

TITLE: IMPACTS OF LARGE SCALE INFRASTRUCTURE DEVELOPMENTS ON COASTAL BIODIVERSITY: A CASE OF LAPSSET INFRASTRUCTURE PROJECT IN LAMU: AUGUST 2022

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INTRODUCTION

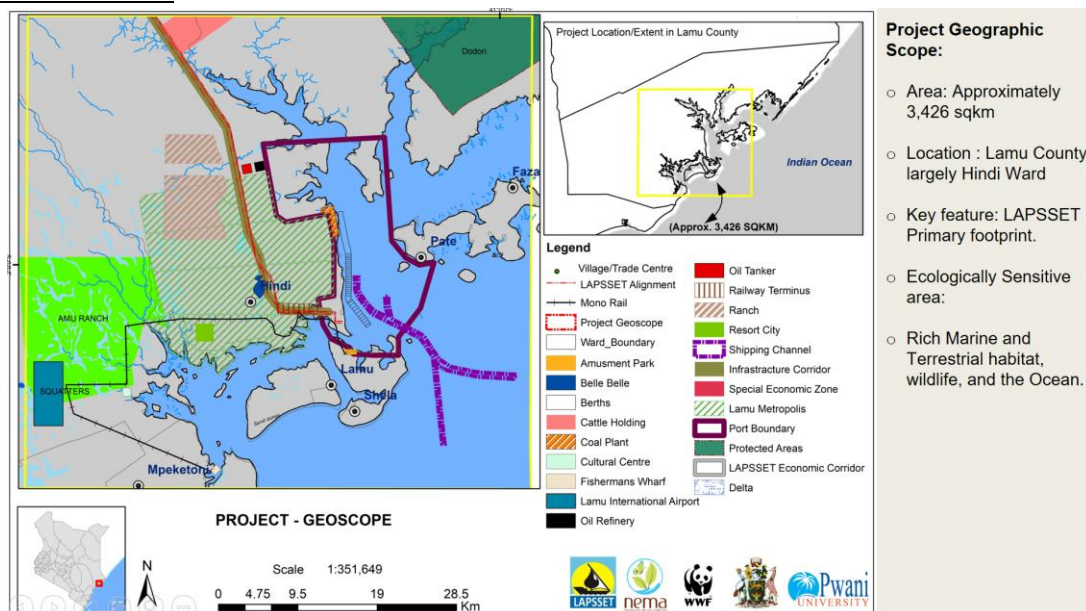
World Wide Fund for Nature - Kenya (WWF-Kenya), jointly with National Environment Management Authority (NEMA) and LAPSSET Corridor Development Authority (LCDA) undertook a research on the impacts of large scale infrastructure developments on coastal biodiversity, a case study of the LAPSSET Project in Lamu.

The research was based on robust scientific methodologies to inform policies on sustainable investments. The research engaged two graduate students to undertake their graduate research.

1. Aim of the research.

- *General objective:* By the end of the project, the research findings will contribute towards safeguarding and maintaining the integrity of critical coastal ecosystems (marine and terrestrial) within the LAPSSET Corridor Program area for people, economy and nature.
- *Specific objective 1:* By 2022, there is data and information available to inform planning and decision-making for better environmental governance and sustainable development in the LAPSSET Program area.
- *Specific objective 2:* By 2022, key policy and institutional frameworks are influenced to create an enabling environment for sustainable management of natural resources.

PROJECT SCOPE



METHOD

We approached this study by conducting a number of sub-topical researches largely undertaken by students undertaking their master research and the project teams. The following subtopics were undertaken in the implementation of this research project:

- (i) **Land use/land tenure dynamics & critical ecologically significant areas:** The study entails use of satellite imagery and data from the lands registry in Lamu to determine how land use change and land tenure patterns have happened before and after LAPSSET project's inception. The imagery has also been used to carry out natural capital assessment and mapping of critical ecologically significant areas. A further trend analysis is being done to ascertain the lost natural capital as a result of the construction of the LAPSSET components (mostly the port & associated infrastructure as well as the road network) in Lamu.
- (ii) **Participatory Communication of the LAPSSET work to the host communities:** This study has been undertaken by Alex Kubasu and it incorporated a case study research approach. This method was preferred because it was envisaged as the best suited in capturing community perceptions and understanding of the role of participatory communication in the context of large-scale infrastructure projects. The results have been finalized and published.
- (iii) **Impact of LAPSSET Infrastructure on Fisheries:** This study has been undertaken by Kombe Chanzera with supervision from Prof. Bernard Fulanda and it incorporated participatory field study among members of Beach Management Units and Key Informants. The data has been processed and provided the findings on how LAPSSET development has impacted fisheries in terms of shifting of landing sites, catch statistics in terms of fish species and landing levels (kilograms).
- (iv) **Climate Resilient Infrastructure:** A desktop review is being undertaken to understand the historical and projected climate risks as well as validate this with stakeholders in Lamu. A tool to study the resilience of the LAPSSET infrastructure to climate change/variability has been designed and will be used to conduct this study. In addition, ground truthing and GIS maps will be developed to establish a vulnerability index for the area as a result of the LAPSSET infrastructure.
- (v) **Livelihoods:** A study has been conducted to establish the extent of the impacts of the LAPSSET project on the livelihoods of the host communities. This study established the various types of livelihoods as well as ecosystems and how LAPSSET has impacted these both positively and negatively.
- (vi) **Compliance to Environmental and Social safeguards as per the EMP:** A consultancy to assess the status and extent of compliance by LAPSSET with the measures prescribed in the EMP and recommend areas for improvement to enhance compliance has been undertaken. The results will be disseminated to the various stakeholders for validation and adoption. The results shall also

be communicated to the various government agencies/mandated institutions for potential implementation through policy change and mitigation of negative impacts.

(vii) Population change, human settlement changes and social/physical infrastructure pressures attributed to LAPSSET development: An analysis of the changes in demographics around the LAPSSET infrastructure geoscope, ecosystem conversion, social and physical infrastructure pressure and the overall growth patterns of the coastal cities of Lamu and Hindi will be assessed with a view to proposing measures to ensure that water, sanitation, housing and other services are provided adequately.

(viii) Institutional Capacity Assessment: An assessment of the resident capacity of the various LAPSSET Governance Institutions to determine their gaps and needs and to make recommendations thereof.

FINDINGS/RESULTS

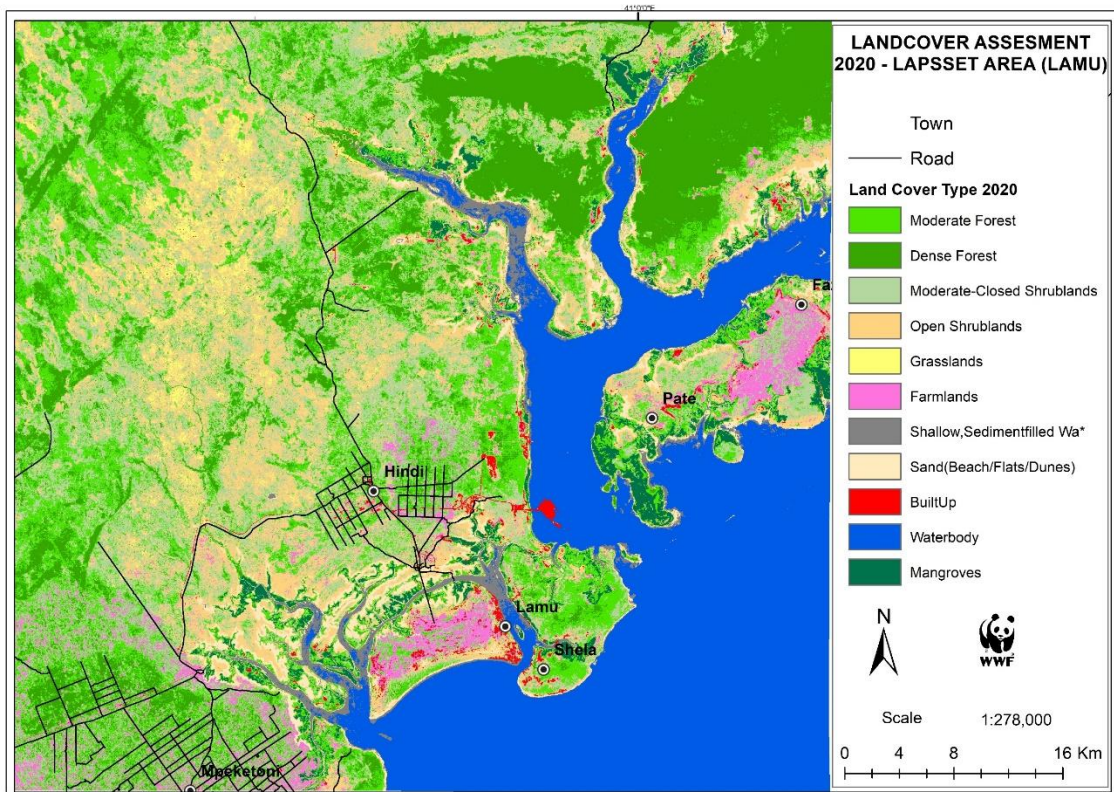
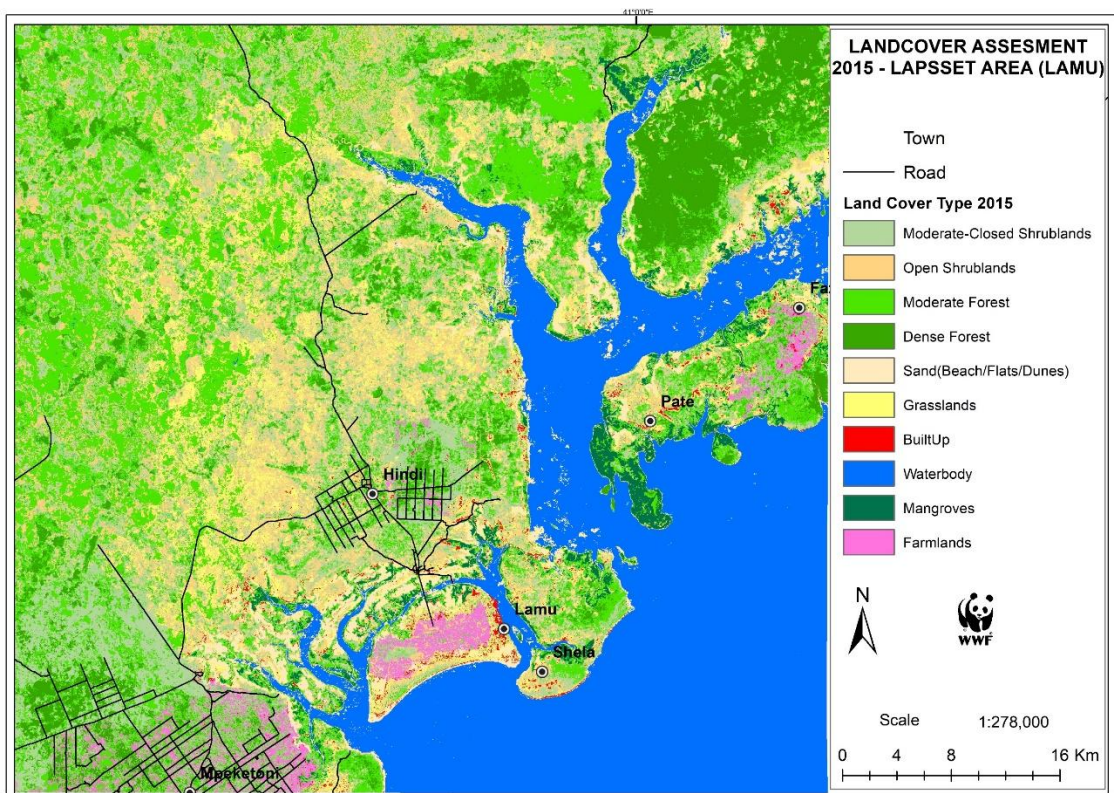
LAND USE/LAND TENURE DYNAMICS & CRITICAL ECOLOGICALLY SIGNIFICANT AREAS (CESAS)

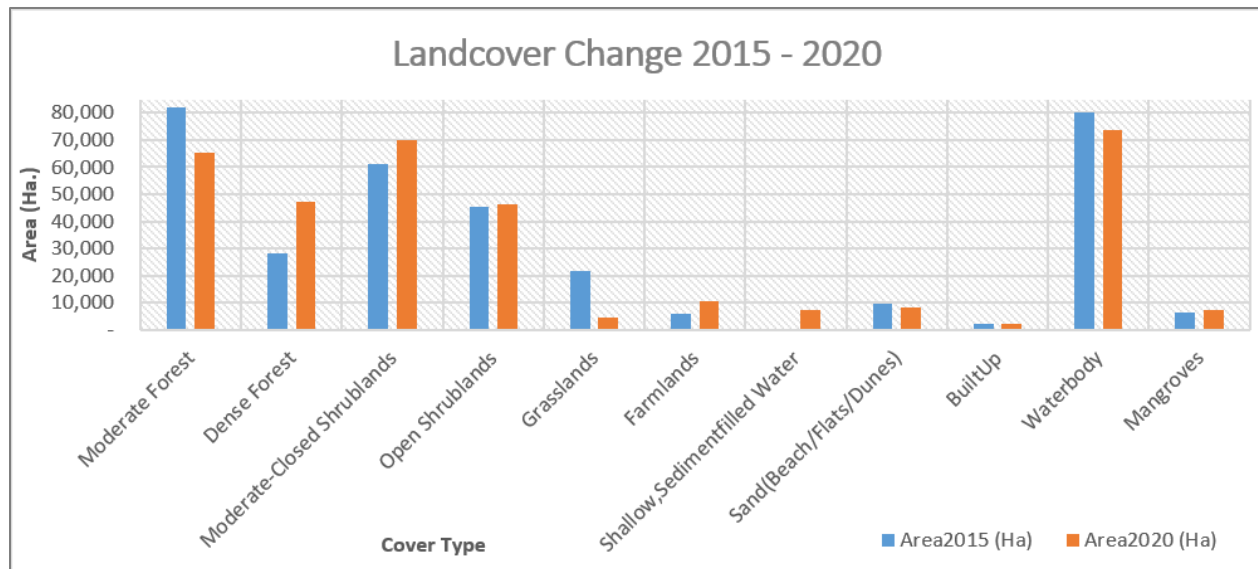
High resolution satellite imagery acquired and processing and analysis being undertaken by the GIS experts. Handheld GPS procured to assist in ground-truthing the result of the satellite imagery analysis. Ground-truthing done and validation of the segmented/classified imagery being done.

The following are the findings under this study:

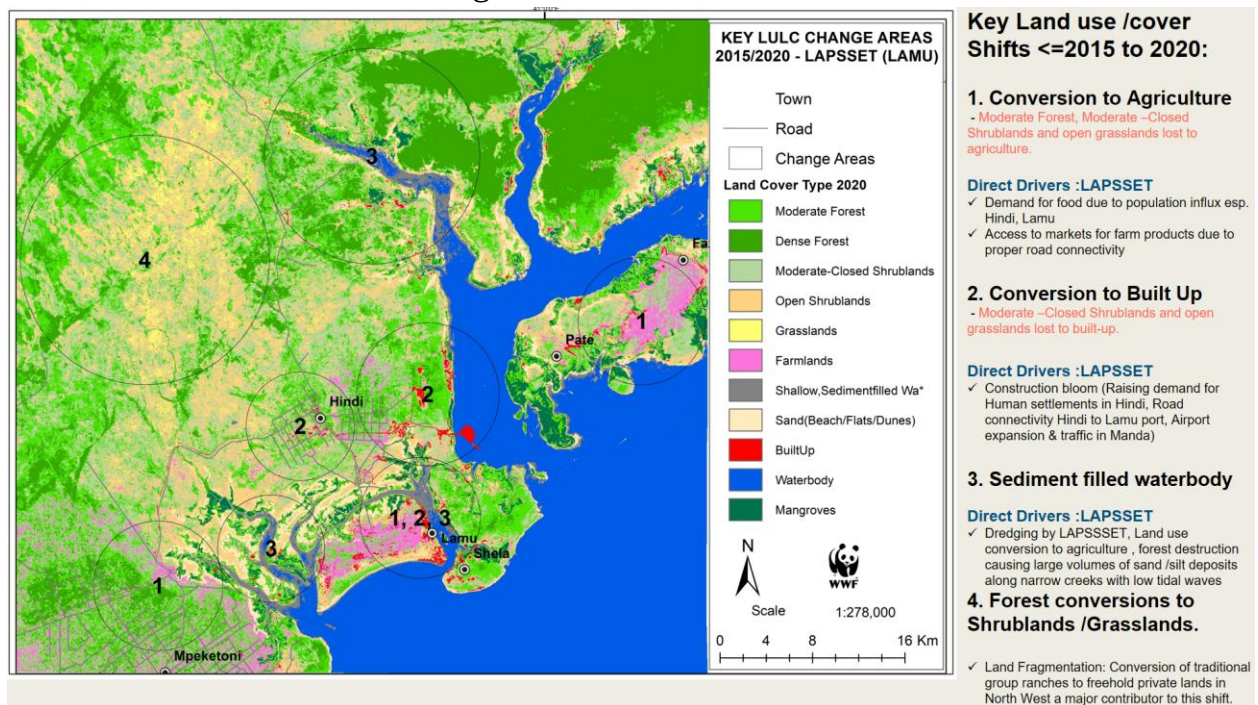
Most changes in natural capital registered in the area directly correlate with LAPSSET activities key among them being:

- ✓ Sedimentation on ocean waters around creeks.
- ✓ Conversion of grasslands, moderate forests and open shrubs to built-up and farmlands





The drivers to the land use changes are as summarized below:

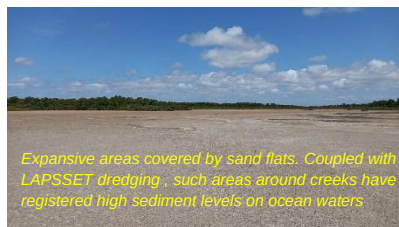


1. Land conversion to agriculture: there was a significant increase in agricultural land within the study area from approx. 6,000ha in 2015 to around 10,700ha in 2020. This change was noticeable albeit at different scales within the southern zones of the study area from Faza to Mpeketoni through Hindi villages where LAPSSET's primary footprint sits. Comparatively Faza and Mpeketoni regions registered higher agricultural activities over this period, moderate forest, moderate shrublands and open grasslands were the most impacted by this conversion.

