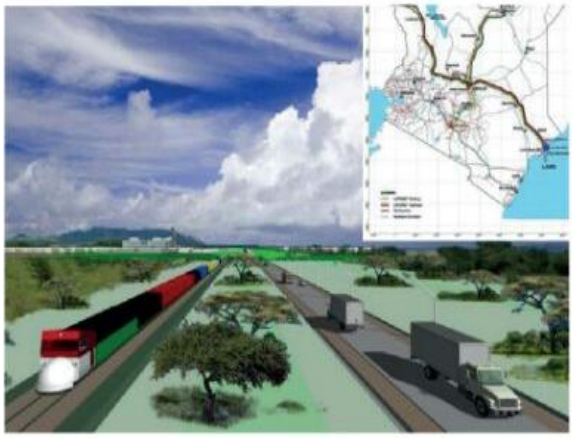
THE PRESIDENCY

LAPSSET CORRIDOR DEVELOPMENT AUTHORITY



TENDER NO. LCDA/SEA/01/2015-16

CONSULTANCY SERVICES FOR THE STRATEGIC ENVIROMENTAL ASSESSMENT FOR THE LAPSSET INFRASTRUCTURE CORRIDOR

Final Report
Volume One: Main Report

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DISCLOSURE PAGE

This Draft SEA Report prepared under auspices of the Strategic Environmental Assessment Study in the Master Plan for the LAPSSET Corridor Infrastructure Development Project (LCIDP) is hereby disclosed as follows:-

Assignment: **Strategic Environmental Assessment Study in the LAPSSET Corridor Infrastructure Development Project -LCIDP**

Parties to the Contract for SEA Study:

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EXECUTIVE SUMMARY

BACKGROUND

About this Report

The LAPSSET Corridor Development Authority (LCDA) is developing the Lamu Port-South Sudan-Ethiopia (LAPSSET) Infrastructure Corridor, an ambitious singularly massive but integrated transport infrastructure corridor project conceived and developed under the Kenya Vision 2030 Strategy Framework as an economic Game-Changer targeted to underpin national aspirations towards delivering a Globally Competitive Kenya with high quality for all citizens life in a clean and secure environment.

The Social Pillar of Kenya Vision 2030 demands development in a clean secure environment for all citizens as essentially guaranteed by the National Constitution 2010 and the Environmental Management and Coordination Act (EMCA) and its 2015 revision-the Environmental Management and Coordination (Amendment) Act. Towards ensuring compliance to both the National Constitution and reigning environmental legislation, the LAPSSET Corridor Infrastructure Development Project (LCIDP) has been subjected to a Strategic Environmental Assessment (SEA) Study conducted as per Legal Notice 101 of June 2003 and the Guidelines for Strategic Environmental Assessment issued by NEMA in 2014.

This document outlines the Final Report in the Strategic Environmental Assessment (SEA) for the LCIDP. The SEA Study process was coordinated and managed under contract by Repcon Associates (NEMA Firm of Experts 002)

About LAPSSET

LAPSSET is an Infrastructure Corridor Project conceived to improve access and connectivity between Kenya, Southern Sudan and Ethiopia and eventually forming a land bridge across the entire Great Lakes region from Eastern Coast of Africa (Lamu) to Western Coast (Douala) Cameroon. LCIDP covers over half of the country with a planned investment resource of Kshs of US$24.5 Billion, equivalent to Kshs. 2 Trillion equivalent to half of Kenya's GDP for the core investment alone. It is anticipated that the project will inject between 2% to 3% of GDP into the economy and it is expected to contribute 8% to 10% when generated and attracted investments finally come on board. Other strategic objectives include;

- Improvement in Socio economic development in Kenya and the region; and
- To attract increased private sector investment in infrastructure development and management in the country.

As designed and aligned, the entire LAPSSET Corridor spans over 2000 Km in length from Lamu – Isiolo – Moyale and Isiolo – Lodwar – Nakodok and comprises an international class highway, a Standard Gauge Railway (SGR), and oil pipelines connecting hinterlands in Kenya, Ethiopia and South Sudan to a new 32 Berth sea port at Lamu in Kenya's North Coast. A Crude oil pipeline will transport oil from well fields in South Sudan and Kenya's Lodwar County to a new oil refinery to be constructed at Baragoni in Lamu from where refined oil will be pumped to Isiolo through a merchant oil pipeline for distribution to the rest of Kenya by trucking and to Moyale by pipeline extension. Other components entail development of three airports and resort cities at Lamu, Isiolo and growth areas targeting Special Economic Zones in value addition centers to allow for integration of the local economies within the traverse.

Implementation Status:

Project LAPSSET is already under implementation with construction of three berths at Lamu Port already underway while the Isiolo-Marsabit-Moyale segment of the LAPSSET Highway is already completed. The analysis of pre-project baseline provided in sections below is aimed at unearthing and documenting the biophysical and social background against which LAPSSET has been conceived and developed. In the process, core issues that define the Northern Counties and which have to be surmounted to secure successful and sustainable development of the Corridor Infrastructure have been identified.

THE SEA PROCESS

The Legal Standards

The SEA process has conformed to all requirements of the National Guidelines for SEA as issued by NEMA. A Briefing Note prepared by the LCDA was reviewed by NEMA who instructed that SEA 038 be conducted for the proposed LCIDP. Screening was followed by Scoping which defined the depth and scope of study at the Detailed SEA Stage. A draft Scoping Report was reviewed by NEMA vide ref NEMA/SEA/5/2/037 dated 22nd June, 2016 based on which, a Final Scoping Report was been issued and approved thus paving the way for the detailed SEA Study.

Scope of the SEA Study

LCIDP previously underwent a feasibility Study on which account standalone Master plans were developed for the all components;- Lamu Port, Highway, Standard Gauge Railway, Oil Pipelines, Resort Cities, International Airports, Lamu Oil Refinery, Lamu Metropolis and Special Economic Zone among others. Given this scenario, it was determined that LCIDP is more of a programme in which case, a Programme Level SEA Study was been adopted. Further, given that major components of LAPSSET namely, the Highway, Lamu Port, Airports etc are under implementation, an Integrated SEA entailing both impact prediction and mitigation was been adopted.

Objectives of the SEA Study

Objectives of the SEA Study are aligned to the general objectives stipulated in the NEMA Guidelines for SEA. Essentially, LAPSSET is conceived as a Transport Corridor aimed at driving economic transformation and mainstreaming of Northern Kenya into the national economy. The corridor will also play economic enabler targeting to open up the Northern Kenya to investment and trade while linking up the same to local and offshore markets in line with aspirations of the Economic Pillar to Vision 2030. In line with such economic transformation gaols, specific objectives of the SEA for LAPSSET have been identified as follows:-

i) To identify key strategic resources and linkages between environmental protection and economic growth in areas to be influenced by LCIDP;
ii) To assess likely significant effects of LCIDP development on such resources;
iii) To formulate a set of measures to address these priority concerns and to take advantage of opportunities that will emerge from LCIDP, considering institutional and financial conditions needed for implementing such proposal; and,

iv) To recommend mechanisms for reducing environmental and social costs associated with achievement of the economic goals of LCIDP including measures that will enable future adjustments to maintain and promote sustainable and equitable growth in response to anticipated development of the LCIDP inclusive of the Economic Corridor.

Tasks in the Detailed SEA

The detailed SEA Study was premised on the notion that LAPSSET is an international transport corridor targeted to drive economic transformation of the arid Northern Counties where the key defining feature is extreme poverty driven by inequality and vulnerability to drought driven erosion of livelihood security. The SEA Study therefore sought to unearth the efficacy of LAPSSET in in achieving set goals and the social and environmental costs attendant to such mission. Seven questions were framed to focus the SEA Study thus:-

i) What are the defining features of the Northern Counties targeted to be transformed through LAPSSET;
ii) How well is LAPSSET attuned to drive the economic transformation;
iii) What is the prevailing legal regulatory, policy , institutional and strategy framework;
iv) What opportunities are available for LAPSSET;
v) What are the Social and Environmental costs attendant to achievement of LAPSSET goals; and
vi) What measures need to be put in place to secure gains anticipated under LAPSSET

Core tasks to be investigated in the SEA for the LCIDP were detailed in the Study TORs approved by NEMA but entailed:-

i) Comprehensive documentation of the receiving environment to better define;
ii) Comprehensive documentation of the LCIDP;
iii) Inventory of all stakeholders by legal mandate, capacity and interests;
iv) Comprehensive analysis of emergent concerns;
v) Participatory assessment of alternative models in the LCIDP;
vi) Modalities for environmental and social management within the Masterplan; and
vii) Other considerations

Scope of data collection

Data correction was achieved through five stand-alone studies aimed at defining the Biophysical baseline, Socio-economic baseline, Biodiversity and wildlife heritage, Policy-legal framework and, socio-cultural heritage and concerns. All studies were anchored on a review of the vast data base available from past research work which was then revalidated through field work.

Stakeholder engagement

In line statutory requirements for with development planning, the SEA Team took time to identify and engage will stakeholders at all levels down to the grassroots. As part of this, a reconnaissance drive along the entire corridor from Hindi to Nakadok was made by the study team. The team did not only meet the primary stakeholders but to also encountered challenges associated with arid land livelihoods.

Data Analysis

All data accruing from both the stand alone studies and other investigations were analysed leading to development of this report. The Core outcome of this report is collation of core concerns pertaining to implementation of the LCIDP as outlined in Chapter Nine followed by development of an Environmental and Social Management Plan (ESMP) as outlined in Chapter Ten below.

Findings from the SEA Process as outline in Sections below.

CORE OUTCOMES FROM THE SEA PROCESS

The Biophysical Resource Base

Administrative Scope: LCIDP between Lamu and Nakadok will traverse the Nine Counties of Lamu, Garissa, Meru, Isiolo, Laikipia, Samburu, Marsabit, Baringo and Turkana.

Physiography of the traverse: Between Lamu and Nakadok, the over 2000Km long Corridor numerous landscapes is characterized by diverse terrains, lithology, drainage and climate all of which explain the diversity of prevailing ecosystems and livelihood patterns with entirely different resilience patterns. Fig ES 01 provides a Relief Profile for the entire traverse between Lamu and Nakadok and between Isiolo and Moyale. Broadly, the relief profile reveals three broad sectors namely:-

A lowlands sector marks the first 400Km of the Corridor stretching from Lamu mainland at Hindi to Kula Mawe in Isolo. The sector is generally low-lying with elevation rising gently from sea-level to a maximum of 500m asl and a corresponding slope of between 0 to 1.7%. Drainage density is very low, mainly dominated by the River Tana and dry ephemeral tributaries.

A highlands sector marks the 200Km stretch falling within the central part of Kenya generally marked by highlands. Elevation is generally above 1000m asl peaking to about 2000m asl at the eastern periphery of Laikipia. Terrain is quite rugged with slopes of up to 10%.

The Dissected Uplands Plateau is the dominant sector within the traverse, extending 500 kilometers from the Laikipia Escarpment in Churo to the Corridor Terminal at Nakadok within a general elevation of 700m asl. Terrain is smooth to fairly rugged with slopes of between 0 to 5%. The Isiolo – Moyale section constitutes an extensive plain lying between 500m and 900m above the sea level, sloping gently towards the north east and south east. Within the three physiographic units, eight broad landscapes are discernible namely:-

- The Lamu Archipelago;
- The Coastal lowland between Hindi and Garissa;
- Garissa to Banana;
- The Waso plateau (Benane-Isiolo);
- Highlands Section between Isiolo and Kisima (Mugie);
- The Rift Valley System (Kisima- Nginyang-Kapendo-Lokori;
- The Lake Turkana Basin (Lokichar-Lodwar to Nakadok); and
- Isiolo-Marsabit-Moyale.

All 8 landscapes form the basis for detailed documentation of the baseline preceding development of the LCIDP.

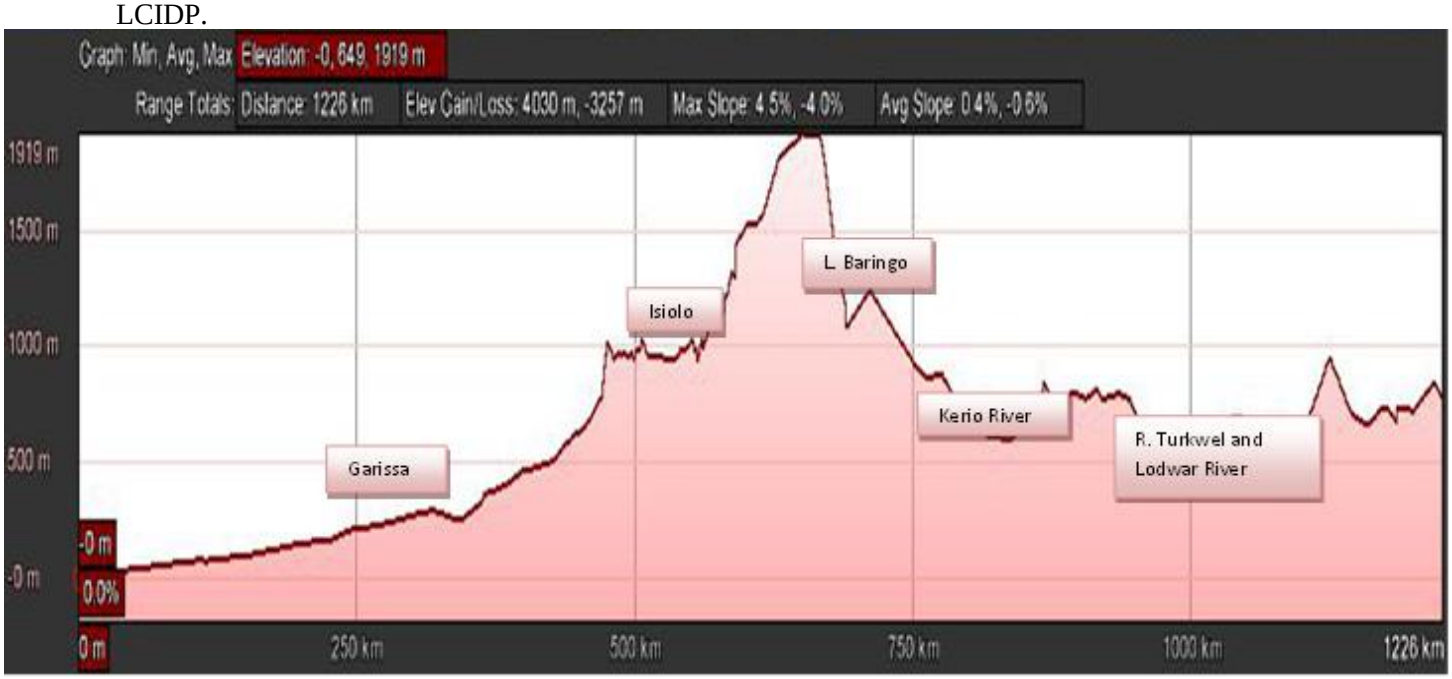


Fig ES01 Landscapes along the LCIDP traverse

Climatic designation: Rainfall in the entire traverse is heavily dominated by evapotranspiration (Fig ES 02) on which account, huge moisture deficits prevail throughout the year. Additionally, on account of aridity, ASAL hydrology is characterized by moisture shortage which translates to poor recharge of surface and groundwater resources.

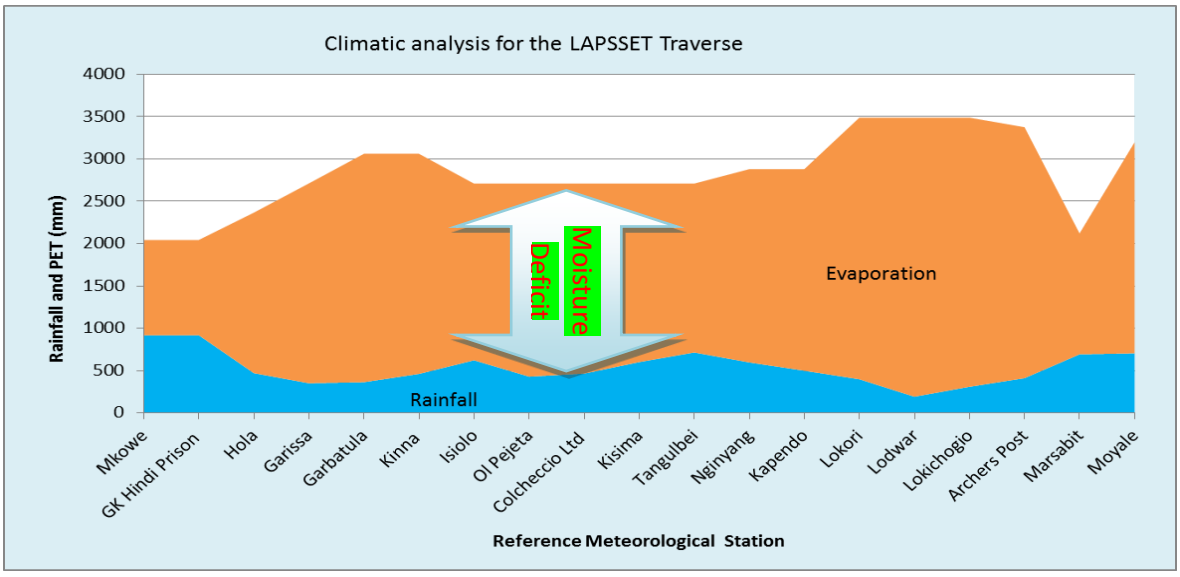


Fig ES 02: Climatic analysis for the LAPSSET Corridor

Drought occurrence: The climatic situation in ASALs is one of perpetual aridity occasionally punctuated by short wet seasons widely spaced in time and space. Occasionally, the dry periods in between rainy seasons prolong beyond the norm ushering drought seasons during which, water, fodder and food are in short supply. During the last half of the 21st Century, droughts in Kenya occurred in 1951, 1952-55, 1957-58, 1974-76, 1980-81, 1983-85, 1987, 1992-93, 1995-96, 1999-2000 and 2004-2006. These droughts occur on a cyclic basis the exceptionally severe ones coming every ten years, for instance, the 2004 drought was a replica of the previous cycle of severe droughts that affect the country every decade as experienced in 1974, 1984 and 1994.

The Economic Resource Base

The Water Resource Base: Essentially, the LCIDP traverses a water scarce country on account of aridity. Typically, water input from rainfall is quite limited, implying that there is little water circulating in ASAL areas; Evaporative demand is quite high and cannot be met by water available from rainfall, leaving instead, a huge deficit. Any water stored or introduced into the system is primarily evaporated to meet this huge deficit. By extension, ASAL Rivers originate from more humid highlands upstream but loose most of their water to evaporation and seepage upon entering ASAL territory.

Between Lamu and Nakadok, the water resource comprises of 3 of Kenya's 5 major catchment areas namely: - The Tana River, The Ewaso Ng'iro North Drainage basin and, the Rift Valley drainage basin. Three aquifers within the traverse are worth of mention; - The Sheela aquifer which supplies Lamu Island's water needs, the Merit Aquifer located at the triangle between Garissa, Weir and Isiolo and the newly discovered Lotikipi aquifer in Turkana. Of these three, both the Merti and Lotikipi aquifers are trans-boundary.

Water demand-supply scenario within the LCIDP: A comprehensive National Water Masterplan modeling the water demand and supply scenario up to year 2030 was recently launched by the WRMA based on which, computation of water demand/supply models for the LCIDP was attempted. Table ES 01 presents an analyzed catchment level water balance for Kenya in the period 2010 to 2030 based on the NWM 2030.

Table ES 01: Demand vs supply model for Kenya up to 2030 (MCM)

Catchment area	**2010**			**2030**			
	Water Demand (a)	*Water resource (b)*	*a/b (%)*	*Water Demand (c)*	*Water resource (d)*	*c/d (%)*	*% demand growth*
LVNC	228	4742	5	1337	5077	26	23.39
LVSC	385	4976	8	2953	5937	50	51.61
RVCA	357	2559	14	1494	3147	47	44.43
ACA	1145	1503	76	4586	1634	281	228.94
TCA	891	6533	14	8241	7828	105	112.51
ENNCA	212	2251	9	2857	3011	95	117.50
Total	3 218	22564	14	21468	26634	81	80.88

Source: The National Water Masterplan 2030

Inference can be made as follows:-
As at 2010, the national water demand stood at 3,218 MCM equivalent to 14% of the supply base of 22,564 MCM. On account of hosting Nairobi and Mombasa Cities, their peri-urban areas in addition to Machakos, With regard to LAPSSET, the catchments of traverse namely TCA, ENNCA and RVCA enjoy favorable balances with demand estimated at between nine and 14% of supply. By year 2030 when LAPSSET is targeted to be functional, the water balance scenario is expected to undergo dramatic change with the national demand growing 80.88% to stand at 21,468 MCM against a supply of 26.634 MCM. Simultaneously, demand will outstrip supply in several catchments; 281% for ACA, 105% for TCA, 95% for ENNCA and 47% for RVCA respectively as some development become clearly non-viable.

Upon scrutinizing demand components in the NWMP 2030 were for accommodation of LAPSSET interventions and demand areas revealed that most of investments proposed under LAPSSET are not supported with water allocation in the NWMP 2030 implying that, the water stress anticipated in TCA and ENNCA is pre-LAPSSET. Imposition of LAPSSET interventions on such strained water budgets will only aggravate an already stressed scenario. Implications are as follows:-

Water demand will largely outstrip supply by 2030: All three basins traversed by the LCIDP are projected to experience huge deficits in water supply (Table ES 01 above) with the greatest pressure being felt in the Ewaso Ng'iro North River. Further, given that the NWMP 2030 has not factored demand expected from LAPSSET, pressure on water resource is likely to be more severe with dangerous consequences on competing needs including livelihoods.

Drying/ receding rivers: The water supply scenario is likely to be aggravated by observed backward recession/ drying of rivers especially the Ewaso Ng'iro River which has been experiencing declining dry season river flows in the lower reaches on account of increased abstraction upstream. Past studies have observed that the mean monthly river flow at Archer's Post gauging station during the driest month (February) has been declining from 9 m^3 s^{-1} in 1960's to 4.59, 1.29 and 0.99 m^3 s^{-1} in 1970's, 1980's and 1990's respectively. The number of days with flows at Archer's Post <1 m^3/s has also increased over the years (Fig. ES 03)

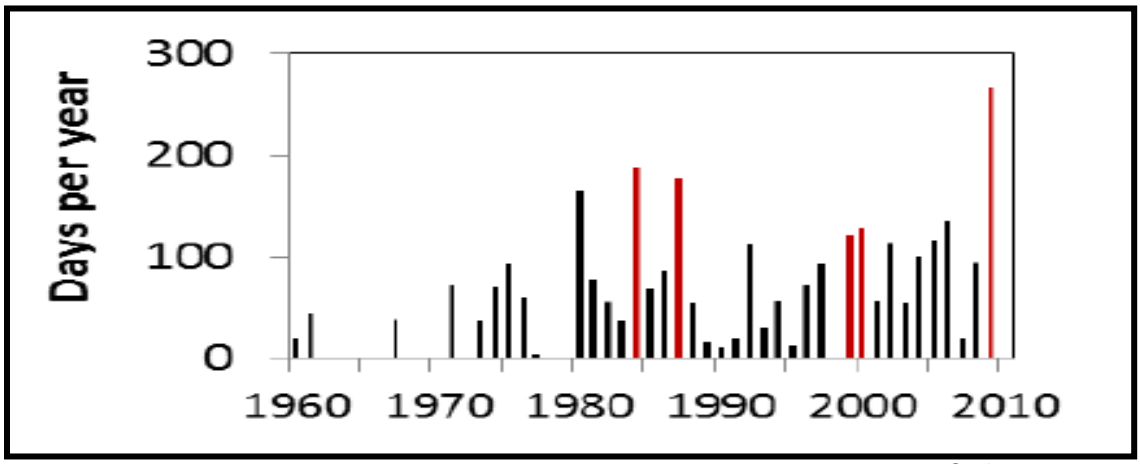


Fig ES 03: Number of days in a year when flow at Archer's Post was below 1 $m^3 s^{-1}$

According to another one source, the proportion of water abstraction as a percentage of available flow in the Naro Moru river was found to increase from 22% in the forest zone, to 43% in the foot zone and to 61% in the savannah zone and worsens in low flow years. In 2002 which was a low flow year, the average abstractions for Naro Moru River were 40%, 50% and 77% of available river flows at forest zone, foot zone and savannah zone respectively with consequential low flows in the river. In the wider Ewaso Ng'iro North catchment, permitted abstractions have cumulatively increased from 1 to 2m^3 s^{-1} (31.5–63 MCM per year) between 1960 and 1990 to hit 7 m^3 s^{-1} (221 MCM annually) in 1994 (Figure 4.5-b). The volume of permits issued was reduced in 1995 and subsequent years, but increased again to 6 m^3 s^{-1} in 2000 and 2001, at the height of a severe drought.

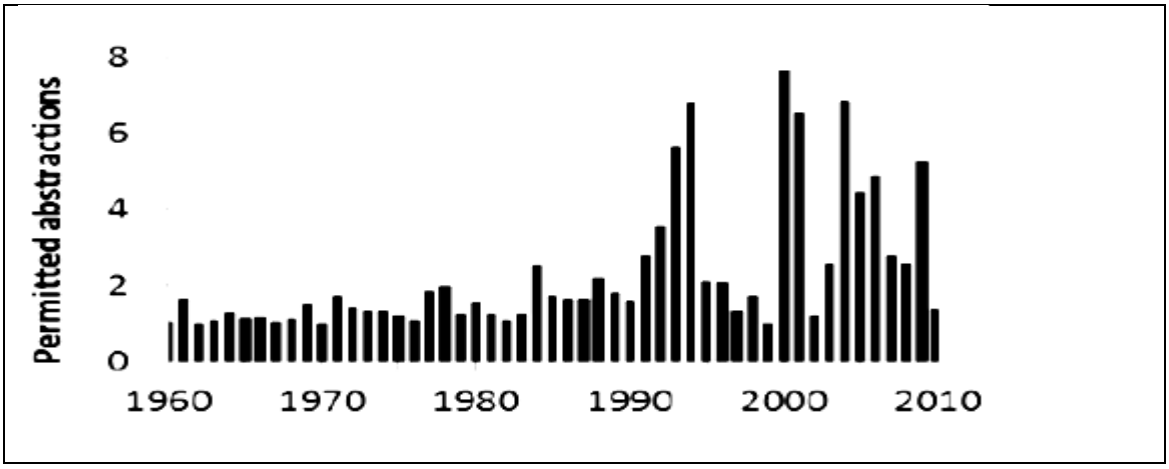


Fig ES 04: Permitted abstractions (m3s-1) in the upper Ewaso Ng'iro River Catchment

Thus, even as more development is proposed under LAPSSET, the question of rivers already suffering abstraction pressure and indeed, future availability of water in LAPSSET requires resolution.

The Land Resource Base

Tenure systems within the traverse: For a country where 40% of GDP growth is driven by agriculture, land becomes an important factor in economic production. Further, for subsistence economies that rely on primary extraction of ecosystem goods and services, land becomes a critical resource whose access and control is central to livelihood security and is often defended aggressively.
Within the LCIDP Traverse, all three forms of official land tenure are encountered within the LAPSSET Traverse thus:-

- *Government land:* Government land reserved for Livestock Holding Grounds is encountered twice at Lamu (Msumarini) and Isiolo (Kipsing Gap). GoK land in Lamu is however under diverse stages of formal and informal (Witemere) conversion into private land;
- *Protected land:* Protected land comprises the Mangrove Forests at the coastline site of Lamu Port which is protected under the Forests Act 2005 and the Losai and Marsabit Game Reserves protected under the Wildlife Management and Conservation Act 2013. Both game reserves are reserved largely for wildlife use but some limited exploitation such as grazing is allowed. The Corridor partly traverses the Arwale and Rahole Game Reserves in Garissa County which are important habitat for Hirola antelope and elephant breeding sanctuaries respectively;

- *Community land:* This is probably the dominant land tenure within the Corridor spanning all the 9 LAPSSET Counties. Within some urban centers in the traverse, some of the Community Land is undergoing conversion into urban plots for housing and trade but the bulk of land is communally used for grazing either under ranches/conservancies or Elder controlled grazing use;
- *Private land:* Privately owned land within the traverse mainly comprises private ranches in Samburu and Laikipia, some recently adjudicated land in Igembe North and urban centers; - Garissa, Isiolo, Archer's Post, Marsabit among others.

The Crises facing pastoral land systems: Of Kenya's land area of 582,650 square kilometres, pastoral rangelands account for 82.43% equivalent to 483,840 square kilometres. On account of low biomass productivity, pastoral production systems rely on extensive land-use which requires that vast stretches of land be available for rotational exploitation. As a consequence, of the national livestock herd of 21,649,855 TLU, only 70% equivalent to 15,154,898 TLU is held in the ASALs suggesting a stocking rate of 44.8 TLUs per square kilometre equivalent to 2ha per TLU.

On account of mandatory seasonal migration, access to dry season grazing and water is the essence of resilience of pastoral livelihoods which calls for a very flexible land tenure system. Traditional land tenure systems therefore evolved to allow pastoralists to move out and access dry season grazing grounds sometimes outside of tribal jurisdictions in a system whereby though many communities held jurisdiction over certain territories, the whole range was managed and used as a single resource often under reciprocal arrangements. This inherent right of pastoralists to seasonally move their flocks has persistently been eroded through decisions that overtime, tended to confer exclusive rights over parts of the range to individuals or groups in the process restrict pastoralists and their herds from accessing resources.

Large-scale government takeover of pastoral lands in Kenya is probably associated with the Uganda Railway which is a transport corridor developed by the Colonial Administration at the turn of the century to enable them reach Uganda, a country rich in mineral resources. In the early twentieth century, the Laikipia and sections of the Uasin Gishu Maasai were relocated to southern Maasai territories, especially to Narok District. Their former lands were then redistributed by the Colony to European farmers for commercial agricultural purposes with more than 5,000 square kilometers of pastoral land being taken in Laikipia alone. The alienation of land for white settlers (and, later, the creation of protected areas for wildlife conservation) deprived many pastoralists of their traditional lands. The colonial government, however, restricted land titles to individuals and did not provide for titling of common property.

With Kenya's independence in 1963 came huge pressure to re-settle landless peasants from other, more densely populated areas of the country which, in Laikipia led to a radical transformation of land tenure as several ranches were bought and sub-divided into smaller 1-4 hectare parcels for smallholder settlement[1]. As a result largely of in-migration, population numbers in the County increased from approximately 60,000 in 1960 to 399,227 in 2009. As the human population has increased so has the livestock population and demand for water.

The land laws in Kenya have thus focused on individualization of land rights at the expense of customary/community rights to land. A core outcome of this process has been gross interference with

[1] Gichuki, Francis. 2002. Water conflicts in the Upper Ewaso Ng'iro North Basin: causes, impacts and management strategies. E-conference paper. 22p.

viability of pastoral livelihoods[2] mainly through restricting their seasonal migration to reach forage and water thus endangering their survival while their restriction to shrinking land resources has occasioned overgrazing and degradation of the land beyond repair. The very survival of pastoral livelihoods especially in Laikipia-Mukogondo and Samburu is under severe threat. The general impoverishment of certain of Kenya's pastoral areas, resulting primarily from a loss of rangeland, has led to increased dependence on government relief, government-sponsored irrigation schemes and settlements, and the incorporation of wage employment in pastoral families to supplement decreased production and declining incomes.

This scenario is likely to replay depending on how LAPSSET is implemented.

Game Conservation within the LCIDP Traverse

A common feature of the ASAL ecology is its shared nature between human settlements and wildlife. Wildlife is overwhelmingly present along the traverse of the corridor with Isiolo, Laikipia, Samburu and Baringo being key counties that have a generous. It is known that over 75% of wildlife are found in community lands and northern Kenya has the highest number of wildlife that are found outside protected parks compared to anywhere else in the country.

According to the Wildlife Conservation Strategy for Laikipia, the County is a leading wildlife conservation area in East Africa's on account of having higher populations of large mammals than any protected or unprotected landscape in Kenya, outside of the Maasai Mara National Reserve. Secondly Laikipia is rich in biodiversity with over ninety-five species of mammals, 540 species of birds, over 700 species of plants and almost 1000 species of invertebrates already identified. Laikipia also has the highest assemblage of globally threatened mammals;- half of Kenya's black rhinos; Kenya's second largest population of elephants; a third largest and the only stable population of Kenya's, the world's sixth largest population of African wild dogs, a large proportion of the world's remaining Grevy'z zebras, perhaps as many as two thirds of the world's remaining Reticulated Giraffe, a globally significant population of cheetah, Kenya's largest population of patas monkeys and a unique race of hartebeest.

Alongside water, perhaps this wildlife resource resident outside of protected areas and whose habitat stands to suffer further fragmentation from the corridor that faces the most severe treat from LAPSSET. Yet, wildlife provides the main selling point for tourism, Kenya' number one foreign income earner and is a core anchor to the Economic Pillar of Vision 2030. In Laikipia alone, the wildlife sector generated an estimated $US 20,500,000 in tourism revenue in 2009, directly supporting 6,500 people. The wildlife sector raised a further $3,500,000 for social development projects such as education, healthcare, infrastructure development, security and livelihood support and $5,000,000 for wildlife conservation.

Protected Ecosystems: The section of the Traverse between the Indian Ocean at Lamu and Kisima (Samburu) hosts a total of 13 areas protected under both the Forests Act 2005 and the Wildlife Management and Conservation Act 2013 comprising 9 National Reserves, 3 National Parks (Fig ES 04) and 1 (one) gazzetted Forest, which host diverse wildlife including elephants, buffaloes, various antelope and all the big cats which makes them important conservation areas. Of the 13 protected areas, 4 areas namely;- The Mangrove Forest in Lamu and the Nyambeni, Losai and Marsabit Nature Reserves are

[2] AU-IBAR 2013. Sustainable Natural Resources Management and Land Policies: A Review in Kenya and Burkina Faso. AU-IBAR Monographic series No.3

traversed by the corridor which also passes in very close proximity of the Araware, Rahole Nature Reserves and Meru national Park largely reserved as habitat for wildlife including the endangered Hirola antelope. The rest of the traverse is an important dispersal area for wildlife especially elephants migrating in between the protected areas.

Conservancies: The LAPSSET infrastructure will traverse many community-owned and private ranches some of which have been transformed into conservancies. Conservancies have been used in the ASAL areas in Kenya as a tool to manage natural resources to enhance sustainable livelihoods, and also to ensure equitable sharing of resources. Most of the conservancies have developed management plans to deal with aspects of livestock/pastoralism, pasture management; water resources management; infrastructure development; health and education; peace and security; and wildlife management.

Important Bird Areas: Several important biodiversity sites are within the LAPSSET corridor traverse or within close proximity including 12 IBAs and about 10 National Parks or Reserves. These biodiversity areas are important particularly for the protection and conservation of the unique fauna and flora that includes several endemic species, especially of the eastern coastal forest. IBAs also play important economic roles in income generation at national level while supporting livelihoods locally. Many of the IBAs in Kenya are protected but there are several that are under no formal protection within the LAPSSET corridor including the Dida Galgalu IBA to the East of Marsabit forest, which could be possibly traversed by the corridor. IBAs are also in constant pressure from being overgrazed and over utilized by pastoralist due to lack of good management of land. Illegal selective logging and vegetation destruction is severely threatening some IBA sites.

Status of species conservation: Kenya ranks second highest in terms of bird and mammal species richness when compared to other African countries and has high levels of species endemism or species that live nowhere else on earth. This notwithstanding, the trend in Kenyan wildlife populations is alarming. A recently published study has revealed that bbetween 1977 and 2016; Kenya's rangelands lost 68.1 percent of wildlife equivalent to 1.7 percent loss per year (Ogutu, et al 2016). The declines were particularly extreme (72–88%) for warthog (*Pharcoerus africanus*), lesser kudu (*Tragelaphus imbermbis*), Thomson's gazelle, eland (*Taurotragus oryx*), oryx (*Oryx gazelle beisa*), topi (*Damaliscus lunatus korrigum*), hartebeest (*Alcelaphus buselaphus*), impala (*Aepyceros melampus*), Grevy's zebra (*Equus grevyi*) and waterbuck (*Kobus ellipsiprymnus*); severe (60–70%) for wildebeest, giraffe (*Giraffa cemelopardalis*), gerenuk (*Litocranius walleri*) and Grant's gazelle (*Gazella granti*); and moderate (30–50%) for Burchell's zebra, buffalo (*Syncerus caffer*), elephant (*Loxodonta africana*) and ostrich (*Struthio camelus*).

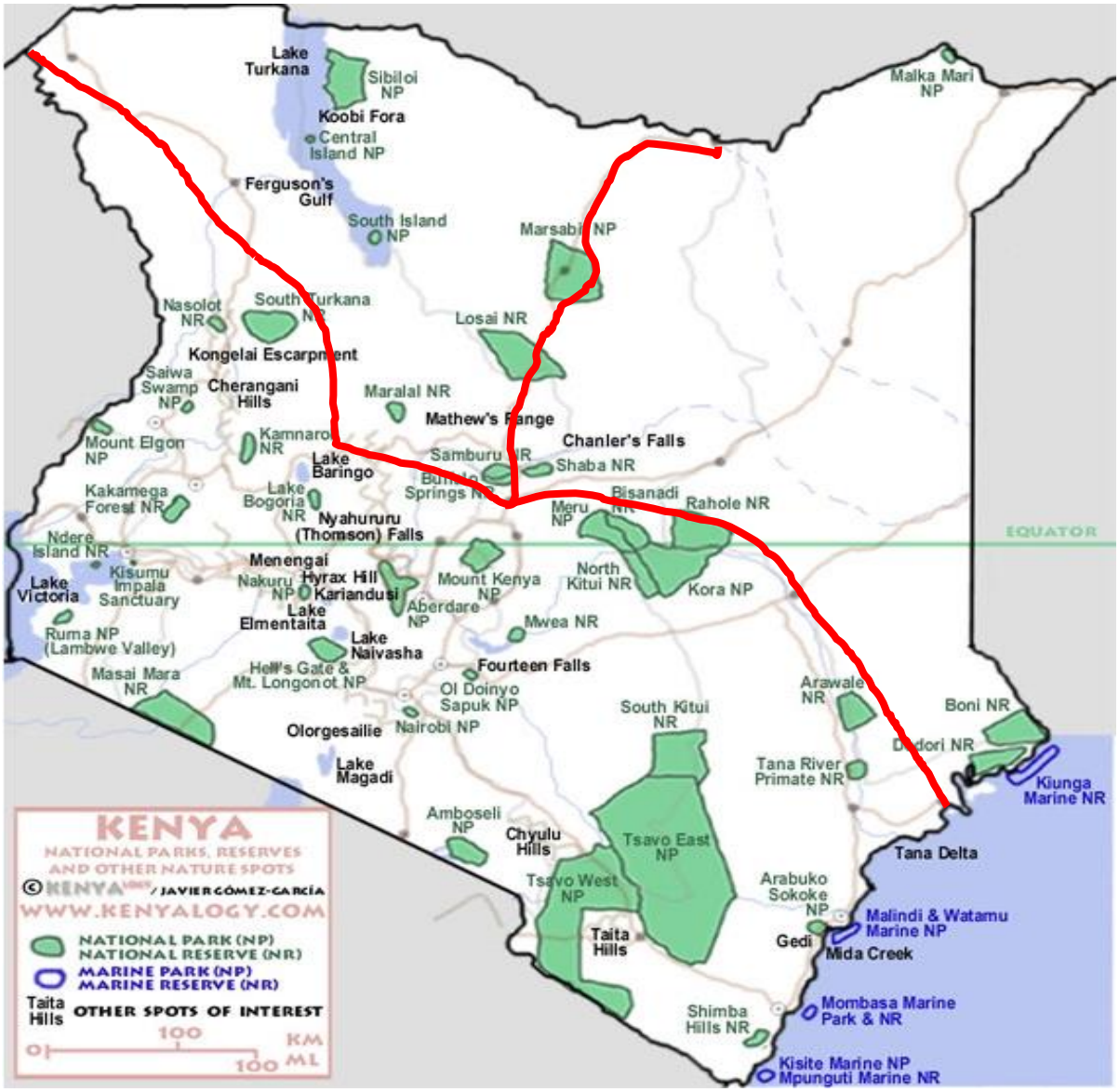


Fig ES 05: Protected areas traversed by the LCIDP

Simultaneously, the Study observed a spectacular increase in numbers of sheep and goats (124.5–648.1%) in 8 counties (Narok, Taita Taveta, Lamu, Laikipia, Samburu, Garissa, Wajir, Mandera and Marsabit), moderately (3.8–89.3%) in 10 counties but decreased marginally (3.8–64.4%) in Kwale and Elgeyo Marakwet counties. The population of camels also increased many-fold (450–17896%) in Kitui, Laikipia and West Pokot counties and, to a lesser extent (89–119%), in Baringo, Garissa and Samburu counties, signifying increasing and widespread adoption of camels in these counties. Such an inverse relationship indicates a worrying clear and systematic trend whereby wildlife is being replaced by livestock in pastoral counties including those within the traverse. The main drivers to this displacement are habitat loss and fragmentation, blockage of migratory corridors, loss of breeding and water sanctuaries, retaliatory killing among others.

Population and settlement patterns

The People: Kenya's dryland areas make up more than 80% of the country and are home to approximately 4 million pastoralists who constitute 16% of Kenya's population normally straddling national borders with Somalia, Ethiopia, Sudan, Uganda and Tanzania. Pastoralists are divided into various ethnic and linguistic groups, ranging from the large and famous groups like the Maasai and the Somali, who number in excess of half a million people each, to small and so far obscure groups numbering a few thousand (Umar 1997). Essentially, the traverse is dominated by pastoral communities better known for livestock keeping who largely subsist on livestock sometimes supplemented with hunting and gathering as is the case with Wabanjuni, Wasanye and Waboni of mainland Lamu.

Population distribution: A total of 55 Administrative Wards covering 102,467 square kilometers and accounting for 2.8% of the national population of 44.35 million people will be traversed (Fig ES 06).

