical, financial, policy) are needed?

5.3 How can local livelihoods be better integrated into Prosopis management policies?

Section 6: Local Practices and Control Measures

6.1 What control measures are currently being implemented (manual, mechanical, utilization-based)?

6.2 How effective and sustainable are these approaches?

6.3 Are there opportunities for upscaling or replicating local innovations?

6.4 What barriers exist to wider adoption (technical, financial, social)?

Section 7: Comparative Insights and Recommendations

7.1 Are you aware of successful models from other countries or regions?

7.2 What policy changes or interventions would you recommend for improving Prosopis management?

7.3 What enabling conditions are needed to attract investment or private sector involvement?


GROUND PROSOPIS FLOUR
(ANIMAL FEED)


PROSOPIS PODS