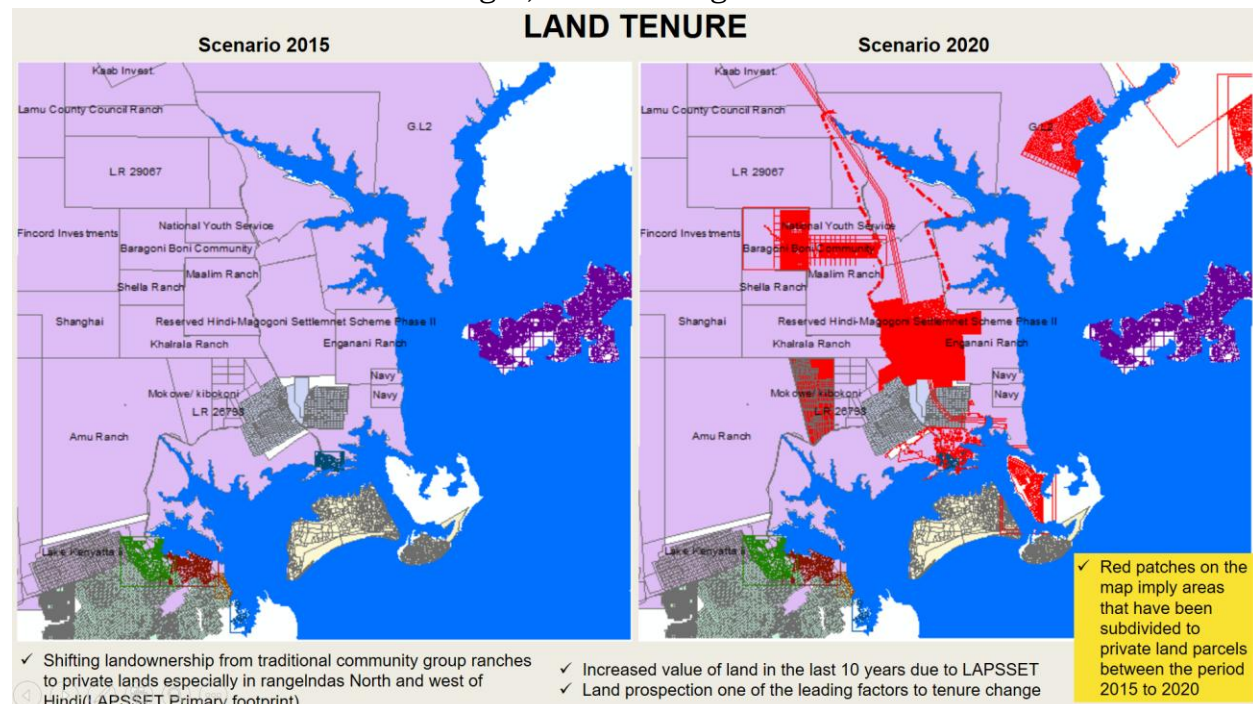
2. Land conversion to built up: Major land use/cover shifts to built up occurred in the central parts of the study area largely impacting Hindi town towards the sea where the Lamu Port is situated. Key developments in this zone include major road constructions connecting Hindi town as a growth centre and the LAPSSET primary components like the port and Manda airport; other changes relate to the incremental construction of human settlements and transportation infrastructure including Manda airport in Hindi and Lamu towns respectively. These changes directly correlate with LAPSSET developments which have attracted population influx around the LAPSSET project areas for a variety of direct and indirect economic and social development interests.

3. Sediment filled/turbid waterbody: While comparing the 2020 and 2015 land use/cover maps, it became apparent that around 7,000ha covering the central lying creeks surrounding the Lamu Island contain sand/silt deposits resulting in higher turbidity and subsequent shallow depths of the fringe waters. While this has been largely attributed to the large-scale dredging commissioned by LAPSSET, other land use conversions in the catchment areas like agriculture might imply high siltation rates. These changes have direct implications on livelihoods such as fishing where fishermen have been forced to migrate to other fishing grounds.

4. Forest conversion to shrublands and grasslands: This change is commonly observed in the North western parts of the study area. Majority of these changes have been influenced by the increased land demand in the areas resulting in land tenure conversions in the region where group ranches have been subdivided to freehold private lands resulting in land clearance paving way to human settlements.



In terms of the land tenure changes, the following shifts have been noted:



PARTICIPATORY COMMUNICATION OF THE LAPSSET WORK TO THE HOST COMMUNITIES

Preliminary findings of the research conducted by Alex Kubasu indicate that a majority of the community in Hindi ward were not adequately involved in the design, planning and implementation of the LAPSSET Project neither were they communicated to adequately the impacts of the project on their livelihoods. This partly explains the legal and street protests that characterized the project during its initial stages.

Below is a summary of the findings:

1. General Objective

The study sought to interrogate effectiveness of participatory communication in the context of large-scale infrastructure projects focusing on the Lamu Port Project in Hindi Ward, Lamu-West Sub-County.

2. Specific Research Objectives

The following were the specific study objectives:

- To investigate deployment of participatory communication in the Lamu Port project planning
- To determine the role of participatory communication in implementation of the Lamu Port project
- To establish the understanding of participatory communication by indigenous people in Lamu Port Project
- To interrogate the definition of free, prior and informed consent by the local Hindi Ward residents in the context of participatory communication in the Lamu Port project

3. Study Findings

Deployment of Participatory Communication

- There was little involvement of the local community in participatory communications needs assessment given that 36% responded in the affirmative to having been involved while 64% indicated that they were not engaged
- 78% of the respondents indicated that they were not involved in the communication strategy design compared to 22% who responded in the affirmative
- Less than one fifth of the respondents were involved in implementation of communication activities in the Lamu Port project
- 26% of the respondents were involved in monitoring and evaluating the Lamu Port project communication strategy while a majority, 74% were not involved
- 29% of respondents felt the community did not understand issues confronting them nor get feedback regarding problem analysis and actions taken by the project. 25% of the respondents felt that the community is used symbolically to show the real appearance of participation
- Generally, 84% of the respondents felt that the local community did not understand the Lamu Port project and therefore did not participate effectively in its design and implementation. This is in line with the finding that only 14% of the respondents felt the community was informed and consulted and therefore understood the project design and operation. A paltry 2% indicated that the community contributed adequately and that they bore a high responsibility in the project.

Factors Influencing Local Community's Participation in the Lamu Port Project

- Lack of transparency, attitudes and perceptions of the local community toward government led public participation had the greatest influence on the respondents followed by government priorities and timelines, and political interference
- Clashing schedules was also highlighted as a key factor that hampered participation as noted by one of the key informant from the local community for the largely Muslim community in the region:
- While the study findings point to public barazas being the most preferred communication platform, one key informant representing Kenya Ports Authority reckoned the inherent challenges that made the Lamu Port project owners not to fully deploy it despite its popularity and efficacy.
- Respondents attributed more influence to political leaders, the national and local governments and little or no influence to local community-based groups. This is in line with the earlier finding that the local community's opinion is not really a part of this project. In addition, it corroborates an earlier finding that local communities defer their decision making to their political leaders.

Free Prior and Informed Consent

- 71% of the respondents did not consent to the Lamu Port project before it commenced
- 80% of the respondents did not know of the magnitude of the project
- 77% of the respondents did not have access to primary reports on the economic, environmental and cultural impact of the project.

A former planner at the Lamu County who was one of the key informants stated:

"In order to foster a participatory communication process in a large scale

infrastructure project, the owners ought to consider the prevailing political dynamics including the influence local leaders wage, dedicate adequate resources to paint a proper picture of the expected economic benefits and losses to all affected citizens, availability of all relevant data and information in an easily accessible format and ultimately promote civic education supported by the various government agencies and civil society organizations at the local, national, regional and even international level depending on the magnitude of the project.”

- 78% of the respondents did not consent to the project, while 22% did consent to the project. This finding was corroborated by Kenya Ports Authority community liaison officer who stated as follows:

A government of Kenya cabinet minister conceded that the government erred by not involving the community members adequately.

Conclusion

The Lamu Port project lacked a properly designed participatory communication process and plan. This implies that what the project owners deployed to allow for the local participation in the project lacked transparency and muffled the voice of the local community and hence did not gain from their participation. The project owners were equally agile enough to quickly pick the important lessons the first phase of the project which was the Lamu Port and tried to do better in the subsequent phases.

Recommendations

- Large-scale infrastructure project owners must prioritize a robust participatory communication process during the design and implementation stages; not as a fringe benefit that they grant as and when they wish but as a human being's birthright that is undeniable and unpreventable
- Participatory communication is a key planning tool for decision making and implementation of large-scale infrastructure projects
- For adequate and full participation, women should be separated from their male counterparts given the gender hindrance in participation in certain cultures
- Project implementers should paint a clear picture on the vision of the large infrastructure projects for all to see and buy into, especially the host community. The architectural models ought not to be kept in a few privileged members/representative's offices but distributed in churches, mosques, jetties and other relevant places where community members congregate including during public barazas
- Information on projects should be provided in local languages for ease of understanding
- Public Barazas being the most preferred model of communication should be encouraged as well as easily accessible advertisements and mass media
- Projects owners should adequately and transparently describe the key benefits of large scale infrastructure projects to host communities in order to obtain free prior and informed consent
- Large infrastructure projects ought to respect cultural values as well as eco-sensitive regions in order to gain acceptance and avert opposition
- Benchmarking trips should be organized not only for politicians as it is the norm but also for local leaders and community members in order for them to understand the grand vision
- Citizens have an obligation to participate and not defer it to their leaders which often occurs

IMPACT OF LAPSSET INFRASTRUCTURE ON FISHERIES

This study has been undertaken by Kombe Chanzera and it incorporated participatory field study among members of Beach Management Units (BMUs) and Key Informants. The data is being processed and will provide findings on how LAPSSET development has impacted fisheries in terms of shifting of landing sites, catch statistics in terms of fish species and landing levels (kilograms).

A summary of the findings are given below:

1. Background

- ✓ Coastal communities have highly depended on oceans and fisheries for both food, livelihoods and aesthetic services for centuries, and the Lamu archipelago is no exception!
- ✓ However, the launch of the LAPSSET project (2012) within the archipelago, straddling the Manda has presented a big challenge for the fisheries livelihoods in the area.
- ✓ The overall project comprises resource cities, internal airports, a line, an oil pipeline, highways, an oil refinery and the Lamu port.
- ✓ Manda, where the Lamu port is situated has been crucial fishing ground for artisanal fisheries as well as a crucial fish breeding ground supported by rich mangrove fridges along most of the archipelago creeks and bay.
- ✓ Manda has calm waters and a rich biodiversity hence developments with new use of the bay presents a huge a threat to biodiversity, fisheries and livelihoods in the Lamu archipelago.



2. Ripple effects of LAPSSET Impacts on fisheries

- ❑ Mainly driven by direct impacts on fishing grounds, fish landing sites, related biodiversity and ecosystems
- ❑ Major drivers: noise related to dredge, sediment perturbations, little or no use of silt curtains to contain sediments etc., increased turbidity, sediment deposition within critical habitats (seagrass beds, reefs, creeks) which are breeding, feeding and nursery grounds (see sediment flood mapping)
- ❑ Ripple effects:
 - ✓ Displacement from fishing grounds
 - ✓ Displacement from landings sites and boat anchor sites (citing security and safety issues)
 - ✓ Resultant fisher migrations due to declining catches, lost fishing grounds and fish landing sites
 - ✓ Ripple effect of general fisher migrations (mass tragedies where fishers move, due to general movement of impacts fishers)
 - ✓ Most impacted: fishers targeting reef species (e.g. *Lethrinus*, thrives in clear waters), seagrass bed species (e.g. *Siganidae*) and creek prawn fisheries (sediment floods impacts)

3. LAPSSET (Lamu Port) as driver of fisher patterns and migrations

- ❑ Archipelago fisheries are traditionally non-migrant fisheries (>40%)
- ❑ ≈31.3% of the fishers are migrate seasonally to richer fishing grounds; northwards during SEM and southern during NEMS.
- ❑ However, LAPSSET Project andas changed the dynamics, additional Lapsset PAP driven migrations accounting ≈ 27.8%.
- ❑ Major impacts on Matondoni with 7.7%; Amu (6.6%), Mtangawanda (4.3%), Mokowe, Kipungani and Mngini with 2.3% each, Shella (1.2% and Manda and Siyu at 0.8
- ❑ Seasonality accounts for 31.3% of the fishing vessel migrations in and out of the LAPPSET area with FRP boats (fiberglass) account for ~13% followed by Dau (6.6%), Mashua (6.18), and Jahazi at 2.7%). Hori, Mtori and Mtumbwi vessel types accounted for <2% of the migrations.
- ❑ The entry of the Lamu Port has seen the vessel migrations increase by 27.8% out of the project area, with FRP boats at (10.4%), Dau and Mashua (6.6%) while Hori, Mtumbwi accounted for <2% owing to their limited capacity to migrated, suggesting these as the most impacted fishers

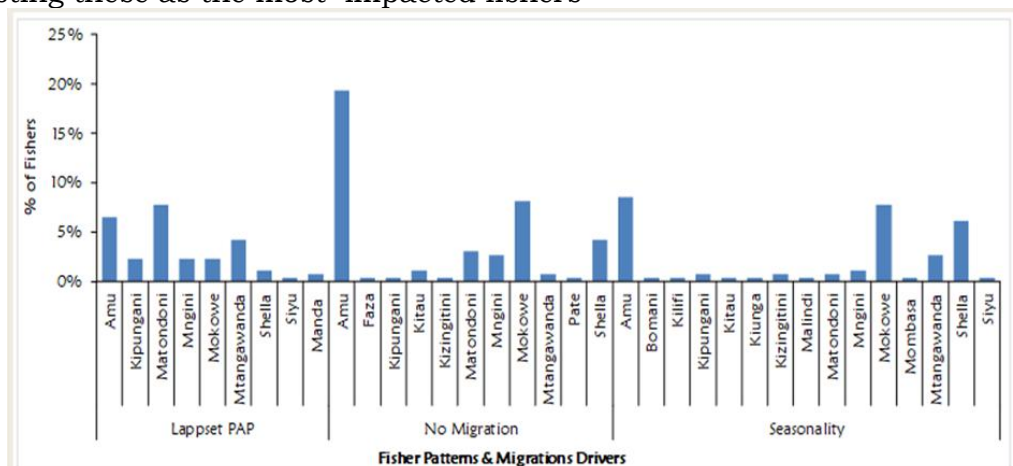


Figure 1. LAPPSET driven Fisher Migrations

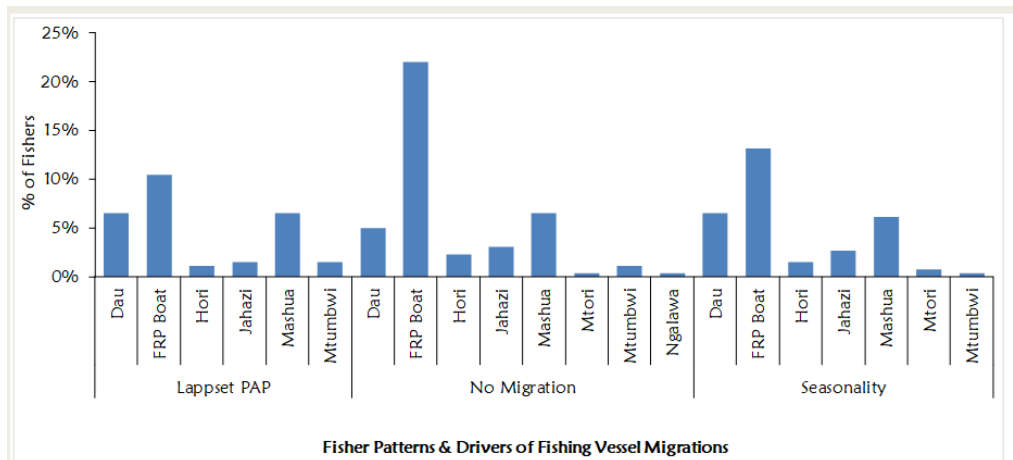


Figure 2. LAPPSET driven Vessel migrations

4. LAPSSET (Lamu Port) Impacts by Marginal Groups

- ❑ The most affected fishers were those with lower levels of education (primary & madrasa) at 15.8% and 8.1% likely due to limited opportunities for alternative livelihoods.
- ❑ Those with secondary level of education accounted for 3.1% of the survey respondents impacted by forced migrations

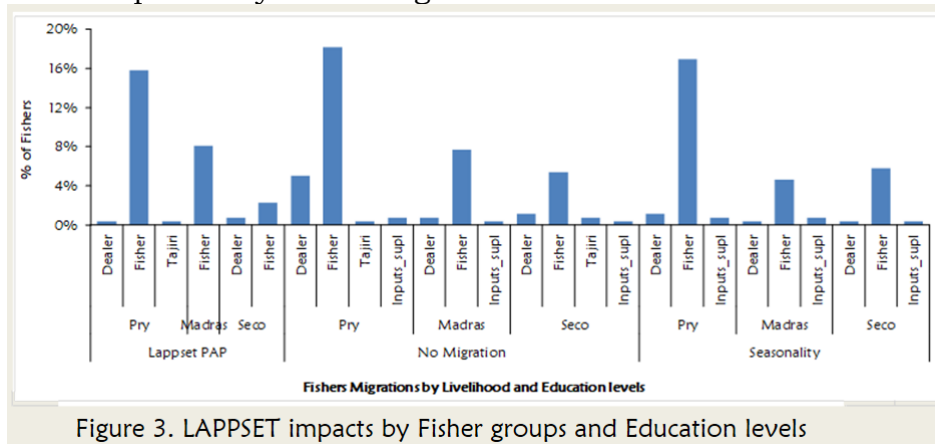


Figure 3. LAPSSET impacts by Fisher groups and Education levels

5. LAPSSET (Lamu Port) Impacts by landing sites

- ❑ Lapsset PAPs migrations accounted for 8.9% of the movements
- ❑ Most affected landing sites were Matondoni (3.19%) followed by Amu (1.93%), Kipungani (1.54%), Mtangawanda (1.16%), Shella (0.77%) and Mngini at 0.39% (Figure 5).
- ❑ The migrations were mainly tied to change of fishing grounds away from the impacted fisheries within these areas.

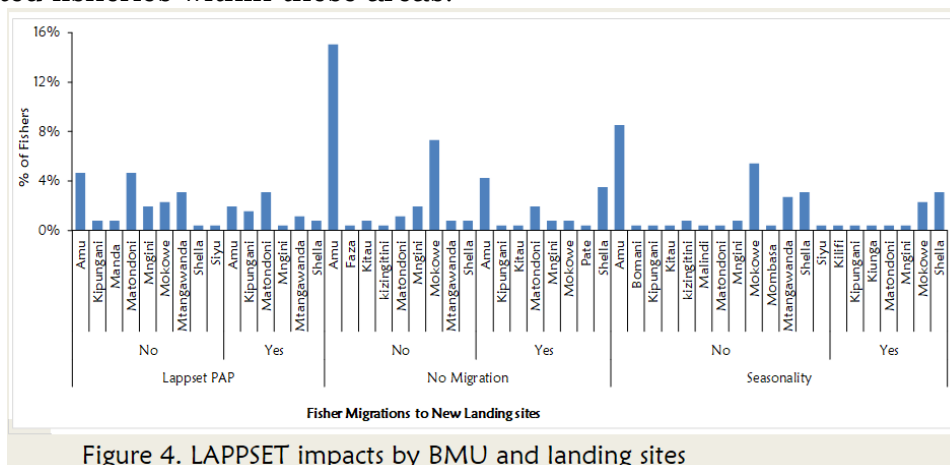


Figure 4. LAPSSET impacts by BMU and landing sites

6. LAPSSET (Lamu Port) Impacts Fish Landings

- ❑ LAPSSET fishery impacts were mainly linked to impacts on critical ecosystems such as mangroves, seagrass beds and reefs due to clearing as well as sediment deposition
- ❑ Landings within the BMUs bordering the Lamu Port declined by 62.6% (from 57.4 Mt/day to 21.5Mt/day before and during the construction. However, there was a slight recovery in overall landings to 23.9Mt/day after construction, putting the LAPSSET impacts to ~58.4% decline in catches

- ❑ Amu was the most affected site with landings declining from ~27.8Mt to a meagre 4.7mt before and after constructions while Mngini, Mtangawanda recorded higher landings after constructions likely attributed to fisher migrations

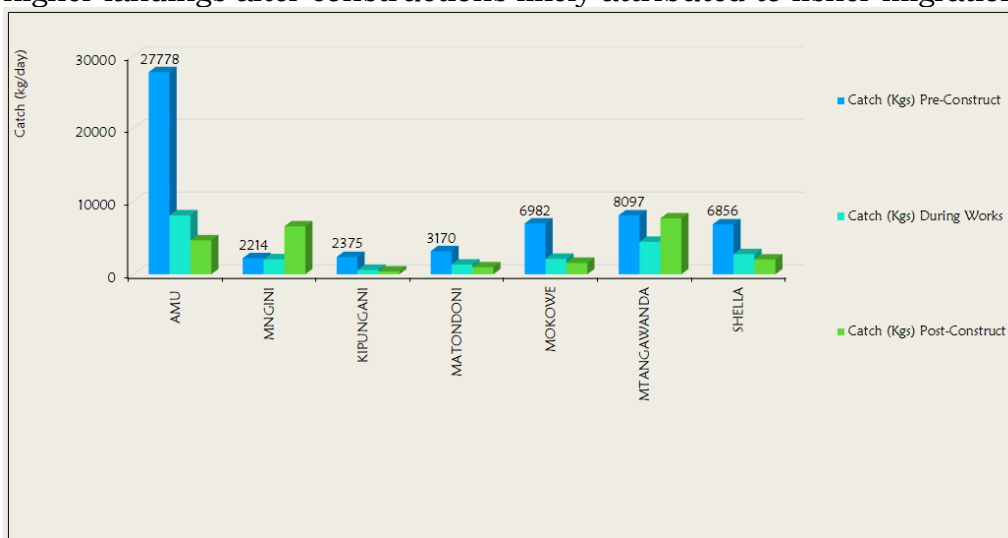


Figure 5. LAPPSET impacts on fish landings within the projected affected sites

CLIMATE RESILIENT INFRASTRUCTURE

Tools to undertake climate change vulnerability assessment (CCVA) were developed and deployed at the field.