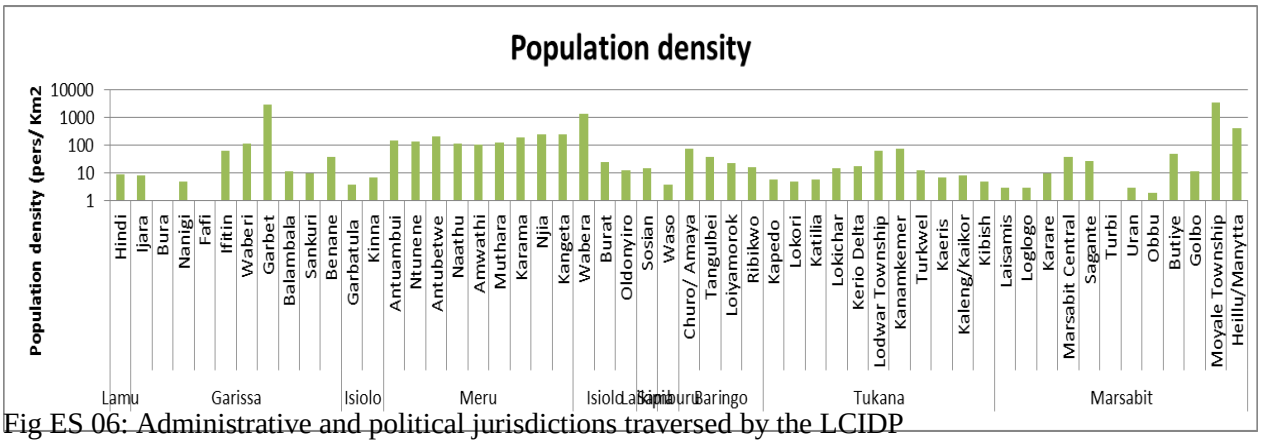


Fig ES 06: Administrative and political jurisdictions traversed by the LCIDP

Population density within the 55 LAPSSET Wards is quite varied but three patterns are evident:-

- **Pastoral settlements:** These are the most common within the traverse and are characterized by low densities ranging from 1-20 persons per square kilometer;
- **Agro-pastoral settlements:** Agro-pastoral settlements as encountered at Hindi, Meru (Igembe and Tigania) have most population densities averaging 100 to 250 persons per square Kilometer;
- **Urban and peri urban settlements:** These are encountered at Garissa, Isiolo, Moyale and Marsabit and have characteristically high population densities in excess of 1000 persons per square kilometer with Moyale township leading at 3422 persons per square kilometer. Displacement impact within urban traverses is likely to be substantial.

Livelihood Systems

From analysis of dominant livelihood systems for landscapes in the entire LCIDP, it emerges that, with the exception of the two sites of Lamu Mainland and Rift Valley Escarpment at Churo where fishing and agro-pastoralism dominates, livestock herding is the economic driver for the rest of traverse.

Fishing based livelihoods: The Lamu Archipelago comprises of a 130Km long rugged coastline stretching from Daresalaam point in Kiunga to Ras Tenewi in association with over 60 islands separated by numerous mangrove-covered marine channels and estuaries separated from the ocean by coral reef systems all of which create conditions quite conducive to fishing. Fishing is the economic mainstay for Lamu County accounting for incomes for 80% of the population Artisanal fishing in marine areas is the dominant fishing activity accounting for 80% of the 2200 metric tonnes of annual catch valued at Kshs. 180 million. As at 2014, Lamu had 28 Fish Landing Sites (FLS) some under Beach Management Units overseeing activities of 1500 fisher folk.
Marine fishing at Lamu is restricted to the sheltered areas inside the fringing coral reef on account of reliance on old traditional fishing technology which restricts fishers from venturing into the deep sea. Though Kenya has an Exclusive Economic Zone (EEZ) which extends up to 350 nautical miles (nm), this resource remains under- exploited by the artisanal fishers and continue to be exploited by the Distant Water Fishing Nations (DWFN).

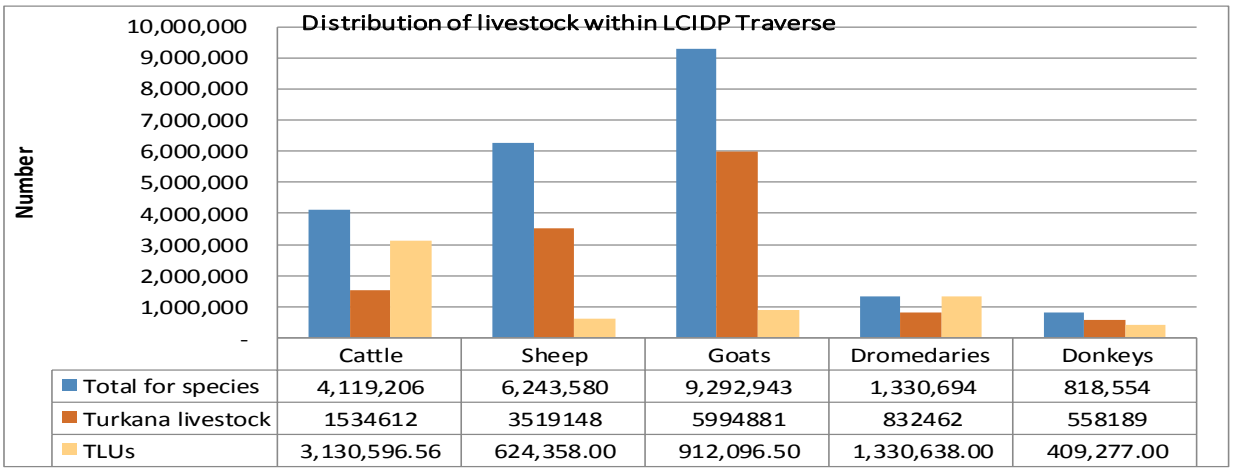
Long-term total landings of demersal coral reef fishes average 2.53 t/km^2/year implying very low yield. Productivity among fisher folks as indicated by long-term average CPUE (catch per unit of effort) was observed to average 4kg/fisher/trip though with high variability mainly dominated by demersal fish.

Yield of marine fisheries is constrained by many factors; - among them a narrow fishery measuring 8500 km^2. Secondly, strong winds associated with prevalence of the South-East Monsoon in March to October occasion rough currently which render the sea inaccessible by local fishing craft such as dugout canoes thereby imposing a seasonal ban on fishing activity and rendering 80% of the population destitute.

Pastoralism: To the pastoralist, the animal is a mediator enabling human beings to extract sustenance from a hostile ecology and is often the sole means to survival in ASAL areas and core to pastoral livelihoods. Traditional pastoralism is typically a subsistence-level production system, with families relying more on milk than meat for nutrition, selling animals to get cash for other economic needs, and building herd sizes to accrue social status, wealth, and risk buffering (Plate ES 01).

Goats, sheep, cattle, dromedaries and donkeys are the predominant holdings in the pastoral economies. In terms of absolute numbers, the goats predominates the traverse with a count of 9.3 million followed by sheep and cattle. However, in terms of biomass as expressed in Tropical Livestock Units (TLUs), cattle account for 48.9% followed by camels at 20.8% with goats coming a distant third at 13.2% (Fig ES 07).

Counties traversed by the LCIDP command a total of 6,406,966 TLUs of which 50% is contributed by Turkana. Thus, while ASALs account for 70% of the national livestock resource base, 37% of the national base equivalent to 52.9% of the ASAL livestock population is accounted for by the LAPSSET Corridor Counties which also command 45% of the national camel and donkey population respectively.



	Cattle	Sheep	Goats	Dromedaries	Donkeys
Total for species	4,119,206	6,243,580	9,292,943	1,330,694	818,554
Turkana livestock	1534612	3519148	5994881	832462	558189
TLUs	3,130,596.56	624,358.00	912,096.50	1,330,638.00	409,277.00

Fig ES 07: Population of dominant livestock within the LCIDP traverse

Productivity of pastoralism: A core feature of the range resources/ range units is low productivity on account of aridity as illustrated by the case of Isiolo County based on data from the Range Management Hand book. Isiolo's 10 Range Units cover an estimated 71.1% of the County's land area of 25336 Km^2 and are characterized by low biomass yield with six producing on average less than 0.5tonnes/ ha annually. None of Isiolo's Range Units has capacity to support both the cattle and camel herds for more than 100 days every year, a situation compounded by limitation of grazing and forage in Samburu and Marsabit where none of the 43 Range Units can support cattle, sheep, goats and camels for year round grazing even in a median rainfall year, let alone a drought year. This explains observed tendency for Isiolo and Samburu livestock to converge at Losesia and then head southwards along Nanyuki road destined for Mt. Kenya Forest.

The example of Isiolo serves to illustrate the worrying trend of declining land available for use by pastoralist livestock in Kenya. Further, given that this computation has relied on 20 year old data on range condition and seven year old livestock census data, conclusions arrived at here may not be representative of actual conditions on the ground particularly considering that the Range Management Team had already raised an alarm over accelerated land degradation in all the nine arid counties. There is chance that some of the range units have been lost to degradation while range condition in others has further deteriorated thus reducing on residency time for all flocks and increasing the need and frequency of seasonal migration which could explain the current pastoral crises in Kenya.

Provision of family sustenance: Pastoralism is essentially a subsistence level economy in which livestock provides family sustenance supplemented with purchased. In the case of pastoralists in Garissa County, family herds generate 90% of the milk and dairy products input into the family diet while markets account for 80-100% of maize meal consumed, beans/pulses, roots and tubers, wheat products, fats and oils. Goats are the highest source of food (50%), followed by sheep (30%), cattle (15%) and camels (5%). Similarly goats are the highest contributors (55%) to household income from livestock, followed by cattle (25%), sheep (15%), and camels (5%). Goats are also the most sold species at 46% and also accounted for 49% of the milking animals.

Contribution to household cash income: Livestock production is the dominant income earner amongst pastoralists sometimes contributing up to 72% of the total household income through sale of animas and

milk. Amongst pastoralists around Lake Baringo, livestock was found to contribute 24.9% and 62% of the total income, during wet season, amongst under Sedentary Agro pastoralists (SAP) and Sedentary Nomadic Pastoralists (SNP) respectively but this reduced to 21.9% and 45.9% respectively during the dry season. Amongst the SAP, income from livestock supplemented that from crop production (40.8 and 12.2% in wet and dry season respectively), trade, wage employment, charcoal and bee keeping while among the SNPs, bee keeping and supplemented by livestock production at 15.3% and 13.2% respectively. Amongst the SNP, reliance on charcoal was observed to increase from 4% in wet season to 10.5% in the dry season respectively implying that climatic conditions is a driving force to environmental degradation.

Status of Wellbeing within the Corridor

Poverty levels: Incomes amongst pastoral households are generally low, just slightly above Kshs 94,209 annually equivalent to a daily per capita income of Kshs 44 which is inadequate to meet the basic minimum calorie intake. The official, pa capita county level mean monthly household income for Counties traversed by LAPSSET of Kshs 1,817 falls in between both the rural and urban poverty indices against which it cuts across. Prevalence of poverty within the Northern Arid Counties remains quite high as documented in Fig ES 08 based on 2009 Census estimates for administrative Wards traversed by the LAPSSET Corridor. Out of 33 wards sampled between Lamu and Nakadok, only 9 have poverty prevalence below 50% with only four falling below the national average of 45.2%. Lowest showing of poverty is recorded for Lamu and Meu North sections of the traverse while Turkana and Marsabit account for the highest prevalence in excess of 80%.

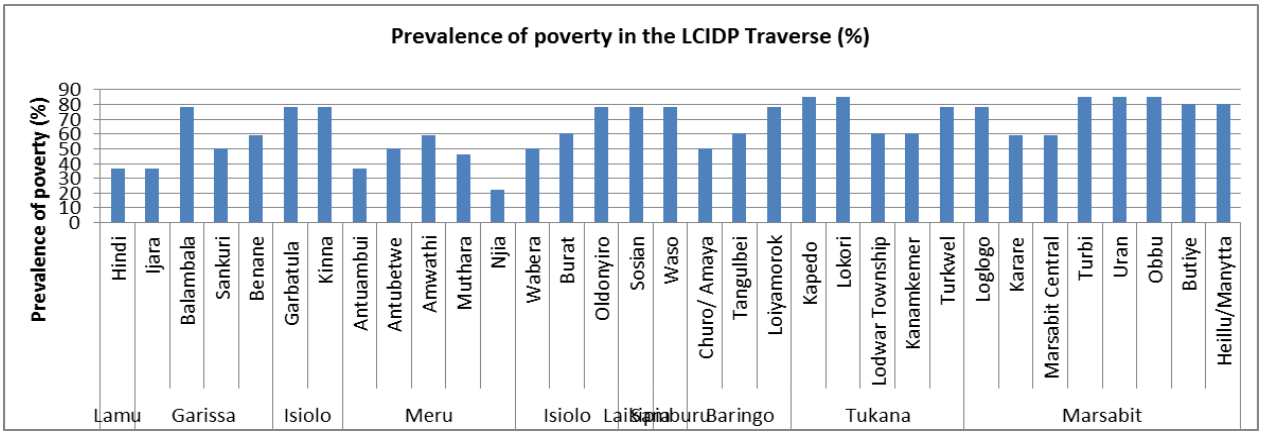
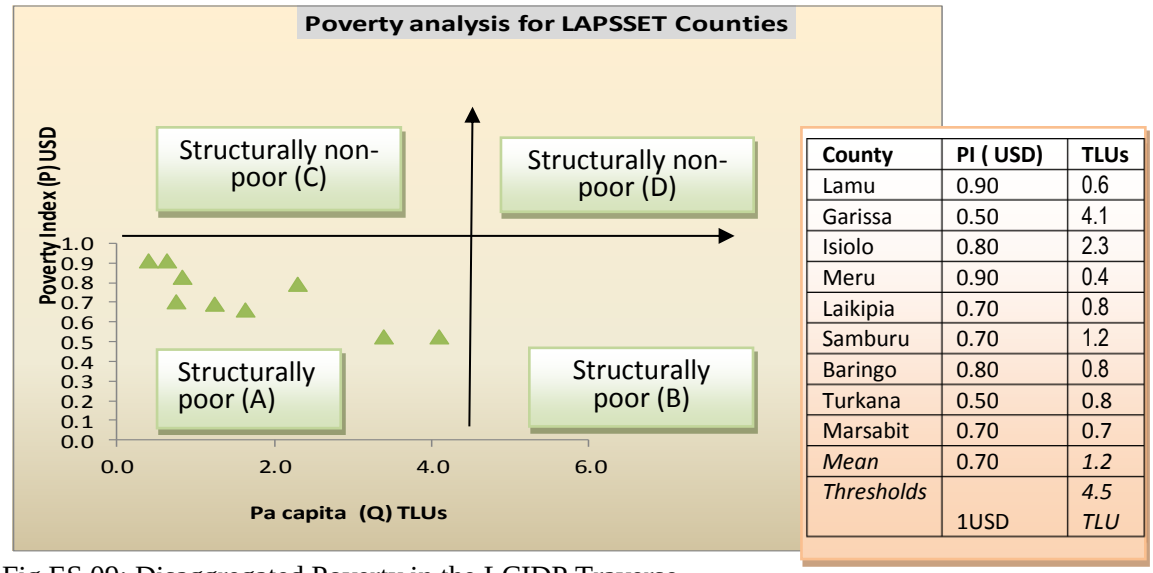


Fig ES 08: Prevalence of Poverty within wards traversed by the LCIDP

Disaggregated Poverty: Towards better understanding of the dimensions of poverty amongst pastoral households, and towards providing a basis for targeting interventions, poverty occurrence has been disaggregated based on application of an asset poverty line whereby, a per capita asset threshold of 4.5+TLU is applied to delineate between better-off and poor pastoral households. Here, the asset poverty line is simply the level of assets that predicts a level of well-being equal to the poverty line.
Application of this analysis to the LAPSSET Corridor Counties based on per capita TLUs alone (Fig ES 09) reveals that, pastoral income levels and livestock holdings within the LAPSSET Traverse are below both the Income Poverty Line (1 US dollar per day) and the Asset Poverty Threshold of 4.5TLU. Essentially, households within the traverse are both asset and income poor. This agrees with recent findings in Marsabit County which documented majority of households surveyed to be structurally poor

with the proportion rising from 66.8% in 2009 to 69.3% in 2013 primarily through loss of assets thus supporting the general observation that poverty within the pastoral belt of Kenya is on the increase.



County	PI (USD)	TLUs
Lamu	0.90	0.6
Garissa	0.50	4.1
Isiolo	0.80	2.3
Meru	0.90	0.4
Laikipia	0.70	0.8
Samburu	0.70	1.2
Baringo	0.80	0.8
Turkana	0.50	0.8
Marsabit	0.70	0.7
Mean	0.70	*1.2*
Thresholds	1USD	*4.5 TLU*

Fig ES 09: Disaggregated Poverty in the LCIDP Traverse

Dimensions of Poverty in Northern Kenya: Findings on prevalence of poverty as documented above support the long held view that one of the core socio-economic parameters defining Northern Kenya Counties is high prevalence of poverty as manifested by the fact that eighteen of the 20 poorest constituencies in Kenya where 74% - 97% of people live below the poverty line, are in Northern Kenya. According to the UNDP, the arid north of Kenya lacks basic foundations of development given that access to education, health, water, infrastructure, energy, among others which are all critical enablers of growth are well below the national average and this holds the region back. Fig RS 09 compares the Human Development Index (HDI) and the County Development Index (CDI) for Counties traversed by LAPSSET against the national average.

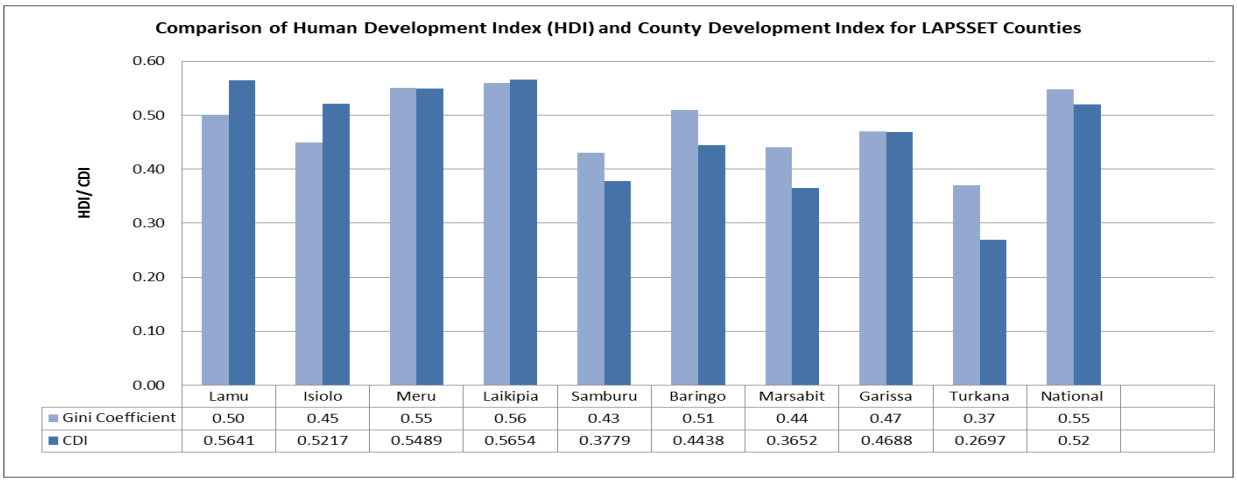


Fig ES 10: Comparison of HDI for Kenyan Counties

The CDI was developed by the Commission for Revenue Allocation following on the methodology of the HDI as a composite indicator as a criteria that measures the level of development in the 47 counties. Indicators applied in the computation include poverty, water, roads, electricity, sanitation, immunisation, birth deliveries with qualified medical personnel, secondary education and literacy level with the resultant Index being applied to compare counties in terms of human development and the level of marginalisation. Counties with low CDI value are considered less developed (not enjoying basic services) while those with high CDI values emerge more developed or less marginalised.

Avery strong correlation between County HDI and CDI values is evident in Fig ES 09. Further, five of the nine LAPSSET Counties have CDI values below the national mean of 0.52 with Turkana, Marsabit, Samburu and Baringo being among the 10 most marginalised Counties in Kenya. Overall, Turkana is the most marginalised County with a CDI of 0.2697. The Counties of Lamu, Isiolo, Meru and Laikipia have CDIs above the national mean, a position most likely skewed by prevalence of more developed areas within their counties.

The Economic Perspective

Kenya Economic Structure: The Kenyan economy is dominated by agricultural sector which accounts for over 25 percent of the GDP over the years.

GDP and Per Capita Growth Rates: The Kenya economic performance has remained positive but still below the 10.0 percent growth envisaged in the Vision 2030. Real GDP growth declined from 6.1 percent in 2011 to 4.6 percent before stabilizing at above 5.0 percent in starting 2013. On the other hand, the per capita growth rates have remained significantly low. With the population growing at 2.6 percent alongside insignificant growth in real per capita income, poverty remains a real challenge, with 46 percent of the population estimated to be living below the poverty line.

International Trade and Balance of Trade: Africa has remained the leading destination of Kenyan exports over the years accounting for 41.7 percent of total exports valued at USD 2,421.9 million in 2015. The EAC states accounted for 52.3 percent of the total exports to Africa with Uganda as the leading destination of Kenya's exports over the years. Europe was second destination of Kenya's exports valued at USD 1,459.4 million in 2015. The main exports to Europe include the horticultural products, coffee, tea etc. Major Europe countries consuming Kenya's exports are Netherlands, United Kingdom, Germany, Belgium etc.

Asia has dominated as the leading source of the country's imports despite a drop in value of imports from USD 9,901.7 Million in 2014 to USD 9,816.5 Million in 2015. Imports from Asia include petroleum products from Middle East, pharmaceuticals, machineries, motor vehicles etc. Within the Asia region, China is the largest source of the country's imports that expanded significantly from USD 2,486.5 million in 2014 to USD 3,208.1 million in 2015. This can be attributed to imports of construction materials related to the construction of the Standard Gauge Railway (SGR).

The potential for LCIDP induced economic growth

The Historical perspective: The LCIDP is the single most important intervention designed and implemented as part of the Kenya Vision 2030 strategy for reducing inequality and re-balancing regional development in Northern towards ensuring that the dream of a just, equitable and prosperous nation is

shared by all Kenyans across board. LAPSSET therefore is aimed at redressing regional inequality occasioned by past development strategies which were skewed in favour of Kenya's high-potential areas and which only succeeded in increasing social disparity within the 89% of Kenya described as Arid and Semi-Arid and home to 36% of the national population who currently feel marginalized on account of disproportionately high poverty levels, poor dietary intake, poor access to social infrastructure and basic facilities, high infant mortality, poor enrolment in schools and generally low quality life. This yearning for development and economic transformation is the singularly most important asset in implementing Kenya Vision 2030 flagship projects. In favouring LAPSSET as an economic enabler, the aim is to unlock the high economic potential that remains unexploited in Northern Kenya. In sections below, an overview of the region's untapped potential is provided.

The Human Capital: Counties of northern Kenya account for 13.6% of national population equivalent to 5.234 million people most of who rely on pastoralism for subsistence. However, on account of aridity and other challenges to pastoralism, 56.3% of the resident population accounting for 7.7% of the national population subsist below the poverty line and are therefore unable to fully participate in nationhood.

Economic empowerment would bring this population into the mainstream economy as consumers of goods and services, traders, tax payers and other capacities that contribute to earning the National GDP. Indeed, injection of modest capital to eliminate the poverty gap will increase spending by 36% thereby occasioning a 0.2% growth in the GDP. With better targeting, investment in LCIDP Components has potential to address and reverse core drivers of poverty namely unemployment, lack of functional markets, and inadequacy of opportunities for income diversification thus even increasing rural incomes and by extension, purchasing power.

The Strategic Position: Kenya's development strategy, Vision 2030 and the Medium Term Plan (MTP) 2008- 2012 identifies infrastructure development as the main pillar in the GOK's quest in transforming Kenya into a globally competitive economy and in expanding intra-regional trade with neighboring countries while enhancing incomes and social welfare in rural areas. Specifically, the LCIDP targets to interlink Northern Kenya to South Sudan and Ethiopia whose vast economic potentials largely remain untapped by Kenya.

Ethiopia: Kenya shares a 1000 km common border with Ethiopia-the second-most populous country in Sub-Saharan Africa with a population of 97.0 million, and population growth rate of 2.5% in 2014. In 2014, the GDP of Ethiopia was $55.6B and its GDP per capita was $151 then rapidly tripling by 2014 to hit US$550 supported by an average annual growth rate of 10.5% over the same period to become one of the fastest growing economies in Africa aspiring to reach middle income status over the next decade. Expansion of the services and agricultural sectors account for most of the growth followed by manufacturing, private consumption and public investment. Ethiopia exported US$ 5.56B and imported US$16.4B, resulting in a negative trade.

A growing Ethiopian economy offers great potential for trade with Kenya. In 2014, trade volume between Kenya and Ethiopia totaled $58million compared to US$837 million for Uganda whose population is only a quarter that of Ethiopia. Imported refined petroleum volume of 24,910 barrels a day accounting for 15.5% of Ethiopia's external trade worth US$21.98 Billion is transported by truck from Port of Djibouti. Assuming that this oil is handled through the LAPSSET oil pipeline with a US$ 2 levied per barrel would inject an additional Kshs 4.6 billion into the national economy equivalent to 0.08% GDP growth.

South Sudan: Prior to independence, South Sudan produced 85% of Sudanese oil output and given continued reliance on pipelines, refineries, and the Bashayer port facilities controlled by the north, oil revenues are shared equally between both states with RSS receiving on average US$8 billion which accounts for 98% of government revenue. Provision of an alternative export route for SS oil would reduce over reliance on the north while simultaneously allowing participation by other players including American Oil Companies. By extension, part of the US$ 10 processing fee levied on every barrel of SS oil exported through Sudan could accrue to Kenya, in the process, creating a new revenue source worth USD 23.73 million equivalent of 0.2% GDP growth. This is part of the trade volume that Kenya will secure from extension of an oil pipeline to South Sudan while more would be expected from increase in cargo movement and trade across the border.

Livestock Industry: From analysis above, LAPSSET Corridor Counties command a total of 6,406,966 TLUs equivalent to 37% of the national TLU resource base and this includes 45% of the national camel and donkey population respectively. The sector still remains the main economic driver in the arid counties accounting for the bulk of family sustenance and up to 95% of household income. On a prolata basis, therefore, LAPSSET counties probably account for up to 37% of the livestock sector's contribution to Agricultural and National GDP and should therefore be strategically positioned to ride on the LAPSSET economic game changer wave. Towards this, the Government through ENNDA is developing an abattoir at Isiolo with capacity to process 790 TLUs equivalent to 700 heads of cattle, 100 camel and 2000 shoats daily while a similar one is proposed in Wajir County.

Tourism: The Laikipia-Isiolo-Samburu tourist circuit traversed by LAPSSET hosts numerous state protected game conservation areas namely; Buffalo Springs National Reserve, Samburu National Reserve, Shaba National Reserve, Nyambene National Reserve all within vicinity of the Mt. Kenya Ecosystem which gives the region a comparative advantage in tourism-Kenya's top foreign exchange earner accounting for 12% of National GDP. As well and in appreciation that over 70% of Kenya's wildlife reside outside protected areas on land occupied by pastoralists, many former group ranches operated purposely for livestock have slowly adopted game conservation as an alternative land use promising even better returns when linked up to the tourist market. In this league is included world-acclaimed private game sanctuaries such as the Lewa, West Gate, Mugie, Ill Ngwesi, Lamunyak, Kalama, Losai among others that have adopted management geared towards environmental conservation as an economic activity. Partnering in this paradigm shift are numerous interests groups such the Ewaso Forum, African Wildlife Foundation, Laikipia Wildlife Foundation, The Nature Conservancy, Northern Rangeland Trust, Save the Elephants, among others.

Oil and gas: Every passing day brings commercial oil exploitation in Kenya closer to reality; following years of massive oil exploration in 47 Blocks spanning the Anza, Mandera, Tertiary Rift and Lamu Basins (NOCK). Indeed, with the exception of the Isiolo-Laikipia section, the LAPSSET Corridor traverses oil exploration blocks including the Lokichar area where Tullow Oil Corporation has reported oil finds to the tune of 1 billion barrels out of which, commercial production from Block 10BB is set to start by September 2017. Evacuation of crude oil from Lokichar is bound to be constrained since construction of both the LAPSSET Pipeline and the one through Uganda is yet to start. Indeed, given the massive demand for refined oil in landlocked Ethiopia and the overwhelming evidence of availability of commercial oil deposits in Turkana and neighbouring South Sudan is major justification for investment in LAPSSET.

STAKEHOLDER PERCEPTIONS AND CONCERNS IN LAPSSET

A total of 47 meetings at the Detailed SEA stage were held mainly speaking and listening to grassroots communities all the way from Lamu to Lodwar. A total of 1871 stakeholders were met who raised issues as highlighted here. These concerns have directly informed the selection and prioritisation of concerns and the outcome of this SEA.

Public Disclosure of LAPSSET: Without exception all stakeholders engaged complained of lacking information about LAPSSET. It was in reaction to this that the series if County Level Workshops and Community Level Public Hearing meetings were held under auspices of this SEA in all Counties. It was however recommended that the same process be adopted and intensified by LCDA.

Issue of Land: This issue was emotively discussed in all the Community level meetings. Communities are apprehensive that their land is being alienated. Communities want protection for their land. Communities want LAPSSET to negotiate with them before acquiring the land.

The issue of Wildlife: Stakeholders in Wildlife are concerned that LAPSSET is traversing critical wildlife habitats in Ijara, Isiolo, Laikipia, Samburu and Marsabit which host vast populations of wildlife outside protected areas with some endangered species such as Hirola antelope, Elephant, Wild dog, Grevy's Zebra among others. The corridor should realign to avoid high density migratory corridors and provide modalities for traffic separation to allow free movement of wildlife.

The issue of water: This issue came out forcefully during meetings at Laikipia and with ENNDA where the sad state of Ewaso Ng'iro River dues to over abstraction was highlighted. It was highly recommended for the pace of LAPSSET development to be pegged to development of water storage infrastructure. The question of Isiolo Mega dam and Crocodile Jaws dams remain contentious as downstream communities see them as attempts to further deny them of water through storage of floods.

Support for LCIDP: The stakeholder engagement process brought out one fact:- LAPSSET enjoys overwhelming support nationally. Many County governments are proceeding to make plans on how to partner with LAPSSET. Their core requirement is data and information to facilitate capture of the same in the County Spatial Plans and revised CIDPs.

POTENTIAL CONCERNS IN DEVELOPING THE LCIDP

Basis for Impact Assessment: Impact analysis was approached at different levels namely;- i) Screening for compatibility/ relevance to GoK Planning Goals at National, Regional and County levels, ii) Screening against international standards for sustainable development and , iii) Screening against stated stakeholder concerns and interests

Screening for LAPSSET therefore, applied an array of tools whose criteria represent the broad range of interests from diverse stakeholder categories. As a strategy, the entire corridor and proposed investment portfolio that make up LAPSSET have been screened against parameters that define the operating environment to firstly gauge out how the project blends with pre-existing mandates, local and international standards and to map out discordant aspects that would require resolution towards achieving technical viability, economic sustainability and social acceptability in project development. The basis for screening is a checklist of issues/criteria from tools that define the operating environment for LAPSSET.

Outcome of the screening process: A total of 194 Criteria obtained from 83 diverse tools were applied in the Screening. Essentially, screened against the 194 criteria, a total return of 127 negative (caution) outputs equivalent to 65.5 % of all outcomes was observed against 67 positive outcomes. LAPSSET scores very poorly against grassroots and Fundamental Rights Holder Interests at 87.5% and 77.8% caution respectively (Fig ES 10). By implication, the bulk of adverse impacts are anticipated to accrue at both stakeholder levels. In sections below, the salient concerns under each stakeholder category are highlighted.

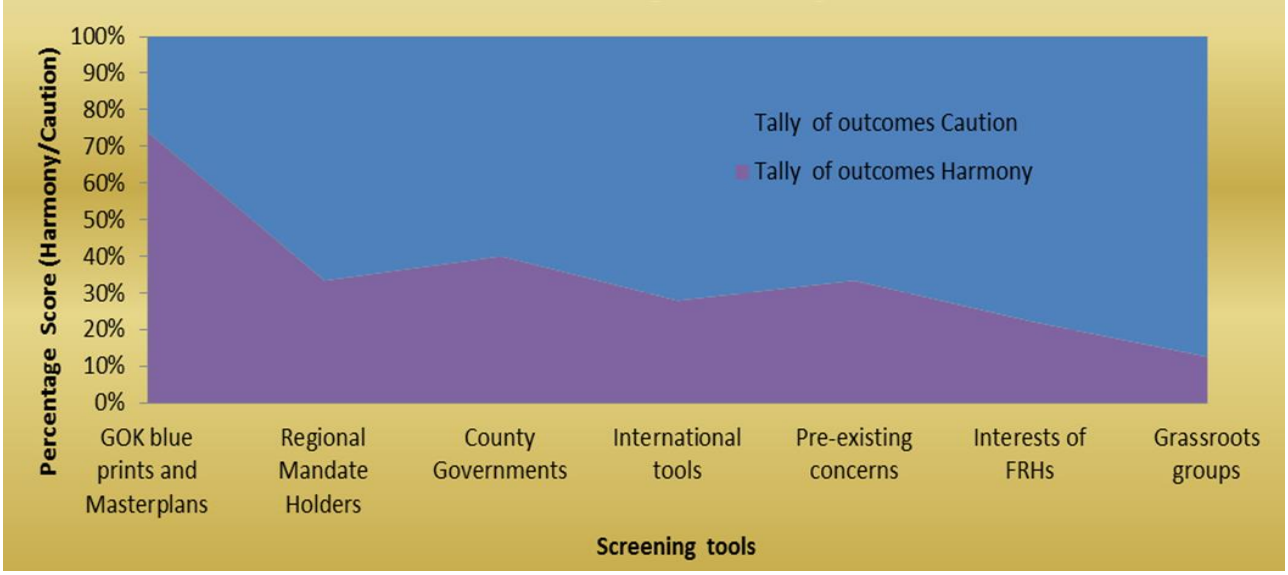


Fig ES 11: Broad-based screening of the LCIDP against diverse criteria

The Core Concerns in implementing the LCIDP

In sections below, the scope, depth and dimensions of issues emerging as being critical in the successful development of LAPSSET are analysed to pave way for formulation of an issues-based mitigation strategy.

Core Stakeholder Concerns in LAPSSET: Analysis of issues for this SEA has largely relied on collation of concerns (published, written or verbal) as obtained from stakeholder categories through the process schematically illustrated in Fig. ES 12 below. Numerous issues received underwent preliminary screening and grouping to yield 20 thematic issues considered to represent the main stakeholder interests in LAPSSET. All 20 issues underwent further cross referencing against screening tools with the frequency of trigger helping to rank each issue in terms of importance. The resultant ranking is presented graphically in Fig ES 12 and its *Jar of Issues*. In the view of this SEA, land and land based resources, water and livelihoods stand out as the most critical costs in developing and operating LAPSSET and by extension hold the key to unlocking the strategic impact of the project.

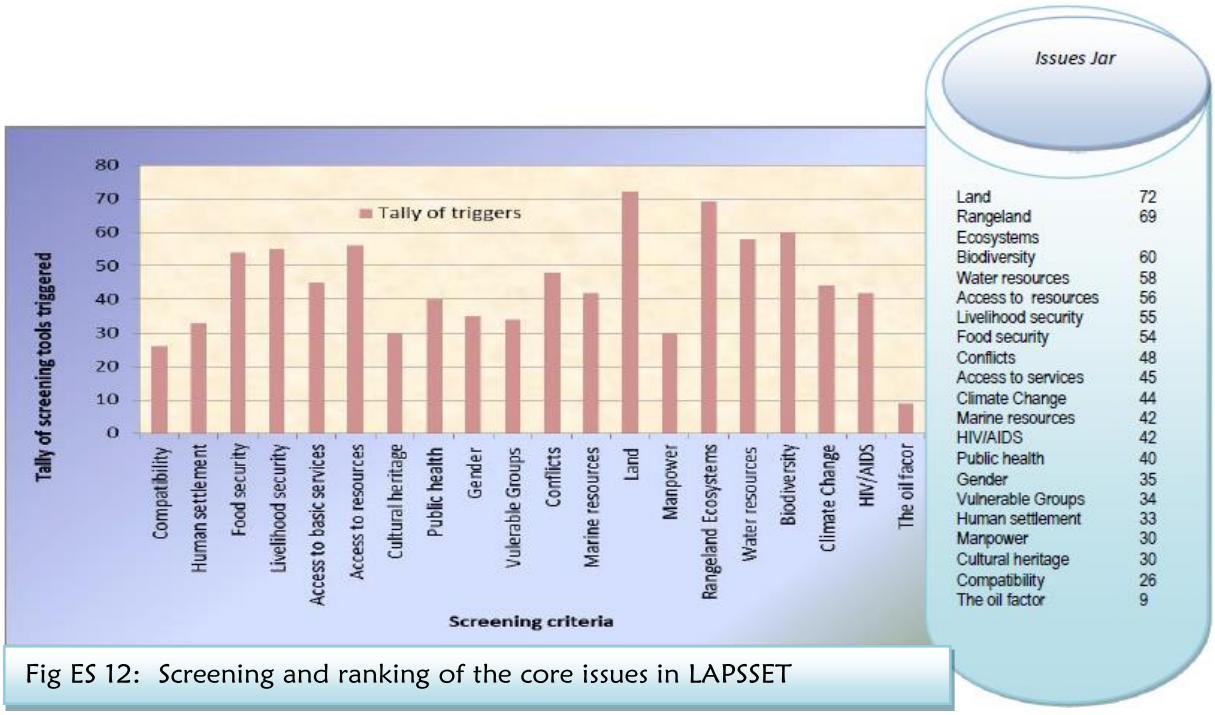


Fig ES 12: Screening and ranking of the core issues in LAPSSET

Realignment of land-use along the corridor and beyond: The most drastic long-term impact of land alienation for LAPSSET is land use transformation along the Corridor and beyond. As happened, with development of the Uganda railway, currently extensive use of land for pastoralism is likely to slowly be replaced by aggressive, capital intensive commercial investments to take advantage of modern transport infrastructure in form of airport, road and railway. In this regard, the Garba Tula-Nginyang-Marsabit triangle where attempts to introduce commercial horticulture for export has been constrained by increasing distance from Nairobi and poor state of roads, is likely to see more horticulture developing to take advantage of Isiolo Airport and the new highway. The vast riparian grazing belt of the Tana River riparian belt in Garissa is likely to come under more horticulture, further fragmenting both dry season grazing grounds and wildlife habitats.

Erosion of pastoral resilience: Land use change in response to LAPSSET will take place mainly at the expense of pastoralism which, in spite of providing livelihood for 15% of the national population and hosting 37% of the national livestock herd which contributes to the 5% of National GDP earned from livestock, have continued to lose grazing territories to ranching, conservation, horticulture and urbanization will lose additional land especially to large-scale commercial horticulture, hospitality, industrial belts and real estate. With additional loss of grazing land to commercialization as anticipated from LAPSSET, remaining pastoral land will come under increased grazing and denudation pressure ultimately eroding their capacity to recover and support livestock production. In the estimation of this study, huge proportions of the ASAL territories currently under pastoral land have completely been lost to desertification. The indicator trend here is that, the camel which is able to survive through browsing on trees has systematically replaced cattle as pastoralists adapt to both climate change and land degradation impacts. The Study by *Ogutu eta al* observed a many-fold (450–17896%) increase in camel population (1977-2013) in Kitui, Laikipia and West Pokot counties and, to a lesser extent (89–119%), in Baringo,

Garissa and Samburu counties, signifying increasing and widespread adoption of camels in these counties.

Plate ES 01 Denudation process in the Doldol, area of Laikipia

Reduced land productivity will erode pastoral resilience, increase their vulnerability to drought whose frequency is said to be on the increase and ultimately, some could drop out of pastoralism in favour of settlement along the corridor to live on famine relief and wage employment. By so doing, they will join the league of pastoral dropouts who are recognised as being among the poorest in Kenya.

Environmental implications in pastoral dropouts: Without animal assets to produce food for their own consumption, stockless households are highly dependent on cash earnings to survive and end up working in towns as unskilled labourers (often in food-for-work schemes) or pursue petty trade in firewood, charcoal, and illicit brews. In a study investigating household income patterns amongst agro-pastoralists and semi-nomadic pastoralists, it was observed that households normally fall back to trade, charcoal making and honey trade as a coping strategy in dry seasons with the contribution of charcoal rising from 3.3 to 19% and a corresponding increase in cash income of Kshs 3,914 in one season alone. Assuming that a third of the 1.54 million households resident in the arid counties engage in charcoal making seasonally, a total of 14.1 million trees equivalent to 28,128 ha of closed canopy forests are cleared seasonally with a double output annually. Indeed, this is already the trend in places such as Maji ya Chumvi between Voi and Mombasa and in many other places including Turkana implying that, the cost of pushing pastoralists into poverty is likely to manifest in loss of the national vegetation cover and by extension, the carbon sequestration capacity with very clear consequences to mankind.

Costs to the taxpayer: On its part, the government will be called up to commit huge resources in cushioning pastoral households against drought and associated shocks. Some of the economic gains earned from LAPSSET could well be eroded through increased dependency by the 15% of the national population resident within the ASALs. LAPSSET is superimposing on a scenario marked by increasing drought frequency and severity. On account of degradation, every drought and prolonged dry spell leaves behind weakened land whose ability to recover and restore carrying capacity is greatly eroded thus

undermining capacity to host flocks for prolonged periods. A trend is emerging whereby water and fodder trucking are increasingly becoming part of the emergency relief basket to pastoralists with attendant skyrocketing of the emergency assistance budget.

The real costs for developing LAPSSET will manifest in the accelerated erosion of productive capacity of ASAL lands through denudation and attendant burden on both the environment and the tax payer.

Implications to national harmony, peace and integration: Other than aridity, conflict manifesting either as ordinary crime and thuggery, fights of resources and boundary disputes is the other salient feature of northern. Cattle rustling which towers high above all others in terms of frequency and geographic spread (it spans Isiolo, Laikipia, Samburu, Baringo and Turkana counties) is reported to be graduating from culturally motivated moranism to commercial scale operations relying on sophisticated weaponry and logistical support. This same self-renewing culture could easily transform and upgrade to target sabotage of the Corridor through theft and vandalism especially on the isolated, lonely section between Chemulingot and Lokori through Kapendo.

By far however, displacement of communities from traditional riparian pastures to give way to investments deemed mutually exclusive to mobile pastoralism is likely to deflect pressure to remaining resources with competing groups striving to gain control thus creating fertile grounds for armed conflict. In this case, expansion of on-going irrigation development within lower Ewaso Ng'iro basin between Malka Daka and Sericho, and along the basins of Kerio and Turkwel Rivers has potential to escalate conflict over remaining dry season grazing.

Concerns pertaining to rangelands and terrestrial biodiversity

The Silent Disaster in Kenya: A major concern currently is that LAPSSET is being developed against the backdrop of massive decline in the national wildlife resource base. Between 1977 and 2016, Kenya lost on average 68.1% of her wild herbivores with very severe declines of over 70% being reported for waterbuck *(Kobus ellipsiprymnus); Grevy's zebra (Equus grevyi); Impala (Aepyceros melampus); hartebeest (Alcelaphus buselaphus); Topi (Damaliscus lunatus korrigum); Oryx (Oryx gazelle beisa); Eland (Taurotragus oryx); Thomson's gazelle; Warthog (Pharcoerus africanus) and Lesser kudu (Tragelaphus imbermbis).* Severe losses of between 60–70% were reported for wildebeest, *giraffe (Giraffa cemelopardalis), gerenuk (Litocranius walleri), Grant's gazelle (Gazella granti), Burchell's zebra, buffalo (Syncerus caffer), elephant (Loxodonta africana)* and ostrich *(Struthio camelus)* falling in the third category at 30–50%. Kenyan rangelands which host over 70% of wildlife in privately owned land outside of protected areas are currently undergoing accelerated degradation and are likely to experience land-use realignment in response to market forces attracted by the LAPSSET Corridor.

Decreasing range and size of wildlife habitat required to maintain Minimum Viable Populations: While development of such land into a transport corridor will directly reduce the amount of habitat available for wildlife and pose direct and long-term consequences to wildlife during operation, it is the anticipated realignment in land-use that should pose the greatest threat to long-term survival. Non-controlled commercialization of land along the corridor is likely to reduce the territory and rage available for wildlife, block access routes to water, forage and salt licks, block seasonal migratory corridors and possibly escalate human wildlife conflicts. Such reduction in wildlife territory has potential to reduce the habitat required by diverse species for purposes of maintaining the minimum viable populations required for survival with disastrous consequences.

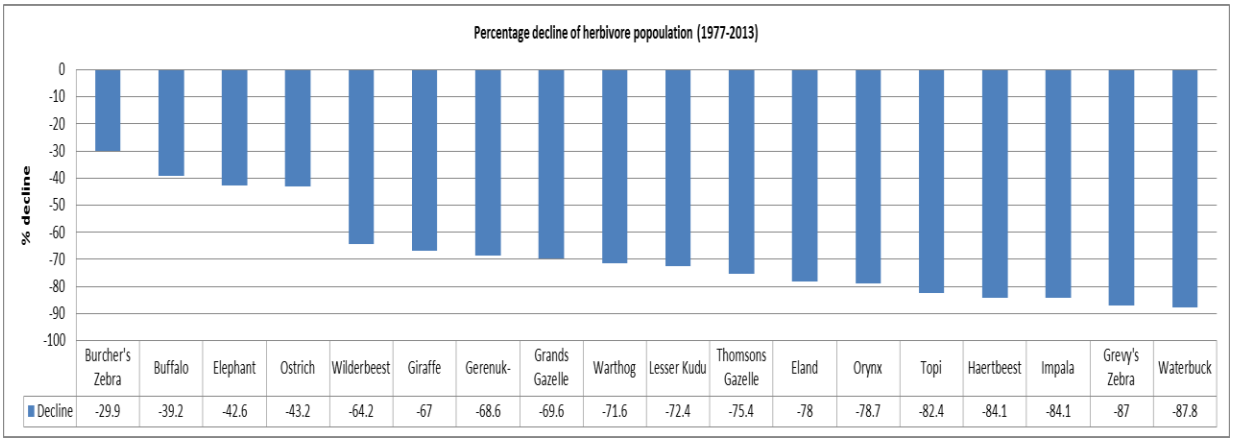


Fig ES 13: Observed decline in wildlife populations (1997-2013)

Table ES 02: Summary of wildlife hotspots in the LCIDP Traverse

Section	Concerns
Hindi-Ijara-Garissa	Fragmentation of critical habitat for the critically endangered Hirola antelope and associated wild dogs which are endangered around the Arwale nature reserve and conservancies Blockage of watering paths for the Roschids Giraffe accessing River Tana watering Points. Loss of woodland habitat for Buffaloes from the Boni Forest Nature reserve
Garissa-Benane- Kula Mawe	Fragmentation of habitat around Rahole National Reserve
	Fragmentation of the vast Meru Conservation area whose nucleus is Meru National Park and Bisanadi National Reserve
Isiolo Archers Post (Ngaremara area)	Blockage of Elephant Migratory corridor between Lewa Conservancy-Bufallo Springs, Samburu and Shaba game reserves
Isiolo-Seleolipi	Blockage of the Kirimon Elephant Migratory Corridor
Isiolo-Oldonyiro-Kirisia Forest	Blockage of major elephant migratory corridor
Loosai and Mt. Marsabit Nature Reserves	Blockage of Elephant Migratory Corridor to and from Marsabit National Park

Source: This Study

Other agents of change within the ASAL: Another quite worrying trend in the ASALs currently is the rapid expansion Mesquite (*Prosopis juliflora)* locally christened Mathenge. *Prosopis juliflora* is a native of Mexico and was first introduced to the Afar Region of Ethiopia in the 1970s with good intention, and has been in Kenya since the 1980s. The tree has since gone out of control on account of its ability to withstand high temperature, drought, and saline soils which make it an aggressive coloniser. Within the LAPSSET traverse, the weed generously occurs in Masalani, Bura East, Garrisa, Isiolo Town, Marigat/ Nginyang, Lodwar, Kakuma and Marsabit where it is normally introduced in river sand and later on spread by goats upon feeding on the ponds. As such, with movements of river sand associated with

construction activity in LAPSSET, the probability of its introduction and eventual spread into pastureland is quite real. Eventually, this is a tree with potential to colonise and change entire landscapes with disastrous effects on both wildlife and livestock.

Concerns pertaining to water resources

The water crises in Kenya: Assessed against the Falkenmark indicator- perhaps the most widely used measure of water stress which applies a Water Barrier Differentiation Index (*Falkenmark 1989*) to categorise countries by status of water availability, Kenya is categorised as water scarce based on a national average per capita access of 586 m^3. The same scenario obtains in the ENNCA and RVCA while the TCA is at Stress level reflecting a slightly better position. The fact that, the national water resource base indicates a per capital annual water supply of 589.3 m^3 for the ENNCA is quite unsettling given observed actual water scarcity on the ground as reflected by seasonal lack of surface water, reliance of non-conventional sources such as river bed wells and increasing distances travelled to reach water.[3] This is indicative of a resource that is present but not available where and when people need it. It is also indicative of the situation whereby most surface water is abstracted and diverted within the upper and middle catchment leaving dry river beds downstream.

Table ES 03: Demand vs supply model for Kenya up to 2030 (MCM)

Catchment area	2010				2030			
	Population (10^6)	Water resource (MCM)	pca (m3)	Category	Population (10^6)	Water resource (MCM)	pca (m3)	Category
LVNC	6.96	4742	681.3	Scarcity	12.36	5077	410.8	Absolute scarcity
LVSC	7.37	4976	675.2	Scarcity	12.72	5937	466.7	Absolute scarcity
RVCA	4.86	2559	526.5	Scarcity	7.45	3147	422.4	Absolute scarcity
ACA	9.79	1503	153.5	Absolute scarcity	20.54	1634	79.6	Absolute scarcity**
TCA	5.73	6533	1140.1	Stress	10.37	7828	754.9	Scarcity
ENNCA	3.82	2251	589.3	Scarcity	4.40 (6.60)	3011	684.3 (456.8)	Scarcity (Absolute scarcity)
National	3.853	22564	585.6	Scarcity	63.44	26634	419.8	Absolute scarcity

Come year 2030 and on account of projected population growth, the national water availability situation will drop to **absolute scarcity** in spite of all measures recommended to beef up annual water supply from 22,564 MCM to 26,634 MCM. The optimistic scenario presented by NWMP 2030 should be approached with caution given that; i) water availability in 2030 is pegged to the success of a proposed aggressive infrastructural development plan which has own challenges, ii) some of the proposed supply interventions such as trans-boundary imports from the Omo River of Southern Ethiopia are beyond Kenya's Control and may not materialise. Clearly, a very cautious approach to development will be required.

The NWMP 2030 projects the water availability situation for ENNCA to remain at Scarcity mainly on account of the very low population growth of 0.58 million projected for this catchment. However, given

[3] During the time of drought in January 2011, the drying of water pans and dams in Wajir and Mandera is reputed to have increased trekking distances for livestock to an average of 15 km to 20 km and up to 40 km compared to the norm of 5 km to 10 Km (NWMP 2030).

that demand computations in the NWMP 2030 failed to capture potential impact of LAPSSET inclusive of the population influx attracted by the road and pipeline, a Scarcity rating as reflected for ENNCA is a gross underestimation of the actual situation and the same applies to the RVCA where growth associated with both LAPSSET and oil production have not be allocated for. This notwithstanding, the entire traverse is water scarce and super-imposition of LAPSSET onto such a system has grave implication as follows:-

Continued collapse of downstream ecosystems: Systematic recession/ drying of the Ewaso Ng'iro River downstream of Archer's Post (Section 4.4.8) above is clear enough signal that this river cannot afford any further direct withdrawal of river water. A situation whereby communities, flocks and even wildlife are left exposed to death on account of artificial shortage of river water calls for immediate restitution. Indeed, the situation calls for a review of future investments pending resolution/ restoration of the Compensation Flow (Q_{80}) provided for in law which currently has been diverted elsewhere. Deaths associated with drought should be the very loud signal that the upper ceiling of water abstraction has long been surpassed in which case, national priority should focus on equitable provision of water to all arid living communities as a basic right before venturing into investments.

Disruption of hydrological balance through flood harnessing schemes: Provision of water in the NWMP 2030 targets Proposed damming of the Ewaso Ng'iro River at Kihooto, Archers Post, Crocodile jaws among others sites to intercept and store flood water for both domestic supply and irrigation is likely to reduce the amount of flood waters arriving at the Lorian swamp to recharge the Merti Aquifer which is currently exploited possibly beyond recharge at Dadaab. Swarenski and Murdoff describe the extensive 200Km long fresh-water zone of the Merti aquifer as following alignment of the Ewaso Ng'iro and Lak Dera extending south-eastward from Habaswein to Liboi at a width ranging from 20 to 90 km and widening towards the Kenya border with Somalia, near Liboi. Thus, in an area of approximately 10,000 km^2 water of good quality can be obtained in one of the chief economic assets of northern Kenya. Seepage losses from the Ewaso Ng'iro, upstream from Sericho, where it normally goes dry, have been considered a major source of recharge to the Merti aquifer. Howard Humphries and Sons (1958) in a report to the Government of Kenya estimated losses for different reaches of the river from Melka Bulfayo, near Merti, where it leaves its bedrock channel, to Habaswein. The estimated losses were heaviest in the upstream area and averaged about 180,000 m^3/d, or about 1,000 $(m^3/d)/km$ of stream channel. It is believed that such channel losses potentially contributes to groundwater recharge and its withdrawal through damming implies loss of this vital ecological service.

The vain hope in flood harnessing reservoirs: Dam planning and development will take place against the backdrop of accelerated soil erosion countrywide which has left the land badly denuded by gullies and the rivers heavy laden with sediment load. Interception of this sediment load accounts for drastic loss of reservoir volume as already experienced for the 1560 MCM capacity dam commissioned in 1981 and was observed to have lost 215.3 MCM (13.59%) of design storage capacity thus cutting down its economic life to 217 years. Investment in reservoirs for flood storage especially in the Ewaso Ng'iro basin is only viable when preceded by aggressive catchment conservation programmes to cut down on the sediment load entering rivers.

Plate ES 02: The Ewaso Ng'iro at Archer's Post

Possible drawdown on aquifers: The strategy of NWMP 2030 in the ENNCA is to favour exploitation of groundwater to supplement surface water to the tune of 16-25% in supplying private and communal consumers not covered by schemes particularly in the lower catchment. While such development is inevitable, extreme caution is required to protect the Merti Aquifer whose recharge is still unclear in spite of numerous research studies on the same.

THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This SEA Study conducted in line with the National Guidelines for SEA sought to clarify how attuned LAPSSET will is to full deliver on its stated goal of opening up northern Kenya for economic transformation. From an intensive study programme that reviewed numerous reports and documents, conducted numerous field investigations including public hearing meetings with communities, workshops with technical managers, interviews with leaders and interests groups, the observation is that, the project has a vast potential to positively impact and transform local economies while tapping on vast developing international markets across the borders. However, observed sad state of deterioration of the local resource base that has left local communities poor and highly vulnerable to drought and poverty, implementation of LAPSSET should be preceded by targeted action at policy, legal and strategic level to secure local resources and stabilize livelihoods to create a suitable foundation for delivering the anticipated change. In sections below, an outline of requisite measures is provided.

Pre-existing concerns: In the view of this SEA, achievement of economic transformation goals for northern Kenya will face challenges from pre-existing concerns whose priority resolution is necessary to create a favourable environment for implementation of LAPSSET. Five pre-concerns have been identified as follows:-

i. Increasing structural poverty as households continue loosing assets to drought;
ii. Declining land productivity on account of accelerated erosion;
iii. Declining productivity of other livelihood systems;
iv. The declining water resource base; and
v. Escalating loss of wildlife populations.

Emergent concerns: Implementation of the LCIDP is likely to occasion concerns as follows:-

i. Realignment of the land resource base to the disadvantage of pastoral livelihoods and wildlife;
ii. Continued habitat loss and threatened survival of wildlife;
iii. Escalate pressure on water resources at the expense of pre-existing livelihoods and downstream ecosystems;
iv. Marginalization of fishing-based livelihoods and aquatic habitats; and
v. Erosion of the cultural heritage

Essentially, the ten concerns provided the template on which this ESMP is designed and amplified. Mitigation action at Policy, Legislative, Strategic and operation level for pre-existing and emergent concerns are unveiled in matrix form. Brief highlights for each are provided in sections below.

Mitigation of growing poverty in pastoral systems: Poverty alleviation has been an obsession and focal point of the government of Kenya since independence days, and the same has been elaborated in all National Development Plans and policy blue-prints since independence. The apex of government commitment to bridging national inequality and poverty was the adoption in 2008 of Vision 2030 development blue-print currently in its second Medium Term Expenditure Plan (MTEP) which sought to consolidate and build on gains achieved through past initiatives such as;-the National Poverty Eradication Plan (1999-2015); Poverty Reduction Strategy Paper (PRSP) 2000-2003; Millennium Development Goals (2000-2015); Economic Recovery Strategy (ERS) for Employment and Wealth Creation (2003-2007); among others. Further, adoption of a devolved system of government in line with the National Constitution 2010 was meant to allow for local prioritization of development planning and resource allocation and the same is being supplemented by continuing initiative such as the Equalization Fund.

Essentially therefore, poverty eradication is a pre-existing development goal and also a major motivation for development of LAPSSET. This SEA therefore, will focus on cushioning communities from being driven deeper into poverty by LAPSSET rather than eradicating poverty which is already the focus of initiatives outlined above. Engagement of the SEA Study on this matter is restricted to only identifying action required to rebuild resilience of target communities as precursor to their participation in LAPSSET induced economic growth.

Policy level measures: In the review of this SEA, degradation of pastoral lands which is their only available economic resource has attained catastrophic proportions and is actually a national disaster requiring redress at all levels. The lack of policy guidelines that hold land owners accountable for degradation is identified as the main enabler to the vicious cycle about which a lot has been written. Policy intervention is required to set guidelines for grazing land management with a view to in-building accountability on the part of Community and Individual land owners. Under the new policy dispensation, land owners will be required to develop grazing land management plans clearing pegging stocking to the carrying capacity. Such management plans will require approval by respective range management authorities at County Level and will be attract annual returns to facilitate auditing. The same policy will allow for locally recognised institutional set-ups to oversee implementation of the management plans to ensure that land owners remain accountable for land conservation all the time.

Legislative level Action Plan: Implementation of the Grazing Land Management Policy will require legal, strategic and other backup. Legal intervention is particularly crucial to provide a framework for

policy implementation including institutional, incentive and enforcement frameworks. Thus, under the proposed, it will be a statutory requirement for all land owners to develop land management plans to be implemented under supervision by relevant range management authorities. Alternatively, similar effect can be achieved through issues of grazing management rules by NEMA under EMCA 1999. For a start, the Guidelines on Livestock Rearing issued by NEMA (see below under strategic interventions) could be gazetted to allow for legal enforcement.

Strategy level Action Plan: Strategic level activities are aimed at operationalizing the policy objectives as stated. The principal action will be to guide and supervise land owners in developing and implementing Grazing Land Management Plans (GLMPs). The requirement here is for County Governments to build capacity through sensitization and formulation of guidelines to enable land owners to develop and adopt use of GLMPs in agribusiness. Tentative guidelines which could form the basis for action have been provided by NEMA as follows:-

i. Delineating rangelands according to agro-ecological zones e.g. rainfall, altitude;
ii. Keep the most appropriate species and breeds for each ecological zone;
iii. Ensure that stocking levels are within the carrying capacity set for each ecological zone - (Ha/livestock unit);
iv. Ensure that the siting, distribution and density of water points is done in consultation with relevant stakeholders after doing an EIA;
v. Rehabilitate degraded rangelands with appropriate technology e.g. reseeding, soil conservation among others;
vi. Set aside blocks for seed bulking and pasture conservation;
vii. Control the use of fire in rangeland management (frequency of burning, intensity);
viii. Promote harmonious co-existence between livestock and wildlife (e.g. avoid fencing off migratory corridors and buffer zones);
ix. Ensure the ranch size is not smaller than the minimum recommended size of a commercially viable ranch for a given ecological zone;
x. Encourage rotational grazing (wet season and dry season grazing areas) through regulated grazing procedures developed by grazing committees;
xi. Ensure siting of livestock handling facilities (markets, holding grounds, dips, routes that animals follow on their way to markets etc) is done in consultation with the local communities and DEC;
xii. Locate livestock and human water points in consultation with public health officers and the DEC;
xiii. Control human settlements near watering points;
xiv. Develop conflict resolution mechanism by forming natural resource committees and ensure adequate facilitation;
xv. Develop early warning and disaster management systems;
xvi. Encourage the location of processing facilities in livestock rearing areas;
xvii. Inventorize, map and register community grazing areas;
xviii. Carry out EIA for ranch development; and
xix. Encourage electronic tagging of animals to discourage cattle rustling.

In line with the NEMA guidelines, formulation of GLMPs should be preceded by based evaluation of the land condition to prescribe requisite action and investment as necessary. Given the massive requirement for rehabilitation in most the pastoral belt, there would be need for reorganisation of grazing patterns through creation of feeding/ fattening lots where livestock can be concentrated while allowing time for land to rehabilitate and recover. Simultaneously, County Governments or Regional Development

Authorities could use the range rehabilitation programmes to engage all able-bodied people in gainful employment following the Model of the Tennessee Valley Development Authority. Whatever approach is followed however, pastoral lands are in dire need for rehabilitation and healing as a precursor to investment in capital intensive water harvesting infrastructure.

Timelines in land restoration programme: A major goal of the pastoral land restoration programme is primarily to rebuild pastoral resilience while also establishing capacity for participation in LAPSSET. The challenge, therefore, is to synchronize pastoral economic production to the commissioning of relevant LAPSSET infrastructure such as the abattoirs, highway and railway and this creates the sense of urgency. For the abattoir soon to be commissioned at Isiolo to operate at full capacity and create demand for a second one as proposed at Wajir, range rehabilitation should commence immediately. Indeed the on-going 2016/17 drought should serve as the clearest signal on the need to take affirmative action in pastoral land rehabilitation.

The need for stakeholder mobilization and coordination: Analysis of actions required towards range restoration highlight the critical importance of stakeholder participation in that, as yet, LAPSSET lacks a clear mechanism for engaging with County Governments who hold the legal mandate for agricultural land management and would be expected to spearhead the range rehabilitation programme, amongst others. Action is required as follows:-

- The LCDA to develop in-house capacity for stakeholder engagement; and
- The LCDA to develop a time bound Action Plan for implementation of the non-infrastructure component. So far, all effort has been directed to rolling the Infrastructure component

Measures to cushion pastoralists

Policy Level Action Plan: The stated goal of LAPSSET is to open Northern Kenya for economic development, which in the view of this SEA is understood to mean transforming both the land and the livelihoods. Yet, a question that this SEA has had to contend with is whether pastoralists themselves want to change with all indications pointing to the opposite. As such, there is need to amend the policy goals of LAPSSET to embrace development within the context of empowering rather than transforming pastoral economies. The proposal here is policy intervention to allow for development control which fully recognises and allows for preservation of pastoral territories.

With regard to pastoralism, the Draft National Land Use Policy (DNLUPs) state that Arid and Semi-arid areas are threatened by land fragmentation, resource conflicts, reduced productivity, and loss of species, desertification and sedentarization resulting in loss of livestock during droughts. To protect the natural resource and environment in the Pastoral/ASALs, the DNLUP calls for Government intervention thus:-

i. Recognize pastoralism as a legitimate land use and production system by establishing suitable methods of defining and registering land rights in pastoral areas while allowing pastoralists to maintain their unique land systems and livelihoods;
ii. Ensure that all land uses and practices under pastoral tenure conform to the principles of sustainable resource management;
iii. Promote the formulation and implementation of an integrated land use plan for ASALs;
iv. Conduct surveys to determine the carrying capacity of land in ASALs;
v. Provide technologies for surface water storage;

vi. Facilitate incorporation of indigenous knowledge and the participation of local communities in infrastructural development in pastoral areas;
vii. Establish flexible and negotiated mechanism for cross boundary access to protected areas, water, pasture and salt licks among different stakeholders for mutual benefit;
viii. Formulate and implement an integrated land use framework for ASAL areas

With regard to rangelands, the DNLUP requires the Government to:-

i. Study and update the carrying capacity of rangelands;
ii. Establish mechanisms for enforcing adherence to the optimum stocking rates for each area;
iii. Establish a framework for livestock management in rangelands including provision of water, pasture and fodder development;
iv. Discourage open access to grazing land among the pastoralists by promoting development of Communal grazing management plans.

This SEA fully aligns to proposals in the DNLUP.

Legislative Level Action: The intervention here is to ensure legal backing development control within the Traverse areas. Zoning along the traverse will be captured in the County Spatial Plans and backed up by rules to be legislated by County Assemblies.

Strategic Action Plan: County Governments to include zoning of Traverse within their CSPs with attention being given to land reservation for pastoral and wildlife use.

Time frame: County Governments are in the process of developing respective CSPs and this provides an opportunity for development control to be mainstreamed into this activity. Data on the exact location and dimensions of the traverse need however to be shared with County Governments.

Measures to cushion fishing based livelihoods

Lamu Port: Measures here are aimed at integrating fishing into LAPSSET Activities in Lamu while cushioning the same from marginalization by the new economic order.

Lake Turkana: Lake Turkana provides a vast fishery which could be developed and exploited commercially as a value chain. Further, given population influx to Turkana by speculators attracted by the Oil Industry, demand for fish is bound to increase hence providing an opportunity to anchor livelihoods. The County Government should take advantage of this opportunity to build capacity for commercial fishing especially towards Todonyang where the fisheries are richer owing to nutrient supply at the Omo Delta.

Measures to resolve water resource concerns

Legislative action is required to reign in current water diversion tendencies that over exploit water resources upstream leave downstream communities destitute. Indeed, the water Act 2016 has adequate provision for this and would only require implementation. Under Articles 24 and 25, the Water Act 2016 makes provision for establishment of Basin Committees to serve advisory mandates on water management in respective basins. This offers a window of opportunities for downstream communities to

have a voice in management of water resources. This said, recovery of diverted waters will require more than just legal provision to take effect.

Measures to resolve pre-existing concerns in wildlife

Saving of Kenyan wildlife from extinction will require very decisive action at all levels.

Policy level intervention: The fact that Kenya nearly lost 70% of wild herbivores in about 40 years is a national disaster probably indicative of mass failure of polices and strategies tried so far. Policy intervention is required to create space for wildlife in the minds of all Kenyans and phase out the current scenario of wildlife being fugitive in their own territories. Secondly, policies and strategies that target to confine wildlife within protected areas are also doomed to fail given that wildlife is mobile and requires using different habitats at difference times of the year. The whole concept requires re-engineering with a view to creating mutually acceptable corridors for use by wildlife when accessing diverse habitats and this will require identification and commitment of land for the purpose. The same policy thinking will require permeating the whole realm of benefit sharing in wildlife conservation as a way of cushioning landowners from losses incurred from hosting wildlife. Time has come when regulated harvesting of certain wildlife species should be allowed as a way of creating ownership for wildlife. In any case, close to 70% of wildlife alongside with its 40 year production has probably been harvested illegally without benefitting those that host wildlife on their land. These are matters that require policy direction.

Legal intervention: There is need to review current wildlife legislation to give effect to proposed policy intervention including re-organisation of land to create game corridors, game cropping and harvesting and enhance accountability in dealing with wildlife.

Time frame: Intervention in mitigation of wildlife decline cannot afford further delays. Species previously declared endangered are among those recording the highest rate of decline underlines the need for urgent action.

Mitigation of potential LAPSSET impacts on wildlife

Policy level intervention has already been highlighted elsewhere above. Strategic intervention largely targets realignment of LCIDP in crucial areas thus:-

Preservation of wildlife habitat in the coastal lowlands: The entire Corridor between Bura East and Benane traverses close to the River Tana flood plain which is a crucial dry season watering reserve for diverse wildlife. Development of a busy transport corridor almost aligned to the riparian reserve will create a major barrier for wildlife trying to access the water. The section of the Corridor in this area will require to be pushed 10 Km eastwards to stay clear of the riparian reserve.

As aligned, the LCIDP passes in close proximity of the Arawale and Rahole National Reserves both of which were created for conservation of the endemic and endangered Hirola antelope and provide breeding sanctuaries for elephants. Creation of a 500m wide corridor at the boundary of the game reserves is likely to fragment the ecological range of the Hirola and leave it more vulnerable.

Re-alignment of the Corridor to avoid Isiolo Town: In light of observed decline of the national wildlife resource base, mainly on account of habitat fragmentation, focussed action is needed to forestall similar

impact from the LCIDP which calls for minor realignment mainly to avoid known game corridors. Firstly, there is need for the entire corridor to stay clear of Isiolo Town and its environs so as to escalating conflict at Isiolo Town, Ngaremara and Kipsing elephant corridors. The proposal is to reroute the Corridor north-eastwards at Kula Mawe so as to connect Archers Post directly. Both Kulamawe and Archer's Post have space for expansion and are devoid of boundary disputes which make then ideal as designated termini for the railway, oil pipelines and the highway.

Relocation of Resort City from Kipsing to Igembe North or Kula Mawe: There is need to relocate the resort city from Kipsing Gap which is a major elephant sanctuary and migratory corridor in favour of a site at either Kula Mawe or Igembe North where space is available. Development of the Isiolo Metropolis at Kula Mawe would bring it within reach of the Tana River catchment and its vast water resource base.

The need to avoid traversing through Laikipia: The LCIDP as aligned in Laikipia would traverse and fragment important game sanctuaries including the Laikipia Nature Reserve, Mugie and moist woodlands in Ol Moran Division which are important for diverse wildlife. The proposal is to map and identify a suitable route through Samburu provided that adequate physical measures such as overpasses and underpasses are provided to separate wildlife traffic from motorised traffic.

Timeframe for Mitigation: Most components of LAPSSET are at diverse stages of design which affords them good opportunity to accommodate proposed realignments. For components such as the Isiolo-Moyale road which is already completed, the respective ESMPs will be reviewed in light of the SEA findings.

The question of local participation in LAPSSET

Observed low literacy levels could constrain effective participation of local communities in LAPSSET in spite of costs incurred in terms of land acquisition and loss of livelihoods. A scenario whereby jobs and opportunities associated with LAPSSET appear to benefit newcomers at the expense of locals can be violently resented as already happens elsewhere and is a potential source of conflict. There is need for concerted effort by stakeholders to fast track skills building and upgrading programmes to empower local youth in readiness for opportunities to be availed by LAPSSET. Local businessmen also need to be protected to ensure first priority in business borrowing the example of Dadaab Refugee Camp.

Public Disclosure of LAPSSET

This SEA observed a generally poor disclosure of LAPSSET at all stakeholder levels. The situation is particularly worse within County Governments who not only control land targeted by LAPSSET but are legally required to plan for accommodation of LAPSSET growth within jurisdiction. On an urgent need basis, the LCDA should roll out a Work plan for mobilization of the non-infrastructure component so as to link up with respective stakeholders. Further, the SH engagement already initiated as part of this SEA Study should be adopted and expanded by LCDA more so at grassroots level.

Modalities for Environmental and Social Mitigation at implementation level

This SEA calls for action as follows;

i) All components of LAPSSET will be preceded by full ESIA studies in line with EMC (A) 2015. EIA Licenses issued before this SEA will be amended to capture issued raised herein.
ii) All displacement will be resolved through Resettlement Action Plans prepared in full consultation with stakeholders. Concerns raised in Chapter Seven to be resolved in the RAPs. This to include resolution of all outstanding compensation.
iii) Where doubts on the Impact of components more so with regard to water and Wildlife, the pre-cautionary approach to be adopted.

LIST OF ABBREVIATIONS

ALDEV	African Land Development Board
asl	above sea level
LTWP	The Lake Turkana Wind Power Project
amsl	Above mean sea level
ASAL	Arid and Semi-Arid Land
AU	Africa Union
BMUs	Beach Management Units
BoPs	Balance of Payments
BPO	Business Process Out sourcing
CA	Catchment Area
CD	Chart Datum
CDA	Coast Development Authority
CDI	County Development Index
CETRAD	Center for Training and Research in ASAL Development
CIDPs	County Integrated Development Plans
CIDPs	County Integrated Development Plan
CSPs	County Spatial Plans
DEC	
DNLUP	Draft National Land Use Policy
DSGR	Dry Season Grazing Reserve
DWFN	Distant Water Fishing Nations
EAC	East Africa Commission
EDEs	Ending Draught Emergencies
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
ENNCA	Ewaso Ng'iro North Catchment Area
ENNDA	Ewaso Ng'iro North Development Authority
ENNR	The Ewaso Ng'iro North River
ENSDA	Ewaso Ng'iro South Development Authority
Eo	Evapotranspiration
EPZA	Export Processing Authority
EPZs	Export Processing Zones
ESMP	Environment and Social Management Plan
ESMP	Environmental and Social Management Plan
FGM	Female Genital Mutilation
FLS	Fish Landing Sites
FRHs	Fundamental Rights Holders
GDP	Gross Domestic Product

GLMPs	Grazing Land Management Plans
GOK	Government of Kenya
ha	hectares
HDI	Human Development Index
HIV/AIDs	Human Immune deficiency Virus
HSGOC	Heads of State and Government Orientation Committee
IBAs	Important Bird Areas
IGAD	Intergovernmental Authority on Development
ITK	Indigenous Traditional Knowledge
IUCN	International Union for Conservation of Nat
KAA	Kenya Airports Authority
KeNHA	Kenya National Highways Authority
KFS	Kenya Forest Service
KPA	Kenya Ports Authority
KPC	Kenya Power Company
KPRs	Kenya Police Reservists
KRC	Kenya Railways Commission
Kshs	Kenya Shillings
KVDA	Kerio Valley Development Authority
KWDA	Development Authority
KWS	Kenya Wildlife Service
LAPSSET	Lamu Port-South Sudan- Ethiopia
LBDA	Lake Basin Development Authority
LCDA	LAPSSET Corridor Development Authority
LCG	
LCIDP	LAPSSET Corridor Infrastructure Development Project
LSME	Laikipa-Samburu-Marsabit Ecosystem
MCA	Meru Conservation Area
MCM	Million Cubic Meters
MCMyr-1	Million Cubic Meters per year
MDGs	Millennium Development Goals
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
MTEP II	Medium Term Economic Plan Phase II
MTPII	Medium Term Plan Phase II
MW	Mega watts
NEAP	
NEMA	National Environmental Management Authority
NGA	Northern Grazing Area
NGOs	Non-Governmental Organisation

NLC	National Lands Commission
NPP	net productivity
NWMP	National Water Management Plan 2030
OVC	Orphans and Vulnerable Children
PAs	Park Areas
PICI	Presidential Infrastructure Championship Initiative
PLWHAs	People Living With HIV and AIDS
PPA	Power Purchase Agreement
PPP	
PRSPs	Poverty Reduction Strategy Papers
PSC	Peak Standing Crop
PWDs	People With Disabilities
RVCA	River Catchment Area
SAP	Sedentary Agro pastoralists
SDGs	Sustainable Development Goals
SDP/CGs	State Department of Planning /County Governments
SEA	Strategic Environmental Assessment
SEZs	Special Economic Zones
SGR	Standard Gauge Railway
SRA	Strategy for Revitalizing Agriculture
TARDA	Tana and Athi Rivers Development Authority
TDS	Total Dissolved Solid
TLU	Tropical Livestock Units
TORs	Terms of Reference
UNDP	United Nations Development Program
WHA	Water Harvesting Authority
WRMA	Water Resources Management Authority

Table of Contents

1.0 Introduction

1.1 About this report

The legal mandate for this Report is Contract No. LCDA/SEA/01/2015-16 dated January 28th 2016 between the LAPSSET Corridor Development Authority and Repcon Associates for the provision of Consultancy Services in the Strategic Environmental Assessment for the LAPSSET Corridor Infrastructure Development Project-LCIDP.

Under auspices of The Presidency of the Republic of Kenya, the LAPSSET Corridor Development Authority (LCDA) is developing the Lamu Port-South Sudan- Ethiopia (LAPSSET) Infrastructure Corridor, an ambitious singularly massive but integrated transport infrastructure corridor project conceived and developed under the Kenya Vision 2030 Strategy Framework as an economic Game-Changer targeted to underpin national aspirations towards delivering a Globally Competitive Kenya with high quality for all citizens life in a clean and secure environment. The LAPSSET Corridor Infrastructure Development Project thus combines the dual roles of economic driver and enabler to the Economic Pillar of Kenya Vision 2030 whose successful implementation will also see Kenya's under-developed north brought into the economic circuit thus anchoring the just, cohesive and equitable social development anticipated under the Social Pillar. Thus, as currently conceived, the LAPSSET Corridor singularly holds the best potential towards delivering on Kenya Vision 2030 goals.

The Social Pillar of Kenya Vision 2030 demands development in a clean secure environment for all citizens as essentially guaranteed by the National Constitution 2010 and the Environmental Management and Coordination Act (EMCA) and its 2015 revision-the Environmental Management and Coordination (Amendment) Act. Towards ensuring compliance to both the National Constitution and reigning environmental legislation, the LAPSSET Corridor Infrastructure Development Project (LCIDP) has been subjected to a Strategic Environmental Assessment (SEA) Study conducted as per Legal Notice 101 of June 2003 and the Guidelines for Strategic Environmental Assessment issued by NEMA in 2014.

This document outlines the Final Report in the Strategic Environmental Assessment (SEA) for the LCIDP. The SEA Study process was coordinated and managed by Repcon Associates a Nairobi based consultancy duly registered and licensed by NEMA (Firm of Experts No. 002). Appendix 1.1 provides NEMA registration documentation in respect of Repcon Associates and SEA Team Leader.

1.2 Systematic Approach and Focus in the SEA Study

1.2.1 Conformity with statutory requirements

Conduct of the SEA followed the Activity Schedule prescribed in the National Guidelines for SEA (Table 1.1 below). Comments on activities at each stage of study are provided in sections below.

1.2.2 The SEA Screening Stage

This SEA process has conformed to all requirements of the National Guidelines for SEA as issued by NEMA. A Briefing Note prepared by the LCDA was reviewed by NEMA who instructed that SEA 038

be conducted for the proposed LCIDP. Appendix 1.2 provides a copy of NEMA Letter (Ref. NEMA/SEA/5/2/037) issuing a go ahead for the SEA Study.

1.2.3 SEA Scoping Stage

The Scoping Stage was crucial in that, it defined the depth and scope of study at the Detailed SEA Stage. Considerable time went into the Scoping Study following which, a draft Scoping Report was reviewed by NEMA vide ref NEMA/SEA/5/2/037 dated 22nd June, 2016 based on which, a Final Scoping Report was been issued. This paved the way for the detailed SEA Study.

Table 1.1 Systematic procedures for SEA Studies up to Draft Report Stage

Stage	Activity	Status
Screening Stage	Brief on PPP submitted to NEMA	Done
	Screening of PPP to decide need or otherwise for SEA within 7 working days	Done
Scoping	Understanding the PPP	Done
	Other preparatory tasks	Done
	Selection of SEA Experts	Done
	Scoping Study	Done
	Preparation of SEA Scoping Report	Done
	Submission of SEA Scoping Report to NEMA	Done
	NEMA reviews the Scoping Report for adequacy	Done
	NEMA decision on the Scoping Report	Granted
Detailed SEA Study	Conduct of SEA culminating in Draft Report	Undertaken
	Quality control of draft report	Underway
	Submission of Draft Report to NEMA	Underway
Public Review and Validation Stage	Public review and validation meetings	Pending

Source: SEA Study Team

1.3 Detailed SEA Study

1.3.1 Scope and Scale of SEA Study

From investigations conducted mainly through interviews and review of project documentation, LAPSSET so far has undergone Feasibility Study emergent from which, standalone Master plans were developed for the all components;- Lamu Port, Highway, Standard Gauge Railway, Oil Pipelines, Resort Cities, International Airports, Lamu Oil Refinery, Lamu Metropolis and Special Economic Zone among others with implication that, the study at hand was well beyond the scope of a Plan Level SEA. As such, in consideration of the multiple thematic and wide geographic spread of LAPSSET, a Programme Level SEA Study was been adopted. Further, given that major components of LAPSSET namely, the Highway, Lamu Port, Airports etc. are under implementation, an Integrated SEA entailing both impact prediction and mitigation was been adopted.

1.3.2 Objectives of the SEA Study

Objectives of the SEA Study are elaborated in the SEA TORs as reviewed and approved by NEMA (Appendix 1.3).

General Objectives as per National Guidelines for SEA

Design of this SEA Study has been informed by two sets of objectives. First, the National Guidelines issued by NEMA have identified a raft of objectives aimed at setting the stage for environmentally sustainable development and, to which, any SEA study targeted for implementation in Kenya should be focussed and which have been adopted for this study namely:-

i) Better ensure that a proposed PPP is compatible with sustainable environmental planning and management;
ii) Ensure the consideration of alternative policy options, including the do-nothing option, at an early time when an agency has greater flexibility;
iii) Enhance the consistency of a PPP across different policy sectors, and when relevant, make explicit the trade-offs to be made between different sectoral policy objectives;
iv) Evaluate the regional environmental impacts of multi-sectoral developments over a specified time;
v) Support decision-making and incorporate emerging environmental issues into sustainable development;
vi) Guide investment programs that involve multiple sectoral policies or sub-projects;
vii) Assess the environmental impacts of policies that do not have an explicit environmental dimension;
viii) Identify environmental impacts and integrate mitigation measures during program formulation, and in the process, enhance Environmental Management Plans;
ix) Ensure the consideration of cumulative, indirect, or secondary impacts and other unintended consequences when planning multiple, diverse activities;
x) Support time-efficient and cost-effective development planning by avoiding the need to reassess some issues and impacts at project level (e.g., when an issue or impact was effectively dealt with at a strategic level);
xi) Inform decision makers by evaluating alternative options that meet the PPP;
xii) objective(s), while also being the best-practicable-environmental-option(s);
xiii) Integrate environmental principles into the development, appraisal, and selection of policy options;
xiv) Give adequate attention to environmental considerations in decision making, on par with economic and social concerns, and with a view that trade-offs may be necessary in some situations;
xv) Provide an early opportunity to check whether a proposal complies with national and international environmental policy and consequent legislative obligations;
xvi) Establish a context that is more appropriate for subsequent development proposals; and
xvii) Provide a transparent and accountable decision-making framework.

Specific Objectives in the SEA for LAPSSET

Specific objectives for the LAPSSET SEA have been informed by the Objectives of the LCIDP as enumerated in section 2.2.1 below. Essentially, LAPSSET is conceived as a Transport Corridor aimed at driving economic transformation and mainstreaming of Northern Kenya into the national economy. The corridor will also play economic enabler targeting to open up the Northern Kenya to investment and trade while linking up the same to local and offshore markets in line with aspirations of the Economic Pillar to Vision 2030. In line with such economic transformation gaols, specific objectives of the SEA for LAPSSET have been identified as follows:-

i) To identify key strategic resources and linkages between environmental protection and economic growth in areas to be influenced by LCIDP;
ii) To assess likely significant effects of LCIDP development on such resources;
iii) To formulate a set of measures to address these priority concerns and to take advantage of opportunities that will emerge from LCIDP, considering institutional and financial conditions needed for implementing such proposal; and
iv) To recommend mechanisms for reducing environmental and social costs associated with achievement of the economic goals of LCIDP including measures that will enable future adjustments to maintain and promote sustainable and equitable growth in response to anticipated development of the LCIDP inclusive of the Economic Corridor.

1.3.3 Tasks in the Detailed SEA

The Research Questions

The detailed SEA Study was premised on the notion that LAPSSET is an international transport corridor targeted to drive economic transformation of the arid Northern Counties where the key defining feature is extreme poverty driven by inequality and vulnerability to drought driven erosion of livelihood security. The SEA Study therefore sought to unearth the efficacy of LAPSSET in in achieving set goals and the social and environmental costs attendant to such mission. Seven questions were framed to focus the SEA Study thus:-

vii) What are the defining features of the Northern Counties targeted to be transformed through LAPSSET;
viii) How well is LAPSSET attuned to drive the economic transformation;
ix) What is the prevailing legal regulatory, policy , institutional and strategy framework
x) What opportunities are available for LAPSSET;
xi) What are the Social and Environmental costs attendant to achievement of LAPSSET goals; and
xii) What measures need to be put in place to secure gains anticipated under LAPSSET

Focus of Investigations

Core tasks to be investigated in the SEA for the LCIDP are captured in the Study TORs approved by NEMA as follows:-

viii) Comprehensive documentation of the receiving environment to better define;
- ecological potential and carrying capacity;
- livelihood systems and economically strategic resources;
- local production systems including value addition;

- ecologically sensitive resources;
- socio-economic profiles; and
- issues pertaining to land availability for the Masterplan

ix) Comprehensive documentation of the LCIDP;
x) Inventory of all stakeholders by legal mandate, capacity and interests;
xi) Comprehensive analysis of emergent concerns namely:-

- Grassroots level perspective and disclosure of LAPSSET;
- Impacts on strategic resources and livelihoods;
- Question of water demand management;
- Impacts on wildlife habitat and migratory corridors;
- Potential to escalate resource use conflicts;
- Management of change;
- Impact on physical cultural resources;
- Potential to degrade the local labour resource;
- Overall strategic impact of LAPSSET; and
- Overall social-environmental impacts including solid & liquid waste, cross cutting issues, etc.

xii) Participatory assessment of alternative models in the LCIDP;
xiii) Modalities for environmental and social management within the Masterplan; and
xiv) Other considerations

Review of baseline data: A numerous data base from past research work within the traverse was assembled and reviewed as part of the SEA Study. Several data bases were particularly instrumental namely;-

- Feasibility Study Reports by Japan Port Consultants;
- Promotional material prepared by the LCDA;
- GOK Policy blue prints and planning reports;
- The National Water Masterplan 2030;
- The Range Management Handbook series (generously availed by Professor Emeritus Schwartz of Germany);
- Mapping Studies by the nature Conservancy;
- Hydrological Investigative Reports for the Ewaso Ng'iro Basin prepared under auspices of the Laikipia Research Project and CETRAD;
- Diverse investigative reports on the Merti Aquifer; and
- Dr Sean Avery's investigative reports on the Lake Turkana hydrology, among others.

Lessons drawn and conclusions arrived at in this report are largely informed by the documents among others.

Field data collection: Data correction was achieved through 5 stand-alone studies aimed at defining the Biophysical baseline, Socio-economic baseline, Biodiversity and wildlife heritage, Policy-legal framework and, socio-cultural heritage and concerns. The Work plan, Field Itinerary and data capture tool development for this SEA are provided in Appendices 1.4, 1.5 and 1.6.