1.0 Introduction.

Climate change is a major challenge that humanity has to deal with this century (Jafari, 2013c). Climate change, along with habitat destruction and pollution, is one of the important stressors that can contribute to species extinction. The Inter-Governmental Panel on Climate Change (IPCC) estimates that 20-30% of the plant and animal species evaluated so far in climate change studies are at risk of extinction. The IPCC report (2022) adds that climate change is already causing more frequent and more severe storms, floods, droughts wildfires and other extreme weather events. The report says that in the next decade climate change will drive 32-132 million more people into extreme poverty, leads to additional 48,000 deaths in children under 15 years old by 2030, global warming will jeopardize food security as well as increase incidents of heat related mortality, heart diseases and mental health challenges. Species and ecosystems will face dramatic changes and that there will be large scale tree deaths. The reports find that every tenth of a degree of additional warming will escalate threat to people, species and ecosystems. For instance, with just 1.5 degree Celsius many glaciers around the world will either disappear completely or loss most of their Mass. The report projects that an additional 350 million people will experience water scarcity by 2030. The report adds that in 2022 between 3.3-3.6 billion people lives in countries highly vulnerable to climate impacts. These countries include among others; South Asia, Central and South America and much of Sub-Saharan Africa.

Anthropogenic (human) activities and their related emissions is a carbon-footprint of human beings. In other words, development (infrastructural projects like Lamu Port

South Sudan-Ethiopian Corridor (LAPSSET), do not occur naturally but are made to occur by human beings. These development activities by human beings generate emissions which contribute to global warming potentially influencing climate change vulnerability and viability. Researches on climate change discourse are rapidly increasing in recent years because of increased climatic risks, vulnerabilities and impacts climate change has in all sectors at all levels of human and environmental survival (Lwasa, 2014).

Changes in global climate from both human and natural causes are reflected in indicators for atmospheric chemistry, weather, biological, physical and economic conditions (Cooper et al., 2002, p. 5-6). Humans bear the greatest responsibility for climate change fundamentally due to greenhouse (GHGs) gas emissions resulting from agricultural activities (Loboguerrero et al., 2019, p. 1), transport related activities (Marsden & Rye, 2010, p. 669), manufacturing activities (Worrell et al., 2009, p.111-112) and energy generation (Wuebbles & Jain, 2001, p. 103). Climate change therefore is a consequence of anthropogenic greenhouse gas emissions related to resource consumption and production processes (Halsnæs & Verhagen, 2007, p. 668).

Whereas human-related emissions from fossil fuel use have been estimated for many decades, future carbon oxide levels in the atmosphere will depend on among others the transfer processes between the major carbon reservoirs, such as the oceans with marine biota and sediments and the terrestrial ecosystems (Wuebbles & Jain, 2001, p.105). The usage of heavy machineries like evacuators which use fossil fuel, the destruction of biodiversity and the ecosystem to create sites and source of raw materials for LAPSSET's projects like the LAMU port and axillary roads, and the dredging of the sea all had direct impact on the factors accused of accelerating climate change. Emissions from the heavy machineries directly impacted on greenhouse emission. The destroyed vegetation surfaces led to non-sequestration of CO₂ because trees are not there to feed on this gas (Photosynthesis). As a consequence, there is concentration of CO₂ blanket which in turns increases temperature. Temperature increase on land surface affects and distort the wind cycles and rain pattern. Indeed, it is usually stated that when the land boils, it rains in the ocean, and when the ocean boils it rains in the land. Distorted rain patterns have consequences on rainfall and thus, directly linked to draught.

While LAPSSET's activities by default leads to both positive and negative impact on the environment, the Kenyan 2010 constitution protects climate change explicitly and implicitly. For instance, Article 42 of the Kenya constitution states that every person has the right to a clean and healthy environment. The constitution also guarantees individuals rights to be free from environmental hazards. Specifically, (the government is mandated by Law to eliminate processes and activities that are likely to endanger the environment;

Similarly, Kenya is a signatory to various international conventions linked to climate change; the Kyoto Protocol for instance, it operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets. The Convention lists the following as the sources of pollution related activities: energy/industrial, manufacturing, transport (vehicles, ships, trains and airplanes etc) agriculture and solid waste) the protocol advocates for countries to adopt policies and measures on mitigation of emissions (Kyoto

2005). Kenya is also a signatory to Cites Protocol (1963) which protects endangered flora and fauna by regulating levels of exploitation of some animal and plant species in a manner capable of depleting their population and thus making them becoming extinct. The protocol safeguards flora and fauna for future generation. In Kenya, all All large-scale infrastructure development projects are required by law to conduct an Environmental Impact Assessment (EIA) as prescribed by the Environmental Management and Coordination Act (EMCA) 1999.

The Kenyan Lamu Port is part of the seven key infrastructural projects that form what is generally called; the Lamu Port - South Sudan - Ethiopia Transport Corridor Project (LAPSSET) estimated to cost a total of 2.5 trillion Kenya shillings. This mega project consists of seven key infrastructure projects. It incorporates a new 32 berths port at Lamu Port Project and Interregional Highways. The other elements of the project are the crude oil pipeline, an interregional standard gauge railway line, international airports, three Resort Cities and the construction of a multipurpose High Grand Falls Dam along the Tana River. (GoK, 2017). The project is 'Mega' by any standards! Consequently, the impacts of LAPSSET activities will vibrates in many sectors including climate change. It will bring new landscapes as it will ruin others in equal measure. The LAPSSET project is part of the Government of Kenya Vision 2030 long-term development blueprint. The vision is intended to transformed Kenya into a newly industrializing middle-income country.

1.2Problem statement

Today the wheel of climate change is spinning faster than ever before and in its wake reshaping the world in big ways. The risks associated with climate change are grave and adaptation options to reduce them urgently needed. Like the IPCC report points out, climate change is a threat to human survival and a threat to life sustaining ecosystems. That even though evidence of human ability to adapt to climatic change are there, much more adoption mechanisms are needed and much more knowledge required if effective climate change mitigation measures are to be adopted by majority of people.

In any case, human activities are now unequivocally implicated in contributing to global climate change, therefore, there is an urgent need for strategic action to be considered both from individuals and the private/public sectors involved in any large infrastructural projects to prevent or mitigate harmful corollaries from climate change to individuals and society at large. It need to be known how large scale infrastructural projects like LAPSSET is impacting on critical ecosystem in its loci of operation.

Objectives

- 1 To assess the impact of LAPSSET infrastructural projects on climate change
- 2 To identify drivers of climate change at LAPSSET project area
- 3 To assess how LAPSSET activities impact on critical ecologically significant Areas (CESA)
- 4 To determine possible adoption options by people affected by climate changes in LAPSSET areas.

Literature review

Researches on climate change discourse are rapidly increasing in recent years because of increased climatic risks, vulnerabilities and impacts climate change has in all sectors at all levels of human and environmental survival (Lwasa, 2014).

Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, but since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels (like coal, oil and gas), which produces heat-trapping gases. Climate change is a major challenge that humanity has to deal with this century (Jafari, 2013c). Climate change, along with habitat destruction and pollution, is one of the important stressors that can contribute to species extinction. The Inter-governmental Panel on Climate Change (IPCC) estimates that 20-30% of the plant and animal species evaluated so far in climate change studies are at risk of extinction if temperatures reach the levels projected to occur by the end of this century. Global rates of species extinctions are likely to approach or exceed the upper limit of observed natural rates of extinction in the fossil record. Examples of species that are particularly climate sensitive and could be at risk of significant losses include animals that are adapted to mountain environments, such as Pika as well as animals that are dependent on sea ice habitats, such as ringed seals and Polar Bears; and cold-water fish, such as salmon in the Pacific Northwest. The IPCC (2022) adds that climate change is already causing more frequent and more severe storms, floods, droughts wildfires and other extreme weather events. the report says that in the next decade climate change will drive 32-132 million more people into extreme poverty, leads to additional 48,000 deaths in children under 15 years old, global warming will jeopardize food security as well as increase incidents of heat related mortality, heart diseases and mental health challenges. Species and ecosystems will face dramatic changes and that there will be large scale tree deaths. The reports find that every tenth of a degree of additional warming will escalate threat to people, species and ecosystems. For instance, with just 1.5 degree Celsius many glaciers around the world will either disappear completely or loss most of their Mass. The report projects that an additional 350 million people will experience water scarcity by 2030. And that as much as 14% of terrestrial species will face high risk of extinction. The report adds that in 2022 between 3.3 -3.6 billion people lives in countries highly vulnerable to climate impacts. These countries include; South Asia, Central and South America and much of Sub-Saharan Africa. Climate change can alter where species live, how they interact, and the timing of biological events, which could fundamentally transform current ecosystems and food webs. Climate change can overwhelm the capacity of ecosystems to mitigate extreme events and disturbance, such as wildfires, floods, and drought (United States Environmental Protection Agency, 2007)

For many species, the climate where they live or spend part of the year influences key stages of their annual life cycle, such as migration, blooming, and reproduction. As winters have become shorter and milder, the timing of these events has changed. For instance, in study by Environmental Protection Agency, 2007, reported that, earlier springs have led to earlier nesting for 28 migratory bird species on the East Coast of the United States. Northeastern birds that winter in the southern United States are returning north in the spring 13 days earlier than they did in a century ago and in a California study, 16 out of 23 butterfly species shifted their migration timing and arrived earlier. Because species differ in their ability to adjust, asynchronies can develop, increasing species and ecosystem vulnerability. These asynchronies can include mismatches in the timing of migration, breeding, pest avoidance, and food availability. Growth and survival are reduced when migrants arrive at a location before or after food sources are present.

In both land and aquatic environments, plants and animals have moved to higher elevations at a median rate of 36 feet (0.011 kilometers) per decade, and to higher latitudes at a median rate of 10.5 miles (16.9 kilometers) per decade. While this means

a range expansion for some species, for others it means movement into less hospitable habitat, increased competition, or range reduction, with some species having nowhere to go because they are already at the top of a mountain or at the northern limit of land suitable for their habitat. As rivers and streams warm, warm-water fish are expanding into areas previously inhabited by cold-water species. As waters warm, cold-water fish, including trout and salmon species, are losing their habitat, with projections of 47% habitat loss by 2080. Range shifts disturb the current state of the ecosystem and can limit opportunities for fishing and hunting. The impact of climate change on a particular species can ripple through a food web and affect a wide range of other organisms. Indeed, the only fresh water lake in Lamu County in Kenya, Lake Kenyatta, has dried up. The sudden drying up of the lake has caused massive destructions of marine life and wildlife that it had supported for ages. The drying up of the lake has led to the death of hippos, birds, water snails and other wildlife that depended on the lake for survival.

Ecosystems can serve as natural buffers from extreme events such as wildfires, flooding, and drought. Climate change and human modification may restrict ecosystems' ability to temper the impacts of extreme conditions, and thus may increase vulnerability to damage. Examples include reefs and barrier islands that protect coastal ecosystems from storm surges, wetland ecosystems that absorb floodwaters, and cyclical wildfires that clear excess forest debris and reduce the risk of dangerously large fires.

Similarly, when coral reefs become stressed from increased ocean temperatures, they expel microorganisms that live within their tissues and are essential to their health. This is known as coral bleaching. As ocean temperatures warm and the acidity of the ocean increases, bleaching and coral die-offs are likely to become more frequent. Chronically stressed coral reefs are less likely to recover. Climate change and shifts in ecological conditions could support the spread of pathogens, parasites, and diseases, with potentially serious effects on human health, agriculture, and fisheries

The transportation sector is documented as the largest producer of greenhouse gases in the last 30 years (Aminzadegan et al., 2022, p. 2509). Consequently, the sector is significant in contributing to acceleration of environmental degradation through emissions (Ong et al., 2011; Dzokoto et al., 2022). Agriculture and food-value-chains are significant emitters of greenhouse gases hence very important in fueling climate change (Loboguerrero et al., 2019, p. 2). Agriculture and associated land use change account for 24% of total global emissions (IPCC, 2015; Niles et al., 2018, p. 2) while agricultural food systems contribute about 35% of GHGs global emissions (Foley et al., 2011, P.339).

Methodology

Diverse methodologies were deployed in identifying key issues relating to climate change and environment at the LAPSSET project area. Both qualitative and quantitative frameworks were applied to assess and analyze the climatic risks, vulnerabilities, impacts and also adaptations based on specific research objects. This approach was intended to fuse top-down and bottom up approaches with scientific data, information and local knowledge and practices for detail assessment of the climate change related activities at LAPSSET area. Thus, for holistic understanding of the risks associated with climate change and holistic understanding of adoption processes both scientific knowledge of changing climate as well as the perception, knowledge and practices of local people is important.

The Methods

- (a) Desktop Reviews and Climate Screening of the project areas using WWF Climate screening toolkit

To understand the context of climate change in the project area, the WWF screening tool was deployed to a panel of experts drawn from institutions dealing with environment and climate related activities in Lamu County as well as policy makers in both government and non-government institutions. The panel of experts consisted of 11 experts selected on basis of their knowledge on the issues under investigation and study's objectives. They were distributed as indicated in the table 1 below:

Table 1. Panel experts selected for FGD

Item	Institution	No Expert selected
1	Kenya Ports Authority	2
	Kenya Wildlife Service	1
3	National Museum	1
4	LAPSSET Corridor Dev., Authority	2
5	Indian Ocean Water board	1
6	Kenya fisheries	1
7	Lamu County Government	3
Total		11

Source: Author's data.

The same tool was deployed to a sample of 237 respondents living within the LAPSSET ecosystems areas in Lamu county. The respondents were selected based on the length of residence in the area (for at-least 10 years).

The WWF crowd screening tool is a survey instrument that help researchers define their climate change study parameters. It is a detailed questionnaire aimed at gathering data from the community and integrating the same into scientific synthesis. It is designed to help in identifying climate related hazards, effects of the hazards and peoples' adoption responses to the climate change hazard. The tool broadens understanding of climate related hazards as well as help in crafting of solutions that can help people and nature adapt to changing climate. It is community driven approach to climate studies.

Data from both the experts and survey were then analyzed quantitatively and qualitatively and presented in graphs and tables.

To evaluate impact of LAPSSET activities on climate change, GIS based modelling were deployed as explained in (b) below:

- (b) Modelling climate change in project area using IPCC climate vulnerability frame work.

The IPCC Third Assessment Report (TAR) describes vulnerability as. "The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

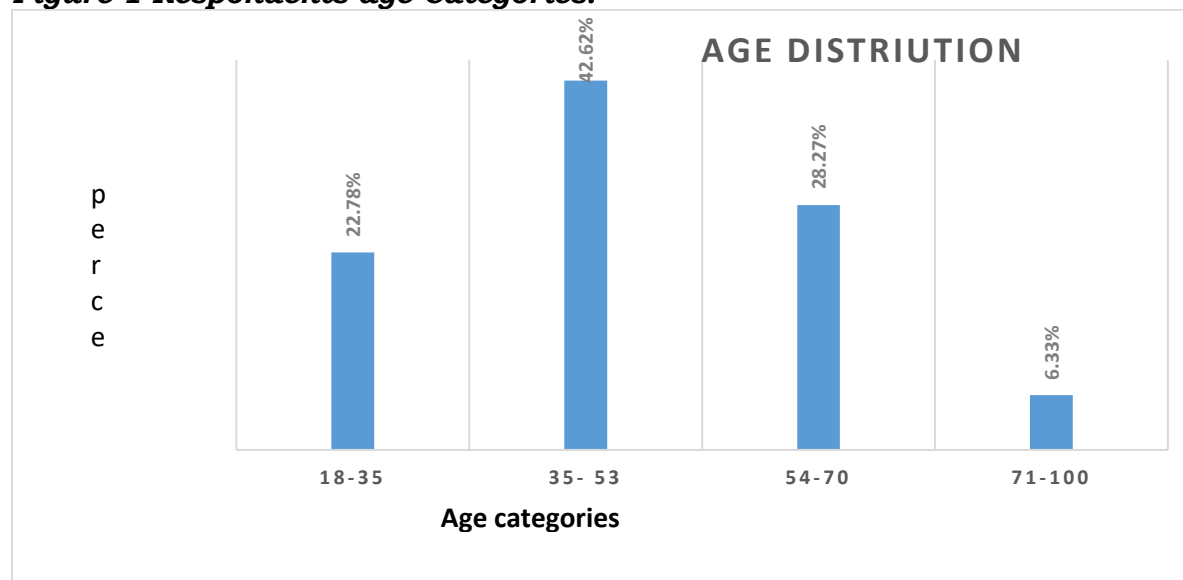
1. Output 1. Climate Hotspot Vulnerability Index map
2. Output 2: Overlay Climate Hotspots Map with LAPSSET Infrastructure components
3. Output 3: Develop adaptation options/Policy/management recommendations on hotspots areas around LAPSSET components

Results and Discussion

237 respondents were selected purposely based on number of years lived in the area and language competence (Swahili or English). The link attached here shows the map and the specific geographical locations of each respondents courtesy of WWF crowd screening tool, <https://wwfclimatecrowd.org/#report-3187>. 80 % were male and the rest female. In terms of age, almost 5 in ten of the respondents were between the ages 35 and 53 years and therefore constituted what is generally considered as the active segment of the population (see Figure 1 below).

Respondents' Age categories

Figure 1 Respondents age Categories.

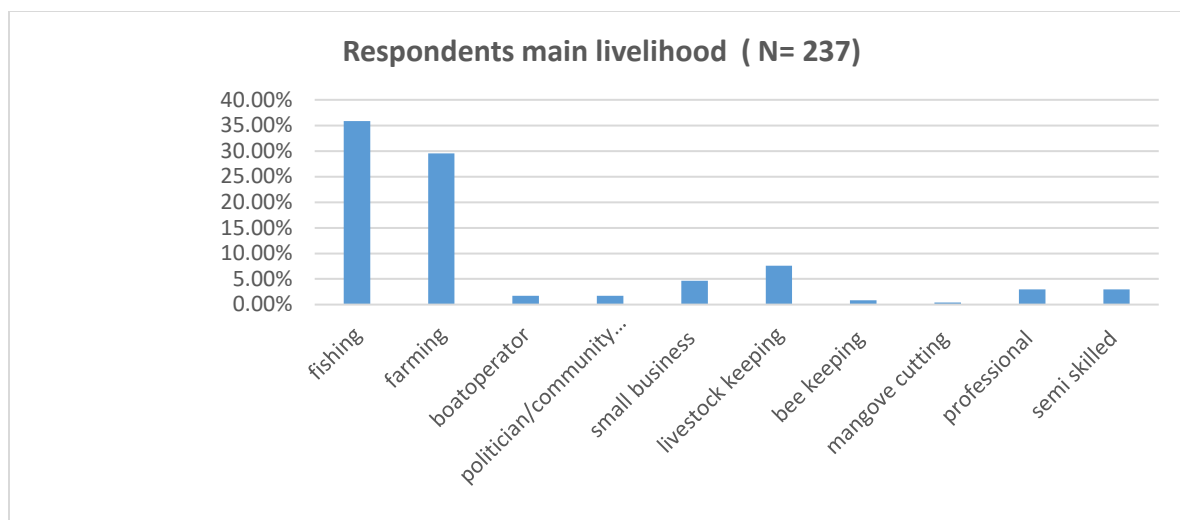


Source Author's' Data

Respondents' Livelihood

Fishing and farming was the main source of livelihoods for the respondents, they constituted 65%. About one in ten of the respondents claimed to be mangrove cutter. And a similar number claimed to be boat operators (Figure 2 captures the respondents' Livelihoods).

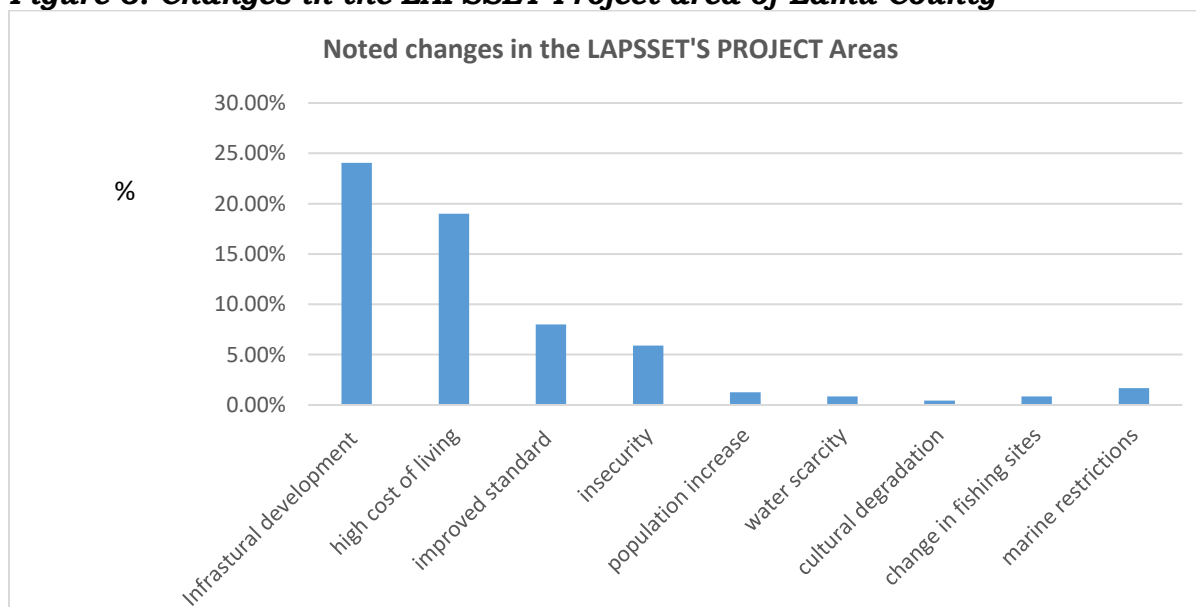
Figure 2 Respondents livelihoods



Major changes in the LAMU Port neighbourhoods in the recent past

About 54% of respondents argued that they had noticed major changes in the neighbourhood in the past few years. Infrastructural development was listed as the most significant change in the environment with a score of 25% followed by high cost of living and third was improved high standard of living, (See figure 3 below).

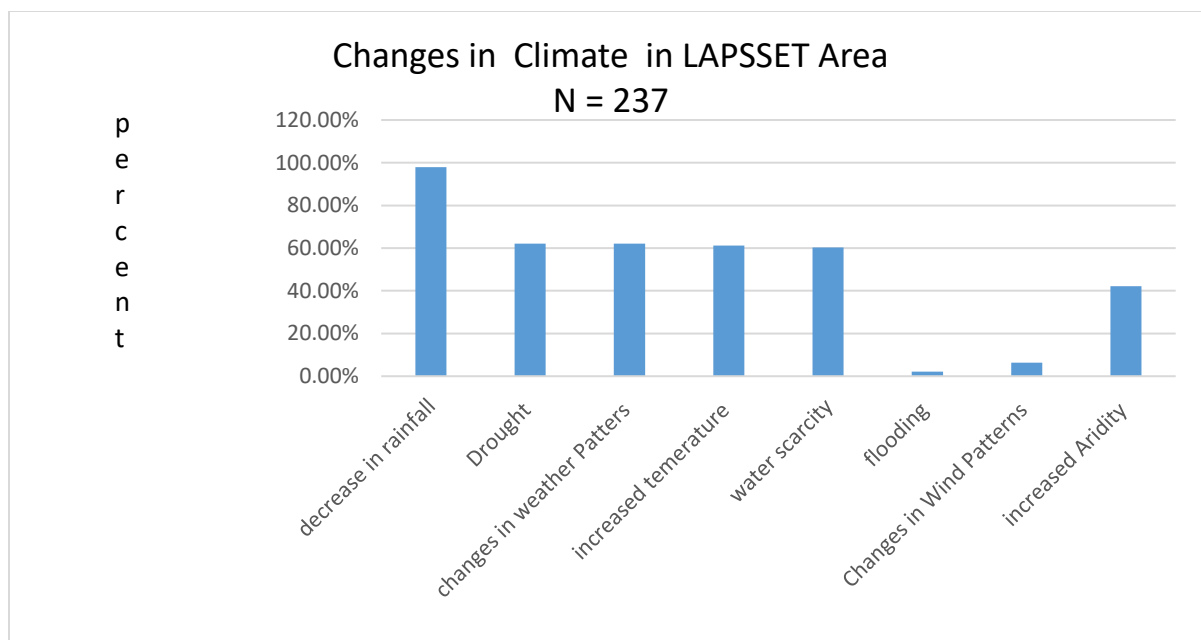
Figure 3. Changes in the LAPSSET Project area of Lamu County



Source: author's Data

Noticeable Changes in Climatic conditions in LAPSSET Area, Lamu County

Figure 4. Changes in Climate in Lamu County



From Figure 4, almost all the respondents (96%) agreed that rainfall decrease has become more profound in LAPSSET area in the recent past and that amount of rainfall received in the area has decreased significantly. As a result, drought was cited as a major issue that has arisen at (63%) other major climatic changes in the area includes are the changes in weather patterns and increased temperature. Similarly, water scarcity and increased aridity were cited as significant.

Ecosystems present in LAPSSET area in Lamu County

Lamu County is generally a pristine environment with a rich and diverse ecosystem that supports her economy. From both the panel of stakeholders (experts) and survey respondents, the following were identified as the most common ecosystems within Lamu County: Coral reefs, Mangroves, Sea grass, Water bodies (Lakes-Kenyatta seasonal rivers, and Indian oceans, Wetlands, Sandy beaches, Creeks, Forests and Sand dunes. Most of the habitats are found both within key protected areas (Kiunga Marine protected areas, *Boni-Dodori* National Reserve, Witu forest reserve, and non-gazetted areas and community conservancies. In these ecosystems, there is diverse wildlife species that span marine and terrestrial ecosystems. Key terrestrial species include: Hyenas, giraffes, buffalo, lion, hippopotamus, zebras, various bird species. Dolphins, Dugong, Sea turtles, fish, crustacean -such as prawns, crabs, and fish are the key marine species.

Climate related hazards in LAPSSET area of Lamu

The respondents observed the following key climate change related hazards in the area:

1. Timings of seasons and change in frequency and/or severity of rainfall:

Both the panel of experts and the survey respondents were unanimous that, the rainfall patterns have been affected. The long rain season is no longer predictable. Traditionally the long rains used to fall from March to July every year. It was observed that, the long rain duration is reducing to two months on average around May/June. Previously short rains occurred from October to December. Now, they are highly unpredictable. Over the past two years, Lamu county has had low rains and this has worsened droughts, caused boreholes/water wells and lakes to dry up, and disappearance of seasonal rivers. The effect of diminished rainfall has culminated into longer drought periods. Both the scarce rainfall and prolonged drought has led to increased aridity in the region directly

impacting agriculture. The aftermath of all the above has seen increased wildfires, degradation of land and water sources and poor agricultural productivity. Death of livestock & wildlife and conflict over limited resources.

2. Frequency and severity of winds:

It was reported that, the winds seasonality has also been impacted. The Southern Monsoon winds (Kusi) which were traditionally experienced in June are now longer i.e. June to August. The Northern Monsoon winds (Kaskazi) wind season has also changed. The respondents insinuated that there has been a relative shift in wind patterns and intensity with recent observations revealing stronger winds near shore than in deep sea.

3. Sea Level rise:

The respondents observed gradual sea level rise in some parts of Lamu Coastline. For instance, in *Mkokoni* area, some of the forested areas near the shore are not accessible due to water intrusion. They reported that, sea water invaded the land by 60-80 metres. As a result, some species of fish that were found in the deeper sea were now easily accessible in the area.

Biodiversity impacts

The respondents observed the following key climate change related biodiversity impacts in the area: A general decline in population or disappearance of a species in an area, species migration, Habitat degradation from natural causes (e.g. increased frequency of drought, floods, fires, heat, etc), Range shift (wildlife moving into an area they previously did not occupy or out of an area they previously occupied), Increase or emergence of new diseases affecting plant/animal species and Mortality/decline in abundance of plants/animal species caused by extreme weather events.

The respondents also reported increased beach erosion, high sea temperature and increased and stronger force of sea waves. This was attributed to death of corals in Kiwani area. Consequently, more sand was reported to have entered into mangroves ecosystems. Apart from these, other marines species, such as the sea cucumber and prawns are reported to have a declined population (were becoming rare. It was pointed out that this was partly because of changed rain pattern.

Species migration:

It was reported that, some of the marine mammals that were present in the area such as Dugong have migrated and they were no longer cited.

Terrestrial ecosystem impacts

Both the panel of experts and the respondents reported that there has been increased incidents of Forests and rangelands wildfires. As a result, there is noticeable biodiversity loss. It was noted that, honey harvesters are nowadays unable to control fires they set during the honey harvesting process. Respondents reported that, pollinators such as bees and birds have become scarce and rare. Respondents reported that, there has been notable increase in human wildlife conflict because wild animals have moved to residential areas in search of water and pasture. It was also reported that due to the drying up of Lake Kenyatta a lot of animals like the hippos died.

The respondents reported that, some trees, shrubs and herbs have disappeared and other invasive species such as *Mathenge* have been observed. Similarly, new pests such as locusts are emerging and noticeable and other pests such as tsetse flies are now found in areas they never used to be.

Marine-terrestrial ecosystem impacts

Sedimentation caused by anthropogenic activities and exacerbated by changes in climate was observed as a key problem in coastal fringes (low intertidal zones along the

shoreline) leading to habitat changes. The changes include conversion from mud flats to sand flats. Another problem is clogging of creeks leading to mangroves degradation and loss of species that depend on a healthy mangrove ecosystem. According to the respondents, major contributors to sedimentation included: i) sea erosion due to erratic floods washing out exposed soils and agricultural lands upstream and along the lagas. ii) Dredging (sea reclamation) by LAPSSSET and other developments in the area resulted in high tonnage of sand dusts released to the atmosphere, this combined with strong wind patterns near shore resulted in high volumes of sand deposits along the creeks. Other changes observed by the respondents were: New animals such as whale sharks being sighted, Fish migrating that impacting fishers, overfishing in the nearshore and some fishers moving to the EPZ area or adopting alternative income opportunities such as tourism

Community response to climate change and their impacts [Proposed Adaptation Options]

The respondent highlighted the following as Some of the adaptation/coping interventions that are being implemented/adopted: Shifting forms of livelihoods intervention e.g. from fishing to farming, Adoption of agricultural innovations such as greenhouses, growing drought resistant crops, adoption of irrigation, use of pesticides and fertilizers, use of Early Warning Systems/weather forecasting, Sinking of boreholes, and people migrating to areas with available pasture. Other adoption measures included; community conversion of areas from farming to conservation, settling of communities in one area and communities not practising shifting cultivation.

Perceptions on LAPSSSET's contributions to Climate Change

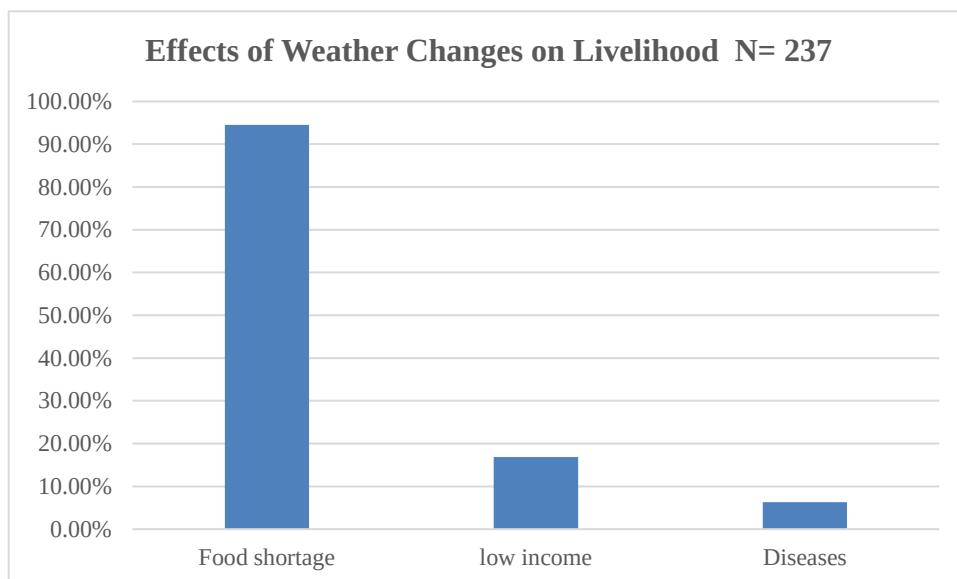
The respondents were of the view that, the LAPSSSET projects has led to the rising of the cost of living. As a result this high cost of living has inhibiting people's ability to cope with climate change impacts. Similarly, the respondents perceived LAPSSSET activities as limiting access to traditional fishing grounds that were near the Lamu Port. Access to these areas is constrained leading to conflicts. It was also argued that, the dredging by LAPSSSET would directly affect mangroves and eventually led to their habitat loss.

About seven in ten respondents believed that, the LAPSSSET activities have caused high land values prompting change in land ownership, corruption and land use patterns in the area. This has led to an increase in land fragmentation which in turn would lead to high biodiversity loss. 60 %Poverty index has risen due to communities losing their lands or main source of income. This has contributed to their inability to cope/adapt with increasing climate change impacts further worsening the poverty cycle. Majority of the respondents 85% were of the view that. High population influx due to LAPSSSET's pull factor (employment, business investments opportunities etc) have resulted to demand for housing and overall expansion of the built environment which has resulted in high biodiversity loss. 8 in 10 respondents accuse the LAPSSSET project of causing increased emissions from the construction activities.

Respondents perception about climatic change Effects on Livelihoods

The respondents pointed out that food shortage has become more pronounced and that more people were now prone to hunger and poverty as a result of the harsh climatic conditions. See figure six below.

Figure 6/ Effects on Livelihood

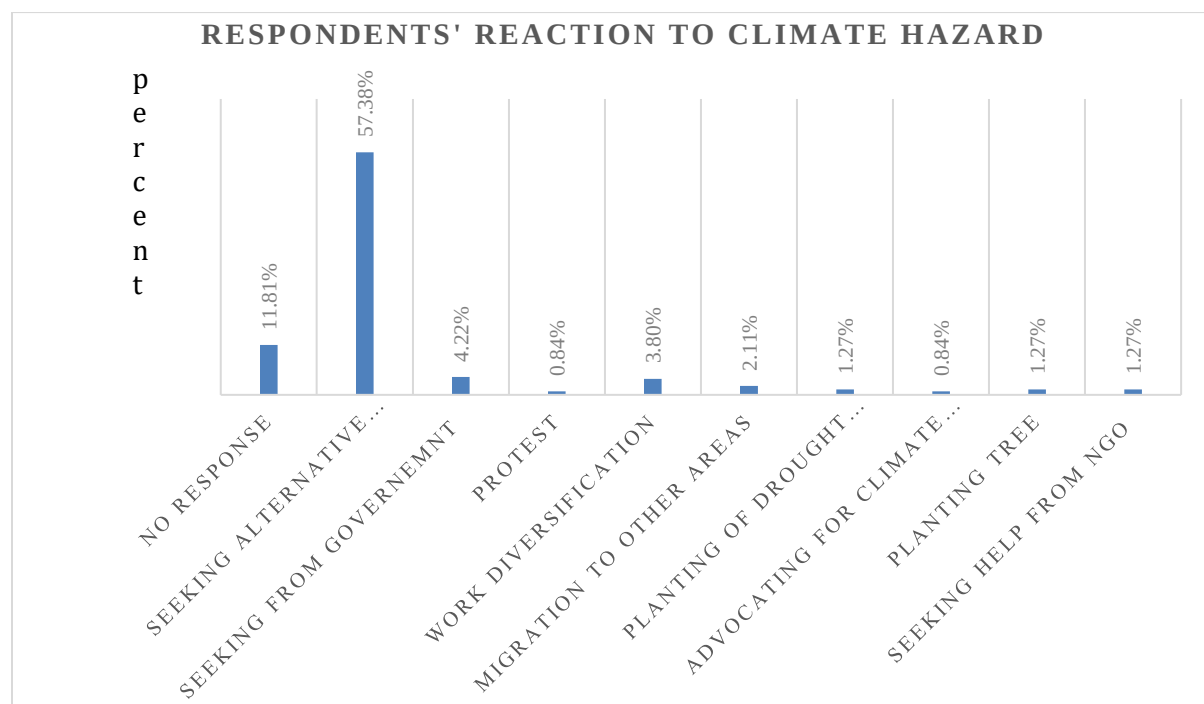


Climatic Hazards identified by Respondents

The respondent's identified the following as the hazards associated with climate changes in LAPSET project area of Lamu county; Severe droughts, Desertification, Destruction of ecosystem, Scarcity of fresh water, Death of livestock, Sea level rise, Severe hate waves, drying up of well ,Well water becoming saline, Drying up of water bodies and reduction of certain species such as prawns, crabs , turtles

Respondent's Response to Climate Related Hazards

Figure 6



The impacts of climate changes on people and their livelihood are real. Respondents said that they would consider protest as a mechanism of expressing their voice on matters of climate changes and their related impacts. Apart from protests, respondents said that, they would migrate from the area if the problem of climate change persisted and indeed, they said they knew people who had relocated to other more hospitable areas. The respondents also identified the following adaptation mechanism rain water harvesting, Borehole drilling, Use of saline well water, Relying on government for water, Purchase of clean water and factoring more money for water budget. They cited the following as coping mechanism: water export from neighbouring villages, Purifying saline water and Recycling sea water

LIVELIHOODS

The study team has already developed tools to undertake the livelihoods study. The study will be jointly undertaken by LCDA, WWF and NEMA.

Key findings:

1. Objectives

General objectives: By 2022, there is data and information available to inform planning and decision-making for better environmental governance and sustainable development in the LAPSSET Program area.

Specific objectives:

- ☐ To explain how the LAPSSET project has impacted on the ecosystems
- ☐ To expound how the LAPSSET project has affected People (PAP)
- ☐ To describe how the LAPSSET project has impacted on fisheries resources at the Lamu port.
- ☐ To provide/develop policy advice on how large scale projects can safeguard PAP livelihoods.