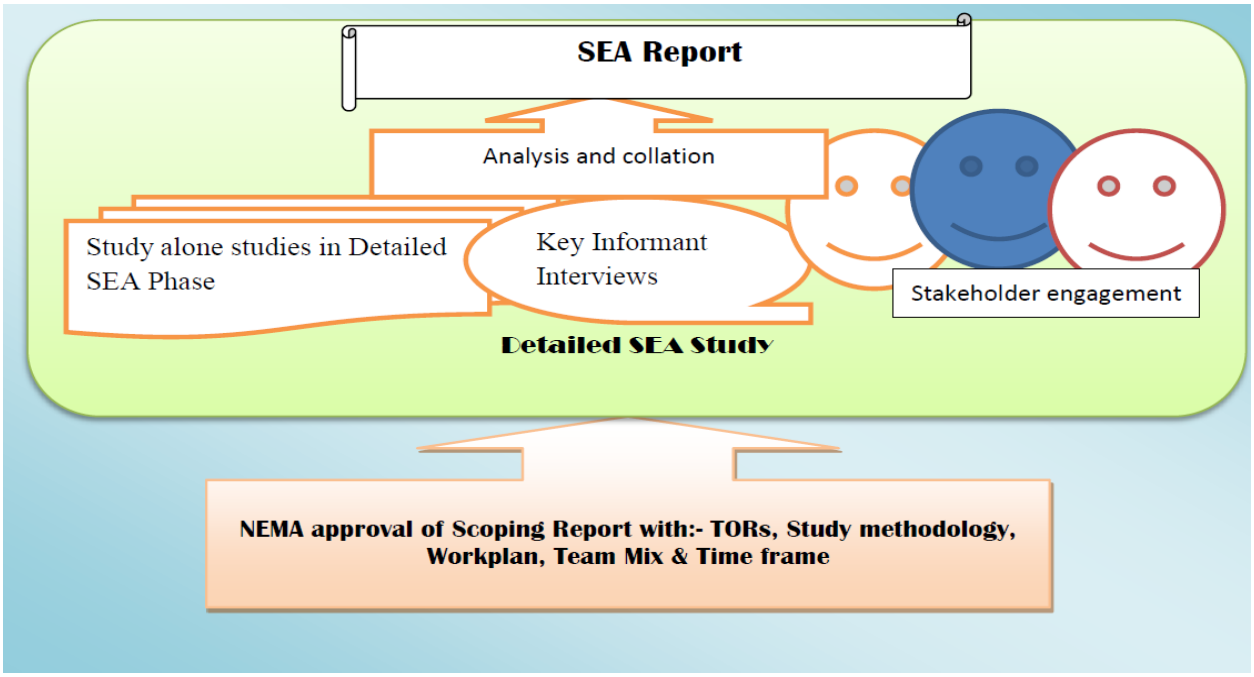


Plate 1.1 Conceptual flow/activity plan in the Scoping Study

Stakeholder engagement: Considerable time and effort was invested in identifying and engaging with diverse stakeholders at all levels. As part of this, a reconnaissance drive along the entire corridor from Hindi to Nakadok was made by the study team. In the verge of this reconnaissance drive, the team did not only meet the primary stakeholders but to also encounter challenges associated with arid land livelihoods. Chapter Seven and its appendix are solely devoted to documenting the process and outcomes in stakeholder engagement where by experiences accruing from this activity largely informed the impressions made on livelihood systems in this study.

1.3.4 The SEA Study Team

A multi-disciplinary Team of experts was deployed for this Study as follows:-

Staff Member	Responsibility
Michael M. Wairagu	SEA Lead Expert/Team Leader
Dr. Alexander Kireria	Development Economist/ Deputy Team Leader
Prof. Nicholas Onguge	Wildlife Biologist /Policy Analyst/ Conflict Resolution
Dr. Alfred Muthee	Range Management Specialist/ Socio-Economist
Chris Magero	Range /Natural Resources Expert
Joseph Ruhiu Mungai	Wildlife Ecologist
Irene Keino	Conflict Resolution Specialist
Mbiri Gikonyo	SEA Expert/ County Coordinator
County Coordinators	
Paul Githumbi Nderitu	Garissa

Staff Member	Responsibility
Angeline Mwangi	Isiolo/Laikipia/Baringo
Nancy Kanyi	Meru/Isiolo/ Marsabit
Mbiri Gikonyo	Samburu /Turkana
Mboni Mwalika	Meru-Nairobi Transect/ Economist
Janet Wairagu	Field Coordinator
Edwin Owino	Data Management Specialist

1.4 Content of this SEA Report

This report is presented in 2 volumes namely:-

- Volume One: Main report inclusive of Executive Summary; and
- Volume Two: Appendices 10 Chapters and diverse appendices.

Volume one comprises of 10 Chapters:-

- Chapter One (This chapter) introduces the Detailed SEA study Report and Process;
- Chapter Two discloses the LAPSSET Corridor Infrastructure Development Project;
- Chapter Three provides a brief outline of the policy-legal framework defining limits of the proposed SEA;
- Chapter Four provides a brief overview of the biophysical environment;
- Chapter Five outlines the socio-cultural baseline;
- Chapter Six outlines prevailing economic scenario at national and regional levels;
- Chapter Seven outlines the process and outcome of the stakeholder engagement;
- Chapter Eight outlines the analysis of alternatives;
- Chapter Nine documents analysis of concerns and possible impacts; and
- Chapter Ten outlines the Environmental and Social Management Framework in the LCIDP

2.0 The LAPSSET Corridor Infrastructure Development Project-LCIDP

Good environmental practices require full disclosure of proposed development initiatives-PPPs in the case of SEA Studies. In sections below, an overview of the scope and geographic coverage of LAPSSET Corridor is provided starting with an overview of the policy legal anchorage.

2.1 Development Context

2.1.1 Ownership

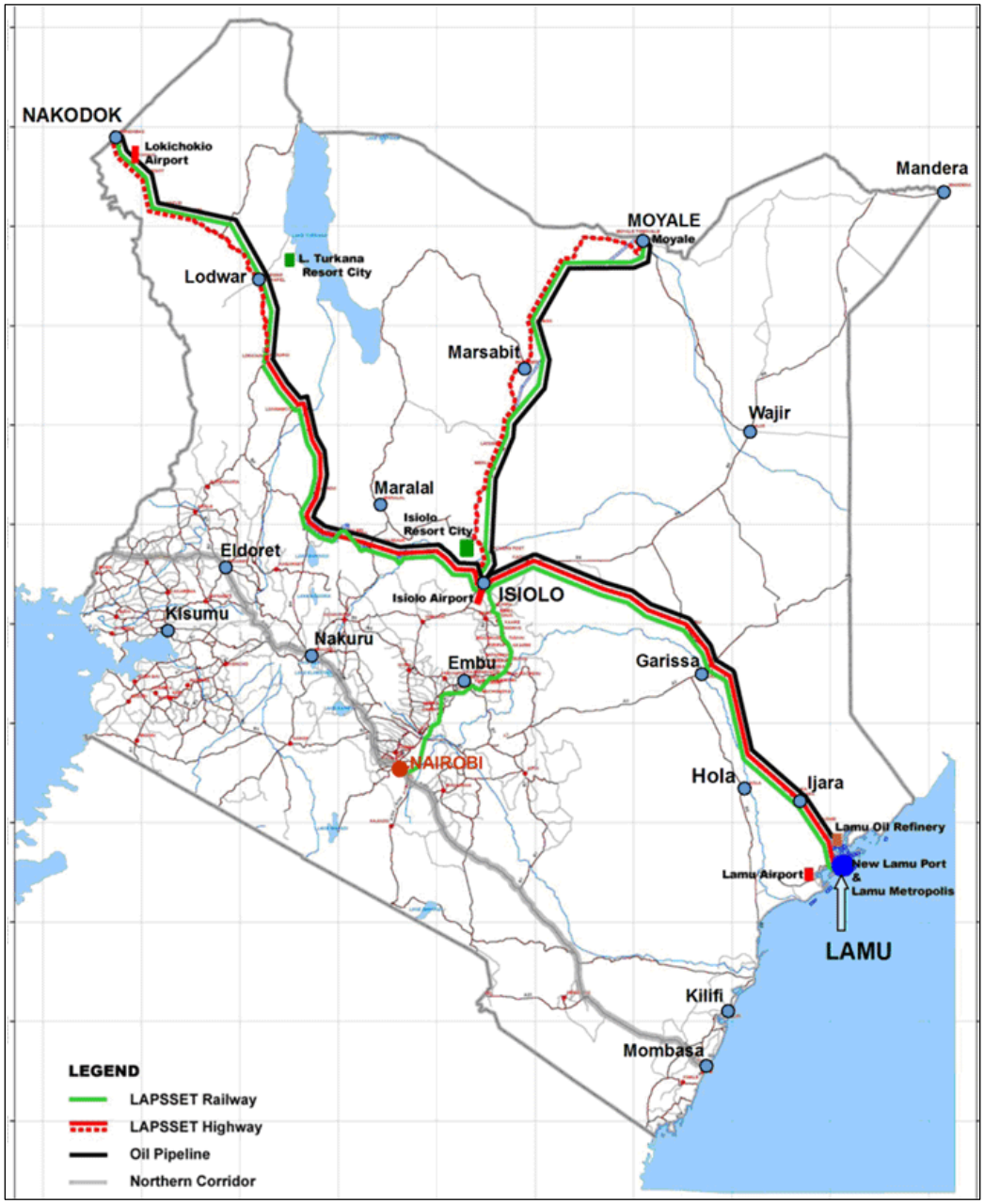
LAPSSET is an undertaking of the Government of the Republic of Kenya in association with like-minded neighbors. The LAPSSET Corridor Project was recently added to the Presidential Infrastructure Championship Initiative (PICI) Project list during the African Union (AU) Heads of State and Government Orientation Committee (HSGOC) meeting at the AU Summit held in June, 2015, in Johannesburg, South Africa. The admission of LAPSSET Corridor Project into the PICI gives the project the continental institutional and leadership approval and recognition which in turn strengthen investor confidence in the Project. The recognition also strengthens the prioritization of the LAPSSET Corridor Program in the government development agenda and regional and continental infrastructure investment plan.

2.1.2 Policy Perspective

Development of the LAPSSET Infrastructure Corridor Project is being pursued as part of long and medium term GOK strategies for achieving national economic and social transformation. Specifically, LAPSSET is a Flagship Project under the Economic Pillar of Kenya Vision 2030 -the country's development blueprint which aims to transform Kenya into a newly industrializing, "middle-income country providing a high quality life to all its citizens by the year 2030". The Economic Pillar has identified six key sectors to spearhead the drive to attain high and sustainable economic growth namely tourism, agriculture, wholesale and retail trade, manufacturing, business process outsourcing and financial services and finally, Oil, Gas and Mineral Resources.

Kenya's Second Medium Term Plan (2013-2017) is the second in a series of successive 5 year medium term plans through which Vision 2030 is being implemented. For the infrastructure sector, the Vision and MTPII focus on gradually closing Kenya's infrastructure deficit. The MTP II point out that reliable infrastructure is an enabler for sustained economic growth, development and poverty reduction. It not only lowers the cost of doing business, but improves security and livelihoods and eventually affects the country's global competitiveness.

On the improvement of trade the MTP II focus on expanding trade to increase its share in the fast expanding regional and other emerging markets. Hence trade in the broader region will be backed by joint infrastructural investments with neighboring countries. In this light, part of the growth strategy for Kenya in a bid to maximize her geographical comparative advantage and as identified in the MTPII is the development of the LAPSSET corridor traversing from the East Coast of Africa (Lamu) through to the Northern, and North Eastern Kenya and connects south Sudan and further joins other corridors linking up with the Western Coast to Doula -Cameroon.


NAKODOK
Lokichokio Airport
Lodwar
L. Turkana Resort City
MOYALE
Moyale
Mandera
Marsabit
Wajir
Maralal
Isiolo Resort City
Eldoret
Isiolo Airport
ISIOLO
Kisumu
Nakuru
Embu
Garissa
NAIROBI
Hola
Ijara
Lamu Oil Refinery
New Lamu Port & Lamu Metropolis
Lamu Airport
LAMU
Kilifi
Mombasa
LEGEND
LAPSSET Railway
LAPSSET Highway
Oil Pipeline
Northern Corridor

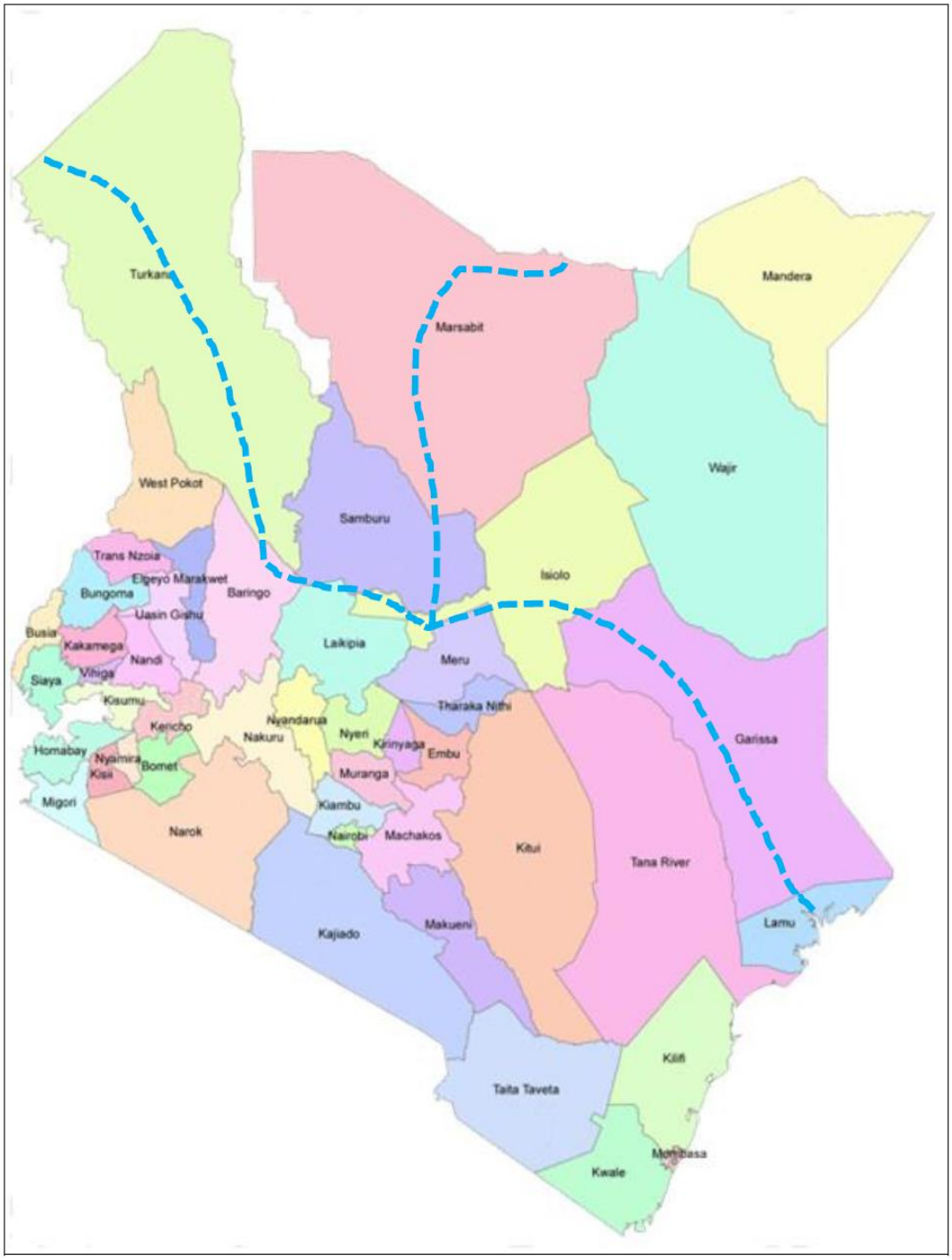


Fig 2.1: Counties traversed by the LCIDP

2.2 Objectives of the LCIDP

2.2.1 Physical Objectives of the LCIDP

The basic objective of the LAPSSET Infrastructure Corridor Project is to improve access and connectivity between Kenya, Southern Sudan and Ethiopia and eventually forming a land bridge across the entire Great Lakes region from Eastern Coast of Africa (Lamu) to Western Coast (Douala) Cameroon.

2.2.2 Strategic Objectives of the LCIDP

The LAPSSET Corridor Project covers over half of the country with a planned investment resource equivalent to half of Kenya's GDP for the core investment alone. It is anticipated that the project will inject between 2% to 3% of GDP into the economy and it is expected to contribute between 8 to 10 percent of revenue when generated and attracted investments finally come on board. Other strategic objectives include;

- Improvement in Socio economic development in Kenya and the region; and
- To attract increased private sector investment in infrastructure development and management in the country. Currently, there are a number of private sector involvements particularly in the energy, water and railway sub-sectors. More private sector investments are being explored in roads, railways, ports and water services

2.3 Scope and Scale of the LCIDP

The LCIDP traverses nine counties of Lamu, Garissa, Isiolo, Meru, Marsabit, Laikipia, Samburu, Baringo and Turkana. It comprises of several subsidiary projects as discussed below.

2.3.1 Components of the LCIDP

The LAPSSET Corridor comprises of two core elements mainly;- an 500 m wide Infrastructure Corridor which will accommodate the Highway, SGR Railway, Oil Pipeline utilities (water and power transmission lines), and a 50 Km wide Economic Corridor spanning either sides of the infrastructure corridor where industrial investments will be situated. The Corridor is intended to originate from Lamu, pass through Isiolo and on to the border with Southern Sudan with a branch to Moyale from Isiolo. At Continental level, the Corridor will connect the East and West Coasts of Africa from Lamu Port to Douala and then on to the Douala– Lagos–Cotonou-Abidjan Corridor. Ultimately, once operational, the transport corridor will open and link up Northern Kenya and the interior of Central Africa, thereby creating new markets and investment zones to meet the growing investment appetite in Kenya and the entire African Continent.

As a transformative and game changer infrastructure project, LAPSSET is intended to operate as an Economic Corridor with the objective of providing multiple East African nations access to a large-scale economic trade system. The port will allow transport linkage between Kenya, Ethiopia, and South Sudan, and thereby serve as a promoter of socio-economic development in the region.

Given the scale of the LAPSSET project as a whole, the project has been broken down into the start-up subsidiary projects ("projects components") as follows:-

i) Lamu Port at Manda Bay;

ii) Special Economic Zone at Lamu;
iii) Standard gauge railway lines from Lamu to Isiolo, Isiolo to South Sudan and Uganda, Isiolo to Ethiopia and Nairobi to Isiolo;
iv) Highway from Lamu to Isiolo, Isiolo to Nadapal/Nakodok (South Sudan), Lokichar/Hoima (Uganda), and Isiolo to Moyale - Addis Ababa (Ethiopia); Malindi – Garsen – Lamu Road;
v) Crude Oil Pipeline from Lamu to Isiolo - Nadapal/Nakodok (South Sudan) Lokichar/Hoima(Uganda) and Product Oil Pipeline from Lamu to Isiolo - Moyale Addis Ababa (Ethiopia);
vi) International Airports at Lamu, Isiolo, and Lake Turkana;
vii) Resort Cities at Lamu, Isiolo and Lake Turkana;
viii) Merchant Oil Refinery at Lamu;
ix) High Grand Falls Multi-purpose Project; and
x) Fibre Optic Cable with Communication systems

Brief highlights on each component are provided here below:-

Lamu Port at Manda Bay: The Lamu Port is already under construction at Manda Bay having undergone full ESIA and RAP studies and subsequently approved by NEMA. Lamu was chosen due to its almost perfect natural location ideal for a port boasting a depth of more than 18 metres as opposed to Mombasa's 13 metres thus requiring minimal dredging for the construction of a port. Whilst Mombasa's narrow entry can only allow one ship at a time, Lamu's wide entry will accommodate multiple ships to approach the port at the same time. The port phase construction alone is expected to cost some US$3.5billion. Once complete, Lamu Port will have a quay length of 3,500m, 32 berths and handle cargo capacity of 35 million tonnes per year, joining the few global ports that can handle Super Port Panamax vessels. Given that this facility is already under development, SEA activity here will concentrate on helping resolve outstanding issues especially pertaining to preservation of fragile ecosystems, cultural heritage and benefits to the local economy.

The Lamu Special Economic Zone: Special Economic Zones are spatial or legal spaces that are intentionally engineered to drive economic transformation in target areas/ sectors. Characteristically, SEZs are conceived and designed to catalyse growth and take diverse forms such as; - export processing zones, economic processing zones, free zones, and foreign trade zones often enjoying administrative, regulatory, and fiscal regimes that are different from those of the domestic economy. Traditionally, zones are created with four policy goals namely;-

i) To attract foreign direct investment;
ii) To serve as "pressure valves" to alleviate large-scale unemployment;
iii) To support a wider economic reform strategy; and
iv) As experimental laboratories for the application of new policies and approaches.

In Kenya, Export Processing Zones were first gazetted in the 1990 under auspices of the Export Processing Zones Authority (EPZA) established in 1990 through the Export Processing Zone Act (Cap 517). By 2012, a total of 47 EPZs hosting 82 firms had been gazetted. Most of the firms within EPZ are in the garment (26.83%) and agro-processing (21.95%) sectors which also account for the highest levels of investments, employment, sales and exports. Globally, the EPZ concept has evolved from just promoting manufacturing for export to encompass a wide range of economic activities under the Special Economic

Zones including Export Processing Zones, Industrial Parks, Research/Technology Parks, IT Parks, Free Ports and Free Zones.

Highways: This component targets to develop an interlinked 1980 km long Highway Network leading to South Sudan and Ethiopia. The Road Network Component is ambitious, comprised of three sub systems namely:-

- Sudan LAPSSET Corridor- 1,250km**:** Lamu – Garissa – Kula Mawe- Isiolo – Kisima - Nginyang – Lokori– Lokichar – Lodwar – Lokichokio - Nakodok.
- Ethiopia LAPSSET Corridor- 460k**:** Isiolo – Laisamis - Marsabit – Moyale
- Isiolo-Nairobi Link: 270 km- mainly connecting the LAPSSET Corridor to the Northern Corridor.

Railways: Scope of the LAPSSET Railway is largely aligned to the road network and is thus likely to be 1980km long. Based on the demand forecast, design standards, and temporary route setting, a Standard Gauge Railway has been adopted for all three railway sections namely;-Lamu-Garissa-Isiolo, Southern Sudan Section (i.e. Isiolo-Nginyang-Nakodok) and, the Ethiopia Section covering Isiolo to Moyale. The railway line crosses many rivers and needs many bridges, most of which are less than 100 meters long. At the section between Isiolo and Nginyang, it is estimated that five tunnels each 5 km long and six short tunnels will become necessary to abide by the maximum gradient of 1.5% to pass the Rift Valley part. At the Isiolo-Moyale section, two tunnels with lengths of 2 to 4 km are necessary.

It is estimated that number of freight trains on the Lamu Section will reach 78 trains (74 freight trains and 4 passenger trains) per day at the busiest section between Lamu-Isiolo in 2030. Thus, it is planned that, until the target year of 2030, the railway keeps the single track line. Furthermore, in view of long distance and high construction cost for electricity supply (Kshs 80 billion for about 1,800km long power transmission line), the railway shall be operated by the diesel driven system to minimize the capital and maintenance costs.

Construction of LAPSSET Railway Network was planned to take three years to be completed by end of 2016, subject to all necessary arrangements for implementation of the Project being satisfactorily made. In order to improve economic investment efficiency, it may be considered that construction of the Southern Sudan – Isiolo section should be deferred until the time when agriculture and other new industries in Southern Sudan will be developed substantially, say five years after the other sections. The share of railway transportation volume constitutes more than 90% of long-hauling cargo movement between Lamu and Southern Sudan/Ethiopia. The total volume in 2020 is 3 million tonnes for import and 4.7 million tonnes for export, including containers of 2.1 million and 1.8 million tonnes for import and export, respectively. In 2030, they increase to 5.1 million tonnes and 9.3 million tonnes, including containers of 3.5 million and 3.8 million tonnes, respectively.

Oil Pipeline: The crude oil pipeline is planned to run from Lokichar to Lamu, Jonglei (South Sudan) to Lokichar and a product oil pipeline from Lamu to Isiolo - Moyale - Addis Ababa (Ethiopia). The crude oil is being designed by Kenya and Southern Sudan, while the product pipeline is being designed by Ethiopia and Kenya. A bilateral agreement on the product pipeline has been signed by the two countries. Estimated cost for the 864 km Kenyan side of the crude oil pipeline is US$3B.

Resort Cities: Three Resort Cities are planned at Lamu, Isiolo and Turkana as Flagship Projects of the Economic Pillar to Kenya Vision 2030 where the aim is to enhance marketing of Kenya as a tourist destination.

The Isiolo resort city will be situated between Katim hill and Oldonyo Degishu hill commonly known as Kipsing gap. Neighbouring game parks and national reserves include Lewa Wildlife Conservancy in the south, Buffalo Springs and Shaba National Reserve to the North, Samburu Game Reserve and Ewaso Ng'iro River to the West. The area also boasts a wide variety of plants and animals, including the big five, leading to it also being known as the Jewel in the crown. Kipsing Gap was picked in preference of Kula Mawe and Archers Post due to security, accessibility, cultural diversity, natural diversity, wildlife, water availability, electricity, good drainage and sewer system possibilities, among other factors.

Airports: Three international airports are proposed at Lamu, Isiolo & Lokichogio mainly to serve the tourist industry and then meet the needs of business travel to be generated by LAPSSET.

The Proposed Value Chain Development Initiative under LAPSSET: In addition to development of strategic infrastructure, LAPSSET has proposals on Value Chain Development for local produce in a two-pronged approach aimed at commercialising local economies and creating business for LAPSSET. The role of the SEA here is to study and evaluate proposed mode of engagement to ensure creation of mutually beneficial, economically viable and socially acceptable business models. The products being targeted for value chain include among others, pineapples, sugarcane, Mangoes, beef, hide, avocadoes, maize, rice, sorghum, cotton, and French beans.

Table 2.1 Status of Implementation of the LAPSSET Components

Component	Status of Implementation	Comment
Lamu Port Building and Port Police and security	95%	
Port Area	The physical development plan and survey for the Port area has been completed	An allocation of Kshs 4.2 billion has so far been set aside by the government in preparation for the commencement of construction works for the first three berths.
Highways		
Lamu – Garissa (D568) 250 km), Garissa – Isiolo (C81,D586,B9) (423 km) and Isiolo - Nginyang	Design completed	Financing being fast tracked
Isiolo – Moyale (A2) (505 km):	over 90% completed	
Isiolo – Merile (136 km)	100%	
Merille – River Marsabit (123 km)	Construction works ongoing at an advanced stage	
Marsabit – Turbi (126 km)	Construction works ongoing at	

	an advanced stage	
Turbi – Moyale (128 km)	Construction works ongoing at an advanced stage	
Kitale – Lodwar – Nadapal Road (623 km	95%	
Garsen – Lamu Road (115 km):	Design reviews complete.	Awaiting mobilization of resources for construction.
Railway	preliminary designs are complete	The Government of Kenya and the Government of Ethiopia have signed a Bilateral Agreement to jointly pursue the development of the LAPSSET Standard Gauge Railway.
Resort cities	Planning stage	effective participation of local stakeholders in the Tourist Industry, new product lines,
Airports	Lamu -completed including a 2.3km runway and terminal building. Isiolo-1Km runway completed in Isiolo. Construction works on the terminal building ongoing with an estimated completion rate of 80%.	
Oil pipelines	Consultancy services for the FEED(Front End Engineering Design) for Lokichar- Lamu is ongoing	Pre feed studies completed in December 2015

2.3.2 Economic Scope/Goals

The LAPSSET Corridor Project covers over half of the country with a planned investment resource equivalent to half of Kenya's GDP for the core investment alone. Conservative feasibility statistics shows that the project will inject between 2%-3% of GDP into the economy. Statistics estimate that contribution of the LAPSSET Corridor Project to the country's economic growth might even range between 8%-10% of GDP when generated and attracted investments finally come on board. This view is supported by the fact that new investments of the magnitude of LAPSSET Corridor Project in hitherto low developed areas usually yield higher growth figures.

Table 2.2: LAPSSET Corridor Project Components

No	Item	Quantity	Cost (USD) millions	EIRR %
1	Lamu port	32 berths	3,095	23.4
2	Railway	1,710 km	7,099	17.8
3	Highway	880 km	1,398	12.9
4	Crude Oil Pipeline	2,240 km	3,949	21.6
5	Product Oil Refinery	120,000bpd	2,800	13.9
6	Resort Cities	3 Lots	1,214	20.8
7	Airports	3 Lots	506	20.7

Table 2.3: Services

No	Item	Quantity	Cost (USD) millions	Cost (KES) trillions
1	High Grand Falls (Hydro + Water)	1 Lot	2,110	
2	Associated Infrastructure		2,500	
	Total cost		**24,524**	**2,403**

Note 1: Both all and each project components are judged as viable in view of national economy as EIRRs computed are more than 12%, which is opportunity cost.

Note 2: Cargoes are generated by the Corridor itself. Higher figures than the above table can be realized.

2.3.3 Cost of LAPSSET Corridor Program

The seven key infrastructure project components of the LAPSSET Corridor Program require substantial amounts of resources with a budget estimate of US$24.5 billion, equivalent to KES 2 trillion at current exchange rates in construction costs. It is estimated that Lamu Port with its 32 berths alone will cost approximately US$3.1 billion, the Railway US$7.1 billion while the crude oil pipeline will cost a further estimate of US$3 billion for Lamu to Lokichar trunk line alone.

2.4 Justification of the LCIDP:

2.4.1 Unlocking the economic potential for Northern Kenya

One of the regions which vision 2030 singles out for special attention is the arid and semi-arid lands of Kenya, making up 89% of the country. The arid counties cover 70% and are home to 36% of the population.

The region's geographical location and its social and cultural attributes make it well-positioned to benefit from surplus capital in the Gulf, one of the fastest growing parts of the world. It is also the bridgehead to a regional economy of more than 100 million people. Countries such as Ethiopia, Sudan and Somalia need outlets for their products, imports of manufactured goods and, in the case of South Sudan and Somalia, materials for reconstruction will most likely be sourced from Kenya.

Through Vision 2030, Kenya aspires to be a country that is firmly interconnected where no region will remote. This statement is highly significant for the north, where infrastructure is consistently ranked among people's top three priorities. The lack of infrastructure has undermined investment and reinforced the separation of the north from the rest of the country. [4] The LAPSSET corridor will link the East Coast at Lamu with land-locked areas of South Sudan and Ethiopia and this is targeted to open up new areas of growth and opportunity.

East Africa has four landlocked countries, which use Dar-es-Salaam and Mombasa as their gateways to the sea. Ethiopia uses Djibouti as its gateway, and Sudan has access to Port Sudan. Rwanda and Burundi have the option of using either Mombasa or Dar es Salaam, which creates the possibility of competition along corridors and between ports. Burundi's most direct route to the coast is through neighboring Tanzania. Yet infrastructure along that route has traditionally been poor, which diverts Burundian transit to the route through Rwanda and Uganda into Kenya, which is 600 kilometers longer. The northern corridor that runs inland from Mombasa is by far the most significant trading corridor in the region, greater even than the southern corridor through Tanzania (the central corridor). Further north, a corridor connects Addis Ababa with Djibouti, and another connects Addis Ababa with Sudan. Strikingly, no major road routes link Ethiopia and Sudan with the EAC. The LAPSSET Corridor Program is a regional flagship project intended to provide transport and logistics infrastructure aimed at creating seamless connectivity between the Eastern African Countries of Kenya, Ethiopia and South Sudan and eventually to West Africa through Doula in Cameroon.

It's aimed at opening up inaccessible inland parts of Africa to unlock potentials and create new opportunities and markets of economies of greater scale to nationals and investors. It will provide multiple east African nations access to a large scale economic trade system.

Steady advances in regional integration and services will finally create a shift from overseas trade to trade between countries and within and across regions, helping fulfill the promise of the 2028 African Common Market.

2.5 Institutional Context

Development of the LAPSSET Corridor is an undertaking by the LCDA, a Body Corporate established under the State Corporations Act Cap 446. The LAPSSET Corridor Development Authority (LCDA) is charged with the responsibility of steering the LAPSSET Corridor Project .The Authority is domiciled in The Presidency in accordance with the Constitution of Kenya 2010. The LCDA is headed by Director General/ Chief Executive Officer and Chairman. The LAPSSET Corridor Development Authority has the inter-ministerial coordination committees composed of relevant ministries including;

[4] Republic of Kenya, 2011: *Vision 2030 Development Strategy for Northern Kenya and other Arid Lands*.

- The National Treasury;
- Ministry of Energy and Petroleum;
- Ministry of Transport and Infrastructure;
- Ministry of Lands, Housing and Urban Development;
- Ministry of Water, Environment and Natural Resources;
- Ministry of Devolution and Planning;
- Ministry of Interior and Coordination of National Government;
- Ministry of East Africa, Trade and Tourism;
- Ministry of Industrialization and Enterprises Development;
- Ministry of Agriculture, Livestock and Fisheries; and
- Ministry of Defence among other agencies in the implementation of LAPSSET Corridor Project.

3.0 Policy, Legal and Institutional Framework

This chapter defines the policy, legislative and institutional frameworks which will govern development, implementation and operationalization of the LCIDP. By design, LAPSSET is multifaceted and cuts across many sectors of the economy, some of which enjoy protection under diverse local, national, regional and global policy/ legal tools. An analysis of requirements of such tools has been undertaken as part of the SEA process to ensure that the LCIDP attains the goals of social acceptability, economic viability and technical sustainability in line with internationally accepted standards for good practice. A detailed analysis of potential inter-phasing of the Master plan with diverse legal instruments is briefly highlighted in sections below.

3.1: The Policy Framework

Two policy frameworks are considered relevant to development planning as envisaged in the Master Plan for the proposed Leather Industrial Park :-

- Policy Framework for development planning;
- Policy Framework for development of Northern Kenya; and
- Policy Framework for environmental management.

3.1.1 Policy framework for Development Planning

The mandate for development planning: The policy framework for development planning in Kenya is vested in the Constitution and the long term development blue print - Kenyan Vision 2030. Chapter Four of the Constitution focuses on the Bill of Rights. Article **19** (1) describes the Bill of Rights as "an integral part of Kenya's democratic state" and "as the framework for social, economic and cultural policies". Article **69** (2) states that: - "every person has a duty to cooperate with State Organs and other persons to protect and conserve the environment; and ensure ecologically sustainable development and use of natural resources".

Chapter Eleven of the constitution describes development planning through devolution. Article **174** defines the object of devolution of government including (*f*) "to promote social and economic development and the provision of proximate, easily accessible services throughout Kenya". It also allows county assemblies to receive and approve plans and policies for the development and management of its infrastructure and institutions (Article **185**(4) (b)). However, it also notes that the structure of the development plans and budgets of counties shall be prescribed through national legislation (Article **220**. (2)(a)). In Chapter Twelve, the Principles of Public Finance is positioned, including Article **201**.(b)(iii) stating that "expenditure shall promote the equitable development of the country, including by making special provision for marginalized groups and areas".

Kenya Vision 2030: In order to have a development strategy that answers to the aspirations for a prosperous society, the Government developed the Kenya Vision 2030, and launched in June 2008. Through the Vision, Kenya is anticipated to transform into a newly- industrializing, middle income

country providing a high quality of life to all its citizens in a clean and secure environment by the year 2030. At the point of development, the Vision aimed at meeting the Millennium Development Goals (MDGs) while making the country globally competitive.

The overarching vision is "A globally Competitive and Prosperous Nation with a high quality of life by the year 2030". The vision is anchored on three pillars namely Economic, Social and Political pillars. To support the three pillars are transversal institutional reforms and infrastructure development interventions. To drive the economic pillar, six priority sectors were identified, i.e. Tourism, Agriculture, Wholesale and Retail Trade, Manufacturing, Business Process Out sourcing (BPO) and Financial Services (see Figure 3.1). And the growth target was to be achieved through implementation of several flagship projects in the six priority sectors.

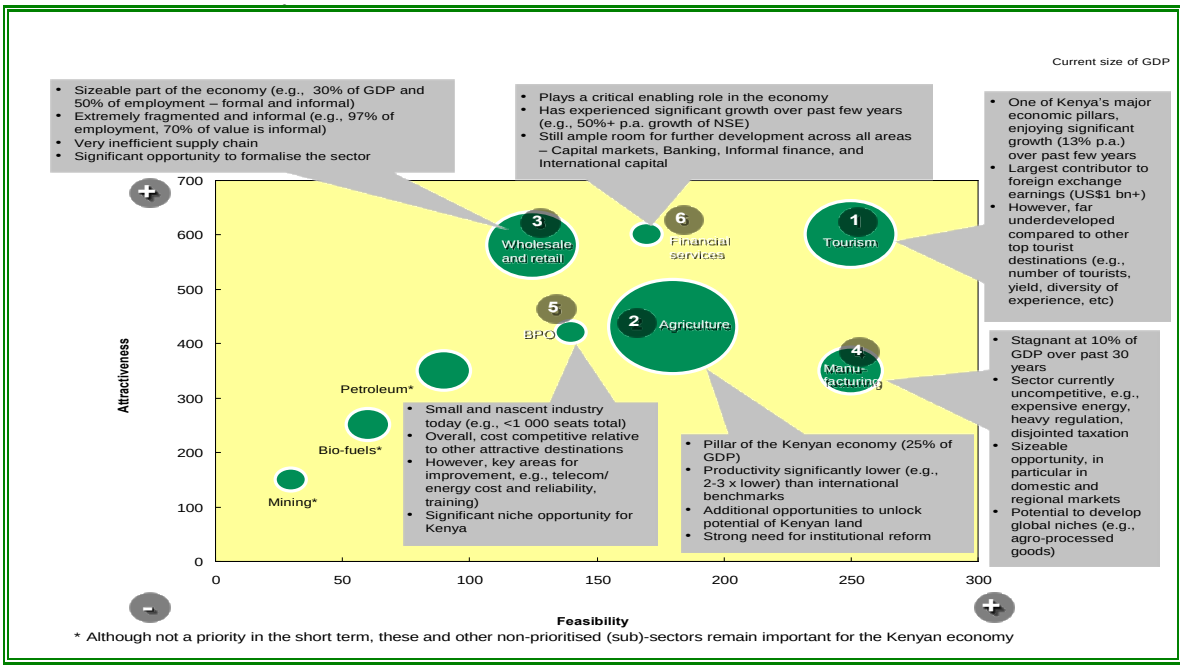


Figure 3.1: The six priority areas in the Kenya Vision 2030 (Source: Ndungu, Thuge & Otieno 2009)

Visions, goals and strategies were developed for each of the six priority economic sectors. The visions were as follows:

1. Tourism - "To be among the top 10 long haul tourist destinations offering a high-end, diverse, and distinctive visitor experience";
2. Agriculture - "Innovative, commercially oriented and modern farm and livestock sector";
3. Wholesale and Retail - "Move towards a formal sector that is efficient, multi-tiered, diversified in product range, and innovative";
4. Manufacturing - "A robust, diversified and competitive manufacturing";
5. Business Process Outsourcing - "The top BPO destination in Africa";
6. Financial Services - "A vibrant and globally competitive financial sector driving high-levels of savings and financing Kenya's investment needs".

There were 20 major projects strategized for the Economic Pillar (Table 3.1)

Table 3.1 The Flagship Projects for the various sectors

Priority sector	Flagship projects
Tourism Sector	1. Development of 3 resort cities two at the coast and one in Isiolo. 2. Premium Park Initiative. 3. Under Utilized Parks Initiative. 4. Development of Niche Tourism Products.
Agriculture Sector	5. Enactment of the Consolidated Agricultural Reform Bill. 6. Fertilizer Cost-Reduction Initiative. 7. Setting up of five livestock Disease Free Zones in the ASAL regions. 8. Land registry. 9. Land use master plan. 10. ASAL Development Projects.
Manufacturing Sector	11. Development of Special Economic Zones in all the eight regions. 12. Development of 5 SME parks.
Wholesale and Retail Sector	13. Build 1 free trade port in Mombasa in order to bring Dubai to Kenya. 14. Create at least 10 hubs and 1000-1500 Producer Business Groups (PBGs) - start with a pilot in Maragua. 15. Build at least 10 Tier 1 mark in all the regions - starting with a pilot in Athi River.
ICT and BPO Sector	16 Establish one major BPO park
Financial Sector	17. Issuance of benchmark sovereign bond. 18. Pursue comprehensive remittances strategy 19. Develop and execute comprehensive model for pension reform. 20. Facilitate transformation towards stronger, larger scale banks.

The social pillar of Vision 2030 seeks to create **"a just, cohesive and equitable social development in a clean and secure environment"**. It, therefore, presents comprehensive social interventions aimed at improving the quality of life of all Kenyans and Kenyan residents. The vision classifies interventions in the social pillar into six broad areas of focus. These include education, health, water and sanitation, environment, housing and urbanization, and gender, youth and vulnerable groups.

1. Education - The medium term goal is an ***"Overall reduction of illiteracy and enhancement of wealth creation; focusing on access, transition, quality and relevance of education, training and research";***
2. Health sector - The sector vision envisages overcoming the current constraints in the sector by the year 2030, i.e. **"Equitable and affordable health care system of the highest possible standards".** This is to be achieved through three strategic thrusts: ***Health structures, Health service delivery and partnerships,*** and ***equitable health financing mechanism;***
3. Water and Sanitation - the Vision for the water and sanitation sector is **"To ensure Water and**

Improved Sanitation availability and access to all by 2030". Realizing this vision would entail adoption of strategies in five broad areas: ***Resource Management, Water Storage and Harvesting, Water supply, Sanitation, Irrigation and Drainage***;

4. Environment - The vision for environment is that of **"A nation living in a clean, secure and sustainable environment".** Realization of this vision will require implementation of measures in four broad areas: conservation, pollution and waste management, ASAL and disaster zones, and environmental planning and governance;
5. Housing and Urbanization - The vision for housing and urbanization is **"An adequately and decently housed nation"**. The country's efforts aimed at realizing this vision will be concentrated in four broad areas. These are planning and management, housing development, finance, and legal and administrative reforms; and
6. Gender, vulnerable Groups and Youth - The vision for gender is **"Men and women enjoying a high quality of life and equal opportunities"**; for the vulnerable groups is **"Improved livelihoods for the vulnerable persons at household, community and national levels"**; and for the youth is **"A responsible, globally competitive and prosperous youth".**

The political pillar vision is to have **"A democratic political system that is issue-based, people-centered, result-oriented and accountable to the public"**. This was envisaged as a complete overhaul of the current system dominated by tribal and regional political alliances with emphasis on patronage rather than issues. The vision was driven by the country's desire to confront the current challenges concerning Rule of Law and Human Rights; Electoral and Political Processes; Democracy and Public Participation; Transparency and Accountability; Public Administration and Service Delivery; and Security, Peace-Building and Conflict Management.