2. Research questions

The research question aimed to answer the following questions: -

Qn 1: What are the impacts of the LAPSSET Corridor Program development on livelihoods of the PAPs?

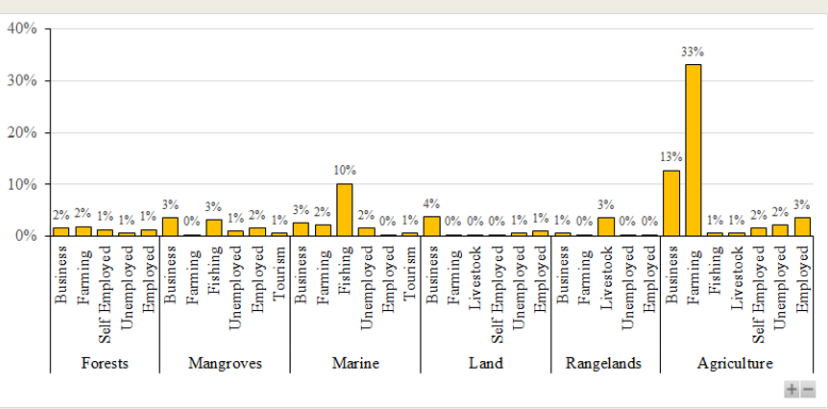
3. Methodology

The study was based on applied research approaches supported by Geographic Information Systems (GIS) to provide factual spatial assessments and quantification. Qualitative approach enabled obtaining complex textual description about the study topic (Mack et al., 2011).

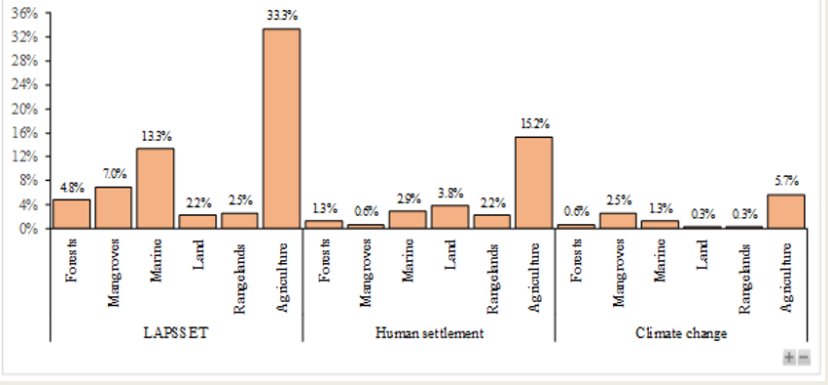
The researchers conducted semi-structured interview sessions with key informants from National Government agencies, County Government of Lamu, and civil society organizations working on Natural Resource Management in Lamu. Additionally, the researchers interviewed PAPs within the LAPSSET growth area. Secondary desktop reviews analyzed information from LCDA, NEMA and County Government of Lamu such as Vision 2030, Infrastructure Master Plans, Resettlement Action Plans, Lamu County Spatial Plan, Feasibility studies and Strategic Environmental Impact Assessment reports. Data collected was analyzed to inform the research.

4. Key Findings

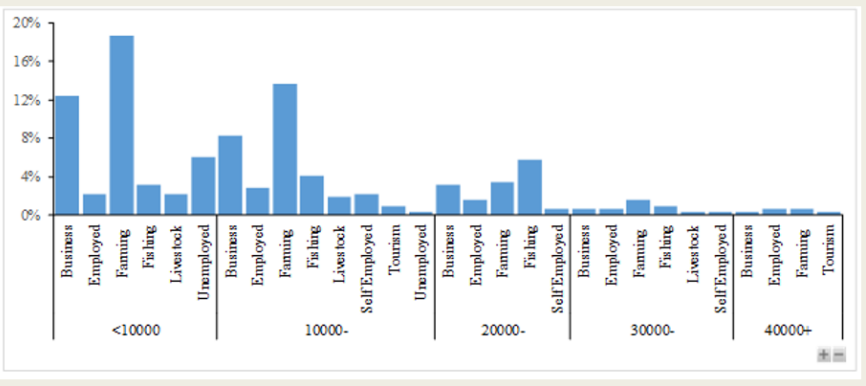
1. Livelihood Dependency on NRs



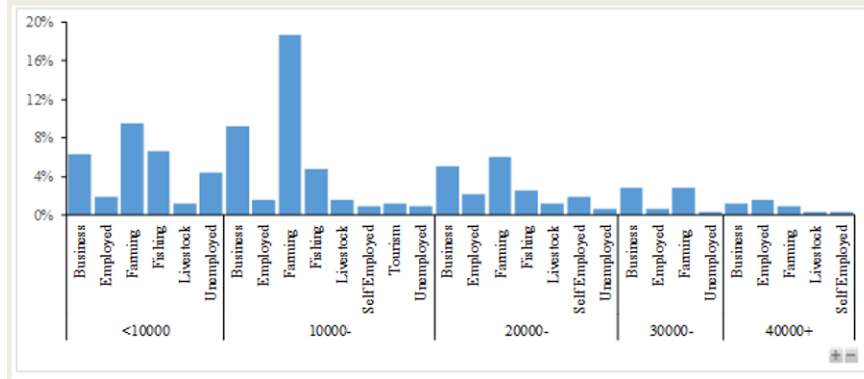
2. Current Anthropogenic Pressures to NR



3. Pre-LAPSSET Earnings (PAPs)



4. Post-LAPSSET Earnings (PAPs)



The following table summarizes the positive and negative impacts of the LAPSSET:

Positively	Negatively
-Creation of employment opportunity -Roads expansion -Scholarship opportunity -Increased rental income -Business has expanded due to increased human settlement -Better roads to the market has made it easier for me to trade -Better infrastructure and enlightenment to locals	-Decreased fish catch (Fish population has been reduced around the LAPSSET project route due to construction of port) - Dredging at the sea has disrupted fish (It destroy fishing activities and mangroves) -It lower living standard due destruction of fishing activities -Fishing areas banned due to port -Land loss -Agricultural land was destroyed when mining marram for road construction (Agricultural land has been degraded) -Resettlement of my relatives and business associates -Affected me and most of this area since people left the farms to live in town and it becomes difficult to practice farming because of wild animals due to a large area of bushes

Conclusion and Recommendations

From the study's findings, there is no doubt that large-scale infrastructure projects affect a variety of stakeholders to very different degrees as argued by Mefalopulos, (2008). The respondents identified many issues that constituted how their livelihood and environment had been impacted by the LAPSSET project. The major impacts included effects on: ecosystems, people's Livelihoods, ecosystem, fisheries activities and challenges they faced as occasioned by the concerned project. This therefore calls for effective 'listening of the variegated voices' in order to build trust between project implementers and PAPs that ultimately would help in reducing the social distance between communicators which ensures smooth exchange of information and feedback and ultimately ensure success of the project. The following sections summarize the key findings as informed by the studies objectives.

COMPLIANCE TO ENVIRONMENTAL AND SOCIAL SAFEGUARDS

Consultant has completed Environmental and social Audit Report and received comments on it from the project team. Plans are underway to present the revised draft report to stakeholders for review and inputs in a workshop to be held in Lamu. The final report has been prepared following the stakeholders workshop. Based on the findings of the assessment the consultant has also started working on manuscripts for publication.

Below is a summary of the findings:

1. Objectives

- ☐ Review environmental and social management performance of various projects being implemented under the LAPSSSET Programme
- ☐ Assess the progress in implementation of EMPs (i.e. are the recommended mitigation and management measures followed?)
- ☐ Assess the overall effectiveness of the EMPs in ensuring environmental and social safeguards for the projects
- ☐ Document lessons learnt and recommend best practices that the activities should embrace to improve compliance with safeguard measures

2. Methods

1. Literature review

- ✓ Feasibility Study Report
- ✓ Integrated Transport Infrastructure Master Plan for Lamu Port City
- ✓ SEA for the Master Plan for the LAPSSSET
- ✓ Lamu Port City Agreed Investment Framework Report

2. FGDs

3. Key informant interviews

4. Stakeholder consultations

- ✓ Government agencies
- ✓ Conservation organizations CSOs
- ✓ BMUs

5. Field visits and verification to material borrow sites, Lamu port, access road and Garsen- Witu -Lamu Road

3. Key Findings

Prerequisite studies:

1. A feasibility study for LAPSSSET Programme was carried out prior to programme
2. SEA was carried out while implementation of LAPSSSET programme projects was in progress. As a result implementation of SEA recommendation to first address pre-existing could not be executed on time.

3. ESIA for the first three berths of Lamu Port and associated infrastructure was carried out while implementation of the project was underway contrary to the requirements of environmental regulatory requirements.
4. All of the material borrow sites for the Garsen-Witu-Lamu road were subjected to EIA although some of the EIAs for the site were carried out while extraction of the materials was either in progress or completed

Performance of safeguards:

5. **Safeguards to protect farmers and pastoralist:** The LAPSSET Resettlement Action Plan (RAP) worked well in ensuring displaced persons were compensated for the land they lost to the project.
6. **Safeguards to protect fishing community:** None of proposed safeguards have been executed; this is continuously negatively impacting on the fisher-folk economically, socially and their overall wellbeing.
7. **Safeguards to protect local community from marginalization:** LAPSSET Corridor has a scholarship scheme for local community youths.
8. **Safeguards to protect terrestrial flora and fauna:** Targeted planting of trees in public spaces to offset those lost during construction of Lamu Port access road and Garsen-Witu-Lamu road and parts of the port and establishment and gazettement of wildlife corridors is yet to be implemented.
9. **Safeguards to protect marine flora and fauna:** safeguards either not implemented or if they were, then they were not effective hence their performance in protecting marine flora and fauna from adverse impacts was poor.
10. **Mangroves** were shielded from adverse impacts by minimizing areas cleared and conducting replacement planting of all cleared mangroves in adjacent areas. This safeguard was performing well as only 1.5 hectares of the projected 2 hectares were cleared.

Rehabilitation of material borrow sites

11. Less than 10% of borrow pits in Hindi and Witu areas were fully rehabilitated

- ☐ Improved local business opportunities
- ☐ Reduced travel time
- ☐ Reduced motor vehicle operating costs
- ☐ Improved access to social services such as Medicare
- ☐ Improved road transport and communication
- ☐ Reduced commuter transport cost
- ☐ Improved local security in Lamu and its environs
- ☐ Access to scholarship from LAPSET for local youths
- ☐ Improved infrastructure and property value

Negative social impacts

- ☐ Loss of livelihoods such as access to fishing grounds in the port area
- ☐ Loss of livestock grazing corridors due to urbanization
- ☐ Loss of livestock water sources at Kibokoni, Chomo and Jambiani areas due to construction of Garsen-Witu- Lamu road
- ☐ Increase in human-wildlife conflicts due to influx of migrant workers to Lamu some have encroached wildlife spill/ migratory areas
- ☐ Increase in demand for bush meat due to increase in population from migrant workers resulting in surge of hunters for bush meat
- ☐ Dilution of local culture due to influx of migrant workers into Lamu area and their accompanying family members coupled with their interaction with indigenous Lamu people
- ☐ Increase in incidents of petty crimes as more business thrive in Hindi and Mokoe, cases of petty crime are also increasing.

Overall Effectiveness of EMPS and Safeguard Practices

- ☐ Mitigation measures proposed in the **EMP for first three berths of Lamu port and associated infrastructure** to safeguard marine flora and fauna, marine water quality, livelihoods of fishing community in the entire fish value addition chain and safeguarding against marginalisation of local community when employing **have not been implemented as envisaged and hence in overall not effective**
- ☐ Mitigation measures proposed in the **EMP for Lamu Port access road** to safeguard local soils, local climate, local air quality, surface and ground water resources **were implemented and were effective**. However mitigation measures meant to safeguard against adverse impacts of material borrow sites, local flora and fauna and social environment **were poorly implemented and hence in overall not effective**
- ☐ Mitigation measures proposed in **EMP for Garsen-Witu-Lamu road C112** to safeguard environmental impacts on local hydrology, drainage enhancement, soil erosion, air quality, water quality and protection of local fauna were and are being implemented. These safeguards measures were largely considered effective

- ❑ However mitigation measures to safeguard against adverse impacts of materials sources and negative effects on local flora have not been fully implemented and hence not effective
- ❑ Safeguards measures to mitigate against socio-economic impacts specifically loss of land have been implemented.
- ❑ However those on safeguarding on spread of HIV/ aids induced migrations are yet to be effective in mitigating perceived potential negative impacts.
- ❑ Safeguards measures to mitigate on occupational health and safety impacts are being implemented.
- ❑ Mitigation measures proposed to safeguard culturally important sites and shrines were not implemented.
- ❑ Potential sites of archaeological importance along the entire stretch of Garsen-Witu-Lamu road C112 could not be identified nor could any potential artefacts be identified, collected and preserved for posterity

Lessons Learnt and Recommend Best Practices

4. Lessons learned:

1. SEA for the any proposed Programme or policy should be carried out before Programme implementation to ensure implementation of SEA recommendations
2. ESIAs for projects under LAPSSSET should be carried prior to project implementation to ensure each project has an EMP to guide project implementation

5. Recommendations

1. A detailed Environmental and Social Management and Monitoring Plan (ESMMP) for Lamu port and associated infrastructure to be developed.
2. The ESMMP to strictly be implemented to ensure strict monitoring of terrestrial, marine and social environments
3. All LAPSSSET stakeholders to be continuously consulted in all phases of implementation of LAPSSSET programme Projects

vii) Population change, human settlement changes and social/physical infrastructure pressures attributed to LAPSSSET development

An analysis of the changes in demographics around the LAPSSSET infrastructure geoscape, ecosystem conversion, social and physical infrastructure pressure and the overall growth patterns of the coastal cities of Lamu and Hindi will be assessed with a view to proposing measures to ensure that water, sanitation, housing and other services are provided adequately.

4. Implications/Applications

Findings from the research will inform decision making by both LCDA and NEMA in regards to sustainable investments by the LAPSSSET project. The research will help NEMA in setting standards for current and future large scale economic developments.

Regionally, the findings will inform Marine Spatial Planning and co-management of marine resources. Policy briefs explaining science to policy shall be produced.

5. Challenges faced and the realignment of objectives to "ground conditions"

Challenge	Adaptive management
COVID-19 lockdowns, restrictions on gatherings, leading to slow progress of project activities	Prioritising on desktop studies as well having virtual meetings
Student funding structure (project only without funding for tuition, or pickup of students into projects due to need to get hands on the project research components. There's a need for fully-funded scholarships in projects with initial adverts for positions and contractual obligations with students. Absence of this lead to student despair, student withdrawal, finding of new students and eventually delays in project execution)	Kombe Chanzera was recruited and is being supervised by Dr Fulanda. Study advanced despite initial setback of lack of university fees to be allowed to complete mandatory units before defending his research. This was resolved with WIOMSA.
Unforeseen procurement delays especially on purchase of aerial imagery for the study area	Virtual meetings for procurement committees put in place to expedite procurement process. Satellite imagery procured and processed.
Challenge in obtaining digital version of the <i>cadastre</i> from county land registry to inform land tenure dynamics	Visits to registry offices and obtention of hard copy maps which were then scanned, georeferenced and digitized. Coverage is not county-wide but sufficient to model the dynamics within core areas of the geoscope.

POPULATION CHANGE, HUMAN SETTLEMENT CHANGES AND SOCIAL/PHYSICAL INFRASTRUCTURE PRESSURES ATTRIBUTED TO LAPSET DEVELOPMENT

1.0 Abstract

The Research study elaborates that the Lamu Port South- Sudan, Ethiopia Transport (LAPSET) Corridor Program is an integrated regional infrastructure program to enhance trade and logistics in the region and position Kenya as a regional hub in trade and logistics as well as provide a platform for opening up vast regions of the country. The Study further highlights the existing Plans that include **Preliminary Master Plan & Investment Framework for Lamu Port City, Integrated Transport Infrastructure Master Plan for Lamu Port City, Advisory Plans for Swahili Settlement Scheme and Jamii Ya Mgini**. The Study shows how the approved land uses are conflicting and therefore seeks to address identified gaps and provide possible proposals and recommendations to enhance the implementation of harmonized Local Physical & Land Use Development Plan for Lamu Port City. The study is focused on the Lamu node within the LAPSET Corridor, which covers approximately 5500 SqKm. The specific objective

of the study include: to collate and analyses the existing data, RIMs and plans within the planning area; to identify gaps and emerging issues in the implementation of the approved LAPSSSET Master Plans and other existing Plans and to prepare a harmonized Local Physical & Land Use Development Plan for effective implementation and sustainable developments within the LAPSSSET Corridor Project areas. An integrated and inclusive approach has been applied that would yield a relevant, effective and implementable Plan Proposal. A mixed approach method was utilized as part of the process taking into account guidelines provided in various statutes including the Constitution of Kenya 2010, the Physical and Land Use Planning Act 2019, the County Governments Act 2012 and the Urban Areas and Cities Act 2012. Major phases of undertaking the Study include Project Design, Thematic Studies, Plan Preparation and Development of Proposals have been applied. Some of the emerging issues identified within/around the Planning area include Unemployment, Insecurity, Destruction of Fragile Ecosystem, Land Ownership Disputes and Uncontrolled The next pending phase of the Planning process include: Development Framework (Proposals), Implementation Framework, Capital Investment Plan and Monitoring and Evaluation.

2.0 Background and Scientific rationale

The Lamu Port South- Sudan, Ethiopia Transport (LAPSSSET) Corridor Program is an integrated regional infrastructure program, which is a critical component of Kenya Vision 2030, broadly intended to enhance trade and logistics in the region by providing an alternative and strategic corridor to serve the landlocked neighboring countries of Ethiopia and South Sudan. It is also intended to position Kenya as a regional hub in trade and logistics service by providing the country with a second transport corridor and port as well as provide a platform for opening up vast regions of the country, which have been under developed. Through engagement with key stakeholders, the LAPSSSET Corridor Development Authority developed the approved **Preliminary Master Plan & Investment Framework for Lamu Port City** and **Integrated Transport Infrastructure Master Plan for Lamu Port City**. However, after the approval of the Master Plans, the Ministry of Lands & Physical Planning developed other **Plans that include Advisory Plans for Swahili Settlement Scheme** and **Jamii Ya Mgini** which were not compatible with the approved Master Plans that had earlier proposed Industrial Land Use and Port development respectively. The Study therefore seeks to address identified gaps and provide possible proposals and recommendations to enhance the implementation of harmonized Local Physical & Land Use Development Plan for Lamu Port City.

3.0 Problem Statement

Some of the emerging issues within/around the study area include Unemployment, Insecurity, Destruction of Fragile Ecosystem, Land Ownership Disputes and Uncontrolled Land Use.

Unemployment: In Lamu, unemployment continues to be major obstacle to the full utilization of human resources. To address this obstacle, the key aim of the he Local Physical & Land Use Development Plan for Lamu Port City is to ensure sustainable

investments within/around the LAPSSET Corridor Project areas to create employment opportunities for better livelihood.

Insecurity: Insecurity Lamu County has caused loss of lives and wealth. The Plan offers solution to the security challenges by opening up the vulnerable LAPSSET Corridor Counties through sustainable developments.

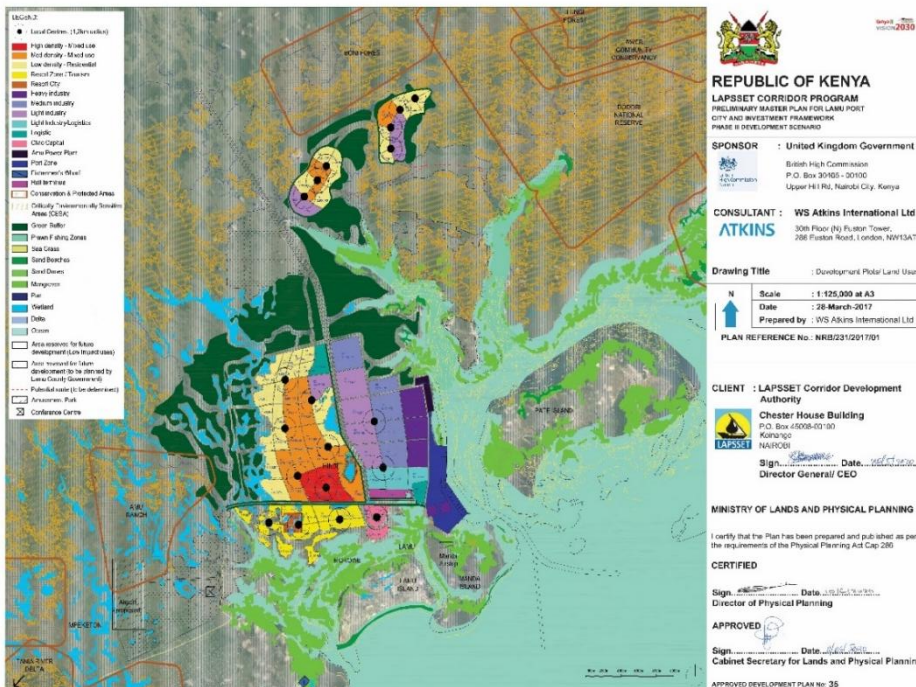
Destruction of Fragile Ecosystem: The Plan support an integrated, inclusive and transparent approach to the planning, design and implementation of the LAPSSET Corridor Project areas so that sustained economic development and poverty reduction outcomes are best achieved and aligned with the Sustainable Development Goals (SDGs).

Land Ownership Disputes: Ownership disputes in Lamu occurs due to lack of Title Deeds, Double claimant of the same piece of land, Lack of Land Compensation for LAPSSET Corridor Program, among others. The Local Physical & Land Use Development Plan for Lamu Port City provides spatial advisory for land titling and effective utilization.

Uncontrolled Land Use: Uncontrolled developments within the LAPSSET Corridor Project areas has occurred due to lack of detailed Physical & Land Use Development Plans. Development control provision derived from the Local Physical & Land Use Development Plan for Lamu Port City aims to achieve through regulation, growth of the Lamu Port City in a planned and orderly manner. The rationale control over land use is to ensure economic efficiency in the use of space, environmental health, safety and the general welfare.

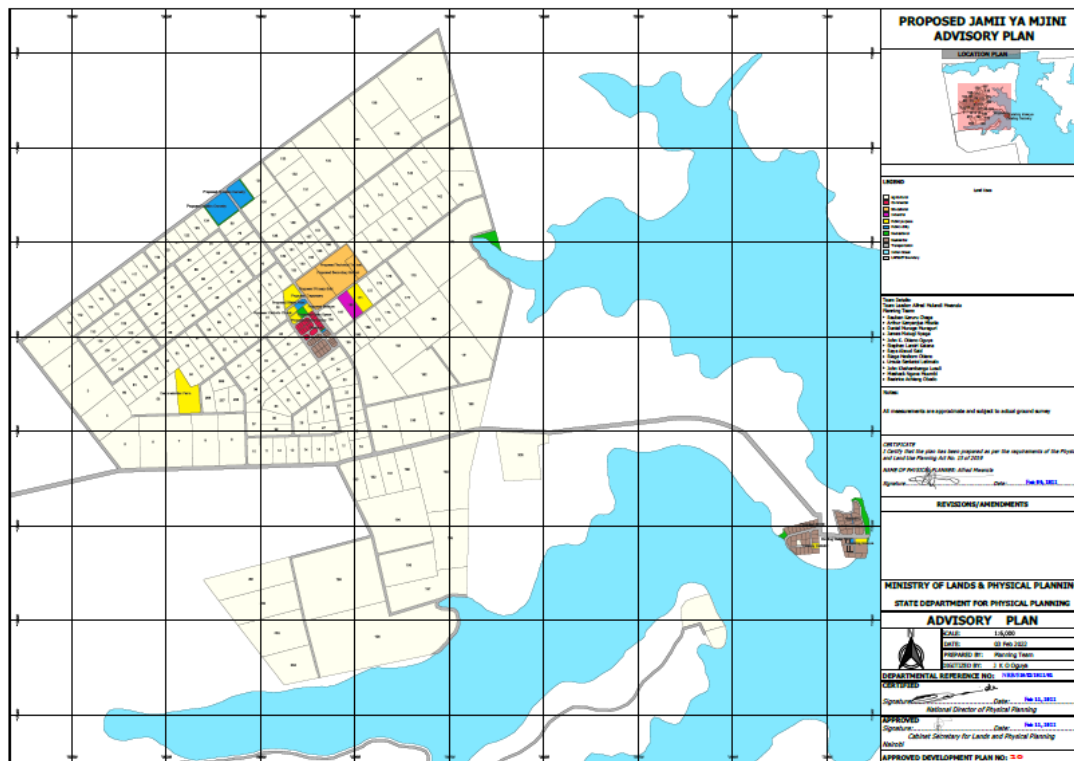
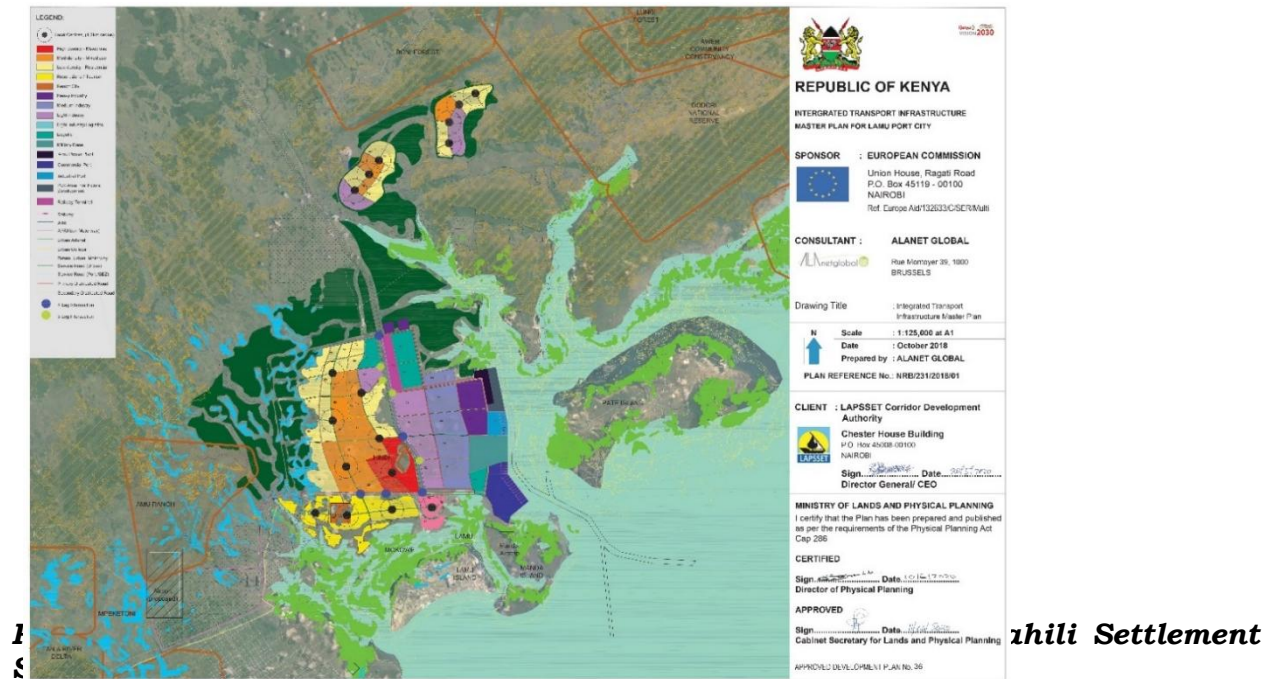
Conflicting Physical & Land Use Development Plans

Plan 1: Preliminary Master Plan & Investment Framework for Lamu Port City



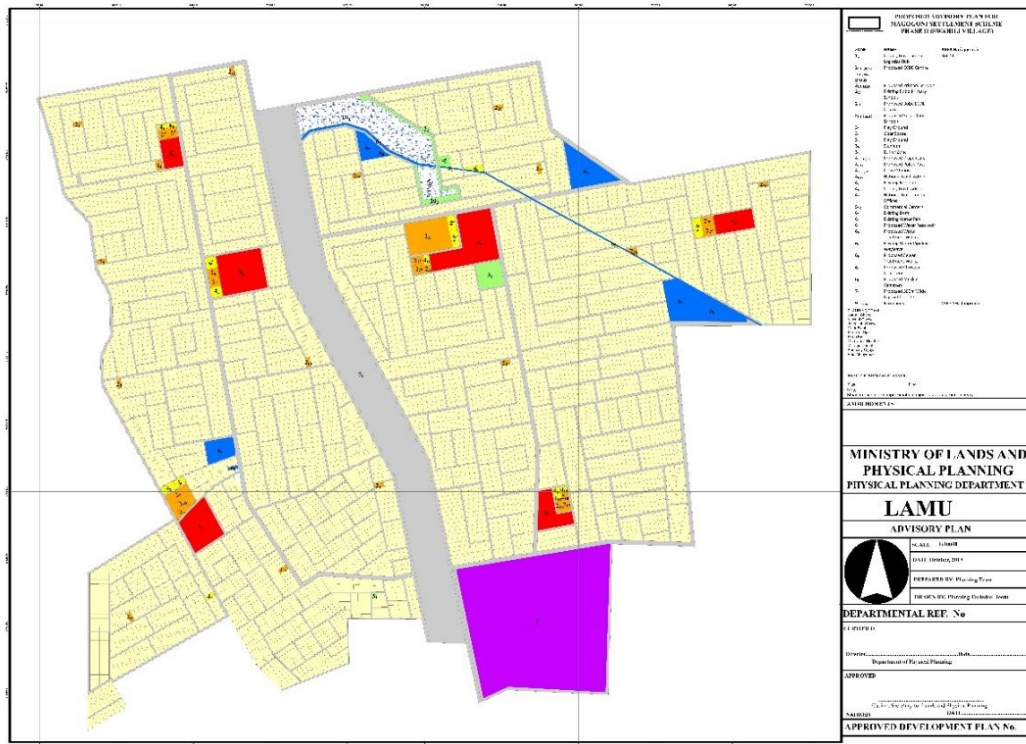
The LAPSSET Corridor Development Authority developed the approved Preliminary Master Plan & Investment Framework for Lamu Port City and Integrated Transport Infrastructure Master Plan for Lamu Port City in order to provide an overarching strategy and spatial framework for sustainable implementation of the LAPSSET Corridor Program as shown in the Plan 1 and 2

Plan 2: Integrated Transport Infrastructure Master Plan for Lamu Port City



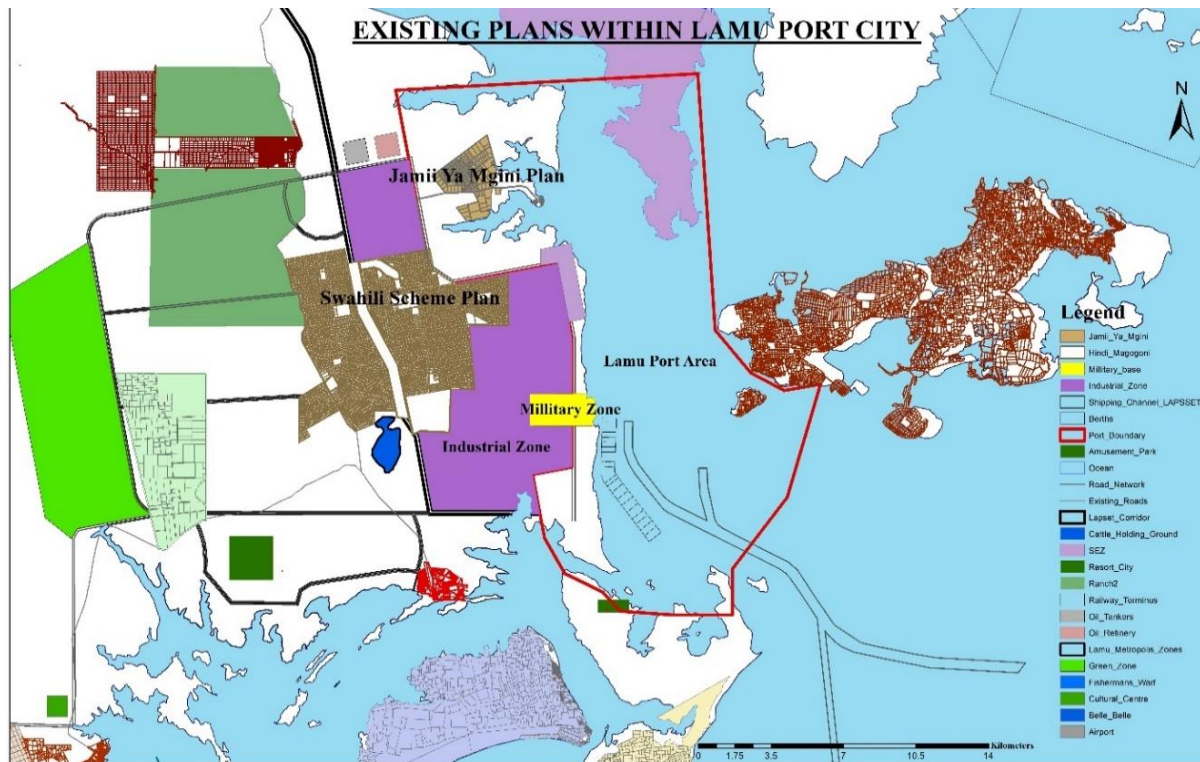
After the approval of the two Master Plans, the Ministry of Lands & Physical Planning developed and approved two **Local Physical & Land Use Development Plans** for **Swahili Settlement Scheme** and **Jamii Ya Mgini**, which conflicts with the planned LAPSET Corridor Program Industrial Zone and Lamu Port Area respectively as shown in the **Plan 3, 4 and 5** below.

Plan 4: Local Physical & Land Use Development Plan for Jamii Ya Mgini



Plan 5:

Existing Overlapping Plans within Lamu Port City



4.0 Objectives

The specific objectives of the Study entails the following key activities:

- To collate and analyse the existing data, RIMs and plans within the planning area;
- To identify gaps and emerging issues in the implementation of the approved LAPSSSET Master Plans and other existing Plans;
- To prepare a harmonized Local Physical & Land Use Development Plan for effective implementation and sustainable developments within the LAPSSSET Corridor Project areas.

5.0 Research questions

The key Research questions include the following:

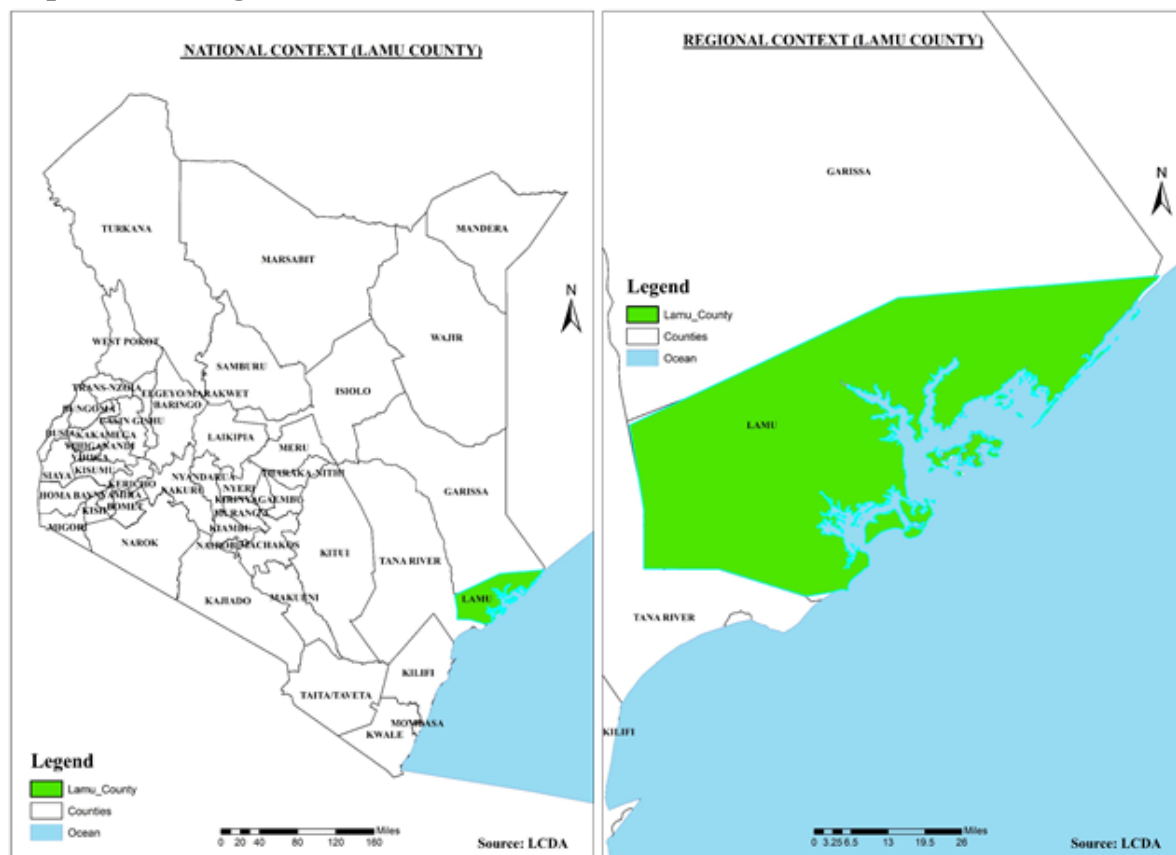
1. What are the existing Physical & Land Use Development Plans within the Lamu Port City? ;
2. Does the existing Plans conflict with the approved land uses within the Lamu Port City?

6.0 Project description: Study Site, Methodology and Activities

Scope of the Plan

The planning area is in Lamu County, Lamu West Sub County/Division within Hindi Ward/Location.

Map 1: Planning Area



The plan proposal is focused on the Lamu node within the LAPSSET Corridor. The planning area (Geoscope) covers approximately 5500 SqKm.

Methodology

This section focuses on the techniques undertaken in the preparation of this plan proposal. In undertaking this assignment, the team adopted an integrated and inclusive approach that would yield a relevant, effective and implementable plan proposal. A mixed method approach was utilized as part of the process taking into account guidelines provided in various statutes including the Constitution of Kenya 2010, the Physical and Land Use Planning Act 2019, the County Governments Act 2012 and the Urban Areas and Cities Act 2012. This was necessary in order to ensure that the processes and the final products are legally compliant.

The process had the following major phases:

Project Design- This is where defining the methodology (data collection tools, data collection methods, data analysis methods and interpretation, data synthesis and presentation), the base map (using the agreed upon planning area in with all the cadastral data from the survey of Kenya) and work plan were created.

Thematic Studies - The data collection process for the project began in April 2022, soon after which the thematic studies (situation analysis) began. The data used for the preparation of this plan proposal was obtained from both primary and secondary sources. Primary data was obtained through field surveys and visits. Methods involved; Land use surveys, where each plot within the planning area was identified in the satellite imagery and its land use mapped. Other attributes of the individual parcels were collected and filled in a mapping sheet.

Secondary data collection was achieved through desktop survey, and this was mainly collected for thematic sectors that had current data (demography and physiography). Secondary sources reviewed included various policy and legal documents, previous plans and maps in Lamu, with special interest on the approved LAPSSET Master Plan, among other credible and authoritative sources. Following data collection, an assessment of physical and social infrastructure and environmental & natural resource evaluation were undertaken. This was aided by various computer programs such as ArcGIS for production of shapefiles as well as for spatial analysis.