3.1.2 Policy framework for Development of Northern Kenya

Policy aspirations for development of northern Kenya are elaborated in Kenya Vision 2030 which acknowledges the special circumstances of previously marginalized communities, and places a premium on reducing poverty and inequality and re-balancing regional development.

Kenya Vision 2030 Strategy for Developing Northern Kenya and Other Arid Areas: The Kenya Vision 2030 Development Strategy for Northern Kenya and other Arid Lands observed that previous resource allocation in development planning in Kenya favoured the so-called high-potential areas – those which, in the words of Sessional Paper Number 10 of 1965, have 'abundant natural resources, good land and rainfall, Different parts of the country will be moving towards this goal from different starting points.

Accelerated investment in previously neglected regions, such as the north, is required if all Kenyans are to have an equal chance of sharing in the promise and benefits of Vision 2030. The Strategy Document sets out what form that investment will take in the north of Kenya and the country's arid and semi-arid lands. It explains how the distinctive characteristics of the region will be taken into account, and sets out the broad strategies and priorities which will be pursued. It will be operationalized through a series of costed five-year medium-term investment plans, the first of which is in preparation in 2011.

The National Policy for the Sustainable Development of Northern Kenya and other Arid Lands (Releasing Our Full Potential): The thrust of this Policy is that Kenya will not achieve sustained growth in her economy and progress as a nation if the ASALs are not appropriately factored into national planning and development. The goal of this policy is to facilitate and fast-track sustainable development in Northern Kenya and other arid lands by increasing investment in the region and by ensuring that the use of those resources is fully reconciled with the realities of people's lives. The objectives of this policy are:

i. To strengthen the integration of Northern Kenya with the rest of the country and mobilize the resources necessary to reduce inequality and release the region's potential;
ii. To improve the enabling environment for development in Northern Kenya and other arid lands by establishing the necessary foundations for development;
iii. To develop alternative approaches to service delivery, governance and public administration which accommodate the specific realities of Northern Kenya and pastoral areas;
iv. To improve the standard of living of communities in the ASALs and ensure sustainable livelihoods.

Implementation of this policy is targeted to contribute towards the Government's vision of security, justice and prosperity for the people of Northern Kenya and other arid lands while helping achieve the three pillars of Vision 2030 – economic, social and political – but particularly the social pillar, which seeks to 'create a just and cohesive society that enjoys equitable social development in a clean and secure environment'. Finally, it will reduce dependence on relief interventions and the heavy financial burden of emergency response.

3.1.3 Policy framework for devolved government

Devolution under the Constitution of Kenya, 2010 entails the transfer of fiscal, administrative and political power to the devolved entities with citizens playing a central role in governance. This is a departure from the past where power and resources were centralized and citizens had minimal participation in governance. The devolved system created a two-tier government: the national and the 47 County governments listed in the First Schedule to the Constitution. Both levels of government are distinct and interdependent and are required to conduct their mutual relations on the basis of consultation and cooperation.

The devolved system operates within the context of overarching national and county frameworks. Such frameworks include Kenya Vision 2030, Medium Term Plans (MTPs), national and county strategic plans, and County Integrated Development Plans (CIDPs). Additional frameworks include the policies and guidelines of Ministries Departments and Agencies (MDAs) as well as constitutional commissions and independent offices, with specific roles in the devolved governance and service delivery.

Currently, there is no sessional paper to drive devolution though a draft policy was published in 2015 (GOK, 2015). The draft policy, once adopted, will provide a framework to harness the gains and opportunities of devolution, respond to the challenges and emerging issues, and fill in any gaps in the existing policy framework on devolution. The policy aims to provide a framework for:

- Efficient and effective service delivery at both levels of government;
- Enhance the alignment of roles, coordination, and collaboration among citizens, governments and non-state actors in the devolution implementation process; and

- Monitoring and evaluation mechanisms to ensure better management of devolution for high impact service delivery at both levels of government.

The draft policy focuses on the critical foundations of devolved governance including the objects of devolution. These are: Leadership and Governance; Equity and Inclusivity, Capacity Building and Public Service Delivery; Decentralized Units, Transfer of Powers and Functions and Intergovernmental Relations; Public Finance Management; and Public Participation and informed Citizen Engagement.

3.1.4 Policy framework for the LCIDP

Sessional Paper No 3 on National Land Policy, 2009: The policy regulates rights over land and provides for sustainable growth, investment and the reduction of poverty in line with the Government s overall development objectives. Specifically "the policy offers a framework of policies and laws designed to ensure the maintenance of a system of land administration and management" that will provide:

a) All citizens with the opportunity to access and beneficially occupy and use land;
b) Economically viable, socially equitable and environmentally sustainable allocation and use of land;

c) Efficient, effective and economical operation of land markets;
d) Efficient and effective utilization of land and land-based resources; and
e) Efficient and transparent land dispute resolution mechanisms.

The National Water Policy regulates the demarcation of protected areas.

The Housing Policy facilitates the provision of adequate shelter and a healthy living environment at an affordable cost to all socio- economic groups in Kenya in order to foster sustainable human settlements.

The National Energy Policy seeks to facilitate for the provision of clean, sustainable, affordable, competitive, reliable and secure energy services at the least cost while protecting the environment.

Integrated National Transport Policy (covering Roads, Railways, Ports Airports) whose main purpose of this policy is to develop, operate and maintain an efficient, cost effective, safe, secure and integrated transport system that links the transport policy with other sectoral policies.

Fisheries Policy seeks to promote responsible and sustainable utilization of fishery resources taking into account environmental concerns while encouraging efficient and sustainable investment in the Kenya fishery sector.

3.1.5 Policy framework for Environmental Management

The Constitution embodies elaborate provisions with considerable implications for sustainable development. These range from environmental principles and implications of Multilateral Environmental Agreements (MEAs) to the right to clean and healthy environment enshrined in the Bill of Rights. Its Chapter V is entirely dedicated to land and environment. It also embodies a host of social and economic

rights of an environmental character, such as the right to water, food and shelter – among others.
The National Environment Policy (2012) provides a holistic framework to guide the management of the environment and natural resources in Kenya. It further ensures that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of green economy enhancing social inclusion, improving human welfare and creating opportunities for employment and maintaining the healthy functioning of ecosystem.

3.2 The Legal Framework for Development Planning

3.2.1 Legal Framework for Development Planning

The constitution of Kenya provides the legal framework for sectoral laws in Kenya. Chapter five of the constitution, on Land and Environment, provide the basis for use and management of land in an equitable, efficient, productive and sustainable manner; and there implementation through the National Lands Policy. With the principles of sustainable and productive management of land resources, transparent and cost effective administration of land, and sound conservation and protection of ecologically sensitive areas; such a provision in the constitution advances the rights of the environment by ensuring that is safeguarded and enhanced for its own sake and for the benefits of the present and future generations. Article **61** (2) classifies land as public, community or private. Hence, have implications on development planning.

Furthermore under the constitution (Article 42) the right to a clean and healthy Environment including the right to have the environment protected for the benefits of present and future generation through legislative and other measures, is emphasized by requiring the state to inter alia; ensure the sustainable exploitation, utilization, management and conservation of the environment and natural resources; and the equitable sharing of the accruing benefits. It also requires the state to strive towards achieving and maintaining a tree cover of at least ten per cent of the land area in Kenya; encourage public participation in environmental protection efforts and the elimination of activities and process likely to endanger the environment.

The Kenya Vision 2030 is the long term development blue print implemented through Medium Term Plans (MTPs). The first MTP was 2008-2012 and the current one 2013-2017. While the framework environmental law, Environmental Management and Co-ordination Act 1999 (EMCA, 1999) amended in 2105, defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The constitution advances this further and makes environmental protection an obligation of the government and the citizens. Proper conservation and utilization of the environment and natural resources is encouraged through Article 69 (1 and 2), which obligates the State and every person to protect and conserve the environment to ensure ecological sustainable development and use of natural resources. The Constitution encourages equitable sharing among both men and women of the accruing benefits of the sustainable exploitation, utilization, management and conservation of the environment and natural resources (Article 69 (1, a)). It compels the State to ensure the sustainable exploitation, utilization, management and conservation of the environment and natural resources and ensure equitable sharing of the accruing benefits. The constitution thus takes an ecological perspective to sustainable development; a perspective geared towards the protection of the environment for ecological reasons as well as for satisfaction of human needs, thus advancing Agenda 21

and the *Brundtland Commission report*. Hence, EMCA (1999), Vision 2030 and the Constitution have laid the foundation for a framework for Sustainable Development in Kenya.

3.2.2 Legal Framework for Regional Development Planning

There are six basin development authorities in Kenya, i.e. Lake Basin Development Authority (LBDA), Kerio Valley Development Authority (KVDA), Tana and Athi Rivers Development Authority (TARDA), Coast Development Authority (CDA), Ewaso Ng'iro South Development Authority (ENNDA) and Ewaso Ng'iro South Development Authority (ENSDA). The LAPSSET traverse three, that is, CDA, TARDA and ENNDA).

The Tana and Athi River Development Authority Act Chapter 443 of the Laws of Kenya provided for the establishment of an authority to advice on the institution and co-ordination of development projects in the area of the Tana River and Athi River Basins and related matters. The authority established under Section 3 of this Act is the body corporate by the name of the Tana and Athi Rivers Development Authority. The Authority is empowered by Section 3 of the Act to inter alia taking, purchasing or otherwise acquiring, holding, charging and disposing of moveable or immoveable property. The authority also has borrowing powers. These powers are crucial for the proposed project in that they grant the Authority the capacity to have the property registered in its Authority's corporate name. In the implementation of the project, the Authority must ensure that it operates within the ambit of this Act.

Ewaso Ng'iro North Development Authority (ENNDA) was established on 1st December 1989 through the Ewaso Ng'iro North River Basin Development Authority Act CAP 448 of the Laws of Kenya. Following the passing of the new constitution, CAP 448 was repelled and replaced with Ewaso Ng'iro North Development Authority Act, 2013, which aligned the Authority to the new dispensation of Counties being the political centers at the local level.

3.2.3 Legal Framework for County based planning

An investigation on the legislation on devolution requires a good understanding of various parts of the Constitution, notably Articles 6 (devolution), and 10 (National Values and Principles of Governance); and Chapters Four (Bill of Rights), Six (Leadership and Integrity), Seven (Representation of People), Eleven (Devolution) and Twelve (Public Finance).

Article 6 declares Kenya devolved into the 47 counties specified in the First Schedule, and provides that the national and county governments are 'distinct' and 'interdependent', as elaborated in the Fourth Schedule; and that county planning and development is vested in the County Governments. Article 10 lists the various values and principles of national governance to include amongst others: patriotism; national unity; sharing and devolution of power; participation of the people; equity; social justice; nondiscrimination; protection of the marginalized; good governance; transparency and accountability; and sustainable development. Chapter Six amplifies issues of leadership and integrity. One of the constitutional provisions that devolution should facilitate is the Bill of Rights presented in Chapter Four.

The Rights and Fundamental Freedoms listed in Part 2 of chapter four– especially the economic and social rights (Article 43) and the family (Article 45) – are best monitored at the county level. Chapter Eight establishes Parliament, the National Assembly and the Senate in Articles 93 to 96. The Senate's primary function is to protect the interests of the counties and their governments, debating and approving

bills concerning counties, sharing out the counties' share of national revenues, which shall not be less than fifteen per cent of total revenue. There are, however, specific legislations on devolution that includes the County Government Act 2012, the Transition to Devolved Government Act 2012, Public Finance Management Act 2012 and the Intergovernmental Relations Act 2012.

The County Government Act, 2012

The preamble to the Act gives overriding object and purpose of the Act. It states that, 'An Act of Parliament to give effect to Chapter Eleven of the Constitution; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes.
Part II elaborate on the functions and powers of the county government, emphasizing its constitutional authority to enter into contracts, acquire and hold and dispose of assets, and delegate functions, such as through sub-contracts and partnerships. Part VI considers the foci and administration of decentralization to the sub-county level, including to urban areas and cities.

Part VIII focuses on Citizen Participation stating that "citizen participation in county governments shall be based upon reasonable access to the process of formulating and implementing policies, laws, and regulations, including the approval of development proposals, projects and budgets, the granting of permits and the establishment of specific performance standards" (**87**(b)); and "promotion of public-private partnerships, such as joint committees, technical teams, and citizen commissions, to encourage direct dialogue and concerted action on sustainable development" (**87**(f)).

On the aspect of public communication and access to information, the county governments are vested to "undertake advocacy on core development issues such as agriculture, education, health, security, economics, and sustainable environment among others" (**94**(c)).

The county governments are expected to undertake planning (**103**) to, among others:

- Ensure harmony between national, county and sub-county spatial planning requirements;
- Facilitate the development of a well-balanced system of settlements and ensure productive use of scarce land, water and other resources for economic, social, ecological and other functions across a county;
- Maintain a viable system of green and open spaces for a functioning eco-system;
- Harmonize the development of county communication system, infrastructure and related services;
- Develop urban and rural areas as integrated areas of economic and social activity;
- Provide the preconditions for integrating under- developed and marginalized areas to bring them to the level generally enjoyed by the rest of the county;
- Protect the historical and cultural heritage, artefacts and sites within the county; and
- Develop the human resource capacity of the county.

The County Government Act, 2012, provides the basis for spatial plans as statutory requirements in the county. The Act stipulates a 10-year spatial plan be developed by each county to provide for:-

(a) a spatial depiction of the social and economic development programme of the county as articulated in the integrated county development plan;
(b) a clear statements of how the spatial plan is linked to the regional, national and other county plans; and
(c) a clear clarifications on the anticipated sustainable development outcomes of the spatial plan.

It will indicate the desired patterns of land use within the county and:

- address the spatial construction or reconstruction of the county;
- provide strategic guidance in respect of the location and nature of development within the county;
- set out basic guidelines for a land use management system in the county;
- set out a capital investment framework for the county's development programs;
- contain a strategic assessment of the environmental impact of the spatial development framework;
- identify programs and projects for the development of land within the county; and
- aligned itself with the spatial frameworks reflected in the integrated development plans of neighbouring counties.

This statute has far reaching consequences for LAPSSET as it allows for the project and its associated components to be provided for in the County Spatial Plan. Indeed, provisions of this statute have been applied in the SEA to gauge the state of County preparedness for LAPSSET.

3.2.4 Legal framework in implementation of the LCIDP

The Constitution of Kenya

The Constitution of Kenya embodies a number of principles place a positive obligation upon the Government of Kenya to enact legislation, policy or any other measure that will not violate the same. These, among others, include:

- Social-Economic rights;
- Right to own property;
- Land rights;
- The right to information;
- Public participation;
- National values and principles;
- The right to a clean and healthy environment;
- Public interest litigation; and
- Bill of Rights.

An important regulatory mechanism for the assessment of options is provided in the Physical Planning Act, 1996. This Act provides for the preparation and development of physical development plans. The Act provides for the office of a Director of Physical Planning whose functions include to:

a. Formulate national, regional and local physical development policies, guidelines and strategies;
b. Be responsible for the preparation of all regional and local physical development plans; and
c. Advise the Commissioner of Lands and local authorities on the most appropriate use of land including land management such as change of user, extension of user, extension of leases, subdivision of land and amalgamation of land.

The Community Land Act No 27 of 2016

This is an Act of parliament giving effect to Article 63(5) of the Constitution; to provide for the recognition, protection, management and administration of community land; to establish and define the

powers of Community Land Boards and management committees; to provide for the role of county governments in relation to unregistered community land and for connected purposes.

The Act (Part II (**4**)(3) defines community land tenure system as customary, freehold, leasehold, and such other tenure system recognized under the Act or other written law. The law allows the conversion of community land to public land by (i) compulsory acquisition, (ii) transfer or (iii) surrender (Part V (**22.**)(1).

Land Act No 12 of 2012

This Act provides for the procedure to be followed during compulsory acquisition of land by the Government and the just compensation which should be paid promptly and in full to all persons whose interest in land has been affected.

Land Registration Act No 3, 2012

Certificate of Title is the proof of title of any proprietor of land, under this Act (26(1)). The law also allow all registered land to be subjected to a number of overriding interests, including:

(a) Spousal rights over matrimonial property;
(b) Trusts including customary trusts;
(c) Rights of way, rights of water and profits subsisting at the time of first registration under this Act;
(d) Natural rights of light, air, water and support;
(e) Rights of compulsory acquisition, resumption, entry, search and user conferred by any other written law;
(f) Leases or agreements for leases for a term not exceeding two years, periodic tenancies and indeterminate tenancies;
(g) Charges for unpaid rates and other funds, which, without reference to registration under this Act, are expressly declared by any written law to be a charge upon land;
(h) Rights acquired or in process of being acquired by virtue of any written law relating to the limitation of actions or by prescription; and
(i) Electric supply lines, telephone and telegraph lines or poles, pipelines, aqueducts, canals, weirs and dams erected, constructed or laid in pursuance or by virtue of any power conferred by any written law

National Land Commission Act, 2012

This Act of Parliament makes further provision for the functions and powers of the National Land Commission; that gives effect to the objects and principles of devolved government in land management and administration. This is critical for the allocation of land to LCDA by the National Land Commission along the corridor. The Commissioner of Lands, in respect of 28,000 hectares, has issued LCDA with a Letter of Allotment for the Lamu Port and associated infrastructure, which encompass the concession land.

The Environmental Management and Co-ordination (Amendment) Act, 2015 No 5 of 2015

The framework law on environment, the Environmental Management and Coordination Act, 1999, was amended in May 2015 and took effect on 17 June 2015. Article 57 (A) (1) states that "all Policies, Plans and Programmes for implementation shall be subject to Strategic Environmental Assessment". It describes plans, programmes and policies as those that are-

(a) Subject to preparation or adoption by an authority at regional, national, county or local level, or which are prepared by an authority for adoption through a legislative procedure by Parliament, Government or if regional, by agreements between the governments or regional authorities, as the case may be;
(b) Determined by the Authority as likely to have significant effects on the environment.

The Physical Planning Act, 1996 (Revised 2012)

Section 16 of the Physical Planning Act (Chapter 286) provides that the Director may prepare a regional physical development plan. The plan shall consist of inter alia, a statement of policies and proposals with regard to the allocation of resources and the locations for development within the area. The Act requires the Director to invite any person interested to make representations to do so within sixty days of the publication of the plan. On approval of the regional physical development plan no development shall take place on any land unless it is in conformity with the plan.

Section 24 provides for the Director to prepare also a local physical development plan whose purpose is to guide and coordinate development and for the control of the use and development of land. Physical planning thus provides a mechanism for the assessment of options and establishment of policy objectives and goals. These provisions notwithstanding, the physical planning process has so far not been used to elaborate policy options for development. This omission does not however detract from the potential of the physical planning process to facilitate the identification and regulation of policy options for resource development and use.

Agriculture Act CAP 318

This Act of Parliament was revised in 2012 and enacted to promote and maintain a stable agriculture, provide for the conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry.

The Water Act, 2016

Article 43 of the Constitution stipulates that every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation. In conformity to this constitutional requirement, the Water Act, 2016 was enacted.

It is "AN ACT of Parliament to provide for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes". The law provides for national public water works (Article **8**(2)) that include water storage, water works for bulk distribution and provision of water services, inter-basin water transfer facilities, and reservoirs for impounding surface run-off and for regulating stream flows to synchronize them with water demand patterns which are of strategic or national importance. It vests the administration of water resources to the National Government (Article **9**) and calls for public participation in the formulation of a National Water Resource

Strategy (Article **10** (1)) on five year cycles. The Strategy shall provide the Government's plans and programs for the protection, conservation, control and management of water resources (2).
Article **10**(3) gives the details of the contents of the National Water Resource Strategy, i.e.:

(a) existing water resources and their defined riparian areas;
(b) measures for the protection, conservation, control and management of water resources and approved land use for the riparian area;
(c) minimum water reserve levels at national and county levels;
(d) institutional capacity for water research and technological development;
(e) functional responsibility for national and county governments in relation to water resources management; and
(f) any other matters the Cabinet Secretary considers necessary.

For the regulation of management and use of water resources, the Act establishes the **Water Resources Authority** as a body corporate that will, among others, enforce the Regulations made under the Act (Article **12**). The Authority will be responsible for sustainable management of water resources including allocation plan within a basin. (28(3(c)(d))).
The Act also establishes a **National Water Harvesting and Storage Authority** that will, among other things, be responsible for water resources storage and flood control (**32**.(1)(a)). While the interests and rights of consumers in the provision of water will be vested in the **Water Services Regulatory Board** (Article **70**(1)).

Forest Conservation and Management Act, 2016

This is "AN ACT of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes".

The Act does not address alienation of public forests for infrastructure development. It, however, has a clause on boundary variation. Article **34** (1) allows for petition to the National Assembly or the Senate, for the variation of boundaries of a public forest or the revocation of the registration of a public forest or a portion of a public forest.
Article **34** (2) states *inter alia* "A petition under subsection (1) shall demonstrate that the variation of boundaries or revocation of the registration of a public forest or a portion of a public forest does not —
(a) Endanger any rare, threatened or endangered species; or
(b) Adversely affect its value as a water catchment area; and prejudice biodiversity conservation, cultural site protection of the forest or its use for educational, recreational, health or research purposes".

Tourism Act, 2011

In order to provide for the development, management, marketing and regulation of sustainable tourism and tourism-related activities and services, the government enacted the Tourism Act No 28 of 2011 that came into effect on 1st September 2012. The Act stipulates the development of a national tourism strategy

that prescribes the principles, objectives, standards, indicators, procedures and incentives for the development, management and marketing of sustainable tourism including inter alia:

(a) the packaging of niche tourism products and services;
(b) standards for tourism area development plans;
(c) measures to facilitate and enhance domestic and regional tourism taking cognizance of the county governments;
(d) priority areas for tourism development, capacity building and training;
(e) innovative schemes, incentives and ethics to be applied in the development and marketing of sustainable tourism, including public private partnerships;
(f) clear targets indicating projection in tourism growth over the next five years;
(g) national tourism research and monitoring priorities and information systems, including—
    a. collection and management of tourism data and information;
    b. intelligence gathering;
    c. procedures for gathering tourism data and the analysis and dissemination of tourism information; and
    d. tourism management information systems;
(h) measures necessary to ensure equitable sharing of benefits in the tourism sector;
(i) adaptation and mitigation measures to avert adverse impacts of climate change on tourism and tourism products and services; and
(j) reflect regional co-operation and common approaches in tourism development, marketing and regulation.

Public Health Act (Cap. 242)

This is an Act of Parliament that makes provision for securing and maintaining health. Part IX, contains provision regarding sanitation and housing. Section 115 of the Act states that no person shall cause nuisance or cause to exist on any land or premises any condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health.

Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

The Act also contains provisions on discharges of pollutants into water sources. On responsibility of the Local Authorities Part XI, section 129, of the Act states in part "It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes

Part XII, Section 136, states that all collections of water, sewage, rubbish, refuse and other fluids which permit or facilitate the breeding or multiplication of pests shall be deemed nuisances under this Act. This

part seeks to guard against the breeding of mosquito which is causes malaria. Malaria is one of the major causes of death in this country particularly for children less than five years.

3.3 Legal Framework for Environmental Management

The Environmental Management and Coordination Act of 1999 (EMCA) was enacted to provide an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. EMCA does not repeal the sectoral legislation but seeks to coordinate the activities of the various institutions tasked to regulate the various sectors. These institutions are referred to as Lead Agencies in EMCA. Lead Agencies are defined in Section 2 as any Government ministry, department, parastatal, and State Corporation or local authority in which any law vests functions of control or management of any element of the environment or natural resource.

EMCA addresses itself primarily to Environmental Impact Assessment (Section 58). The Environmental (Impact Assessment and Audit) Regulations of 2003, however, recognizes SEAs as a measure of environmental impact assessment at strategic level such as policy, plans and programmes.

The Regulations section 42 and 43 address Strategic Environment Assessments; section 42(1) requires Lead Agencies in consultation with NEMA to subject all policy, plans and programmes for implementation to a Strategic Environment Assessments. Regulation 42(3) commits the Government and all Lead Agencies to incorporate principles of SEA in the development of sector or national policy.

In EMCA (A), 2015, Strategic Environmental Assessment has been legislated (57(A.)(1). While the SEA Guidelines (NEMA, 2012) defines "Strategic Environment Assessment (SEA) as a tool/process for incorporating environment considerations into policies, programmes and plans".

3.4 The Institutional Framework

3.4.1 Institutional framework for the LCDA

The LAPSSET Corridor Development Authority (LCDA), is charged with the responsibility of steering the LAPSSET Corridor Project and is working with:- The National Treasury, Ministry of Energy and Petroleum, Ministry of Transport and Infrastructure, Ministry of Lands, Housing and Urban Development, Ministry of Water, Environment and Natural Resources, Ministry of Devolution and Planning, Ministry of Interior and Coordination of National Government, Ministry of East Africa, Trade and Tourism, Ministry of Industrialization and Enterprises Development, Ministry of Agriculture, Livestock and Fisheries, Ministry of Defense among other agencies in the implementation of LAPSSET Corridor Project.

A crucial counterpart in developing the LCIDP is County Governments who, in line with the Community Land Act of 2016 are the custoodians of all Community Land which thy hold in trust till registration under the rightful owners. As well, County Governments are mandated to undertakedevelopment of County Spatial plans which are relavant to achievement of LAPSSET goals of stimulating economic growth.

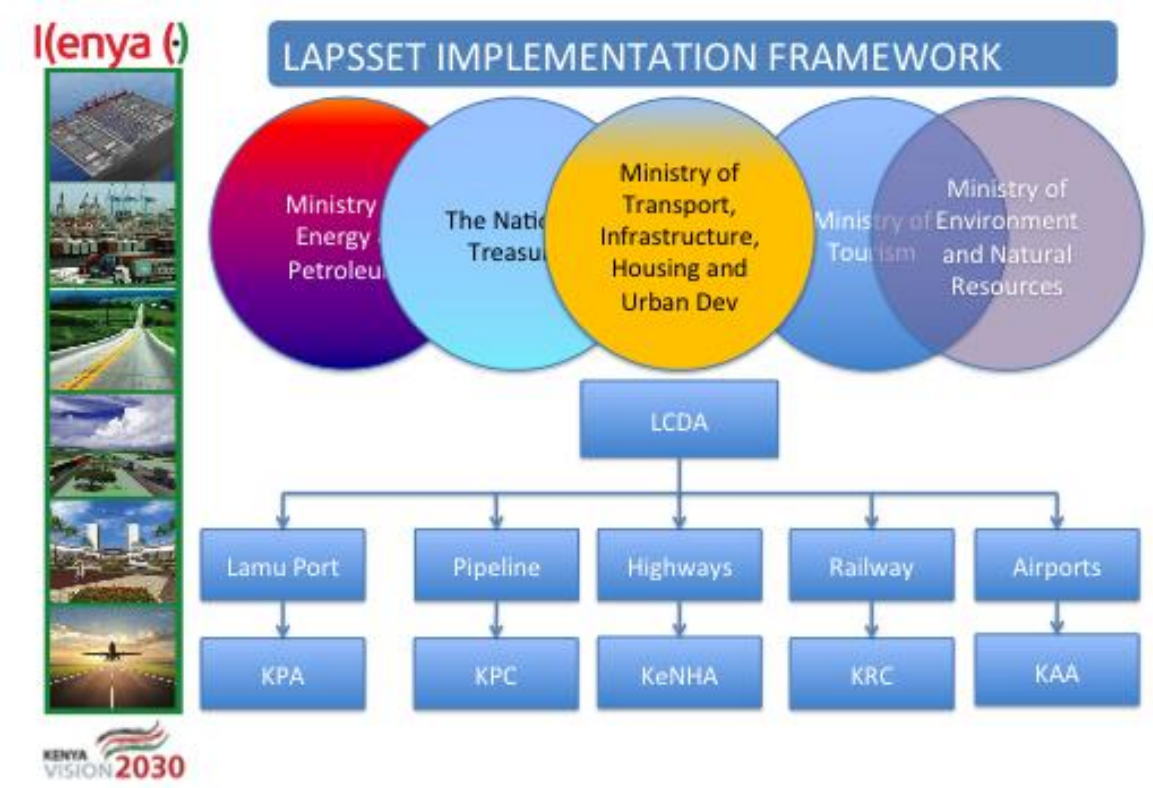


Figure 3.4.1 Institutional framework for the LCDA

3.4.3 Institutional framework for SEA Process

This Study recognizes 2 institutional set-ups that are critical to the successful execution of the EIA process as outlined below.

Institutional framework under EMCA 1999 and EMC (A) 2015

In 2001, the Government established the administrative structures to implement EMCA, 1999 as follows:-

The National Environment Council: The National Environment Council (the Council) is responsible for policy formulation and directions for the purposes of the EMCA Act. The Council also sets national goals and objectives, and determines policies and priorities for the protection of the environment.

The National Environmental Management Authority: EMCA 1999 allows for formation of the National Environmental Management Authority (NEMA) as the body charged with overall responsibility of exercising general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment. Under the Act, NEMA was established in 2001 when the first Director General was appointed by the President.

Activities of NEMA are rolled out through three core directorates in charge of Enforcement, Education and Policy. To facilitate coordination of environmental matters at District level as per requirements of EMCA 1999, NEMA has established County Environmental Committees (CEC) traditionally chaired by respective County Commissioners and bringing together representatives from all the ministries; representatives from local authorities within the province/district; two farmers / pastoral representatives; two representatives from NGOs involved in environmental management in the province/district; and a representative of each regional development authority in the province/district. To each CEC in the country is attached a County Environmental Coordinator who, as the NEMA Officer on the ground is charged with responsibility of overseeing environmental coordination among diverse sectors and while serving as secretary to the CEC.

Thus, this SEA Study recognizes NEMA as the environmental regulator in Kenya.

The LCDA

In the capacity of Employer, the LCDA has administrative jurisdiction over the SEA process and will also act custodian of the ESMP emanating from this study.

4.0 Baseline Characterization and Situation Analysis

4.1 Overview

Comprehensive documentation of a baseline profile for a 500m wide, 1800 kilometer long transport corridor originating from an ancient settlement on the Indian Ocean Coastline to terminate at two international border points and targeting to traverse and stimulate economic growth in diverse semi-arid, water scarce rangelands shared by wildlife and pastoral communities is a complex undertaking. Yet, documentation of the pre-investment baseline remains indispensable to both identification of impacts and formulation of mitigation and monitoring programmes. This Chapter unveils the biophysical and social baseline preceding the LCIDP and associated growth areas.

4.1.1 The distinctive baseline

Though the LCIDP is an infrastructure corridor targeted to provide a functional transport connection to the sea for land locked South Sudan and Ethiopia, it is primarily aimed at opening up Northern Kenya Counties to investment and economic transformation with a view to redressing the huge social and developmental disparities between the region and the rest of Kenya. Commonly called the 'ASALs', they make up 89% of the country, with the arid counties alone covering 70% - and are home to 36% of the population. ASALs principally standout in terms of under-development, exemplified by poor quality life, low dietary intakes, low access to social infrastructure, low health standards, etc. that define the prevailing high poverty levels brought about by increasing proneness to drought that routinely ravages and destroys the local pastoral economy in the process leaving the people destitute and dependent on the rest of the national economy. This is the disparity that LAPSSET is aimed at redressing.

Project LAPSSET is already under implementation with construction of three berths at Lamu Port already underway while the Isiolo-Marsabit-Moyale segment of the LAPSSET Highway is already completed. The analysis of pre-project baseline provided in sections below is aimed at unearthing and documenting the biophysical and social background against which LAPSSET has been conceived and developed. In the process, core issues that define entire Northern Counties and which have to be surmounted to secure successful and sustainable development of the Corridor Infrastructure have been identified.

For an economy that is largely anchored on agriculture, climate is the single most important determinant of livelihood viability and indeed the national economy in Kenya. Thus, for the LCIDP that traverses the Northern Arid belt of Kenya, aridity and associated proneness to droughts determines the nature of livelihoods and their sustainability. We proceed in sections below, to map out the intricate relationship between ecology and livelihoods in the LCIDP traverse. In mapping out the relationship, the study aims to bring out core features as follows;-

- The ASAL Ecology is diverse and complex;
- The ecology is stressed;
- It is a shared ecology; and
- It is a perilous ecology

4.2 The Biophysical baseline and resource base

4.2.1 Physiography of the traverse

The LCIDP traverses numerous landscapes characterized by diverse terrains, lithology, drainage and climate all of which explain the diversity of prevailing ecosystems and livelihood patterns with entirely different resilience patterns. As such, for purposes of this SEA Study, generalized categorization of the biophysical profile has been avoided in favour of a system whereby each unique landscape is identified and profiled separately to allow for capture of all details possible as a template for impact prediction. Profiling of respective landscapes has followed a layered approach in which the geology and resultant physiography and soils is overlain with climatic patters to explain resultant ecosystems as modified by the human factor. The result is a social economic profile anchored on the biophysical baseline but fine-tuned with an analysis of the environmental and social-economic sensitivities (emergent concerns).

Fig 4.1 below provides a Relief Profile for the entire traverse between Lamu and Nakadok and between Isiolo and Moyale. Broadly, the relief profile reveals three broad sectors namely:-

A lowlands sector: This sector marks the first 400Km of the Corridor stretching from Lamu mainland at Hindi to Kula Mawe in Isiolo. The sector is generally low lying with elevation rising gently from sea-level to a maximum of 500m above sea level (asl) and a corresponding slope of between 0 to 1.7%. Drainage density is very low, mainly dominated by the River Tana and dry ephemeral tributaries.

A highlands sector: This sector marks the 200Km stretch falling within the central part of Kenya generally marked by highlands. Elevation is generally above 1000m above sea level (asl) peaking to about 2000m asl at the eastern periphery of Laikipia. Terrain is quite rugged with slopes of up to 10%. This alternative runs from Isiolo in a north-westerly direction slightly above Ol Doinyo Degishu and the Ndare Forest/Mukogodo Forest to the south-west, and below the Buffalo Springs National Reserve/Samburu National Reserve to the north-east, through Kipsing Gap and onto Longopito towards Maralal on the C78 road from where it takes a westerly direction just before Kisima all the way to Nginyang. Drainage density is very high comprised of Ewaso Ng'iro and tributaries Kandogochi, Ol Keju Losera among others.

The Dissected Uplands Plateau: This is the dominant sector within the traverse, extending 500 kilometers from the Laikipia Escarpment in Churo to the Corridor Terminal at Nakadok within a general elevation of 700m asl. Terrain is smooth to fairly rugged with slopes of between 0-5 percent. The Isiolo – Moyale section constitutes an extensive plain lying between 500m and 900m above the sea level, sloping gently towards the north east and south east.

Fig 4.1: Landscapes along the LCIDP traverse

Table 4.1: Landscapes along the LCIDP traverse

Section	Open sea	Coastal Plain	Waso plateau	Central highlands	Rift Valley System and Suguta Valley	L. Turkana Basin	Lotipiki Basin
Elevation m asl	0	0-175	175-665	665-1883	1883-700	500-700	600-800
Geology & soils	Continental shelf	Quaternary sediments yielding loamy sands	Recent lava flows yielding clay loam to clay soils, stony to very stony (Kula Mawe area)	Erosional plains on Precambrian gneisses and plio-pleistocene basalt plateau			
Climate		Semiarid to semi humid	semiarid	semiarid	Semi-arid to arid	arid	Arid
Landscape		Coastal lowland Foothill	Erosion plateau	Foothills	Escarpment and minor Valley	Basin	Plains
Drainage	Sea water inundation	Tana River	Tana River	Ewaso Ng'iro	Lake Baringo and Saguta Valley to L. Logipi	L. Turkana	Tarach river into Loikipi basin
Ecosystems	Open water to intertidal mangroves	Coast forests to savannah woodlands	Savannah thickets to wooded grasslands	Wooded grasslands to moist dry forests, urbans cape	Open woodlands	Bushlands and scrublands	Bushlands to scrublands

Within the three physiographic units, eight broad landscapes are discernible namely:-

- The Lamu Archipelago;
- The Coastal lowland between Hindi and Garissa;
- Garissa to Benane;
- The Waso plateau (Benane-Isiolo);
- Highlands Section between Isiolo and Kisima (Mugie);
- The Rift Valley System (Kisima- Nginyang-Kapendo-Lokori;
- The Lake Turkana Basin (Lokichar-Lodwar to Nakadok); and
- Isiolo-Marsabit-Moyale

All 8 landscapes form the basis for detailed documentation of the baseline preceeding development of the LCIDP. For purposes of capturing the big picture, a description of the general biophysical trends is provided in sections below while detailed data for each landscape is provided in Appendix 4.1 to this report. Core defining features for each landscape are summarized in Fig 4.1 below.

4.2.2 The Lamu Achipelago

Lamu Achipelago is part of the East African Coatsline known for its reach diversity. Specifically, the coastal waters of East Africa sustain a great variety of ecologically important species, including 350 species of fish and 40 classes of corals, 5 species of sea turtles, and 35 species of marine mammals, including whales, dolphins, and the endangered dugong. According to WWF, the East African coastline (northern Kenya through Tanzania and Mozambique) harbors about 64.3 million acres of the coastal forests (including mangroves), slightly larger than the state of Oregon. In total, mangroves and other marine ecosystems constitute 192 million acres of coastal East Africa, almost twice the size of the state of California.

Fig 4.2 provides a map of the Indian Ocean Coastline at Lamu were an extensive stretch of the open water ecosystem is likely to be impacted by LAPSSET on account of navigation by ships calling in and out of the Lamu Port but for purposes of this SEA, analysis is confined to the Manda Bay alone. This landscape comprises of 2 major elements namely the open water (sea) ecosystem at Manda Bay and the Inter-tidal Ecosystem dominated by Magrove formations and mudflats.

(a) The open water ecosystem:

This comprises the openwater system in-between Lamu mainland, Manda Island, Pate and associated Islands which together with Lamu comprise the Lamu Achipelago. Depth of the water is varied from the rootinng zone of mangroves to about 7m below Chart Datum (CD). This is the deep area of the Ocean and has thick forests of sea grasses and associated vegetation. It is a wild zone of the ocean and man has little interaction with it save for deep-sea fishing. The Oceanic Ecosystems are broadly classified as nerretic and Open Ocean Ecosystems. Both are traversed by the Euphotic Zone, which is easily penetrated by sunlight. Below this zone and especially within the Open Ocean Ecosystem is to be found the Aphotic zone where little sunlight reaches the bottom of the sea.

Thus the area between the coral reef and the beaches is easily reached by sunlight. Geomorphologically this is the Continental Shelf Zone. Over the Coral reef is a continental slope, which, in the deeper sector of the Aphotic Zone constitute the Bathyal or the continental rise. Further deeper is the Abyssal Plain, which in Ungwana Bay coastline can lie below 200metres below the sea surface, especially so in the Shimoni area. With these classifications come a wide range of Ocean or Sea Ecosystems. According to the local community, the Ocean Ecosystems are rich in fish, and the common species (in Kiswahili) include: Taa, Puju, Chengo, Kinuka, Tafi, Mkongwe, Karazanga,

Tewa, Papa, Nguru, Simu simu, Mirage, Virongwe, Vidau, Chuchungi, Kungu, Ngisi (squid), Pweza (kamba nane), Pono, Dome (among the squid species), Kamba (Prawns), Kaa (Crabs), Tengesi, Nyamvi, Pungu, Kalau, Suli Suli, Para mamba, Tembo, Mingarengare, Araki, Karwe (Ikeka), Songoro, Pandu, Dizi, Kiboma, Koana, Fwada (a type of Shark), among others. The local fishermen operating in Vanga and Shimoni reported that they are over 150 species of fish, all of which they were confident that they are suitable for human consumption.

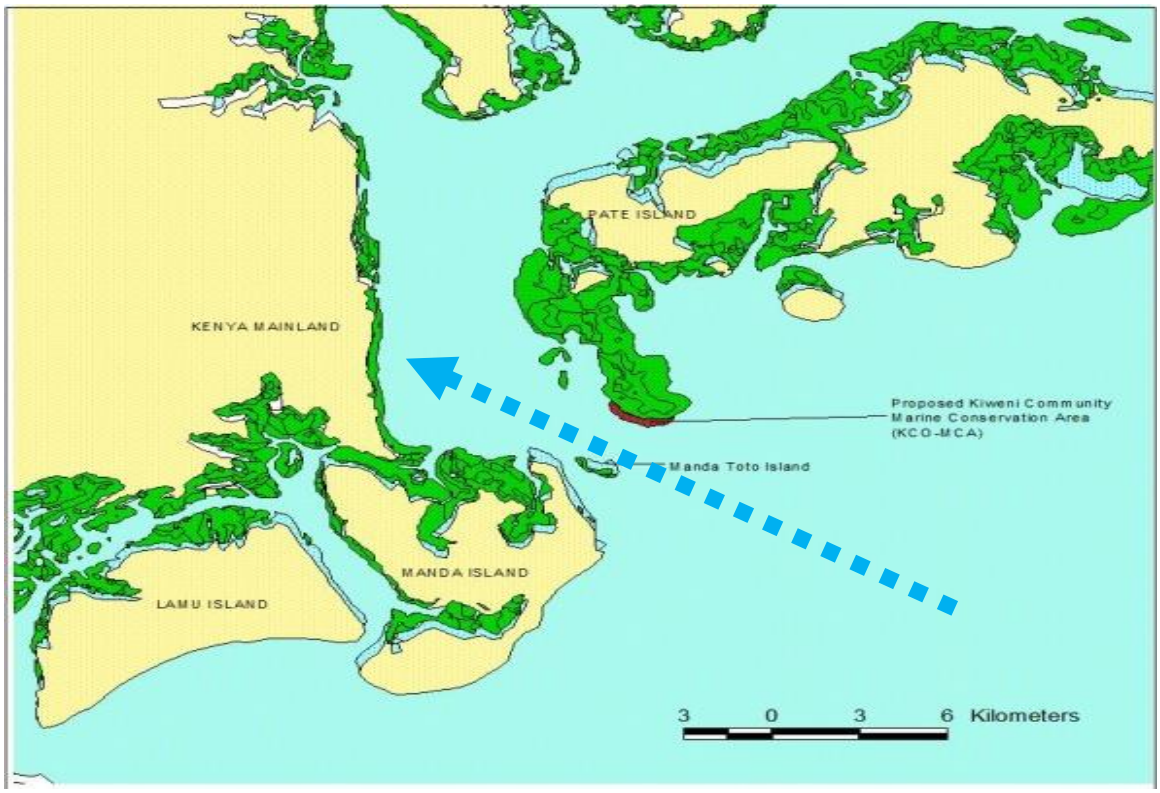


Fig 4.2: The Lamu Achipelago

The seagrass beds of the study area, like the case to other sites show evidence of a high nutrient demand as may be determined by their high annual productivity. They are generally covered by *Boobleopsis pusilla*. At the upper limit of the seagrass beds are to be found the association of *Halophine ovalis* and *Halodule wrightii*. The climax seagrass vegetation has for dominant species the following: *Thalassia hemprichii*, which also occur in association with *Cymodocea rotunda* and *C. serrulata*. It is noted that the deeper sections of the biotope support the following species: *Halimeda opuntia*, *Gracilaria salicornia*, and *G. corticata*. In deed there are more seagrass species in the area, which together with those listed are known to be very sensitive to slight changes in water quality and quantity. For instance, other species easily replaces the lagoon meadows species such as the *Thalassodendron ciliatum*, if the water conditions fall below its requirements.