Plan Preparation and Development of Proposals- The situation analysis was a key consideration in this phase. Preparation of the plan proposal involved formulation of structure plan models and Action plans, Capital Investment Plan, Plan Implementation Strategy and Monitoring and Evaluation Plans.

7.0 Work Plan and Budget

The Work Plan and Budget for undertaking a detailed harmonized Local Physical & Land Use Plan for Lamu Port City is shown in Table 1 below.

Table 1: Work Plan and Budget

This research assessed the capacity of seven organizations: National Environment Management Authority (NEMA), LAPSSET Corridor Development Authority (LCDA), Kenya Wildlife Service (KWS), National Museums of Kenya (NMK), The Ministry of Lands in the County Government of Lamu (MoL Lamu), Kenya Forest Service (KFS) and Kenya Fisheries Service (KeFS).

Objectives

This report provides high level recommendations on institutional capacities to implement environmental governance in contribution towards safeguarding and maintaining the integrity of critical coastal ecosystems (marine and terrestrial) within the LAPSSET Corridor Program area for people, economy and nature. This will provide information on the status of institutional frameworks ability to create an enabling environment for sustainable development and management of natural resources. The information may be used to inform planning and decision-making for better environmental governance and sustainable development in the LAPSSET Program area.

About The LAPSSET Project

The LAPSSET Corridor Program is a regional (involving Kenya, South Sudan and Ethiopia) multimodal infrastructure projects integrating roads, railway, pipelines, resort cities, high grand falls dam and international airports among other components. The core project implementation area is in Lamu County - Kenya. The LAPSSET Area is endowed with rich & diverse ecosystems - Mangroves, Coral reefs, seagrass beds, terrestrial forests, wetlands, wildlife and cultural heritage sites. The implementation of the LAPSSET Program is impacting these ecosystems and there is need to establish the trend and extent of loss of this natural Capital and recommend measures to safeguard them and improve environmental governance in the area.

Methodology/ Approach

WWF-Kenya in collaboration with LCDA and NEMA laid out an Institutional Capacity assessment of the seven government-mandated agencies. The facilitated self-assessment focused on the institutions ability to carry out their mandate in overseeing and monitoring the implementation of the various LAPSSET projects and components. The research assumes that the institutions are mandated to contribute to environmental governance towards Land Use/Land Tenure Change, Livelihoods, Fisheries, Environmental and Social compliance audits, Climate Change as well as Public Participation & Communication around LAPSSET project areas, both terrestrial and marine.

The OCA process was led by WWF-Kenya while working closely with LCDA and NEMA to seek clarifications or further guidance as and when required during the course of the institutional assessments. A well-defined stepwise method was designed to enhance the institutions understanding and ownership of the organizational capacity assessment (OCA) implementation and outcomes. The process started with the development of a jointly tailored OCA tool in a workshop that brought together the institutions' representatives. Figure 1 below provides a summary schematic of the process.

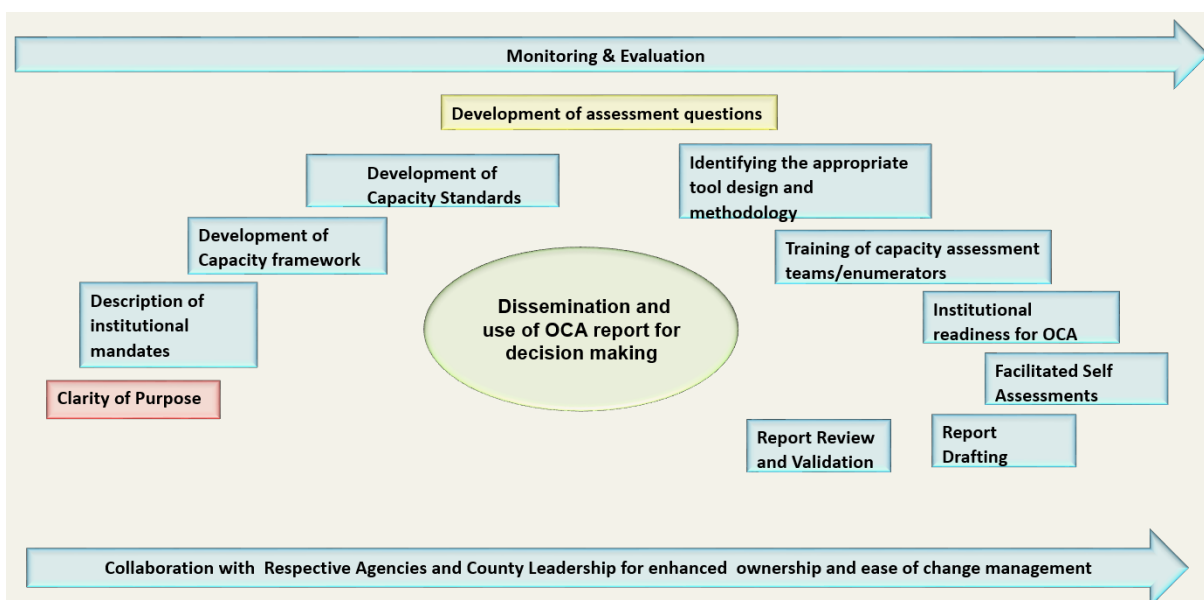


Figure 1 Summary of the Complete OCA Process

Data Collection

WWF-Kenya trained enumerator on how to facilitate OCA self-assessments in the targeted institutions. The jointly developed OCA tool was then disseminated to the institutions to conduct a facilitated self-assessments. The enumerators facilitated the self-assessment at the institutions' work stations in Lamu and respective National head offices where possible. The enumerators were keen to follow-up differing responses in from the institutions that had multiple points of data collections through further probes to ensure synchrony on the responses during the triangulation process.

Data Analysis

Institutional Capacity elements are highly descriptive and therefore a matter of qualitative measures. The assessment focused on descriptive responses which coded into a Likert Scale (1-5) scores to enable quantitative analysis. In essence, the OCA tool to was designed in a semi-qualitative structure. The final scores were categorized in five organizational growth levels as presented in table 1 below showcasing the data analysis spectrum.

Table 2: OCA Data Analysis Spectrum

Category	Embryonic	Developing	Moderately Developed	Well Developed	Expanding
Scores	1	2	3	4	5
Development Spectrum Measures	0%-29%	30%-49%	50%-69%	70%-89%	90%-100%
Colour Code	Red	Orange	Yellow	Light green	Dark green

Score description	Shows a very basic level of development due to lack of systems making Program implementation difficult.	In a rudimentary stage of development and may by chance manage basic operations but with many challenges.	Systems are working at the basic, there is a major need for further strengthening. Organization not able to manage internal changes.	High level but there are still some significant opportunities for strengthening (may need some external technical assistance at complex levels).	Well-developed credible systems reflecting best practice, ability to adopt to changes to move to the next level of development.
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The resulting averages, percentages and graphs were generated from inputs with the distributions per indicator in the capacity areas.

Institutional Profiles

This section of the report provides high level profiles of the seven assessed Institutions and a summary of their established mandates as would relate to the LAPSSSET Project. The seven institutions are: National Environment Management Authority, LAPSSSET Corridor Development Authority, Kenya Wildlife Service, National Museums of Kenya, Ministry of Lands in the County Government of Lamu, Kenya Forest Service and Kenya Fisheries Service

National Environment Management Authority (NEMA)

NEMA was establish under the Environmental Management and Coordination Act (EMCA), (ACT NO 8 OF 1999). As would relate to the LAPSSSET project, this legal framework mandates NEMA to:

- Coordinate the various environmental management activities being undertaken by LAPSSSET,
- Carry out surveys, which will assist in the proper management and conservation of the environment,
- Monitor and assess activities, including activities being carried out by LAPSSSET, in order to ensure that the environment is not degraded by activities and
- Undertake, in cooperation with LAPSSSET, programs intended to enhance environmental education and public awareness, about the need for sound environmental management.

LAPSSSET Corridor Development Authority (LCDA)

LAPSSSET was established under the State Corporation Act, CAP 446, and Legal Notice No. 58 of March 2013 to among other functions; is mandate Plan, Coordinate, and Sequence and Implement the LAPSSSET Corridor projects by:

- Planning, coordinating and sequencing LAPSSSET Corridor projects in collaboration with implementing ministries and agencies,
- Co-ordinate implementation of LAPSSSET Corridor projects across implementing ministries and agencies,

- Provide leadership, direction and guidance in operations and implementation of LAPSET Corridor and
- Ensure implementations of all decisions and resolution of the government. Mobilize funds to project components using a variety of resources including budgetary resources from government, donor loans, infrastructure bonds, and private finance.

Kenya Wildlife Service (KWS)

KWS is a state corporation established by an Act of parliament Cap 376 with the mandate to conserve and manage wildlife Kenya, and to enforce related laws and regulations. As would relate to the LAPSET project, this legal framework mandates KWS to:

- Advise LAPSET on matters pertaining to wildlife policy, strategy and legislation,
- Conserve and manage national parks, wildlife conservation areas and sanctuaries that might be affected by LAPSET and
- Develop mechanism for benefit sharing with communities living in wildlife areas.

National Museums of Kenya (NMK)

National Museums of Kenya (NMK) is a state corporation established by an Act of Parliament, the Museums and Heritage Act 2006. NMK is a multi-disciplinary institution whose role is to collect, preserve, study, document and present Kenya's past and present cultural and natural heritage. This is for the purposes of enhancing knowledge, appreciation, respect and sustainable utilization of these resources for the benefit of Kenya and the world, for now and posterity. NMK's mutual concern for the welfare of mankind and the conservation of the biological diversity of the East African region and that of the entire planet demands success in such efforts

Ministry of Lands in the County Government of Lamu (MoL Lamu)

MoL Lamu implements devolved functions of the National Ministry of Lands. Chapter 11 part two of the constitution of Kenya requires every county government to decentralize its functions and the provision of its services to the extent that it is efficient and practicable to do so.

Kenya Forest Service

KFS is a state corporation that was created through the Forest Act, 2005 (now repealed). The Service derives her mandate from the Forest Conservation and Management Act (FCMA), 2016.

Kenya forest service gave LCDA a private license which permits them to use a specified section of land that is under its protection.

Kenya Fisheries Service (KeFS)

KeFS is a body corporate established under the Fisheries Management and Development Act No. 35 of 2016. The purpose of the Service is to Conserve, Manage and Develop Kenya Fisheries and Aquaculture Resources.

Theory of Change

The figure below presents the theory of change indicating a cause effect relationship among the assessed capacity elements towards institutional ability to implement environmental governance. The elements are Governance and Leadership, Equipment and Infrastructure, Information Management, HR and Administration and Financial Resources

IF	THEN	THEN	THEN	IMPACT
Governance and Leadership - Political commitment to implement environmental governance - Engagement of the right stakeholders - Risk and quality management systems - Develop environmental governance policies and environmental management plans Financial Resources - Availability of financial resources - Mobilized resources ring-fenced	Human Resources - Appropriate structures and Technical expertise to implement Equipment and Infrastructure - ICT and office equipment, Information Management - Research opportunities - Knowledge management	Output - Implement environmental management plans - Monitor and evaluate environmental performance	Outcome - Improved environmental governance - Reduced environmental impacts - Increased stakeholder engagement	Impact - Improved infrastructure project performance - Increased public trust in the project - Increased environmental sustainability

SUMMARY OCA Findings

This section presents the summary OCA findings for the seven assessed institutions. The presentations are in graphics followed by narrative descriptions as appropriate. Further, an analysis of each of the capacity components is presented in the succeeding sub-sections.

Overall Institutional Capacities

Figure 4 below presents an overall view of institutional Capacity to conduct environmental Governance against their mandates.

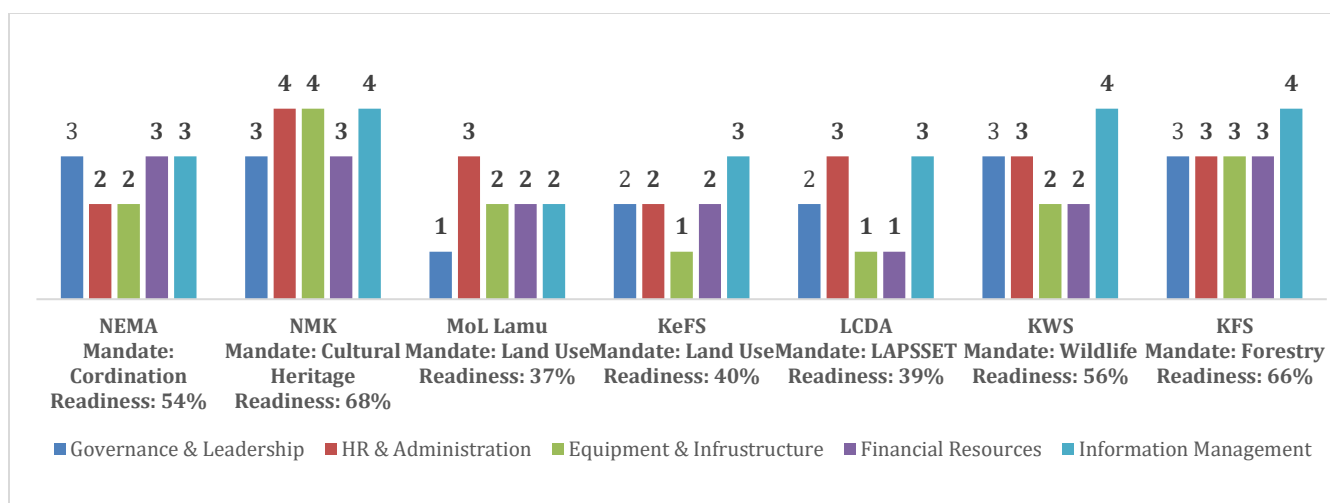


Figure 4 Institutional Capacity Readiness to conduct environmental governance

In reference to the OCA Data Analysis Spectrum presented in Table 5 above, NEMA, KWS, KFS and NMS are moderately developed and therefore, there is a major need for further strengthening the organization to enhance their capacity to participate in environmental governance. On the hand LCDA, MoL Lamu and KeFS are developing - in a rudimentary stage of development and may by chance manage basic operations but

CAPACITY COMPONENTS	NEMA	NMK	MoL Lamu	KeFS	LCDA	KWS	KFS
Governance & Leadership	Well developed	Well developed	Embryonic	Embryonic	Moderately developed	Moderately developed	Expanding
HR & Administration	Moderately developed	Well developed	Well developed	Moderately Developed	Moderately Developed	Well developed	Well developed
Equipment & Infrastructure	Moderately developed	Expanding	Developing	Developing	Embryonic	Moderately developed	Well developed
Financial Resources	Well developed	Moderately developed	Developing	Well developed	Embryonic	Moderately developed	Well developed
Information Management	Moderately developed	Expanding	Developing	Moderately developed	Moderately developed	Well developed	Well developed

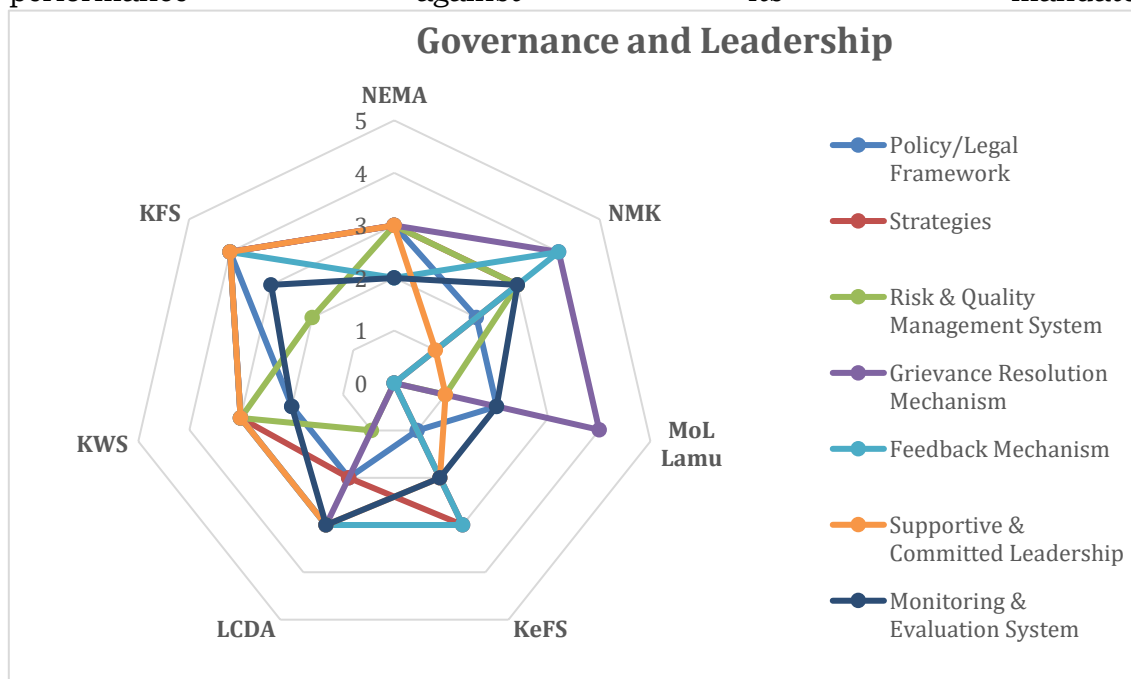
with many challenges.

Figure 6. Below presents a color coded view of each of the five capacity components as they contribute to the overall institutional readiness.

Governance and Leadership

The institutional capacity for Governance and Leadership is determined by is by the ability of the organization to:

- Provision of adequate policy and legal frameworks for enhanced environmental governance Developed short, medium and long term strategies for effective environmental governance
- Provide for effective grievance resolution mechanisms on environmental governance
- The institution has provided for effective risk and quality management system on environmental governance
- Provide for effective grievance resolution mechanisms on environmental governance
- Developed communication channels for effective feedback mechanisms within institutions for environmental governance.
- The organization has a supportive and committed leadership in environmental governance matters.
- The organization has monitoring and evaluation systems to measure its performance against its mandates



INSTITUTIONS	STRENGTHS	GAPS	RECOMMENDATIONS
	The National Environmental Management Authority (NEMA) is established under the Environmental Management and Co-ordination Act (EMCA)		

	number 8 of 1999 as the principal instrument of government for the implementation of all policies relating to environment. The strategic plan - 2018 to 2023 is up-to-date and its very clear on the mandate of NEMA in environmental governance NEMA has streamlined its processes risk management and is ISO 9001:2015 certified NEMA has sound grievance resolution and feedback mechanism		
NMK	National Museums of Kenya (NMK) is a state corporation established by an Act of Parliament, the Museums and Heritage Act 2006. strategic framework that runs from 2016 to 2024 NMK is ISO certified Good Grievance resolution and feedback mechanisms Performance measuring is done through the office of the auditor general. There are parliamentary committees have their own checklist mechanism.	NMK has no listed mandate for environmental governance on the LAPSSET program inadequate financial support and lack of political goodwill from local government in NMK participation on environmental conservation activities	
MoL Lamu	The existing legal and policy framework is found in article 67(2) of the constitution- National Lands commission Participates in implementation of community land compensation activities	The functions defined in the legal existence framework is not explicit in MoL Lamu's role in the LAPSSET project The strategic plan is not up-to-date Not ISO certified in the implementation	

	Has very effective grievance resolution and feedback mechanisms	and may not be adequate in the implementation of risk management Inadequate monitoring and evaluation systems	
KeFS	The Fisheries Management and Development Act provides the legal existence framework Conducts Country level monitoring and evaluation	The KeFS strategic plan does not in any way articulate environmental governance focused on the LAPSSET project Lack of devolved risk management structures Inadequate grievance resolution and feedback mechanism M&E functions not devolved	
LCDA	The LAPSSET Corridor Development Authority (LCDA) was established under the State Corporation Act, CA 446, legal Notice No. 58 of March 2013, to among other functions; its mandate is to plan, co-ordinate, sequence the implementation of the LAPSSET Corridor projects. Have always have a 5 years strategic plan Environmental Sustainability through undertaking environmental assessment Program is no system but there is a manual way of risk management There is a complaints resolution committee in place There is a suggestion box, website, service delivery	The legal structure is not adequate since it does not directly mandate LCDA to implement environmental governance in the LAPSSET Corridor Program. The sole mandate of LCDA remains at Coordination of the implementation of LAPSSET Corridor program which is contracted to a myriad of organizations with specific construction specialties.	