(b) The Terrestrial Ecosystem:

Taking a profile from the sea, the characteristic terrestrial ecosystems are: the coral reef system; the Mangrove forests occurring in the inter-tidal waters marking the boundary between sea and the land surface; the coral rag ecosystem; the coastal forest ecosystems; the wooded grasslands ecosystems and the Scrub and shrub lands.

(c) The Coral Reef Ecosystems:-

The predominant type is the living coral biotope. Coral animals or tiny sea anemone-like animals called polyps, belonging to the *coelenterates* in a symbiotic association with a unicellular protozoon called zooxanthellae, build the biotope. The common coral genera in the study area include: the *Pavona*, *Seriatopora*, *Favia*, *Galaxea*, *Porites*, *Pocillopora*, and *Astreopora*. Nevertheless the diversity of genera in the area is rich as a reflection of the wide range of environmental conditions as determined by the nature of the specific fronting coastline e.g. a cliff, a beach, a cove or even the proximity of an estuarine.

The Lamu Archipelago has an extensive coral garden, part of which constitute the core of lagoonal fishery that provides income for 80% of Lamu populace. The latter has some of the most spectacular sites under any known coral beds along the Kenya coastline. A variety of corals are to be found in the study area, and these include: the stately branching staghorn corals (*Acropora* spp.), the delicate spiky-looking finger coral, rounded lumps of intricate brain coral (*Faviidae* spp.), the mauve or pink tipped corals (*Madrepore* spp.), the mushroom corals and several other types of strikingly beautiful coral formations. Within the coral gardens there are a variety of fish species, some with striking colours and features.

Within the coral reef environments there are a variety of aquatic plant species, which, in the case of Kwale are already threatened by human activities such as pollution from domestic and hotel industry, and destructive methods of fishing. Some of these plant species include Red Algae (*Rhodophyta* spp.), Blu-green Algea (*Cynophyta* spp.), Green Algae (*Chlorophyte* spp.), Brown Algae (*Phaeophyta* spp.), Red Algae (*Laurencia* spp.), *Holophila* spp., *Cymodocea* spp., among others. The introduction of any large-scale natural resource development, such as the ongoing dredging for port development is likely to escalate damage of these fragile ecosystems.

Notably, within the coral environment, a wide range of fish species is found. The study area has striking example of fisheries richness and abundance. Most of the species considered under the Oceanic Ecosystems can also be seen within the coral gardens or in their neighbourhoods.

(d) Mangrove Ecosystems:
Analysis of the mangrove formation in this section has drawn heavily on studies conducted by *Cordio (2015), Langa'at and Kairo (…)* among others. Mangrove swamps are unique ecosystems only to be found in the intertidal zone marking the boundary between open ocean ecosystems and terrestrial ecosystems which, in Kenya is estimated at between 52,980ha *(Doute, et al quoted in Kairo ……)* and 64,246ha (*KFS estimate quoted in Kairo….)* with the Lamu Archipelago accounting for 67% of the cover. According to *Langat and Kairo (,,)*, nine 9 mangrove species are found in Kenya in a tide-ordained formation where dominant species *Rhizophora mucronata* and *Ceriops tagal* comprise 70 % of a formation in which the seaward side is occupied by Sonneratia-Rhizophora-giant Avicennia community followed by Rhizophora-Bruguiera-Ceriops in the midzone and dwarf Avicennia-Lumnitzera-Xylocarpus complex on the landward side. Other plant species associated with mangroves include *Pemphis acidula* and *Barringtonia racemosa*, which have mistakenly been referred to mangroves in some countries in the region. In a recent survey of mangroves in Lamu (*CORDIO, 2015*), Five of the nine mangrove species found in Kenya were encountered namely;-*Avicennia marina, Bruguiera gymnorrhiza, Ceriops tagal, Rhizophora mucronata,* and *Sonneratia alba.* Other accounts however states that individual members of the rare *Heritiera littoralis* and *Xylocarpus granatum* are also encounted within the Achipelago (*Langat…).*

Mangroves provide goods and services that are of ecological, economic and environmental importance to the people. At the ecosystem level, mangroves are classified as the 3rd in productivity after tropical rain forests and coral reefs. Mangroves serve as important habitat and breeding grounds for fish and other fauna. This is in addition to the important role mangroves play in shoreline

protection, waste assimilation, and carbon sequestration. Mangrove forests have been found to have up to 700 t/ha of plant biomass; half of which is carbon. Reforested mangroves in Kenya have been estimated to have biomass of 131 t/ha, thus indicating more than 65 tonnes of carbon per hectare is stored up in these forests.

Mangroves forests in Kenya are gazzetted and protected under the Forest Conservation and Management Act (2016) but are vulnerable to many threats among them over-exploitation, deaths due to siltation, pollution among others. It is estimated that 10,300 ha of mangrove forest have been lost and more continue to be lost.

4.2.3 The Coastal Lowlands

This section extends from the coastline at Manda Bay through to Injara and Garissa within an elevation of 200m asl. The immediate hinterland of the coastline at Manda Bay is a monotonous, flat coastal plateau previously occupied by open grasslands but now under low density agro-pastoral settlements where free grazing of Zebu cattle supplemented by some cropping is the main livelihood system. The only interruption to this is the Hindi area where original secondary thicket has been replaced by agricultural holdings clustered around the administrative outpost at Hindi Center.

The Tana River Flood Plain Forest:
The dominant ecological feature in the Lamu-Garissa transect is the Tana River where fragments of tropical forest occur within a narrow corridor along the semi-arid lower floodplain fed by groundwater Part of the forest is occupied by the Tana River National Primate Reserve (TRNPR) created for conservation of the Tana River Crested Mangabey and Tana River Red Colobus, some of the world's most endangered primates, are found in some riverine forest fragments of the deltaic ecosystem. There are also large herds of buffalo, topi, zebra and other wildlife in the palm woodland on the edge of the Delta.

The Coastal Forest Belt:
The coastal forest formation is an indigenous open canopy Forest formerly part of the extensive Northern Zanzibar-Inhambane coastal forest mosaic (WDPA, 2012) which has overtime been lost to over-exploitation for building wood and forest fires and is currently represented by the fairly intact Boni Forest Reserve. The remnant vegetation is reportedly rich in species diversity (*Antipa, 2015*) with a total of 386 plant species recorded of which 130 were woody species dominated by *Croton pseudopulchellus*, *Dobera glabra, Newtonia hildebrandtii, Adansonia digitata, Diospros cornii* and *Lannea schweinfurthii dominated* (in terms of basal area coverage) while *Brachylaena huillensis, Manilkara sulcata,* Acacia nilotica, and Combretum constrictum dominate in terms of height and crown cover. Five (5) threatened plant species *(Dalbergia vacciniifolia, Canthium kilifiense Canthium pseudoverticillatum, Mkilua fragrans, Synsepalum subverticillatum)* are found in this belt (African Conservation Foundation, 2012). The coastal forest belt across the Lamu-Garissa border is a dispersal area for diverse wildlife species including Hippopotamus, Aardwolf, Buffalo, Bush pig, Bush buck, Caracal, Cheetah, Generuk, Grant's gazelle, Honey badger, Black-backed jackal, Kirk's dik dik, Leopard, Lesser kudu, Lion, Oribi, Porcupine, Red duiker, Spotted hyena, squirrels, Topi, Vervet monkeys, Yellow baboon, elephants, Warthog, Waterbuck, Wild dog and zebra and numerous species of reptiles. Both the Elephant and Wild Dog are endangered.

Among the core threats to this formation include clearing for settlement by the previously hunter gatherer Boni Community, exploitation of Mpepechu, Mbabakofi, Mwangati, Mvule for hardwood timber for furniture and building, exploitation of *Brachystagia huilliensis* (Muhugu), *Combretum schumanii* (Mkongolo) and *Dalbergia melanoxylon* (Mpingo) for the woodcarving industry which is a vital element of the coastal tourism sector, among others.

Another threat to this forest is bush fires started by honey gatherers and livestock owners for pests control and pasture improvement. Bush fires often spread across a large area indiscriminately burning forest biodiversity, thereby affecting the regeneration of some vegetation species. This often leads to degradation of the habitat and expansion of grassland at the expense of the woody plants.

Towards Garissa, vegetation is *Acacia-Commiphora* dominated woodland with scattered bushes / thickets. This area, though mainly occupied by nomadic Somali pastoralists is an important wildlife reservoir famous for numerous herds of the reticulated giraffe *(estimated at 400 individuals)*, Gerenuk, Lesser Kudu, Cheetah, Hippopotamus, Guinea fowls & other passerine species of birds, Common Zebra, Warthog, Ostriches (Somali race), Lion, among others. Two critically endangered species mainly Grevys Zebra and the African wild dog and the locally endangered Hirola occur here.
Wooded Grasslands Ecosystems:
The wooded grasslands ecosystem is characterized by exuberant stands of Mvamva (*Themeda triandra*) grass in association with ASAL growing trees, *Acacias*, *Combretum*, *Croton spp* among others.

4.2.4 Garbatula Plateau

This area extends from the watershed dividing the Tana and Ewas Ng'iro Basins near Balambala Center all the way to the Mt Kenya Footslopes past Kula Mawe at an altitude range of 175-500m asl. Basic physiography is flat to gently sloping plateau originating from Recent-Lava flows dissected by the drainage of the Bisanadi-Ura tributaries of the Tana River.

Vegetation is constrained by extensive surface stoniness and rock outcrops but varies from Acacia-Commiphora bushland, Combretum wooded grassland, and Acacia wooded grassland to swamps along the rivers. Combretum wooded grassland prevails the Northern part, Commiphora bushland in the southern region, Acacia /Terminalia wooded grassland runs along water courses and riverine swamps with sedge Cyprus spp and grasses Pennisetum mezianum and Echinochloa haplacelad. Riverine vegetation includes *Raphai fannifera, Phoenix reclinata, Doum palms Hyphaene spp* and Tana poplar which grows along river Tana. Other riverine tree includes *Ficus sycomorus, Newtonia hildebrandtii, Acacia spp* among others.

The dominant livelihood system in this belt also reffered to as the Northern Grazing Area is nomadic pastoralism by Borana tibesmen. However, on accounting of occuring in between game conservation areas namely;- the Meru Conservation Area- (comprised of Kora National Park, Kitui Nature Reserve, Meru National Park and Bisanadi Game Reserve) to the South and the Nyambeni Game Reserve and Shaba National Park to the north east, the Northern Grazing Area is important in game dispersal. In an aerial count of wildifie in the MCA in 2005, 27% of animals were counted outside protected areas in the wet season compared to an 18% equivalent in the dry season. Of the wet season count however (Table 4.2), many species of interest such as Elephant, Grevy Zebra, Oryx, Lesser Kudu, Gerenuk, Ostrich, Warthog and Gazelles were found to occur overwhelmingly outside the protected areas.

The NGA and indeed all protected areas within the NGA are perpetually under a severe banditry and poaching problem that significantly reduced the number of large mammals to the extent of regional extinction of certain species like the black rhino and calling for massive restocking programmes to the Meru National Park since 1999. Species such as elephants, reticulated giraffes, Burchells zebra, Grevys zebra, impalas, white and black rhinos, reedbuck and leopards have had to be restocked (KWS, 2007).

Table 4.2 Wildlife Counts in the Meru Conservation Area

Species	Count				
	Within PAs	*Outside PAs*	*Total*	*% within PAs*	*% outside PAs*
Elephant	356	391	747	48	52
Girraffe	784	33	817	96	4
Zebra	436	178	614	71	29
Grevvy's Zebra	2	12	14	14	86
Impala	196	4	200	98	2
Buffaloes	1609	223	1832	88	12
Elands	38	21	59	64	36
Oryx	15	33	48	31	69
Waterbuck	62	3	65	95	5
Lesser Kudu	37	56	93	40	60
Gerenuk	65	144	209	31	69
Ostrich	30	37	67	45	55
Warthog	63	78	141	45	55
Gazelles	123	244	367	34	66
Hippopotemus	54	0	54	100	0
Total	3870	1457	5327	73	27

Source: KWS, 2007

4.2.5 The Central Highlands

This area stretching from Isiolo through Laikipia highlands to the Rift Valley Escarpment at Churo comprises the Mt. Kenya Footslopes and is distinct for its steep rise in elevation and the rugged terrain nature compared to the rest of the Corridor traverse. Distinctively also, this area hosts Isolo Town, the designated cog of LAPSSET operations being the point where the Northern Corridor will branch from the Main Corridor in addition to hosting a Merchant Oil Reservoir, Dry Port, Railway Interchange and Station, International Airport and Resort City, all of which make the town a potential major growth area.

Ecology within the 55,000km^2 wide Laikipa-Samburu-Marsabit Ecosystem (LSME) is largely influenced by physiography whereby, on account of drastic change in slope and elevation, the area has a high diversity of habitats ranging from the lowland xeric scrub bush lands comprising Acacia and Commiphora species to the highland, mesic cedar and camphor forests (*Barkham and Rainy 1976*) under both pastoral land use and nature conservation.

A detailed anslysis of livelihoods and land use systems is provided elsewhere below. However, on account of aridity, pastoralism is the dominant livelihood system within the LSME. Major land use systems include community grazing and conservation areas, government-owned trust land, forest reserves, private ranches and sanctuaries and agricultural settlements (*Kahumbu et. al., 1999*). The Ewaso Ng'iro River and its tributaries is the main lifeline supporting both human and wildlife populations in the area.

Core issues in the LSME which are likley to inteface with the Corridor are identiifed as follows:-

Challenges posed to infastrcutural development: Development of Corrior infrastrcuture namely Highway, SGR Railway and Oil pipeline in the rugged and ecologically fragile Highlands Section is

likley to be the most challenging undertaking in LAPSSET. Questions of access and civil works within the difficult terrain, attendant ecological costs etc are likely to be critical in decision making.

Game Conservation and Wildlife Migratory Corridors: Laikipia County does not host a single gazetted protected area yet, it's a major wildlife conservation zone holding both migratory and resident herds of Kenya's more common wildlife including large elephant populations, lion, leopard and cheetah and numerous impala and gazelle. There is also a wealth of endangered species, including roughly half of Kenya's 600-black rhinos, Grevy's zebra, Jackson's hartebeest and wild dog. Many northern species including reticulated giraffe, Somali ostrich, Beisa, oryx and gerenuk are found. In recognition of this fact, may former ranches and Community Group Ranches have now adopted land management for environmental purposes and now host resident wildlife populations that either have been confined by fencing or are free ranging. Some of the wildlife especially Elephants migrate within the LSME especially in search for water which makes them to migrate northwards to the protected areas of Buffalo Springs National Park, Samburu Nature Reserve, Shaba and the Nyambeni National Reserves all situated along the Ewaso Ng'iro North River. Some travel as far north as Mathews Ranges in Samburu. This section has the highest density of north-south elephant migratory corridors all of which will be crossed by both the Corridor and associated infrastructure as currently aligned (Fig. 4.3).

Human- Wildlife Conflict: Extension of human settlements within the range of wildlife habitat is a major cause of human wildlife conflict mainly at the cost of wildlife populations. Normally communities who incur injury, loss of lives, crops, livestock etc. on account of wildlife react by killing the wildlife while others are motivated by financial gains especially where Elephants are involved. In a 2012 study on elephant occurrence within the LSME (*KWS, 2012*), a total of 162, 235 and 301 elephant carcasses were recorded for 2002, 2008 and 2012 with higher concentrations being noted to the immediate north of Kula Mawe-Isiolo-Kipsing-Oldonyiro and Isiolo-Ngaremara-Archers Post transects which incidentally, are the LAPSSET-designated routes. The possibility of this trend being aggravated by Corridor Development is quite real.

Water Scarcity: An analysis of the water resource base for the entire Corridor traverse is provided in 4.2.5 below. It emerges that, the Ewaso Ng'iro basin is critically water deficient which has implicarion for investments and growth anticpated in the Isiolo area under LAPSSET.

Resource use conflicts: The entire transect from Garbatula through Isiolo, Oldonyiro and Rumuruti is prone to resource-centered conflicts where communities mainly fight over access and control of pasture and water. A more detailed analysis of the scenario for the entire Corridor is provided in 4.6 below.

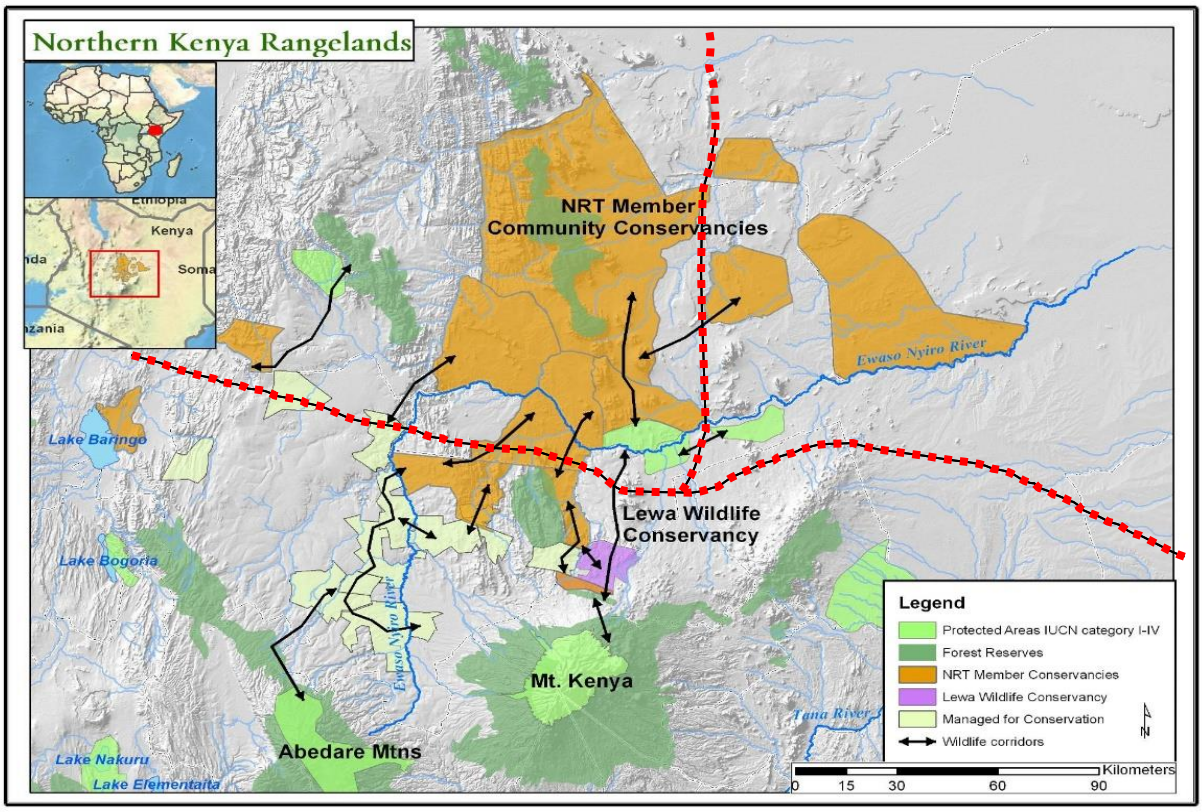


Fig 4.3 Wildlife Migratory Corridors within the Highlands Section

The question of land availability: In course of the SEA Study, questions have already arisen on the availability of land required for LAPSSET Infrastrcuture at Isiolo in way of the Dry Dock, Railway Station, Resort City, Oil Terminal etc. A detailed analysis is provided essewhere below.

Accerelated land degradation in Laikipia and Samburu plateaus: On account of a combination of both overstocking and climate change, ground cover vegetation in sections of the Laikipia and Samburu plateau is badly depleted and trampled leaving behind a landscape severely degraded by both sheet and gully erosion. Indeed, the pastoral economy targetted for anchorage by LAPSSET may no longer be viable as camels are slowly replacing cattle and shoats. Further impact on the shrubs will render camel rearing impossible and the system will hav collapsed irreversibly.

4.2.6 The Rift Valley Escarpment System

This section has four sub-units namely:

(i) Escarpment:
This section marks the 100Km stretch between Churo and Nginyang defined by the Laikipia and Rift System in the Tugen Plateau and which is part of the Lake Baringo catchment. The Section is marked by the steep Laikipia Escarpment connecting the Laikipia Plateau to the Tugen Plateau in an altitudinal drop of 1200m in 100m (relief ratio of 12:1). Concerns here include:-

Sediment load in Lake Baringo: L.ake Baringo is currently threatened by sediment inputs estimated at over 10 million metric tonnes annually (Odada, et al,). [5]

The prosopis menance on L. Baringo:

(ii) The Suguta Valley:
This landscape is a narrow elongated basin that is traversed from Nginyang to somewhere near Lokori. The basin ends in a small pristine, little understood saline lake Logipi. Given that the Corridor has an almost 100 Kilometers traverse through this valley which aloso has hot water gysyers, there is need to invoke the pre-cautionary principle upfront to ring the basin against siltaion and other anthropogenic threats. In regard to the Suguta Valley in Kenya, one issue stands out:-

Insecurity: The section Nginyang-Kapedo- Lokori is an insecurity hotbed often assocaited with the aggressive tendencies of local communities whose economy is built on raiding and counter raids for livelstock. The consflict has however aquired different dimesnions overtime to a fully blown out and sophisticated warfare relying on heavy arms that are often targetted at security forces[6]. There is concern that the same fate could be fall the Corridor investments which will traverse deserted areas between Chemulingot and Lokori where Kapendo is the only settlement in between.

(iii) The Turkana Basin
The Corridor enters the basin near Lokori in the drainage of Kerio River and proceeds to cross the Turkwell Rver at Lodwar Town then exiting towards Kakuma. Concerns within the basin have emerged thus:-

The Oil Production factor: An analysis of potential impact of oil discoverly and production and the Corridor is provided in section 5.3.6 below. The Lokichar Basin that hosts Block 10B currently being exploited for oil by Tullow is a very flagile ecology where vegetation and biomass prodcution is severely undermined by aridity and poor quality of local soils. Oil induced growth and attendant influx of people are likley to strain this ecology if exploited to supply biomass energy, building wood etc beyond the carrying capacity. On its part, over-exploitation of the range resource is likely to undermine the livelihoods of local pastoral households who have no capacity to join the emerging economic order thus rendering them destitute.

The Water Factor: Development of oil mining and loading facilities at Lokichar will require huge supply of water in both injection mining and attendant service industry in an ecology that is already water stressed. Options in meeting the water supply for Lokichar and indeed the entire corridor are explored in Section 4.4 below. It is howeverdoubtful that L. Turkana or the rivers draining there-in are options given that longterm stability of the lake is at stake following Ethiopia's decision to dam the Omo River which supplies 90% of the lakes inflow.

Archaeological heritage in the Turkana Basin: Among the Basin's critical fossiliferous sites are Lothagam, Allia Bay, and Koobi Fora. The Basin is a site of geological subsidence containing one of the most continuous and temporally well controlled fossil records of the Plio-pleistocene with some fossils as old as the Cretaceous. The oldest sedimentary records go back to the Cretaceous and are dominated by eastward flowing fluvial sequences draining into the Indian Ocean; later formations from the Oligocene and Miocene are characterised by similar fluvial regimes that are not however unified under a single geological group or system. Approximately 4.2 million years ago (Ma) the

[5] Odada et al: Lake Baringo-Experience and Lessons Learned Brief. www.worldlakes.org

[6] Two Police Stations were attached on the night of Christmas 2016 in Tiatty Constituency

region experienced widespread and significant volcanism, associated with the Gombe basalts in the Koobi Fora formation to the east and with the Lothagam basalts further south; this event created a lake in the center of the basin and apparently established the modern, continuous depositional system of the Turkana Basin.

(iv) The Tarach-Lotikipi sub basin:
This small basin lies to the extreme north-west of Kenya is important for several reasons:

- It drains the Kakuma Refugee camp complex;
- It drains into the Lotikipi wetlands which is an international waterway spreading across the border into South Sudan; and
- *It harbours the Lotikipi Basin Aquifer:* The latter aquifer discovered for the first time in 2015 with an estimated 200 billion cubic meters of fresh water that allegedly can run Kenya for over 70years is likley to be an economic game changer in the Turkuna region.

Details are analysed in section 2.6 below.

4.2.7 The Isiolo-Marsabit Moyale Sector

Several landscapes occur along this sector of which three are distinct namely;-The Ewaso Ng'iro Valley; The Waso Plateau; Mt Marsabit and Footridges; Quaternary Lava Plateau; and Turbi Plateau and Northern ranges.

4.3 Rainfall and agro-ecological potential

The key defining feature for ASALs is prevalence of grossly low rainfall catch which is erratic in both time and space and heavily dominated by evapotranspiration causing aridity and attendant moisture scarcity thus posing severe limitation to both ecological and economic productivity. Rain fed cropping cannot be supported by available rainfall leaving mobile livestock production as the only viable livelihood system. The little ecological productivity possible is undermined by droughts that frequently ravage the belt, leaving in their wake, trails of death, ruin and despair. The situation within the LAPSSET Corridor is mapped in sections below.

4.3.1 Climatic designation:

The climatic designation for the LAPSSET traverse in mapped out in Table 4.3 and Fig 4.3 based on published rainfall and evapotranspiration data for 15 reference meteorological stations. The climatic value of rainfall has been analyzed based on computation of the climatic index as determined by the ratio of long term mean annual rainfall (r) to corresponding potential evapotranspiration (Eo) based on the method of *Sombroek et. al, 1982* whereby, the ratio is applied to define climatic designations. [7] Essentially, climate within the traverse ranges from semi-arid to very arid with six of the stations having R/Eo ratios below 0.15 implying prevalence of a hyper arid climate with Lodwar being the most arid at 0.07. Rainfall in the entire traverse is heavily dominated by evapotranspiration (Fig 4.2) on which account, huge moisture deficits prevail throughout the year. An entire seasons rainfall is usually accounted for by a few storms which are immediately lost to evapotranspiration driven by

7

prevailing high temperatures leaving the earth scotched of moisture and severely limited in terms of ecological productivity and resultant carrying capacity. Additionally, on account of aridity, ASAL hydrology is characterized by moisture shortage which translates to poor recharge of surface and groundwater resources.

Table 4.3 Climatic data for the LAPSSET Traverse

Station	KMD Reference	Altitude	Rainfall	Evaporation	Evaporation	R/Eo ratio	Climatic designation
Mkowe	9240015	8	918	2044	1126	0.45	semiarid
GK Prison-Hindi	9240007	13	919	2044	1125	0.45	Semiarid
Hola			471	2366	1895	0.20	Arid
Garissa			352	2712	2360	0.13	Arid
Garbatula			364	3061	2697	0.12	Arid
Kinna			462	3061	2599	0.15	Arid
Isiolo			623	2709	2086	0.23	Semiarid
Ol Pejeta	8936065	1678	430	2709	2279	0.16	Arid
Colcheccio Ltd	8936060	1800	466	2709	2243	0.17	Arid
Kisima			602	2709	2107	0.22	Semiarid
Tangulbei	8936019	1379	715	2709	1994	0.26	semiard
Nginyang	8936020	984	598	2880	2282	0.21	Semiarid
Kapendo			500	2880	2380	0.17	Arid
Lokori			399	3488	3089	0.11	Arid
Lodwar			193	3488	3295	0.06	Arid
Lokichogio			310	3488	3178	0.09	Arid
Archers Post			412	3375	2963	0.12	Arid
Marsabit			693	2121	1428	0.33	Semiarid
Moyale			705	3199	2494	0.22	Arid

zone	r/Eo (%)	classification	r average annual rainfall (mm)	Eo average annual potential evaporation (mm)
			excluding areas above 10,000 ft altitude	
I	> 80	humid	1100 - 2700	1200 - 2000
II	65 - 80	sub-humid	1000 - 1600	1300 - 2100
III	50 - 65	semi-humid	800 - 1400	1450 - 2200
IV	40 - 50	semi-humid to semi-arid	600 - 1100	1550 - 2200
V	25 - 40	semi-arid	450 - 900	1650 - 2300
VI	15 - 25	arid	300 - 550	1900 - 2400
VII	< 15	very arid	150 - 350	2100 - 2500

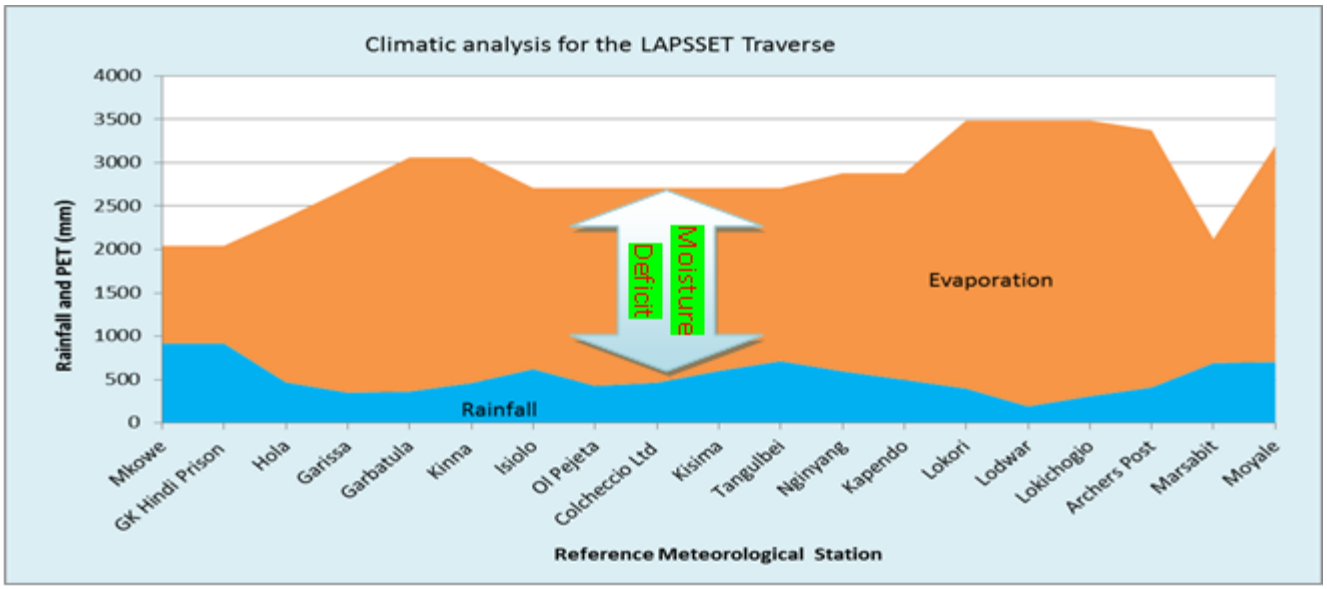


Fig 4.3 Climatic analysis for the LAPSSET Corridor

4.3.2 Occurrence of extreme climatic events

The climatic situation in ASALs is one of perpetual aridity occasionally punctuated by short wet seasons widely spaced in time and space. Occasionally, the periods in between rainy seasons prolonged beyond the norm ushering drought seasons during which, water, fodder and food are in short supply. Due to the vast areas prone to drought, Kenya's vulnerability to food insecurity is highest among the pastoralists and small-scale agriculturalists in the arid and semi-arid lands (ASALs) of the country (UNDP, 2005). In the last 100 years, Kenya has recorded 28 major droughts, three of them in the last decade. The severity and frequency of droughts seem to increase in the country over time (*Murungaru, 2003*). During the last half of the 21st Century, droughts in Kenya occurred in 1951, 1952-55, 1957-58, 1974-76, 1980-81, 1983-85, 1987, 1992-93, 1995-96, 1999-2000 and 2004-2006 (Downing et al, 1985; Ngaira, 2004). These droughts occur on a cyclic basis the exceptionally severe ones coming every ten years, for instance, the 2004 drought was a replica of the previous cycle of severe droughts that affect the country every decade as experienced in 1974, 1984 and 1994. Mild droughts occur almost every 3 to 4 years (UNDP, 2005). Between 1993 to date, Kenya has declared six national disasters in 1992/93, 1995/96, 1999/2001, 2004-2006 due to droughts and 1997/98 and 2003 due to floods related effects. In between these years, a series of severe weather related emergencies, not declared a national disaster, but fairly threatening were experienced.

4.3.3 Humid Islands in the desert:

Low rainfall catch as experienced in the ASAL is associated with lack of orographic barriers required to force lifting and cooling of moisture- laden air masses associated with the south-east monsoon winds. However, where hills occur in arid country, they are able to cause orographic lifting of air masses leading to localized increase in precipitation thus creating humid Islands in the midst of aridity as exemplified by Mt. Marsabit, Kulal, Nyiru and Dottos Ranges whose easterly exposed sides are covered by thick forests which are vital water catchments providing critical fallback for livelihoods and wildlife especially during drought seasons. Similar oasis effect obtains along riparian areas of river systems such as the Tana in Garissa County, Bisanadi and Ewaso Ng'iro in Isiolo County (see 4.4.2 below).

4.4 The Water Resource Base

4.4.1 The ASAL Hydrological Model

In the study of water in different states within a given system, Hydrology applies the Tool of Water Balance where by water input into the system is apportioned between evaporation, surface flow and change in storage (either surface reservoirs or groundwater recharge). Within the ASALs as traversed by the LCIDP, the sole water input is from rainfall which is scarce and unreliable creating a situation of systems that are essentially water starved, arid. A typical water balance in ASALs is expressed thus;-

Table 4.4.1 The ASAL hydrological model

Rainfall (R)	=	Evaporation demand (Eo)	+	Runoff (Q)	+	Change in Storage (ΔS)
Very limited		Quite huge		Modest		Deficit

Analysis of this model for ASALs reveals the following:-

- Typically, water input from rainfall is quite limited, implying that there is little water circulating in ASAL areas;
- Evaporative demand is quite high and cannot be met by water available from rainfall, leaving instead, a huge deficit. Any water stored or introduced into the system is primarily evaporated to meet this huge deficit. By extension, ASAL Rivers originate from more humid highlands upstream but loose most of their water to evaporation and seepage upon entering ASAL territory. This is the case with Ewaso Ng'iro, Milgis, Kerio and Turkwel rivers;
- On account of poor cover and soil condition, infiltration is very low and any torrential rainfall is lost as surface runoff thus creating rivers which only flow and flood in the dry season, and remain dry for the rest of year. These are the numerous laggas-sand rivers so common in ASALs. Some of the flood water is stored in the sandy bed of rivers and is often extracted by sand harvesting;
- On account of all rainfall being lost either as runoff or evaporation, there is no surplus water to be stored as either subsurface or groundwater which is later released as base flow to support dry season flow of rivers and springs. Thus many rivers such as Merile, Sereolipi, Milgis etc originating from the ASAL highland catchments are ephemeral, only flowing during the wet season and remaining dry for rest of the year; and
- The exceptions to this rule are incidences where groundwater recharged in the humid zone upstream is released downstream in form of wells or springs which are known to augment surface water supply as exemplified by the Buffalo Springs, Kora Wells, and Geothermal Springs at Kapendo etc.

4.4.2 Surface hydrology in the LCIDP Traverse

Between Lamu and Nakadok, the LCIDP traverses 3 (three) of Kenya's 5 (five) drainage basins namely:-

- The Tana River (between Lamu and Benane);
- The Ewaso Ng'iro North Drainage basin (between Garbatula and Kisima); and
- The Rift Valley drainage basin (from Churo through Lodwar to Nadakok.

The prevailing hydrology and water resource base in each basin is highlighted in sections below. Both the Ewaso Ng'iro North River and Ltikipi sub-systems of the Rift Valley are transboundary basins flowing into Somalia and South Sudan respectively.

4.4.3 The Tana River Catchment:

Within this catchment, the Corridor traverses two distinct systems:-

The Shoreline tributaries:
The immediate shoreline in the Lamu Port area has an obscure drainage system which links directly to the Indian Ocean mainly through estuaries and minor internal drainages. From the middle to the lower reaches of the Tana River, several tributaries such as Nihunguthu, Maua, Tiva, and Laga Bunda rivers join the Tana River mainstream, but they are seasonal rivers. In the eastern part of TCA, there are rivers flowing to Somalia (13,281 km^2) or into the Indian Ocean (17,253 km^2). The total drainage area of these rivers accounts for 24.2% of TCA. At the Lamu Port are, this is unit is drained by the Duldul, Aroseni, Koreni, Dondori, and Wange which are important water sources for local people and livestock and also discharge into estuarine areas thus providing the dilution effect needed to maintain estuarine ecological balance.

In Lamu, rainwater is the main source of fresh/soft water for the county residents. This is supplemented by surface water from dams, pans, jabiars, lakes, seasonal rivers and the Indian Ocean.

The Tana River System: The Tana River is the dominant hydrological system within the LCIDP where it drains well over 400Km (between Lamu and Garba Tula) equivalent to a third of the traverse and will be relied upon to support components such as the Lamu Port, Oil Refinery, Port related Industries, SEZ, Resort City, International Airport as well as growth areas in the Tana Delta, Garissa and Kitui.

The Tana is the dominant hydrological system in Kenya. It is the longest river in the County travelling 1000 Kilometers from its source in the Aberdare (4000 m) and Mt. Kenya (5199 m) highland masses to the Indian Ocean Delta at Lamu, a catchment area in excess of 100,000 km^2 equivalent to 18% of the national land area containing over 4 million people and drained by main tributaries;-Thika, Chania, Maragua, Mathioya, Gura and Chania II from the Aberdare side and Nairobi, Sagana, Nyamidi, Rupingazi, Thuci, Nithi, Mutonga, Kazita and Thanantu from the Mt Kenya area. Such waters sustain numerous livelihoods and ecosystems downstream including two (2) National Parks (Meru and Kora) and four (4) National Reserves namely;- Basanadi, Kora, Mwingi and Rahole all of which frank the river and its tributaries.

The Tana River is also harnessed heavily water supply and hydropower generation. To date, the river supplies 80% of water consumed in Nairobi through the Sasumua and Ndakai-ini reservoirs and supports commercial irrigation in the Tana Delta. Further, the river accounts for 70% of the national hydropower production (equivalent to 55% of the national power supply) generated through five major reservoirs namely Kindaruma (1968), Kamburu (1975), Gitaru (1978), Masinga (1981) and Kiambere (1988). Construction of the World Bank funded Northern Collector Tunnel targeting a daily supply of 140,000 m3 (1.6m3/s) so as to bridge Nairobi City's daily water deficit of 125,000m^3 (*Athi Waster Service Board,).* These schemes provide nearly three quarters of Kenya's electricity requirements.
The Tana River is the only permanent river in the extremely dry region traversed by the LCIDP draining the Counties and Lamu and entire Garissa County all the way to Kula Mawe where it receives seasonal flow from major Laggas in the Balambala area and some permanent flow from streams such as Murera, Bisanadi and Kinna originating from the Nyambeni Range and groundwater outflows from the Kora wells.

The Tana's annual flow of 5,000 million cubic meters (MCM) is targeted to anchor operations of the LAPSSET in Garissa, Wajir and Lamu Port Complex. Towards this, a 5000 MCM capacity

multipurpose Mutonga-Grand Falls dam, has recently been proposed for construction under Tana and Athi Rivers Development Authority-TARDA to serve four (4) objectives namely;-

- The production of hydroelectricity, with an installed capacity of 700 MW;
- Water supply to Garissa, Madogo, Hola and Lamu;
- Irrigation of 106, 000 hectares; and
- Maintaining the Tana's low-water levels, throughout the year, with the additional supply of large supplies of water in the case of prolonged dry spells, to assure the livelihoods of the delta populations.

The National water masterplan (2030) has also proposed development of a 537 MCM capacity Kora Dam (Tana 4GA) to support 25,000ha irrigation project between Tana River and Isiolo Counties. In Garissa where only one river flows, water is supplement by shallow wells and boreholes. Overall, water is scarce with acute water shortages experienced during the dry season.

4.4.4 The Ewaso Ng'iro North River Catchment (ENNRC)

The Ewaso Ng'iro North River system drains a catchment area of 210, 226 Km^2 equivalent to 36.5% of the national land area. According to the 2009 Census, population of ENNCA was 3.82 million, or 9.9% of the total population of Kenya. Population density is as low as 18/km2. Topography of ENNCA varies, from 5,199 at the highest peak of Mt. Kenya to 150 amsl at the Lorian swamp at 150 m amsl. Most of the area lies below 1,000 m amsl. Ewaso Ng'iro North River is the dominant single river system traversed by the Corridor- accounting for six (Garissa, Meru, Isiolo, Laikipia, Samburu and Marsabit) out of the (9) nine LAPSSET Counties. Two major sub-systems are relevant to the LCIDP:-

The Ewaso Ng'iro North River (ENNR): This river comprises of two tributaries, the Ewaso Ng'iro comprised of Burget, Noru Moro (Tigithi), Nanyuki, Ontulili, Sirimon, Timau) originating from the glaciers of Mt Kenya and the Ewaso Narok river originating from the northern slopes of Aberdares which join upstream of the Crocodile Jaws site to form the Ewaso Ng'iro North River. Within the middle catchment, the river receives waters from Nyambeni Hills streams Lathima, Murompa, Kalibuuri, Liliaba and Rikiundu streams and the Isiolo, Ngare Ndare and Kipsing and the Buffalo Springs (all from the Mt Kenya foothills) which join upstream of Archers Post to begin the journey to the Lorian Swamp downstream. The Ewaso Ng'iro becomes the ephemeral Lagh Dera between Merti and Habaswein. There is no clear cutoff, except that the transition from perennial to ephemeral is retreating westwards (the Lagh Dera is lengthening and the Ewaso Ng'iro shrinking). East of Habaswein it flows into the Lorian Swamp which has however, shrunk over historical time but the name has stuck for this area although currently no swampy vegetation exists to describe it.[8]
The Ewaso Ng'iro North River up to Archers Post is probably the best studied and documented river in Kenya; Largely through the Swiss funded Laikipia Research Project, the Natural Resources Monitoring, Modelling and Management Programme (NM^3) and the CETRAD. The three programs have accumulated data of the river overtime and maintains credible database of the river. Further, a comprehensive baseline mapping of the water resources of the ENNRC was also undertaken by Sir Alexander Gibb and Partners in 1948 under the auspices of Ministry of Works.[9] This complex database has been reviewed in investigating potential interfacing between LAPSSET and the ENNRC.

[8] Heath J., Saenz J. M., Mchele T., Vann D., Kamunge H., (2008), Hydrologic Investigation of the North Eastern Province of Kenya. Combined Joint Task Force-Horn of Africa.
[9] Ministry of Works (MoW). 1962. An Investigation into the Water Resources of Ewaso Ng'iro Basin, Kenya. Hydraulic Branch Report No. 5. Ministry of Works, Nairobi.

The Upper Ewaso Ng'iro Basin is a typical highland–lowland streamflow model where vertical climatic (balance between rainfall and evapotranspiration) gradient exerts a dominating influence on river flow and surface water availability. Through its influence on climate and soils, this altitude has a major influence on the agro-ecology of the Mt. Kenya sub-catchment, whereby rainfall decreases from 1,600 mm on the slopes of Mt. Kenya to an average of 700 mm in the savannah. The highest rainfall is recorded on the slopes of Mt. Kenya where prevailing low evaporation rates favour a positive moisture balance, which is harnessed into stream flow and groundwater recharge within the alpine moorland and forest zones. At the foot zone and further down into the savannah lowlands, rainfall decreases drastically almost in inverse proportion to evapotranspiration (Fig 4.3) thus expanding the moisture deficit band making.

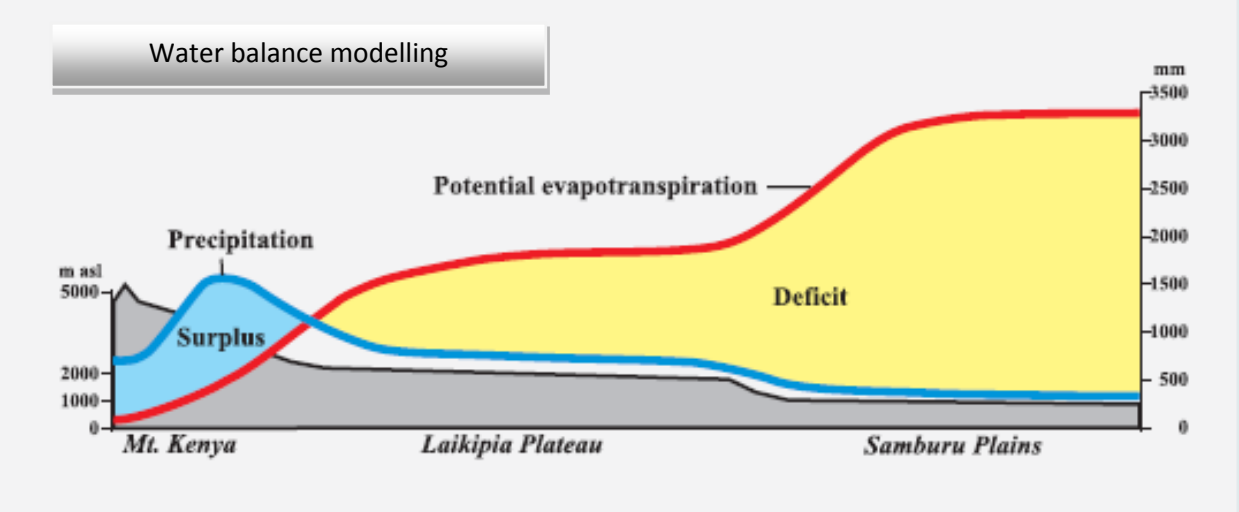


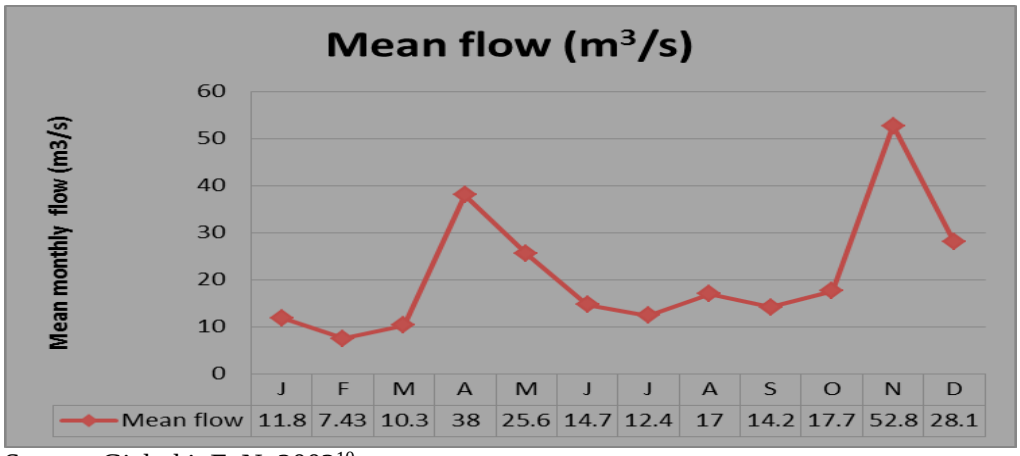
Fig 4.3: Typical water balance scenario for the ENNR

Prevalence of huge moisture scarcity in the middle and lower catchments of the Ewaso Ng'iro has huge implication for surface water availability. Rivers leaving the highland zone incur huge losses in flow principally from evaporation and seepage but also increasingly from abstraction. Thus, though the Ewaso Ng'iro River has a recorded flow of 500m^3/s at the junction of the Mt Kenya and Aberdare arms (Mt Kenya accounts for 80% of dry season flow), the same was observed to reduce to 100m^3/s at Archers Post. Yet, within the lower reaches, the river offers a critical lifeline for pastoral livelihoods whose livestock flocks to the river especially during prolonged drought and is the main water source for wildlife both within and outside the protected areas of Samburu, Buffalo Springs, Shaba and Nyambeni National Reserves. Indeed, the presence of the Ewaso Ng'iro River is partly responsible for the numerous wildlife migratory corridors within the Isiolo-Archer's Post-Kipsing triangle.

Flow of the Ewaso Ng'iro River at Archer's Post has another critical environmental function; it is partly the reason why the Lorrian swamp and Merti Aquifer exist. Since historical times, the Ewaso Ng'iro would routinely flow downstream of Archer's Post to disappear into the Lorrian swamp only during the wet years, flow would continue into Somalia as the Lak Dera. Input of flood waters from the Milgis and Ewaso Ng'iro and normal flow from the latter into the Lorrian swamp is believed to recharge the Merti aquifer which is an important source of water for many downstream communities including the 440,000 refugee population resident at Dadaab camp.

Long term mean monthly flow of the ENNR at Archer's Post is estimated at 20.8m^3/s (*Gichuki, ...)* with peaks in April and November following the double maxima rainfall pattern. The high variability in flow, a long term mean monthly low flow of 7.43m^3/s and corresponding high flow of 52.8m^3/s

(Fig 4.4) is indicative of poor catchment regulatory function on account of natural and anthropogenic factors. A mean monthly flow of 20.8m^3/s is equivalent to an annual flow of 54.7 MCM which is the water resource base delivered by the ENNR at Archer's Post annually. Beyond Archers Post, the river is ungauged and perennial up to Bulesa, from where it becomes ephemeral, with less and less water from tributaries. East of Malka Bulfayo, the river enters a wide flood plain where it loses most of its flow, and evaporation is high. The losses in this region have been estimated to be 1,000 m^{3}day/ km^2 (*Lester 1985*). After Malka Bulfayo, the river often changes course and meanders into ox-bow lakes. East of Merti, the river follows a more northward course, but during the dry season, as a result of high evaporation losses, the water only reaches the Lorain Swamp at Habaswein (*Bake 1993*).



Source: Gichuki, F. N. 2002[10]
Fig. 4.4 Mean monthly flow of the ENNR at Archer's post

Seiya - Barsaloi – Milgis System:
In the Archer's Post –Moyale section, there are no permanent rivers, but four drainage systems exist, covering an area of 948 Km^2. Chalbi Desert is the largest of these drainage systems. The depression receives run-off from the surrounding lava and basement surfaces of Mt. Marsabit, Hurri Hills, Mt. Kulal and the Ethiopian plateau. The seasonal rivers of Milgis and Merille to the extreme south flow eastward and drain into the Sori Adio Swamp. Other drainage systems include the Dida Galgallu plains which receive run-off from the eastern slopes of Hurri hills, and Lake Turkana into which drain seasonal rivers from Kulal and Nyiru Mountains.

The Seiya -Milgis - Barsaloi system drains the Leroghi plateau and the central basin. It is fed by many ephemeral streams from Karisia hills, the Mathews range and the Ndoto Mountains. The catchment covers about 30% of the whole Samburu district and continues into Isiolo and is the second river emptying into the Lorrian Swamp.

Suiyan and Seya luggas

The Kirisia Forest source of the Milgis system is situated within the Leroghi plateau and lies on the northern end of the Laikipia plateau in Northern Kenya. It is one of the oldest state forest reserves in Kenya having been gazzetted in 1933. The forest, which is located at an altitude of 2000 - 2200 m, was initially covering approximately 920 km2 but has now reduced to less than 780 km$^{2.}$ The Leroghi region within which Kirisia forest is situated is largely semi-arid and dominated by ecological zones IV-VI with a mean annual rainfall of around 551 mm. Due to its higher elevation and rainfall, the forest serves as an important water catchment area, with surface water from the forest emerging

[10] Gichuki FN (2002): Water scarcity and conflicts: a case study of the Upper Ewaso Ng'iro North Basin. In: Blank HG, Mutero CM, Murray-Rust H (eds) The changing face of irrigation in Kenya: Opportunities for anticipating change in Eastern and Southern Africa. IWMI, Colombo, Sri Lanka, pp 113–134

downstream in the form of springs and ephemeral streams and laggas. The northern sections of the forest in areas such as Porror usually receive more rainfall at 575 mm compared to the central and southern regions around Mararal town and Baawa area which receive an average of 563 and 552 mm, respectively. The north eastern section of the forest can therefore be considered as the hydrological powerhouse for the forest ecosystem. The northern part of Marsabit County is mainly dominated by the Chalbi Desert. There are no perennial rivers in the county, except seasonal rivers which are water-bearing when rare and usually torrential rain falls in the desert. Marsabit County has also no permanent rivers although mountain run-offs provide temporary surface water in the lowlands mainly through Milgis and Merille Rivers. The highlands are interspersed with several permanent lakes, including Lake Paradise and several water-filled craters on Mount Marsabit.

Samburu and Baringo are all water deficit counties with water shortages in East Pokot Sub-county (Kollowa to Tangulbei) of Baringo County where the corridor traverses. Insufficient water supply is further compounded by recurrent drought whose effects have been devastating to both livestock and human. In Turkana, the distance to and from the nearest water points are varied depending on the areas but on average is between 5-10 kilometers. Water supplies have recently been discovered at Lotikipi Basin Aquifer containing 200 billion cubic meters of fresh water that allegedly can run Kenya for over 70years.The portability of the water is however in question.

Marsabit County is also water scarce with no surface water. Sourcing of water in the few areas it is available also results in catchment degradation. Marsabit forest is the most affected despite it being the source of water for Marsabit town. Other degraded areas include Hurri Hills and the areas around Mt. Kulal.

4.4.5 The Rift Valley Catchment

The Rift Valley is the most expansive of Kenya's Drainage basins spanning from Kenya's northern border with South Sudan to the southern boder with Tanzania. The basin comprises of several internal draining sub-basins of which 4 (three);- Lake Baringo, Suguta Valley (Lake Longipi), Lake Turkana and lake Longipi are traversed by the Corridor.

Lake Baringo sub-basin
Lake Baringo is part of the East African Rift system falling in a depression boundered by the Tugen Hills to the west and the Laikipia Escarpment to the east. Recharge to the lake is mainly from distant catchments to the south that feed the Endao, Perkerra, Chemeron and Molo rivers, and the Tangulbei and its Makutan tributary both of which originate from the Laikipia Escarpment and are therefore traversed by the Corridor. The lake is a critical habitat and refuge for more than 500 species of birds and fauna, some of them migratory water bird species, and also provides an invaluable habitat for seven fresh water fish species of which *Oreochromis niloticus baringoensis* (a Nile tilapia sub-species), is endemic to the lake. Additionally, the area is a habitat for many species of animals including the hippopotamus (*Hippopotamus amphibius*), Nile crocodile (*Crocodylus niloticus*) and many other mammals, amphibians, reptiles and the invertebrate communities.

Such critical function is currently threatened by siltation inflow estimated at over 10 million metric tonnes annually, resulting in reduced lake depth with attendant loss in volume.

The Suguta Valley
This is an extensive 12,915 $Km^{2,}$ 200km long basin that is drained by the Nginyang-Suguta River (2D). The latter starts as many tributaries in the Elegeyo Marakwet Escarpment, crosses the B4 (Nakuru-Sigor Rd) as the Nginyang, the flows northwards along the C113 road (along which the

Corridor is aligned) to the Kapendo Bridge where it receives hot water springs and continues flow as the Suguta to ultimately enter Lake Longipi near the southern tip of Lake Turkana. The river is largely saline with high TDS values influenced by geothermal and coupled with high evaporative loss in the Suguta Valley.

Lake Logipi is a small saline lake at the lowest end of the Suguta Valley separated by a physical barrier from Lake Turkana in the North.

Plate 4.1: The saline Lake Logipi in the Suguta Valley

Lake Turkana Basin

Geographic extent and cover: Turkana basin covers an estimated 135,353 square kilometers of land striding across the Kenya-Ethiopia border almost in equal proportions. Locally, the Turkana basin is famous for hosting Lake Turkana, the largest desert lake in the world, Africa's 4th largest lake and also Kenya largest lake. The basin spans in a N-S projection from the source of the Kerio River near the equator in the Mau Escarpment of Kenya (Fig 4.5 below) to the headwaters of the Omo river near Bako in Ethiopian Shewan Higlands (latitude 9 ° 30`N) - a distance of well over 1100 kilometres. Over half of the Turkana basin is accounted for by the Omo-Gibe in Ethiopia (Table 4.3) while the Turkwel, Kerio, Suguta, Lomunyekupurat and immediate shoreline tributaries share the remaining area. A minute area of the basin comprising the upper catchment of the Suam tributary of the Turkwel falls within Uganda.

Table 4.4.5 Surface cover of the Turkana catchment

Basin name	Country	Code	Area(km2)	Length (km)
Eastern shore	Kenya	2AA	11,965	
Western shore (84 laggas including (Kalokol, Katoboi).	Kenya	2AB	8,131	
Eliye Springs	Kenya	__	-	<1 km
Turkwel	Kenya	2BD	20,283	390
Lomunyenkupurat	Kenya	2CA	3,602	110
Kerio	Kenya	2CB	14,172	403
Omo-Ghibe	Ethiopia		77,200	993
Total area			135,353	

Source: JICA, 1994; UNEP, 2004 Yuretich, R.F., 1986)

Relief and geology: The Turkana basin is narrow and long- possibly no more than 200km at the widest point. Basin boundaries are defined by diverse landforms ranging from piedmont plateaus, to lower level uplands (Republic of Kenya, 1994). The lower sections of the Turkana basin fall within the Gregorian Rift Valley whose escarpment thus defines the western boundary. Altitude of the basin ranges from a low of 370m at the shores of L. Turkana to over 4000m at the Mt Elgon source of the Suam tributary of the Turkwel. Elevation of the Shewan Highland headwaters of the Omo river averages 2200m asl.

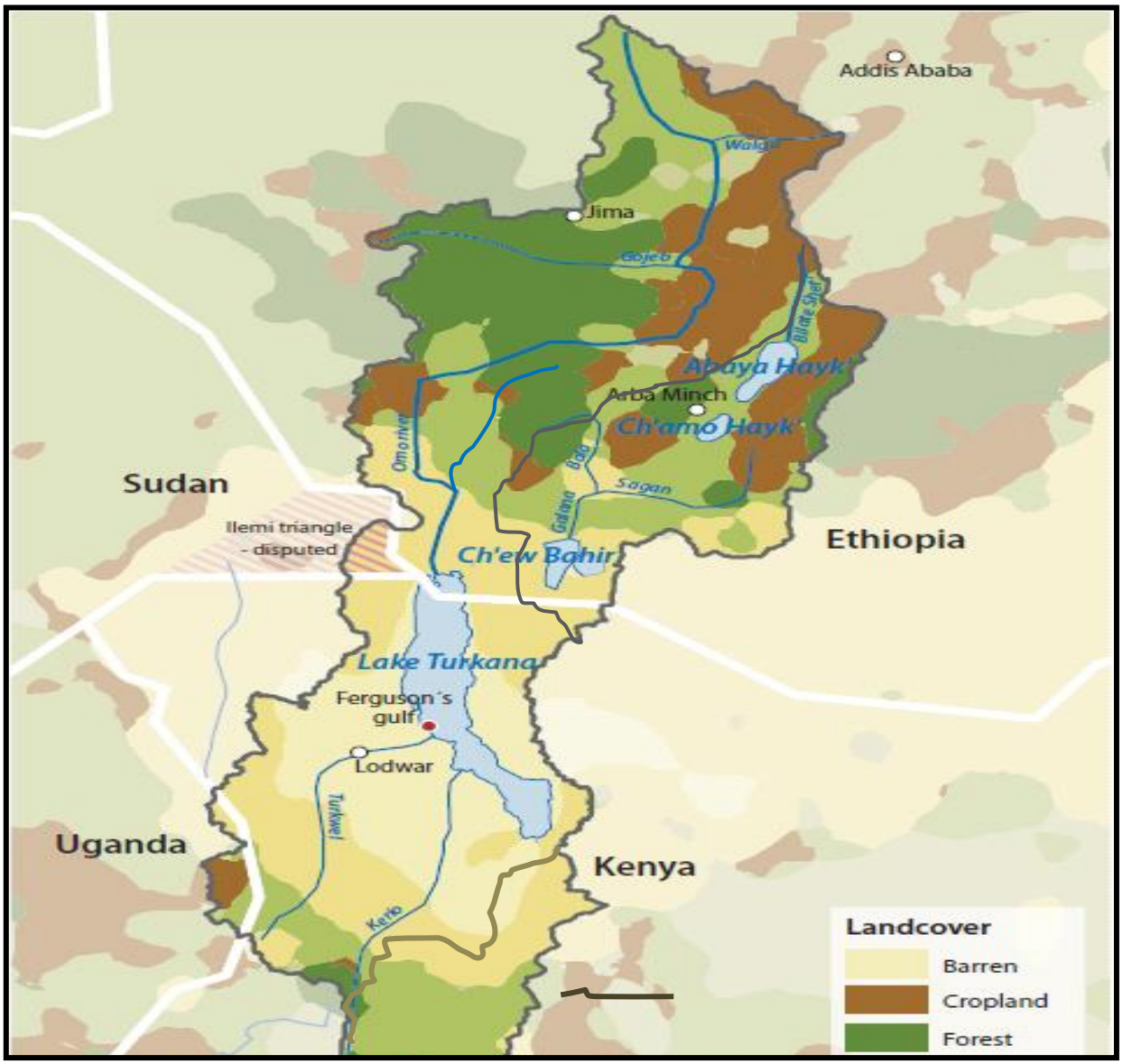


Figure 4.5 Map of the Turkana basin showing main rivers (Adapted from Giwa, 2004)

Drainage and water flow into the L. Turkana: The main surface drainage into L. Turkana is proved in Table 4.4 below. The Omo, Turkwel and Kerio are the dominant rivers. As well, there is a host of other surface drainage (over 80 laggas) that seasonally provide water input into the lake. Their contribution however remains unknown. With a mean flow of 438m3s-1, the Omo River remains the most important supplier of water inflow into L. Turkana, account for over 80% of all inflow. Both Kerio and Turkwell contribute slightly less than 10% inflow but cover 30% of the lake catchment.

Table 4.4.5 Dominant sources of surface water into Lake Turkana

Basin name	Mean discharge (m3s-1)
Eastern shore	Unknown
Western shore (84 laggas including (Kalokol, Katoboi, etc).	Unknown
Eliye Springs	Unknown
Turkwel	17.8 (seasonal behaviour)
Lomunyenkupurat	seasonal
Kerio	6.9 (seasonal behaviour)
Suguta	Seasonal
Omo-Ghibe	438 (permanent flow)

Source: JICA, 1994; UNEP, 2004 Yuretich, R.F., 1986)

Water balance over L. Turkana: Water balance computation for the Lake Turkana was attempted based on river discharge and direct rainfall over the lake as main inputs with evaporation comprising the main output from the lake. Data on river discharge and other parameters are provided in Table 4.6 below. Total annual inflow into the lake amounts to 16.8 billion cubic meters while loss through evaporation amounts to 16.9 billion cubic metres and the lake therefore incurs a deficit of 93.44 million cubic metres of water annually. At current climatic patterns, the lake must continue receding in response to this negative balance.

The implication here is that, Lake Turkana has a very delicate water balance where 82% of annual water inflow is provided entirely by the River Omo. Any non-regulated interference with the inflow of the Omo waters into the lake is likely to impair this balance with disastrous effects. The damming stage of the proposed Gibe dama has to be planned and monitored very carefully. Indeed, any filling programme that withholds water in excess of 3 billion CM from the lake will occasion a 4 billion deficit in the balance and it's not clear that the lake can afford this.

Table 4.4.6 Water balance computation for L. Turkana

Drainage	Area (km2)	Precipitation (mm)	Runoff coefficient	Mean discharge (CMS)	Total water input $MCMyr^{-1}$	Evaporation loss MCM yr^{-1}	Balance MCM yr^{-1}
Eastern shoreline	11965	250	0.01		299.13		
Western shoreline	8131	250	0.01		203.23		
Turkwel River	20283			17.8	561.34		
Kerio River	14172			6.9	217.60		
Omo river	148268			438	13,812.8 (82%)		
Direct precipitation over the lake	6750	250			1,687.50		
Sub-surface drainage	Unknown but probably quite small						
Balances					16,782 (100%)	16,875 (99.4%)	(93.44) (0.6%)

Chemical quality of the lake: Chemical quality of L. Turkana has been the subject of diverse studies which have been the subject of previous reviews (see Avery, 2010).[11] The conclusion is that the lake

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water is slightly saline with high electrical conductivity, but the levels of salinity are very much lower than they might be, reflecting salinity levels equivalent to a lake only 600 years old (*Hopson al, 1972 quoted in Avery, 2010*). The mean conductivity of the lake during 1972-75 (at 25ºC) was about 3,500 µS/cm, ranging from 200 µS/cm near the Omo Delta during the flood season, to over 4,700 µS/cm in Ferguson's Gulf. In other words, salinity increases southwards from the Omo delta. Diversions of Omo waters for irrigation have potential increase the salinity with consequences on the fauna and flora of the lake.

L. Turkana fisheries: Turkana has a fishing industry for both commercial and subsistence ends whose sustainable production is estimated at 15,000 to 30,000 tonnes/year (Avery, 2010) citing other authors). The fisheries are however masked by uncertainty and lack of updated information on the trends. Greater uncertainty is however associated with possible removal of inflow of nutrients and water into the lake once Ethiopian projects are implemented upstream.

Concerns on lake level and health: Of great concern to the future of L. Turkana is the possible impact from the 243 metre high Gibe III hydropower dam being constructed by Ethiopia on the Omo River, 600 kilometers upstream of the lake. It is feared that the lake will be denied inflow from Omo River during the 3 years the dam will be filling up. More disastrous impacts are anticipated from ongoing plans by Ethiopia to develop 445,000 ha of irrigation for sugarcane production. Strangely also, Kenya plans to divert and import some of the Omo river waters to develop the Todonyang Irrigation Project.[12]

Tarach – Lotikipi drainage basin
Nothing much was known about this transboundary basin until discovery of the Lotikipi Aquifer. The Tarach River however crosses the Corridor at Kakuma and flows through the Lotikipi drainage and crosses the border into Sudan. Lotikipi Swamp, also known as Lotagipi Swamp, is located within the vast Lotikipi (Lotagipi) plain, around 90 km to the west of Lake Turkana. This plain is a flat endorheic basin composed of young soils which have been developed on alluvium of recent origin. A large permanent swamp zone resides where the Tarach and Narengor Rivers run along the lowest part of the plain. It is situated in a semi-arid zone, with direct annual precipitation close to 250-500 mm. Lotikipi is a grassy floodplain with reeds and papyrus in the wettest sites, and scattered Acacia and Balanites trees. Since time immemorial, the wetland resources within this plain have been shared by the communities in Kenya (Turkana), Uganda, South Sudan (Didinga, Topasa, and Nyangatom), and Ethiopia (Nyangatom, Dassanetch). Although to visitors it is a vast wasteland, to these communities, Lotikipi Swamp's dry season pastureland is a cherished resource, and indeed there have been numerous conflicts over its control.

4.4.6 Groundwater hydrology and occurrence in the LCIDP

Groundwater resources within the LCIDP traverse are varied on account of underlying geology which determines aquifer dimensions and, climate and geomorphology through their influence on recharge. In Kenya, the most common ground water occurrence is the regional contact aquifer occurring where volcanic lithology sits on the basement complex rocks and the same has been exploited extensively through drilling of boreholes up to 150m depth. Three unique aquifers are worth of mention:-

The Shela Aquifer:
Lamu's Shela Aquifer is the main source of water supply to the Island population of 22,336 people based on the 2009 Census (KNBS, 2009). This aquifer is not located in the mainland Lamu area

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targeted for Lamu Port and other LAPPSET investments but given that most population attracted by LAPPSET will initially seek accommodation in Lamu town, pressure on this resource is likely to be high. Indeed, such eventuality has already been captured and investigated (Okello et al, 2015). Shela aquifer sits underneath a series of sand dunes covering 19Km^2 of Lamu Island's total land surface 50 Km^2. The double row of longitudinal 20-60m high sand dunes located along the entire length of the southern coastline, almost entirely covered with fine–medium-grained Pleistocene carbonate sands, as well as loamy sands and pink coral limestone sediments form part catchment for the 124 Mn m^3 Shella Aquifer[13] -the primary source of water for the entire island.

Plate 4.2: The Shela aquifer

The dunes are underlain by a diversity of materials are the most important recharge areas and are able to store freshwater, which is harvested to supply the 0.489 MCM annual demand by the Lamu population estimated at 22,336 in 2009 (KNBS, 2009). With the Lamu population expected to peak at 1.25million in 2050 on account of LAPSSET, demand on the aquifer will scale up to 0.13 MCM daily translating to 47.45 MCM annually equivalent to 38.3% of the aquifer volume. Such a demand cannot be sustained by this small aquifer.

The Merti Aquifer:

The Merti Aquifer is a fresh water aquifer in an arid area in the North Eastern part of the country straddling between Garissa and Wajir districts. It sits along the Ewaso Ng'iro River drainage way, on the ephemeral section generally known as the Lagh Dera with water flows encountered only during excessive floods such as the El Nino of 1998. The aquifer is transboundary- starting off at Habaswein in the west and extending into Somalia past Liboi in the east.

Generally, groundwater in the aquifer is confined and found at depths between 110 and 180m below ground level (mbgl). Successful wells tap the more permeable zone of the Merti Formation commonly between 105 and 150m bgl (GIBB Africa Ltd., 2004).[14] Several attempts have been made to define the extent of the aquifer (Swarzenski and Mundorff, 1977;[15] GIBB Africa Ltd., 2004). In these studies, the

[13] Okello et al, 2015: Fresh water resource characterization and vulnerability to climate change of the Shela aquifer in Lamu, Kenya. Environ Earth Sci (2015) 73:3801–3817
[14] GIBB Africa Ltd., 2004. UNICEF Kenya Country Office - Study of the Merti Aquifer - Technical Report Issue 2.0.
[15] Swarzenski, W.V. and Mundorff, M.J., 1977. Geohydrology of North eastern province, Kenya, USGS Water Supply Paper 1757-N, 1977, 68 Pp

aquifer is believed to be limited by the presence of adjacent saline water bodies. Most studies agree that the main freshwater aquifer extends from Habaswein into Somalia at Liboi and beyond. The Aquifer has had an estimated recharge of 3.3 MCM per year received mainly from the Lorian Swamp though stable isotope analysis dated the age of the water at 30,000 years, thus classifying it as a fossil aquifer.[16] *Mumma et al. (2011)* [17] report that groundwater abstraction comes from fossil water, with limited annual recharge (~3.3 million m^3 yr^{-1})and major recharge events (~30 million m^3)occurring at intervals of thousands to tens of thousands of years. GIBB Africa Ltd. (2004) however, suggests the possibility of a much higher recharge rate of 33 million m^3 yr^{-1}. Mumma et al. (2011) consider that most of the aquifer is currently under insignificant depletion stress; although very little data is available. The main groundwater abstractions take place in Habaswein and in the refugee camps of the Dadaab area. Influx of refugees into the Dadaab refugee camps has led to a sharp increase of groundwater abstraction from~1 million m^3 in 2002 to~3million m^3 in 2011 (Mumma et al., 2011).

In consequence, water quality in the Dadaab refugee camps has deteriorated overtime, mainly due to increasing salinity, and also in Habaswein evidence exists of some salinization as a result of long term abstraction (Mumma et al., 2011). These observations strengthen the plausibility that a saline groundwater body underlies the freshwater aquifer.

The Lokipi Basin Aquifer:

The Lotikipi Basin Aquifer is a large aquifer in the northwest region of Kenya estimated to contain 200 billion cubic meters of fresh water and covering an area of 4,164 km^2. The aquifer, discovered in September 2013, is nine times the size of any other aquifer in Kenya and has the potential to supply the population with enough fresh water to last 70 years or indefinitely if properly managed.

4.4.7 Water demand-supply scenario within the LCIDP

Alongside climate and land, water is a critical ingredient to any economic development process as anticipated under LAPSSET. This section analyses water availability within the LAPSSET Corridor and growth areas with a view to mapping out sensitivities that could constrain achievement of target goals in the investment. A comprehensive National Water Masterplan modeling the water demand and supply scenario up to year 2030 was recently launched by the WRMA on which account, updated data on water resource modelling is readily available in Kenya. Computation of water demand/supply models for the LCIDP has heavily drawn on this data base supplemented where necessary by other sources. Table 4.3 presents an analyzed catchment level water balance for Kenya in the period 2010 to 2030 based on the national water masterplan 2030. Inference can be made as follows:-

Table 4.4.7 Demand vs supply model for Kenya upto 2030 (MCM)

Catchment area	**2010**			**2030**			
	Water Demand (a)	*Water resource (b)*	*a/b (%)*	*Water Demand (c)*	*Water resource (d)*	*c/d (%)*	*% demand growth*
LVNC	228	4742	5	1337	5077	26	23.39
LVSC	385	4976	8	2953	5937	50	51.61
RVCA	357	2559	14	1494	3147	47	44.43

[16] De Leeuw, J. et al., 2012. Benefits of riverine water discharge into the Lorian Swamp, Kenya. Water, 4(4): 1009-1024.
[17] Mumma, A., Lane, M., Kairu, E., Tuinhof, A. and Hirji, R., 2011. Kenya: Groundwater Governance Case Study.

ACA	1145	1503	76	4586	1634	281	228.94
TCA	891	6533	14	8241	7828	105	112.51
ENNCA	212	2251	9	2857	3011	95	117.50
Total	3,218	22,564	14	21,468	26,634	81	80.88

Source: The National Water Masterplan 2030

Year 2010 Scenario: As at 2010, the national water demand stood at 3,218 MCM equivalent to 14% of the supply base of 22,564 MCM. On account of hosting Nairobi and Mombasa Cities, their peri urban areas in addition to Machakos, Kitui, Mwingi, Kilifi, Malindi and Lamu, the Athi catchment (ACA) is the greatest demand driver at 1,145 MCM equivalent to 35.6% of the national demand followed by the Tana (Nyeri, Thika, Muranga, Embu, Meru, Karatina and Garissa towns) catchment at 891MCM. ACA also has the most strained water balance model with a demand estimated at 76% of available supply. The Lake Victoria catchment accounts for 43.1% of the national water resource base against a demand of only 13% in 2010.

With regard to LAPSSET, the catchments of traverse namely TCA, ANNCA and EVCA enjoy favorable balances with demand estimated at between 9 and 14% of supply.
Year 2030 Scenario: By year 2030 when LAPSSET is targeted to be functional, the water balance scenario is expected to undergo dramatic change with the national demand growing 80.88% to stand at 21,468 MCM against a supply of 26,634MCM. Simultaneously, demand will outstrip supply in several catchments; 281% for ACA, 105% for TCA, 95% for ENNCA and 47% for RVCA respectively as some development become clearly non-viable.

Implications for LAPSSET: Given the scenarios above, there is possibility that LAPSSET is being conceived against a backdrop of severe water scarcity in the section Lamu to Kula Mawe (Tana catchment) and Highlands Section (Ewaso Ng'iro North Catchment) and possibly the Lake Turkana Basin as well. In order to validate this concern, demand components in the National Water masterplan were scrutinized for accommodation of LAPSSET interventions and demand areas with an outcome summarized in Table 4.4. It is apparent that most of investments proposed under LAPSSET are not supported with water allocation in the NWMP30 implying that, the water stress anticipated in TCA and ENNCA is pre-LAPSSET. Imposition of LAPSSET interventions on such strained water budgets will only aggravate an already stressed scenario.

Table 4.4.8 Correlation between NWMP 2030 demand components and LAPSSET water demand

LAPSSET Intervention	Host CA	Target Investments	NWMP allocation MCM	Project	Capacity (MCM)	Outstanding
Lamu Port	TCA	Lamu Port , Oil refinery, Metropolis, SEZ, Port Industries, Resort City	Domestic and Lamu Port	HGF Dam	81.5	Domestic demand for 1.25mi people @0.1m^3 *pdc* consumption is 45.63MCM. **Supply only caters domestic demand in new Lamu Port.**
				HGF pipeline	69	
Garissa-Bura Growth Area	TCA	EPZ , Food processing, Irrigation	Irrigation: 106, 000ha	HGF	81.5	**106, 000ha would require 270.1MCM hence the 81.5MCM supply not adequate**
Isiolo-Meru-Archers Post	ENNCA	Railway interchange, EPZ, Resort	Irrigation 25000ha	Kora dam	155.5	Current demand by 70,000 people population is 2.6MCM Growth to
			Domestic	Isiolo dam	21.0	

Growth Area		City, Livestock, ICD, Oil Depot, Isiolo Airport, Food processing, Wildlife				0.5 million people will require 26MCM. **21 MCM supply excludes LAPSSET**
			Water supply, Irrigation 4000ha	Archer's Post dam	100	Will probably meet demand from LAPSSET at Isiolo
Wajir Growth Area	ENNCA	Meat processing, EPZ, Livestock Farming	Habaswein-Wajir Water Supply project	12 Boreholes (@ 24m^3/hr)	2.3	Supply only enough for current population of 60,000 people. **Does not cover LAPSSET**
Turkana Growth Area	RVCA	Oil production, Fishing, Tourism, Boat making	Domestic	Turkwell River	264	Covers domestic demand for Lodwar, Kakuma and Lokichogio. **LAPSSET, including Lokichar Oil City not covered.**
			Turkwell irrigation 5000ha			
Lokichogio Growth area	RVCA	Free Trade Zone, Domestic Airport, ICD, Tourism	Boreholes	Boreholes		Factored under 264MCM for domestic supply

Source: NWMP 2030; This Study

4.4.8 Issues pertaining to water resources within the LCIDP Traverse

From analysis undertaken above, core issues have emerged as follows:-

Water demand will largely outstrip supply by 2030
All three basins traversed by the LCIDP are projected to experience huge deficits in water supply (Table 4.8 above) with the greatest pressure being felt in the Ewaso Ng'iro North River. Further, given that the NWMP 2030 has not factored demand expected from LAPSSET, pressure on water resource is likely to be more severe with dangerous consequences on competing needs including livelihoods.

Drying/ receding rivers
The water supply scenario is likely to be aggravated by observed backward recession/ drying of rivers especially the Ewaso Ng'iro River which has been experiencing declining dry season river flows in the lower reaches on account of increased abstraction upstream. *Liniger (1995*) reported that the mean monthly river flow at Archer's Post gauging station during the driest month (February) has been declining from 9 m^3 s $^{-1}$ in 1960's to 4.59, 1.29 and 0.99 m^3 s $^{-1}$ in 1970's, 1980's and 1990's respectively. The number of days with flows at Archer's Post <1 m^3/s has also increased over the years (Fig 4.5 -a). Analysis of long-term rainfall records (1925–2000) across the basin showed that there is no clear trend of decreasing or increasing rainfall, but there are clear fluctuations across the long-term mean implying that climate alone is not to blame for decreasing river flow. According to NRM, 2003 (cited in Ngigi et al,),[18] the proportion of water abstraction as a percentage of available flow in the Naro Moru river was found to increase from 22% in the forest zone, to 43% in the foot zone and to 61% in the savannah zone and worsens in low flow years. In 2002 which was a low flow year, the average abstractions for Naro Moru River were 40%, 50% and 77% of available river flows

[18] Ngigi, et al, 2008: Hydrological Impacts of Flood Storage and Management on Irrigation Water Abstraction in Upper Ewaso Ng'iro River Basin, Kenya Water Resources Manage (2008) 22:1859–1879

at forest zone, foot zone and savannah zone respectively with consequential low flows in the river. In the wider Ewaso Ng'iro North catchment, permitted abstractions have cumulatively increased from 1 to 2m^3 s^{-1} (31.5–63 MCM per year) between 1960 and 1990 to hit 7 m^3 s^{-1} (221 MCM annually) in 1994 (Figure 4.5-b). The volume of permits issued was reduced in 1995 and subsequent years, but increased again to 6 m^3 s^{-1} in 2000 and 2001, at the height of a severe drought.

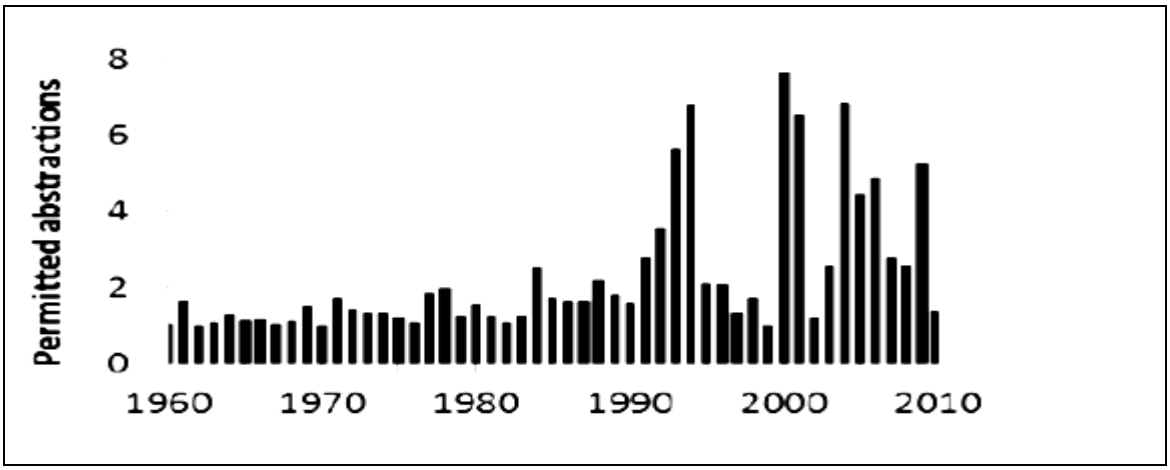


Fig.4.5 Permitted abstractions (m3s-1) in the upper Ewaso Ng'iro River Catchment
Source: De Leeuw, et al 2014[19], Gichuki, F.N, 2004[20]

Thus, even as more development is proposed under LAPSSET, the question of rivers already suffering abstraction pressure and indeed, future availability of water in LAPSSET requires resolution.

Decreasing delivery of recharge to Meri Aquifer

Associated with backward recession of the Ewaso Ng'iro North River is failure to deliver recharge to aquifers notably the Merti Aquifer whose upper reaches are marked by the Lorian Swamp. Upon becoming ephemeral, the Ewaso Ng'iro river becomes the Lagh Dera which, in the 1950's was known to flood the Lorian Swamps near Habaswein regularly but this has reduced drastically on account of changes upstream causing the swamps to retreat many kilometres upstream and reducing in size from 150 to 39 square kilometres. From computations on recharge dynamics, it has determined that for river water to reach the head of the swamp at Merti, 180 km downstream of Archer's Post requires a daily discharge of 0.18MCM at Archer's Post mainly to surmount seepage losses estimated at 1000 m^3 per kilometre per day[21]. The same computation (Fig 4.6), reveal an increasing frequency of years with days when flow passing Archer's post is below this threshold. Thus, while river flow at Archer's Post used to be adequate to reach Lorian Swamp up to 170s, the same drastically reduced with days recording below this threshold steadily increasing. Of necessity, the implication is that. The Merti Aquifer has slowly but consistently lost he dry season recharge from the Ewaso Ng'iro which

[19] De Leeuw, et al 2014: Benefits of Riverine Water Discharge into the Lorian Swamp, Kenya. Water 2012, 4, 1009-1024.
[20] Gichuki, F.N., 2004: Managing the externalities of declining dry season river flow: A case study from the Ewaso Ngiro North River Basin, Kenya
[21] Swarzenski, W.V. and Mundorff, M.J., 1977. Geohydrology of North eastern province, Kenya, USGS Water Supply Paper 1757-N, 1977, 68 Pp

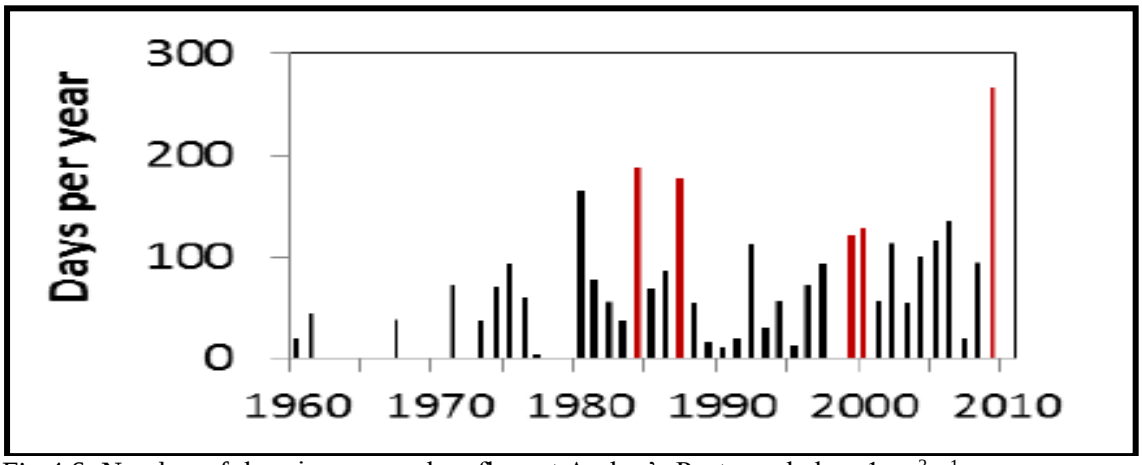


Fig 4.6: Number of days in a year when flow at Archer's Post was below 1 $m^3 s^{-1}$
Source: De Leeuw, et al 2014[8]

4.5 The Land Resource Base

For a country where 40% of GDP growth is driven by agriculture, land becomes an important factor in economic production. Further, for subsistence economies that rely on primary extraction of ecosystem goods and services, land becomes a critical resource whose access and control is central to livelihood security and is often defended aggressively. In this section, we highlight the land resource endowment amongst pastoralists within the traverse.