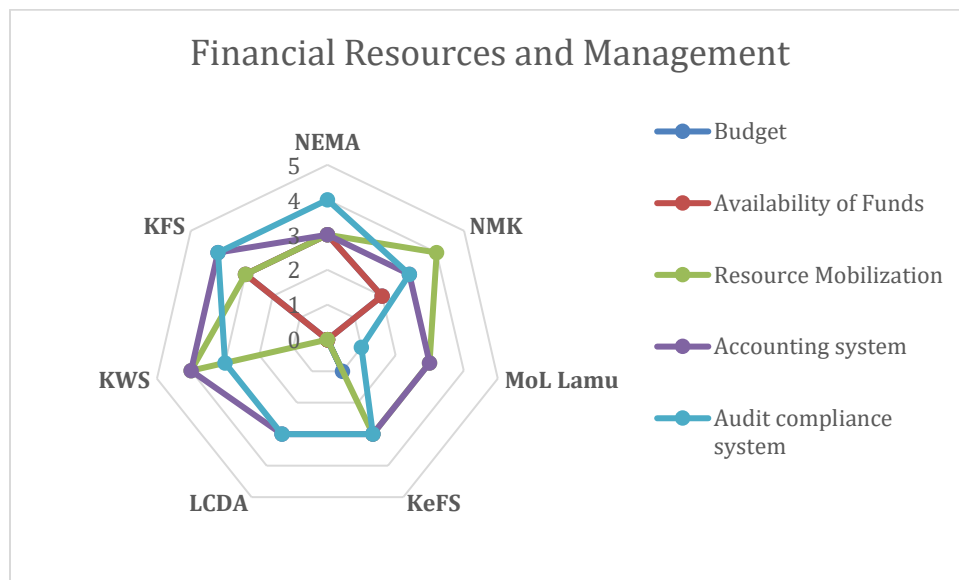
	charter are in place Follow ups are done internally and externally. Environmental governance matters have been included in the LCDA work plan 2022/23FY, performance contract 2022/23Y and strategic plan (2023-2027)		
KFS	• Has legal mandate to conserve and enforce the protection of forests • Good quality management systems - IOS certified • Has efficient grievance resolution and feedback mechanism • Has established monitoring and evaluation based on a performance contract	KFS in Lamu lacks risk management systems	
KWS	Legally mandated to conserve and protect wildlife Good in quality management – ISO certified Strategic plan broadly addresses environmental governance with a target to reverse and stabilize the declining trend across wildlife populations and resilient ecosystems Adequate risk management systems Adequate grievance resolution mechanism and a web-based feedback system Good leadership support Good monitoring and evaluation systems	Legal structures is not adequate to allow KWS implementation of environmental governance activities specific to the LAPPSET project	

Financial Resources and Management

The institutional capacity for Financial Resources and Management strong when:

- The budget is adequately resourced for environmental governance functions

- The institution has a budget for environmental governance functions
- Mobilized financial resources geared towards environmental governance
- The organization has necessary financial and accounting systems for the implementation of environmental governance
- The organization has necessary financial and accounting systems for the implementation of environmental governance
- The institution has provided audit and compliance on financial risk management system for environmental governance



INSTITUTIONS	STRENGTHS	GAPS	RECOMMENDATIONS
NEMA	90% of the budget is from the government but also get funding from partners to supplement the existing budget Efficient Navision accounting system Audit compliant	the budget is inadequate to implement environmental governance activities especially within the LAPSSET project Audit not done at regional level	
NMK	A budget is available at the national level. Austerity measures were introduced and affected budget at local level. Money is allocated at the national level. Only operational	No specific funds is set aside for LAPSSET, Accounting system very manual	

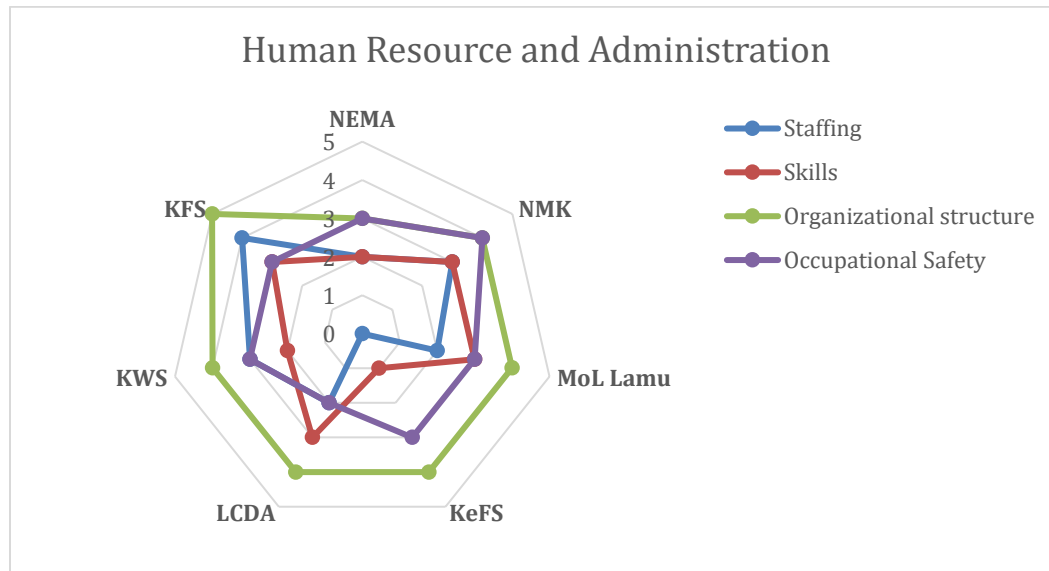
	budget is available at local level. Receives Funds from international donors to run programs. Eg UNESCO, British Council, Getty foundation The audit and compliance system is manual and involves bulky paperwork.		
MoL Lamu	Has budgets with allocations for their defined county mandates Main source of funds are exchequer release, conditional grants and local revenue There is an accounting system - IFMIS	No budgets for the LAPSSET program IFMIS has a challenge in extracting full financial statements, does not recognize commercial banks for payments and also reconciliation from previous transactions The audit compliance system is inefficient and inactive due to lack of clarity on the standard operating procedures	
KeFS	Conditional grants i.e World bank, Exchequer release, government KeFS uses IFMIS as the major financial and procurement system as a mandatory requirement for government institutions	No budgetary allocation focused to the LAPSSET program IFMIS might be difficult for other donors to access for audit purposes	
LCDA	LCDA is fully funded by the government. environmental governance for the LAPSSET	The Authority does not received any funds from other sources The government	

	Corridor program MS Navision ER (Enterprise Resource Planning) The system was introduced in 2021. HR, procurement and finance still need strengthening of system Internal Audit Manual and Audit Charter	provided budget does not support Implementation of environmental governance for the LAPSSSET program	
KFS	Budgets supporting the performance contract Good accounting systems Audit compliant	Has no dedicated funds to support environmental governance in the LAPSSSET project Relies solely on government budgetary allocations	
KWS	Direct funding is from government of Kenya Mobilizes project fund from other partners to supplement the unsupported wildlife conservation activities Efficient accounting systems and audit compliant	No dedicated budget for environmental governance for the LAPSSSET project	

Human Resource and Administration

- Institution has the right number of personnel essential for environmental governance in LAPSSSET
- Employees have the right skills to undertake their duties/responsibilities through regular training, learning and staff development
- Institution has a performance management system that incorporates reward/recognition

- Institution has relevant HR & Admin policy manual to guide staff/management decisions including DEI policy
- Institution has a clear organizational structure (organogram) that factors interdependencies with other actors in the environmental governance of LAPSSET
- Institution provides safe and healthy working conditions/environment for its employees



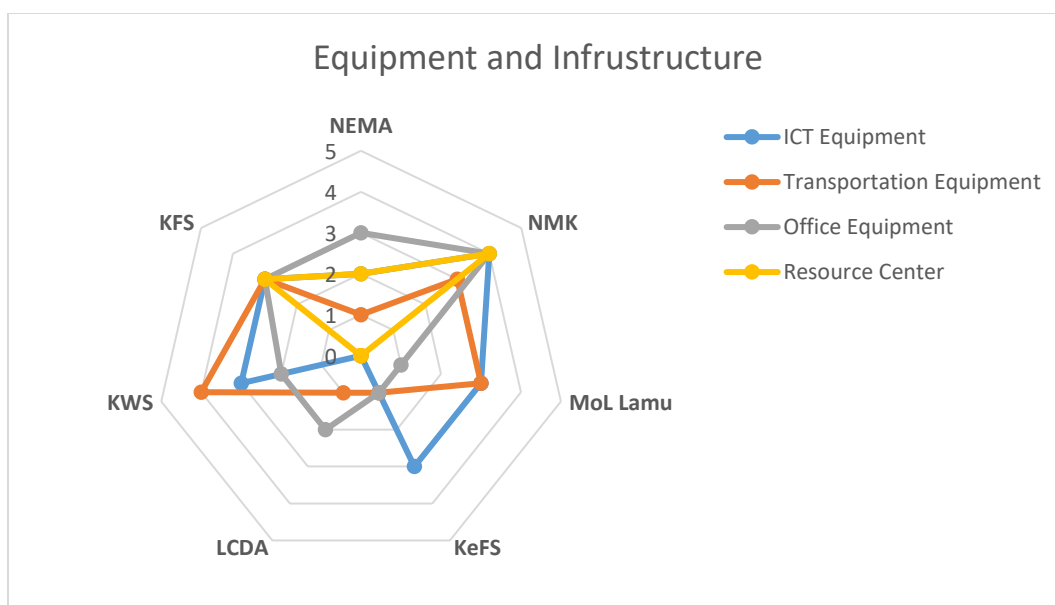
INSTITUTIONS	STRENGTHS	GAPS	RECOMMENDATIONS
NEMA	Annual performance appraisals Most of the key positions are staffed NEMA Occasionally provides staff with courses on safety and health	No specific department for the LAPSSET program Staff trainings not sufficient, Environmental Education and Awareness, Enforcement officers, Research and planning officer	
NMK	Lamu World Heritage site and conservation office addresses LAPSSET affairs within NMK	Training for staff on environmental governance is inadequate	
MoL Lamu	There is an office responsible for environmental governance	The key positions for environmental management staff (principal and chief	

	Annual performance contracting mechanisms in place and checks on staff delivery inclusive of budgetary utilization against time and quality deliverables. Staff are equipped are trained on disaster management and there is also an in house disaster management unit	environmental officers) are not yet filled within the structure of MoL Lamu	
KeFS	• The staff have clear performance contracts a basis for annual appraisals • KeFS works in good coordination with partner institutions	• No department for LAPSSET program • Inadequate occupational health and safety procedures	
LCDA	Under the directorate of trade and tourism LCDA has clear work plans which guides the setting of Performance contracting and annual Appraisals. Staff are clear on their roles and responsibilities and receives adequate support from management. • LCDA Collaborates with NEMA and KFS mostly • Staff Health and safety covered by within the	•	

	human resource procedures and implemented • Staff trainings are done quarterly		
KFS	Sufficient number of staff in most offices Good staff performance management systems	Staff training is not regular especially on environmental governance Performance management for the Lamu staff not sufficiently observed Lamu office has no drivers Insufficient occupational safety measures	
KWS	Staff skilled to deliver their mandate Allows/facilitates staff to attend trainings Good performance management system Sufficient occupational safety measures in place	No specified structure for environmental governance within the LAPSSET project	

Equipment and Infrastructure

- Institution has adequate & modern ICT equipment (hardware and software) and mapping tools to undertake environmental governance work
- Institution has adequate modes of transport (vehicles, boats and motorbikes) for environmental governance
- Institution has a fully furnished office (furniture, electricity, water) to undertake environmental governance activities
- Institution has resource/information centers for promotion of good environmental governance practices



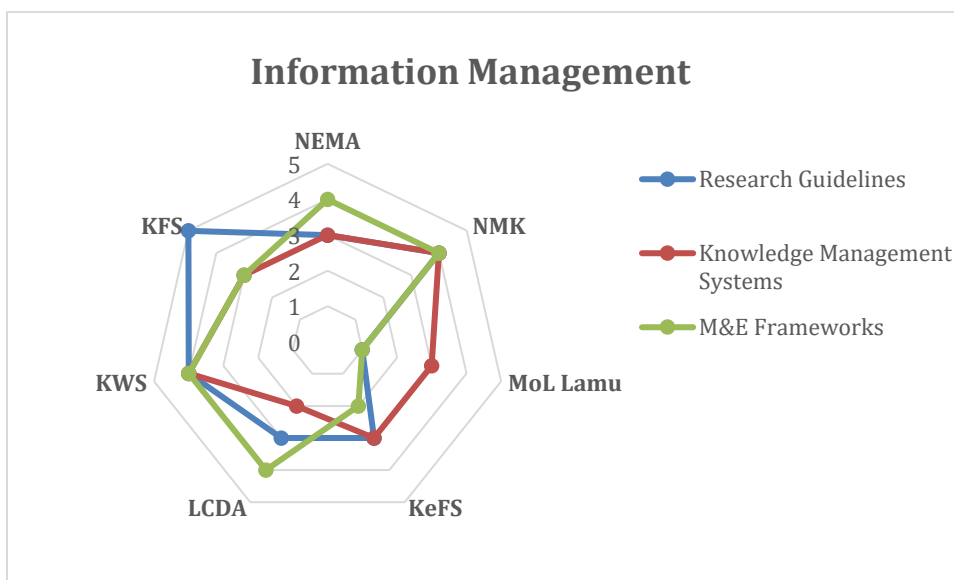
INSTITUTIONS	STRENGTHS	GAPS	RECOMMENDATIONS
NEMA	NEMA has basic mapping equipment Computer/Internet /GPS Has a GIS Lab at the headquarters Well-furnished office in Lamu	Inadequate desktop computer, a printers and projector and weak internet connection in the Lamu Office Need for water quality analysis tools for marine, detection equipment, PH, Turbidity, Element detection and boats No fully functional resource centre	
NMK	ICT equipment are adequate but there is need for more. Libraries available	Need for Workstation, laser measuring equipment and cameras. There's need for drones and access to aerial surveillance transport helicopters In adequate ground and water vehicles Heritage hubs not created – youth targeted	
MoL Lamu		GIS lab is there but no longer functional. They are not functional. The GIS lab was disbanded and room given to a different unit since 2018 Plotters- they need repair. Computers, Hand held GPS (Garmin, RTK), Internet and data storage is needed. Drones would be	

		helpful to view the difficult to access areas. Plotter (needs some repair), desktop and software (they need licenses), global mapper Available mapping tools need repair and/or licences. Desktops are no longer functional Plotters- they need repair. Computers, Hand held gps (Garmin, RTK), . Internet and data storage is needed. Drones would be helpful to view the difficult to access areas. A vehicle: 1 vehicle which doesn't access every part. Boat would help in accessing the islands. Motorbike for accessing places with poor road network. Boats and motorbikes There is manpower but no equipment. Space not enough for everyone. Capacity development for staff needed, last training they had was in 2019 on GIS, Supported by WWF. No training has been sponsored by the county More space needed. Office seats, cabinets with locks, There is no resource centre Yes. They need at least one in every ward for it to be more accessible and avoid the long distance sea travel.	
KeFS	• KeFS has an office in Lamu • Office has equipment for implementing their mandate	No equipment (ICT and transport) dedicated/accessible for use on environmental governance activities e.g. boats, vehicles, laptops and mapping equipment such as GPS No resource centre	
LCDA	LCDA has a Vehicle in Lamu There an office in Lamu office is there but not fully furnished	There are no ICT equipment needed for environmental governance implementation i.e. Laptops, GPS, GIS software's, drones No funds allocated for this ICT equipment's	

	Laptops and other mapping tools There is no resource centre	Inadequate vehicles for dedication on mapping activities Inadequate office equipment in Lamu No fully functioning Resource Centre	
KFS	Some GPS equipment and computers available	In adequate ICT equipment, internet access and mapping tools in Lamu office No resource Centre	Take stock of the available equipment to help in-depth exploration of the gap
KWS	ICT equipment like GPS, Computer, internet connections, radio communication, printers, database servers available	Some of the IT equipment are outdated and are inadequate in numbers for use by all staff Insufficient mapping tools such as GPS, binoculars, night vision, turtle sound transmission, cameras and swimming kits In adequate transportation equipment e.g. motor vehicles and speed boats In adequate office equipment in the Lamu office No Resource Centre	

Information Management

- Established guidelines for research based data collection, processing, storage, dissemination and use for decision making
- Established integrated planning and monitoring and knowledge management system for oversight
- Established Monitoring and Evaluation frameworks and policies to guide knowledge management, monitoring and reporting



INSTITUTIONS	STRENGTHS	GAPS	RECOMMENDATIONS
NEMA	Coordinate and Collaborates with other government data collection for environmental oversight Has a GIS system at the Head office which is the sole knowledge management hub Data disseminated through websites, publication and media magazines There is a clear data sharing protocol	Environmental oversight not routine conducted (on need basis)	
NMK	NMK has a long history of collecting data Research is included in their mandate. Most data is not available to public. Environmental data analysis and reporting is multi-disciplinary in that there is no centralized application used At local level, data is stored in hard drives and compact disks. Website & Museum Library Data Management policy is a work in progress. Challenge; Spam and hacking is common. Institution is issued with antivirus annually. Data sharing requires approval from the director. Each department has its own metadata standards that is specialty based. UNESCO World Heritage Centre Committee have meetings to discuss sites and threats to sites. Data is highly protected because the institution owns lots of academic information that is copyrighted. It's also in charge of copyright for indigenous knowledge.		

MoL Lamu	Uses hand held gaps to collect location and incorporate in the report. This is done in the catchment areas where people try to grab. Hindi Magogoni settlement scheme phase 2 is a sample of the intervention	Does not have any environmental oversight mandate No elaborate knowledge and data management system No data sharing and protection protocols	
KeFS	Data storage is done in hard disks and google drives Uses social media , website and email for data dissemination	KeFS has no system that enables a secured sharing of information and data use No defined Key performance indicators on environmental oversight	
LCDA	Relies on stake holder inputs for environmental oversight Uses website (lapsset.go.ke) to disseminate information Has and ICT policy that guides and provides descriptions on data needs, production date, owner, access and use rights, methodology and legal data protection and sharing protocols.	Inadequate data management systems for environmental governance	
KFS	Collects data for monitoring environmental oversight and sends to Nairobi Gets hard copy reports from Nairobi	Reliance on Nairobi office for data analysis due to lack of a data storage and analysis system in Lamu No legal data sharing protocol	
KWS	Has detailed research guidelines supported	Mostly use analogue	

	Use, hard disks form knowledge management Data sharing protocols available – data mainly shared in the KWS website Well defined metadata standards for data documentation and sharing Clear key performance indicators	information management systems	
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Summary Institutional Capacity Findings

1. To assess the human resource strengths and areas for improvement in the discharge of environmental functions by the respective institutions
2. To assess the skills and training needs of the technical staff involved in environmental management in the programme area
3. To assess the adequacy of working tools and equipment necessary for effective performance of environmental functions in the LAPSET programme area

Overall Recommendations

Reference

A working definition by Jens Newig, 14. JUNE 2019 ~ JENS NEWIG

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