4.5.1 Tenure systems within the LAPSSET traverse

Table 5.4 provides an analysis of land tenure systems along the LAPSSET Traverse. All three forms of official land tenure are encountered within the LAPSSET Traverse thus:-

Government land: Government land reserved for Livestock Holding Grounds is encountered twice at Lamu (Msumarini) and Isiolo (Kipsing Gap). GoK land in Lamu is however under diverse stages of formal and informal (Witemere) conversion into private land.

Protected land: Protected land comprises the Mangrove Forests at the coastline site of Lamu Port which is protected under the Forests Act 2005 and the Losai and Marsabit Game Reserves protected under the Wildlife Management and Conservation Act 2013. Both game reserves are reserved largely for wildlife use but some limited exploitation such as grazing is allowed. The Corridor partly traverses the Arwale and Rahole Game Reserves in Garissa County which are important habitat for Hirola antelope and elephant breeding sanctuaries respectively.

Community land: This is probably the dominant land tenure within the Corridor spanning all the 9 LAPSSET Counties. Within some urban centers in the traverse, some of the Community Land is undergoing conversion into urban plots for housing and trade but the bulk of land is communally used for grazing either under ranches/conservancies or Elder controlled grazing use. Minor variations to this rule are captured in Table 4.5 under respective Counties.

Table 4.5 Land tenure and use within the LAPSSET Traverse

Section	Land Tenure system	Current Use
Lamu Port to boundary with Garissa	GoK (i) Mangrove formation	Nature conservation, partly cleared for Port Construction
	(ii) Livestock holding grounds	Woodlands currently under subsistence agro-pastoralism
	Community Land	Agro-pastoral and hunter-gatherer settlements of Wasanye, Waboni and Wabanjuni
Garissa County	Mainly Community land	Nomadi Pastoralsim by Woriah Community
	Urban settlements in per-urban Garissa	Housing, trade and animal enclosures
Isiolo County	Mainly Community land	Community conservancies and ranches
	GoK land under Livestock Holding Grounds in the Kipsing Gap	Pastoralism and wildlife use
	Individual allotments in Isiolo	Housing
Meru County	Private	Agro-pastoralism and housing
Isiolo-Laikipia	Private	Mainly private ranches and conservancies
Baringo up to Kapendo	Largely Community Land	Agro-pastoralism, catchment conservation
Turkana County	Community Land, Private urban plots	Nomadic Pastoralism, Housing and trade
Isiolo-Marsabit Moyale	Community land	Ranching and game conservation
	Protected land under Losai and Marsabit Game Reserves	Nature Conservation
	Private allotments in Archers Post, Seleolipi, Merile, Laisamis, Marsabit, Turbi, Moyale and other urban Centers	Housing and trade

Source: This Study

Private land: Privately owned land within the traverse mainly comprises private ranches in Samburu and Laikipia, some recently adjudicated land in Igembe North and urban centers; - Garissa, Isiolo, Archer's Post, Marsabit among others.

4.5.2 Land tenure under pastoral systems

Of Kenya's land area of 576,000 square kilometres, pastoral rangelands account for 82.43% equivalent to 483,840 square kilometres. On account of low biomass productivity, pastoral production systems rely on extensive land-use which requires that vast stretches of land be available for rotational exploitation. As a consequence, of the national livestock herd of 21,649,855 TLU, only 70% equivalent to 15,154,898 TLU is held in the ASALs suggesting a stocking rate of 44.8 TLUs per square kilometre equivalent to 2ha per TLU. Pastoralism is therefore based on very extensive land use system. This notwithstanding however, pastoralists have to seasonally migrate from their lands in search for forage, water and sometimes security which calls for a very flexible land tenure system. The case of Isiolo services: - Of the Isiolo County land mass of 18095Km^2 comprised of 10 range

units occupying, only 3 range units occupying 6,115Km^2 can host cattle for longer than 120 days[22] while the reminder 11,980 Km^2 (66.2%) can only host cattle for less than 45 days implying that Isiolo's 101, 525 strong cattle herd has to spend close to half an year outside the County, grazing in adjoining rangelands.

4.5.3 Pastoral land in a crisis

Development is coming into the pastoral lands and this development targets pastoral land. As a precursor to this development, there is need to document the background against which this development is planned and anchored. There is need to clearly understand impacts of past land use change and access control in pastoral areas so as to model possible impact of LAPSSET-driven development.

On account of mandatory seasonal migration, access to dry season grazing and water is the essence of resilience of pastoral livelihoods which calls for a very flexible land tenure system. Traditional land tenure systems therefore evolved to allow pastoralists to move out and access dry season grazing grounds sometimes outside of tribal jurisdictions in a system whereby though many communities held jurisdiction over certain territories, the whole range was managed and used as a single resource often under reciprocal arrangements. This inherent right of pastoralists to seasonally move their flocks has persistently been eroded through decisions that overtime, tended to confer exclusive rights over parts of the range to individuals or groups in the process restrict pastoralists and their herds from accessing resources.

The case of pastoralists in Laikipia serves to illustrate how pastoral livelihoods have systematically been pushed to the edge to the extent that what was once a viable way of life has been reduced to chronic poverty where relief food is a major survival option. It all started with development of a Transport Corridor dubbed, the Uganda railway.

Development of the Uganda Railway through the Kenya Highlands:
Before 1900, most natural pastures in Kenya were used for livestock grazing by various groups of nomadic pastoralists, including the Kipsigis, Endorois, Tugen, Pokot, and Maasai (often collectively referred to as Kalenjin), as well as the Sabaot, Somalis, Borana and other groups. Over centuries, these pastoralist societies had crafted institutions and practices that enabled them to survive in ASALs. Pastoralists managed pastures communally and grazed individually owned livestock extensively, involving the seasonal movement of people and cattle. These systems were regulated by: 1) the availability of water and good pastures; 2) the presence of diseases along nomadic routes; 3) the prevailing security situation; and 4) the timing of important socio-cultural activities.

Largescale government takeover of pastoral lands in Kenya is probably associated with the Uganda Railway which is a transport corridor developed by the Colonial Administration at the turn of the century to enable them reach Uganda, a country rich in mineral resources. Opening of the Uganda Railway line from Mombasa on the coast to Kisumu on Lake Victoria in 1901 resulted in an influx of settlers encouraged by the Colonial government to invest in agriculture and thus provide a market for the railway line. The Crown Lands Ordinances of 1901 and 1902 declared all land in Kenya to be Crown Land[2324], and was invoked to evict Africans from their traditional lands, confine them in

[22] Gok, 1993: Range Management Handbook of Kenya Volume II/4, Isiolo District
[23] World Resources Institute, Rise and fall of Group Ranches in Kenya. Focus on land in Africa focusonlandinafrica@gmail.com www.focusonland.com

"native reserves," and allocate their former lands to white settlers for commercial production. Many settlers acquired land in the fertile White Highlands and established coffee or tea plantations while others acquired freehold titles and long-term leasehold grants of pastureland for ranch development. The best documented examples of such large-scale takeover of pastoral lands by European farmers involve the Laikipia and Uasin Gishu Maasai who inhabited prime agricultural and livestock-producing areas. In the early twentieth century, the Laikipia and sections of the Uasin Gishu Maasai were relocated to southern Maasai territories, especially to Narok District. Their former lands were then redistributed by the Colony to European farmers for commercial agricultural purposes with more than 5,000 square kilometers of pastoral land being taken in Laikipia alone. Ultimately, extension of the railway line to Kitale and Nanyuki opened up additional pastoral territories for occupation by settler farmers with natives being pushed to inhospitable lesser productive territories. Much of this land had been held and used by pastoralists as common property under customary tenure arrangements. The alienation of land for white settlers (and, later, the creation of protected areas for wildlife conservation) deprived many pastoralists of their traditional lands. The colonial government, however, restricted land titles to individuals and did not provide for titling of common property.

Colonial Era Development Plans:
Simultaneously and in an attempt to secure land for Africans, including pastoralists, the British government established "native reserves" with fixed boundaries (the Maasai and others negotiated "treaties" for their reserves in an effort to better secure their lands from alienation by white settlers). The boundaries of reserves for pastoralists were drawn with little regard to seasonal variation, and their need to move their animals to water and greener pastures. Later, however, the British isolated local breeds and discouraged African pastoralism through punitive quarantine regulations that confined cattle to particular areas. The rigid boundaries also undermined the marketing networks that had previously existed between pastoralists and adjoining pastoralists and with no official outlet for surplus stock, the regulations lead to overgrazing and declining pasture conditions in the native reserves, especially after the 1933-34 droughts.

Further attempts were made to develop African pastoralism mainly through forced sedentrization and destocking under both the African Land Development Board's (ALDEV) Ten Year Development Plan (1946-55) and the Swynnerton Plan for the Reform of African Land Tenure of 1955. The latter policy sought to reduce livestock numbers, avoid overuse of vegetation, limit soil erosion, and realize reasonable annual off-take under a five point plan namely:- 1) stock numbers limited to a prescribed carrying capacity for the land; 2) regular outlets to absorb excess stock; 3) construction of permanent water supplies; 4) controlled grazing and grazing areas managed at a productive level; and, 5) eradication of the tsetse fly, which infected cattle with trypanosomiasis (sleeping sickness). However, both plans failed to allow for seasonal migration of livestock and ended up being abandoned.

Independence era development plans-introduction of Group Ranches:
Following the severe drought and floods of 1961-62, concern over the ASALs became more urgent. With independence in 1963 and the experience of severe droughts and floods of 1961-62, the Kenyan government established the Range Management Division in the Ministry of Agriculture to upgrade the range economy by conserving, managing, and developing the ASALs. The Division recognized that that security of tenure would reduce the pastoralists' tendency to overstock the ranges, increase their incentive to invest in range improvement, and act as collateral for loans to invest in these

[24] The Crown Lands Ordinances of 1902 and 1915 defined crown land as: all public land within the East African Protectorate which for the time being is subject to the control of His Majesty. Thus the entire territory known as Kenya was declared to be Crown Land. This set the stage for massive expropriation of lands, belonging to the indigenous peoples, to white settlers. Local communities who may have previously occupied such lands were forcibly moved to what became known as the "native reserves", to make room for white settlers.

improvements. The concept of Group Ranches was introduced on Pilot basis following the Lawrence Report of 1965-66 that favoured group as opposed to individual registration of land rights. Group ranches became a principal organizational structure for the development of traditional pastoral areas, especially in the Maasai districts.

For the government, group ranches had several objectives: 1) increase the productivity of pastoral lands through increased off-take; 2) improve the earning capacity of pastoralists; 3) avoid landlessness among pastoralists, especially from the allocation of land to individual ranchers; 4) avoid environmental degradation due to overstocking on communal lands; and 5) establish a production system that would allow modernization of livestock husbandry while preserving traditional ways. By tying people to fixed areas of land, it was also hoped that group ranches would sedentarize pastoralists, raise awareness of the scarcity and value of land, and encourage them to make the investments necessary to improve the land. Thus, to consolidate this position, in 1968, the government passed the Land (Group Representative) Act which legalized the ownership and occupation of land by a group of people, and provided the legal basis for the establishment of group ranches. The Act provided that "each member shall be deemed to share in the ownership of the group ranch in undivided shares." The law provided for elected group representatives to act as legal trustees of the ranch and to act on the group's behalf regarding property succession matters (to avoid the need for express transfer of property whenever a new group of representatives was elected and registered). The Act also enabled participants to acquire development and operation funds from local financial institutions.

Simultaneously, other legislation, especially laws regarding Trust land, also affected group ranches. In 1939, the British passed the Trust Land Act, which governed land that was occupied by Africans and had not been registered in individual or group names or declared government land. At independence in 1963, Trust land was vested in county councils which had the power to hold and alienate land for the benefit of persons ordinarily resident on the land. Shortly after, the Kenyan government passed the Land Adjudication Act, which came into force in 1968 and was designed to enable the ascertainment and recording of rights and interests in Trust land to ensure that not only were individuals and families recorded and registered as landowners, but groups as well.

Group Ranches in Kenya have largely failed. By the mid-1970s, however, it was clear that group ranches were not an effective means of commercializing beef production by pastoral societies. The causes of this failure were many but mainly centered on disagreements over group versus individual rights registration. More critically, however, many group ranches were not ecologically viable units and occupiers periodically moved out of their group ranches in search of pastures and water, especially during the dry season and in times of stress, such as the drought of 1973-76.

The outcome:
The land laws in Kenya have thus focused on individualization of land rights at the expense of customary/community rights to land. A core outcome of this process has been gross interference with viability of pastoral livelihoods[25] mainly through restricting their seasonal migration to reach forage and water thus endangering their survival while their restriction to shrinking land resources has occasioned overgrazing and degradation of the land beyond repair.[26] The very survival of pastoral

[25] AU-IBAR 2013. Sustainable Natural Resources Management and Land Policies: A Review in Kenya and Burkina Faso. AU-IBAR Monographic series No.3
[26] Thor Erik Sortland 2009: Pastoralism in Transformation Conflict and Displacement in Northern Kenya. Thesis submitted in partial fulfilment of Masters' Degree Department of Social Anthropology, University of Bergen May 2009

livelihoods especially in Laikipia-Mukogondo and Samburu is under severe threat.[27] The general impoverishment of certain of Kenya's pastoral areas, resulting primarily from a loss of rangeland, has led to increased dependence on government relief, government-sponsored irrigation schemes and settlements, and the incorporation of wage employment in pastoral families to supplement decreased production and declining incomes.

Traditional administration of pastoral resources relied on authority of elders who made decisions to safeguard the best interest and long term survival of the community.[28] Within any one location, access was decided by elders, regulated, and penalties for infringement enforced where necessary by warrior age sets, who also played a part in challenging as well as in enforcing the decisions of their elders[29] Of necessity, elders had jurisdiction over access to and use of natural resources pasture, water and salt licks, stocking control and rotational use of range units. Under customary systems, the rangeland was therefore a managed resource where authority of elders' was critical to preventing a free-for-all situation. There is evidence that, partly on account of state policies and actions that have not recognised the right of the pastoralists to own or manage their rangelands, and have therefore ignored their institutional systems, this authority of elders has been eroded and in many communities, they (elders) can no longer control younger herders and have even become dependent on them. As well, elders have lost control to young affluent members of communities who strongly spearhead moves towards individual control of resources through land allocation.

Despite this however, many local communities in Kenya continue to manage land. This is attributable to the resilience of customary tenure, which has withstood sustained subjugation, suppression and denial of juridical content in official parlance. Kenya's first ever National Land Policy (NLP) recognizes the lack of adequate legal attention and treatment for community land in Kenya. In response, it has made provisions for community land with an opportunity to craft new land laws for its management and protection. The NLP notes that individualization of tenure has undermined traditional resource management institutions; ignored customary land rights; and led to widespread abuse of trust in the context of both the Trust Land Act[14] and the Land (Group Representatives) Act[15].

Community land under the new constitutional dispensation:
The constitution vests community land in communities identified on the basis of ethnicity, culture or similar community of interest.[16] It provides that any unregistered community land be held in trust by county governments on behalf of the communities for which it is held. It defines community land to include: land held by groups under the Land (Group Representatives) Act; land lawfully transferred to a specific community by any process of law; land that is lawfully held, managed or used by specific

[27] Starting with a 1904 treaty and followed by another in 1911, Maasai land was reduced by 60 percent when the British evicted them from Laikipia and surrounding areas in the Rift Valley region and made them settle in a reserve in southern parts of Kenya, present day Kajiado and Narok districts. Anderson (2002) writes that by 1906 almost 50 farms of alienated land in Laikipia were allocated to settlers, each farm of about 5000 acres. The 1904 treaty was debated in 2004 because the Maasai signed for a 99 year lease, rather than selling the land for good. Hughes (2006) explains that this was the normal procedure in Kenya at the time. The Maasai have not been successful with their claims. One of the government's main arguments is that the lease at some point had been extended to 999 years, though they have yet to document this legally. Even though Maasai is the ethnic group with the legal grounds for claiming land in Laikipia, they are unlikely to be the only ethnic group that lived in Laikipia in pre-colonial times. Most of my Samburu informants told me that certain Samburu clans had been living in Laikipia for generations prior to colonial times.

[28]Katherine Homewood, Ernestina Coast and Michael Thompson, 2004: In-Migrants and Exclusion in East African Rangelands: Access, Tenure And Conflict. Africa 74 (4), 2004

[29] Sara Pavanello and Simo Levine, 2011: Rules of the range Natural resources management in Kenya–Ethiopia border areas. HPG Working Paper September 2011

communities as community forests, grazing areas or shrines; ancestral lands and lands traditionally occupied by hunter-gatherer communities; and land that is lawfully held as trust land by the county governments.[17] The Constitution requires parliament to enact legislation on land within eighteen months from August 2010 when the constitution was promulgated, and on community land within five years.

Pursuant to the Constitutional requirement, parliament has enacted the National Land Commission Act, 2012; the Land Registration Act, 2012; and the Land Act, 2012.

Post-independence population influx in Laikipia:
With Kenya's independence in 1963 came huge pressure to re-settle landless peasants from other, more densely populated areas of the country. This demand for land was met through government endorsed land re-distribution programmes, which in Laikipia led to a radical transformation of land tenure as several ranches were bought and sub-divided into smaller 1-4 hectare parcels for smallholder settlement[30]. As a result largely of in-migration, population numbers in the County increased from approximately 60,000 in 1960 to 399,227 in 2009. As the human population has increased so has the livestock population and demand for water. [31] The current distribution of different ethnic communities in the basin is a cause of latent conflicts among the original Maasai inhabitants, the White farmers and post-independence African settlers (mainly the Kikuyus and Merus). These potential land conflicts are transformed into manifest conflicts during periods of prolonged droughts when pastoralists move into privately owned land in the Laikipia Plateau and the mountain foot-zones in search of grazing. For example, during the year 2000 drought, pastoralists herded over 10,000 head of cattle into private ranches where they were allowed conditional grazing while others still drove their flocks to Mt. Kenya Forest where many perished on account of Tsetse fly.

In recent years, some remaining large farms in the foot zone of the mountain were transformed into highly modern horticultural enterprises growing flowers and horticultural produce for premium international markets. Densely settled small-scale farming areas, urban centres, and large-scale horticultural enterprises have been established in the foot zone of the mountain and have encroached partly on the forest belt. The high plateau of Laikipia is occupied by small-scale farming areas, which have so far been less densely settled, and remaining large-scale ranches. These land use and land tenure systems in the upper reaches have meanwhile restricted pastoralists to the edge of the plateau and the dry lowlands, where game parks and tourist resorts seeking to attract an international clientele have also been established.

4.6 Game Conservation areas

4.6.1 Game outside protected areas

A common feature of the ASAL ecology is its shared nature between human settlements and wildlife. Wildlife is overwhelmingly present along the traverse of the corridor with Isiolo, Laikipia, Samburu and Baringo being key counties that have a generous. It is known that over 75% of wildlife are found in community lands and northern Kenya has the highest number of wildlife that are found outside protected parks compared to anywhere else in the country.

[30] Gichuki, Francis. 2002. Water conflicts in the Upper Ewaso Ngiro North Basin: causes, impacts and management strategies. E- Conference paper. 22p.
[31] Urs Wiesmann, F rancis N. Gichuki, Boniface P. Kiteme and Hanspeter Liniger, 2000: Mitigating Conflicts Over Scarce Water Resources in the Highland–Lowland System of Mount Kenya. Mountain Research and Development Vol 20 No 1 Feb 2000: 10–15

The case of Meru Northern Grazing Area (Table 4.2 above) and the Laikipia-Samburu transect best illustrates this point. The Wildlife Conservation Strategy for Laikipia[32] identifies the County as a leading wildlife conservation area in East Africa's. Firstly, Laikipia contains higher populations of large mammals than any protected or unprotected landscape in Kenya, outside of the Maasai Mara National Reserve. Secondly Laikipia is rich in biodiversity with over ninety-five species of mammals, 540 species of birds, over 700 species of plants and almost 1000 species of invertebrates already identified. Laikipia also has the highest assemblage of globally threatened mammals;- half of Kenya's black rhinos; Kenya's second largest population of elephants; a third largest and the only stable population of Kenya's, the world's sixth largest population of African wild dogs, a large proportion of the world's remaining Gravy's zebras, perhaps as many as two thirds of the world's remaining Reticulated Giraffe, a globally significant population of cheetah, Kenya's largest population of patas monkeys and a unique race of hartebeest.

The Samburu community land and its environs have rich faunal biodiversity including 51 species of large and medium sized mammals, 153 species of birds, 22 herpeto faunal species (4 amphibians and 17 reptiles) with lizards (14 species) (De Jong & Butynski, 2010). Most of these animals are threatened species like the wild dog (*Lycaon pictus*), African elephant (*Loxodonta africana*) and Grevy's zebra (*Equus grevyi Oustalet*) (Williams, 2002).

Alongside water, perhaps this wildlife resource resident outside of protected areas and whose habitat stands to suffer further fragmentation from the corridor that faces the most severe treat from LAPSSET. Yet, wildlife provides the main selling point for tourism, Kenya' number one foreign income earner and is a core anchor to the Economic Pillar of Vision 2030. In Laikipia alone, the wildlife sector generated an estimated $US 20,500,000 in tourism revenue in 2009, directly supporting 6,500 people. The wildlife sector raised a further $3,500,000 for social development projects such as education, healthcare, infrastructure development, security and livelihood support and $5,000,000 for wildlife conservation. A more detailed analysis of the implications of developing the LCIDP on wildlife is presented in Chapter Eight below.

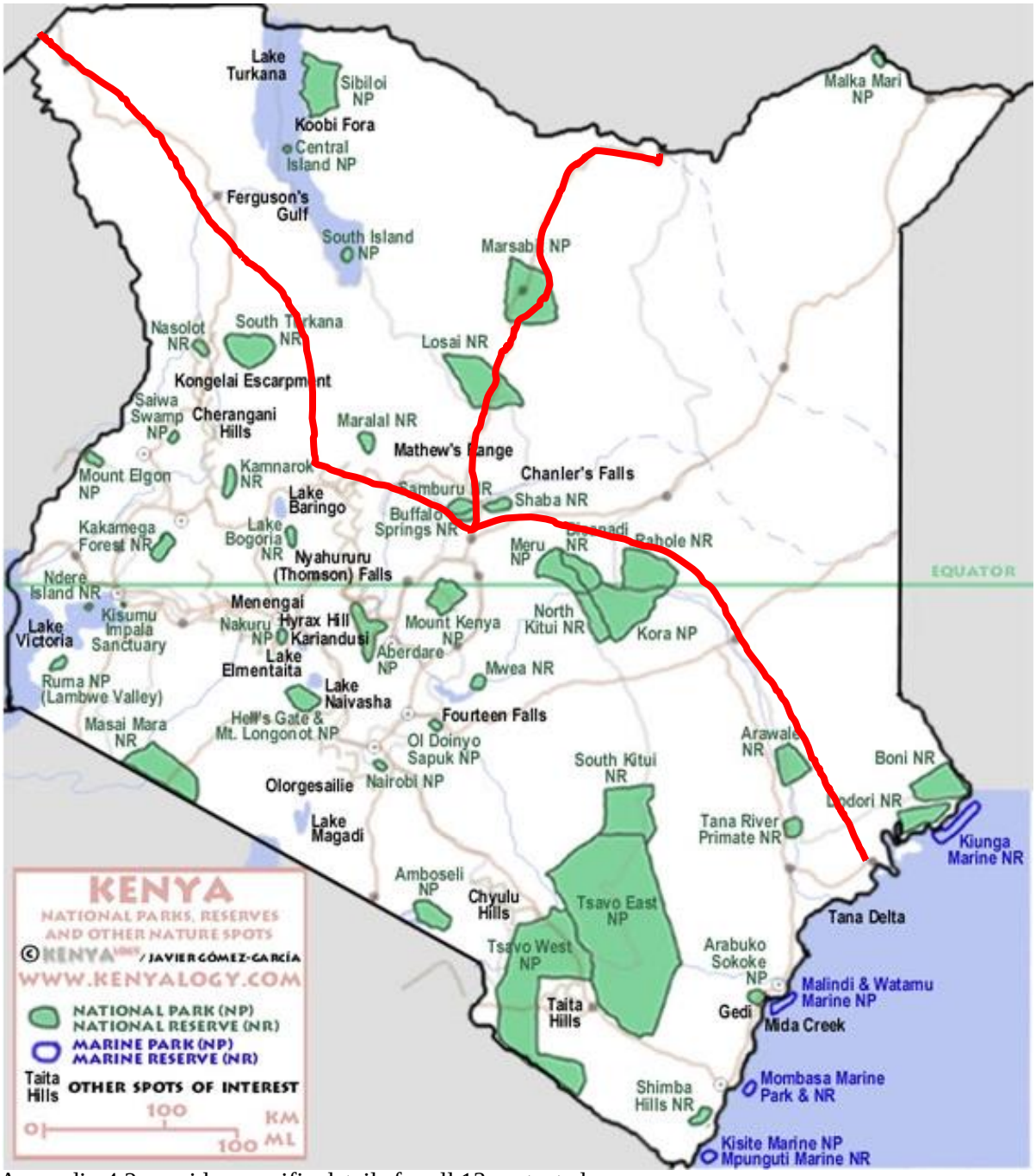
4.6.2 Protected Ecosystems

Numerous areas reserved and managed for nature conservation by both the Government and private entities are encountered within the traverse area.

GOK Protected areas:

The section of the Traverse between the Indian Ocean at Lamu and Kisima (Samburu) hosts a total of 13 areas protected under both the Forests Act 2005 and the Wildlife Management and Conservation Act 2013 comprising 9 National Reserves, 3 National Parks (Table 4.6, Fig 4.7) and 1 (one) gazzetted Forest, which host diverse wildlife including elephants, buffaloes, various antelope and all the big cats which makes them important conservation areas. Of the 13 protected areas, 4 areas namely;- The Mangrove Forest in Lamu and the Nyambeni, Losai and Marsabit Nature Reserves are traversed by the corridor which also passes in very close proximity of the Araware, Rahole Nature Reserves and meru national Park largely reserved as habitat for wildlife including the endangered Hirola antelope. The rest of the traverse is an important dispersal area for wildlife especially elephants migrating in between the protected areas.

[32] Graham, Max, 2012: Wildlife Conservation Strategy for Laikipia County 2012-2030



Appendix 4.2 provides specific details for all 13 protected areas.

Table 4.6: List of Protected areas along the traverse

SN	Name	Protection Status	Impact from LCIDP
1	Mangrove Forest belt in Lamu	Gazzetted Forest	16 Km to be displaced
2	Arware Nature Reserve	NR	Traversed
3	Kora National Park	National Park	Distant
4	Rahole National Reserve	NR	Peripheral
5	Bisanadi National Reserve	NR	Peripheral

6	Meru National Park	National Park	Peripheral
7,9,10	Shaba, Buffalo Springs, Samburu National Reserves/ Lewa Conservancy complex	NR	Traversed
11	Northern Grazing area (Nyambene Nature Reserve)	NR	Traversed
12	Losai National Reserve	NR	Traversed
13	Marsabit National Reserve	NR/ Forest	Traversed
14	Marsabit National Park	National Park	Peripheral
15	Laikipia National Reserve	NR	Traversed

Conservancies:

The LAPSSET infrastructure (railway line, highway and pipeline) many community-owned and private ranches (Table 4.7, Fig 4.8), some of which have been transformed into conservancies. Conservancies have been used in the ASAL areas in Kenya as a tool to manage natural resources to enhance sustainable livelihoods, and also to ensure equitable sharing of resources. Most of the conservancies have developed management plans to deal with aspects of livestock/pastoralism, pasture management; water resources management; infrastructure development; health and education; peace and security; and wildlife management. The LAPSSET corridor will impact on some of these conservancies traversed or those nearby as it may interfere with the implementation of some of their already developed plans.

Table 4.7 Conservancies traversed by LAPSSET

Community conservancy	**County**	**Size (ha)**	**Main livelihood**	**Comments**
Lekurruki	Laikipia	11,950	Pastoralism and tourism	Elephant, reticulated giraffe, rare forest species of plants, butterflies & birds
Leparua	Isiolo	34,200	Pastoralism and tourism	Elephant, Grevy's zebra, eland
Naibunga	Laikipia	47,740	Agro-pastoralism and tourism	Elephant, Grevy's zebra, lion, leopard, giraffe, wild dog, eland
Nakuprat-Gotu	Isiolo	39,300	Pastoralism	Elephant, lion, Beisa oryx
Namunyak	Samburu	394,000	Pastoralism and tourism	Elephant, leopard, reticulated giraffe, buffalo, African wild dog, greater kudu, the rare De Brazza colobus monke
Nasuulu	Isiolo	34,900	Pastoralism	Elephant, Grevy's zebra
Oldonyiro	Isiolo	52,500	Pastoralism	Giraffe, Grevy's zebra, lesser kudu, cheetah, eland, Oryx, elephant, lion
Ruko	Baringo	16,400	Pastoralism and tourism	Buffalo, impala, hippo and translocated Rothschild giraffe
Sera	Samburu	345,000	Pastoralism and tourism	Black rhino, elephant, wild dog, lion, gerenuk, Beisa Oryx, buffalo, reticulated giraffe and Grevy's zebra
Jaldesa	Marsabit		Pastoralism	Elephant, Grevy's zebra, buffalo, giraffe, leopard, antelope species
Melako	Marsabit	387,000	Pastoralism	Grevy's zebra, gerenuk, sand grouse, Beisa Oryx
Awer	Lamu		Farming, honey	Elephant, topi, buffalo, hippo, lion,

Community conservancy	County	Size (ha)	Main livelihood	Comments
			gathering	African wild dog
Ishaqbini Hirolla	Garissa	19,000	Pastoralism	Hirola, buffalo, lion, leopard, cheetah, elephant

Isolated Ecosystems:

Also unique to northern Kenya is the "islands in the desert", which are montane forest existing within the tufts of the highly variable harsh climatic conditions of the northern counties. Dryland forests account for close to 20% of the forest cover in Kenya. Along the LAPSSET corridor traverse, these include Mt. Marsabit, Hurri Hills and Mt. Kulal, Mathew's ranges, Mt. Nyiru, Maralal and Porror reserves. Apart from being forest of biological and ecological significance, these areas are important sources of water and are an oasis of life in the harsh environments. The East African olive, *Olea europaea* ssp. *africana* is found only in few areas, particularly on southern Mt Nyiru and the top of Mt Marsabit, forming almost exclusively the above 10 m high canopy in the latter location but is an endangered species that is highly exploited for its wood. Sandalwood *Osyris lanceolat*a spp is also a threatened species that is exploited mostly for its oil and wood. These forests are threatened also by charcoal burning and fires orchestrated by pastoralists for clearance of bush before the rainy season. Forest provides significant ecosystems services to people and the environment but very little is known about their economic significance at a local, national and international scale. Research has not adequately addressed the value and significance of these forests and few have developed management strategies to ensure their protection. They are however still protected formally and informally based on their importance and what they are used for.

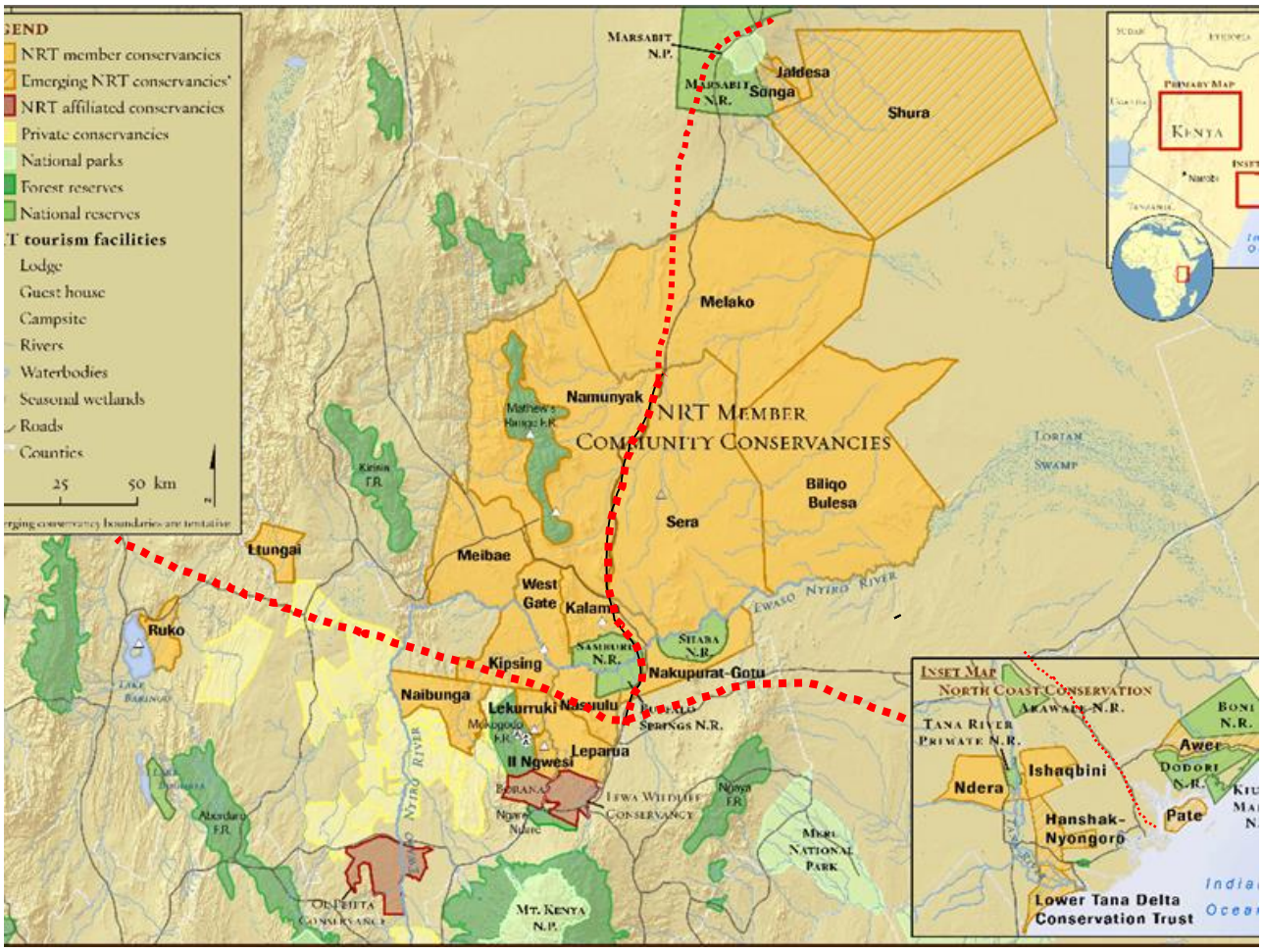


Fig 4.8 Conservancies traversed by the LCIDP

Important Bird Areas:
Several important biodiversity sites are within the LAPSSET corridor traverse or within close proximity including 12 IBAs and about 10 National Parks or Reserves. These biodiversity areas are important particularly for the protection and conservation of the unique fauna and flora that includes several endemic species, especially of the eastern coastal forest. IBAs also play important economic roles in income generation at national level while supporting livelihoods locally. Many of the IBAs in Kenya are protected but there are several that are under no formal protection within the LAPSSET corridor including the Dida Galgalu IBA to the East of Marsabit forest, which could be possibly traversed by the corridor. IBAs are also in constant pressure from being overgrazed and over utilized by pastoralist due to lack of good management of land. Illegal selective logging and vegetation destruction is severely threatening some IBA sites.

Status of species conservation:
Kenya ranks second highest in terms of bird and mammal species richness when compared to other African countries and has high levels of species endemism or species that live nowhere else on earth. This notwithstanding, the trend in Kenyan wildlife populations is alarming. A recently published study has revealed that bbetween 1977 and 2016; Kenya's rangelands lost 68.1 percent of wildlife

equivalent to 1.7 percent loss per year (Ogutu, et al 2016).[33] The declines were particularly extreme (72–88%) for warthog (*Pharcoerus africanus*), lesser kudu (*Tragelaphus imbermbis*), Thomson's gazelle, eland (*Taurotragus oryx*), oryx (*Oryx gazelle beisa*), topi (*Damaliscus lunatus korrigum*), hartebeest (*Alcelaphus buselaphus*), impala (*Aepyceros melampus*), Grevy's zebra (*Equus grevyi*) and waterbuck (*Kobus ellipsiprymnus*); severe (60–70%) for wildebeest, giraffe (*Giraffa cemelopardalis*), gerenuk (*Litocranius walleri*) and Grant's gazelle (*Gazella granti*); and moderate (30–50%) for Burchell's zebra, buffalo (*Syncerus caffer*), elephant (*Loxodonta africana*) and ostrich (*Struthio camelus*).

Simultaneously, the Study observed a spectacular increase in numbers of sheep and goats (124.5–648.1%) in 8 counties (Narok, Taita Taveta, Lamu, Laikipia, Samburu, Garissa, Wajir, Mandera and Marsabit), moderately (3.8–89.3%) in 10 counties but decreased marginally (3.8–64.4%) in Kwale and Elgeyo Marakwet counties. The population of camels also increased many-fold (450–17896%) in Kitui, Laikipia and West Pokot counties and, to a lesser extent (89–119%), in Baringo, Garissa and Samburu counties, signifying increasing and widespread adoption of camels in these counties. Such an inverse relationship indicates a worrying clear and systematic trend whereby wildlife are being replaced by livestock in pastoral counties including those within the traverse. The main drivers to this displacement are habitat loss and fragmentation, blockage of migratory corridors, loss of breeding and water sanctuaries, retaliatory killing among others.

[33] Ogutu et al, 2016: Extreme Wildlife Declines and Concurrent Increase in Livestock Numbers in Kenya: What Are the Causes? http://dx.doi.org/10.1371/journal.pone.0163249

Chapter Five: The Social Economic Profile

Chapter Four above has mapped out the biophysical baseline and sensitivities that precede development of the LAPPSET Corridor and attendant growth areas. In sections below, an attempt is made to introduce the human factor with a view to mapping out how communities have adapted to and utilized the biophysical resource base to develop century's old livelihood systems that have so far been able to withstand the harsh, vulnerable ecology. These are the livelihoods targeted for anchorage and transformation by LAPSSET in which case, an in-depth documentation of their functioning, relationship with the environment, long-term viability and opportunities for improvement would provide an important datum for LAPSSET.

5.1 Population and settlement patterns

5.1.1 The People

Table 5.1 below captures the dominant communities' resident in the belt to be traversed by the LCIDP. Essentially, the traverse is dominated by pastoral communities better known for livestock keeping who largely subsist on livestock sometimes supplemented with hunting and gathering as is the case with Wabanjuni, Wasanye and Waboni of mainland Lamu.

Table 5.1 Dominant communities within the traverse

Section	Inhabitants
Lamu mainland	Wabajuni, Wasanye, Waboni and other Mijikenda groups mixed with immigrant settlers
Garissa County to Benane	Mainly Worriah Community (Somali, Orma, Wardei, Munyoyaya, Awer)
Isiolo County	Borana, Samburu, Turkana, Somali and others
Laikipia to Kisima	Samburu, Kikuyu, others
Baringo County to Kapendo	Mainly Pokot Community
Kapendo-Lokori-Lokichar-Nakadok	Turkana Community
Isiolo to Marsabit	Mainly Samburu, Borana, Rendile
Marsabit to Moyale	Mainly Gabra and Borana

Indigenous People and minorities

Indigenous peoples refer to a distinct social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and the natural resources in these habitats and territories;
- Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or

A distinct language or dialect, often different from the official language or languages of the country or region in which they reside

Objectives of identifying indigenous persons

The main objectives of identifying indigenous persons along the corridor include;

- To ensure that development process fosters respect for the human rights and natural-resource-based livelihoods of Indigenous Peoples;
- To anticipate and address adverse project impacts of projects on Indigenous Peoples' communities;
- To promote sustainable development benefits and opportunities for Indigenous Peoples;
- To establish informed consultation and participation with the Indigenous Peoples; and
- To respect the culture, knowledge, and practices of Indigenous Peoples.

5.1.2 Indigenous Peoples along the LAPSSET Corridor

The Indigenous peoples found along the LAPSSET transport corridor include the Awer in Garissa who are hunter - gatherers, the Orma, Wardei, Samburu, Borana and Turkana pastoralist and pastoral-fisher communities that include the Elmolo.

In Isiolo County, the Borana, Samburu, Turkana and Somali are considered to be the indigenous communities found in Isiolo County. All these communities are pastoralists and have self-identified as "indigenous" in various national and international forums.

However, the identification of "indigenous" people in Lamu is contentious. This is exacerbated by the lack of a clear definition or listing in Kenya for "Indigenous" people. Some civil society organizations identify all communities that have been found in the area for a long time as "indigenous". These include the Bajuns, Orma, Awer, Swahili and Kore Maasai among many others.

Communities like the Awer (Boni) claim to have always been in the area and the pastoralist Orma are thought to have migrated into the area in 17th or 18th century. The Bajun are believed to be a result of Arab and Indian intermarriages with the local Bantu communities during the 14th century inter-continental trade. The Bajuns have dominated the economic, social and political landscape of Lamu.

The "Indigenous" peoples are some of the most excluded from the socio-economic and political fabric of Kenya and may be the least equipped to respond to the new set of challenges that the LAPSSET transport corridor portends.

5.1.3 Cultural Heritage within traverse

Culture is synonymous to humanity and nations take pride in their cultural diversity as manifested in their people, beliefs, dress, language, food, economic activity, among others. The less a community is exposed to external influence, the stronger the grip of cultural practice and belief systems and this holds true of communities along the LAPSSET Corridor which still retain strong cultural practice mostly influenced by the Islamic faith as clearly demonstrated by the case of Lamu which was declared a UNESCO Man and Biosphere Reserve in 1980 followed by the 1985 UNESCO classification as a World Heritage Site in 1985 for being the "oldest and best preserved Swahili settlement in East Africa". Lamu has unmatched archaeological sites and boasts inimitable indigenous communities, namely the Boni, Sanye and Bajuni. Others include Somali, Orma, Pokomo and Miji Kenda, all of whom have made these islands their home. With a rich history dating to the 8th Century and globally acknowledged as East Africa's Islamic capital complete with Islamic festivities observed, Lamu boasts of a rich inter-cultural diversity in its history. The Omani Arabs, Portuguese, Germans and British have all had their flags flown here at one time in history. Other hotbeds of culture along the Corridor include Samburu, Moyale, Baringo and Turkana.

Plate 5.1: A Samburu man holding medicinal plant samples

Table 5.2 Highlights of Cultural Heritage along the LCIDP

County	Tangible Heritage	Intangible Heritage	Remarks
Lamu	Lamu Archipelago Unique buildings/archaeological site/towns e.g. Lamu Old Town, Lamu Town Square Swahili Houses Graveyards/cemeteries Ecosystems e.g. the mangroves	Swahili Cuisine Islamic Faith Fishing Festivals Dressing	Intangible heritage is passed on through festivals such as Lamu Cultural Festival, Lamu Food Festival, Lamu Fishing Competition, Iddu Haji Festival
Garissa	Graveyards/Cemeteries	Clannism[34] Islamic faith	
Isiolo	Landscapes	Clannism	
Laikipia	Manyattas	Moranism Festivals	The Laikipia Maasai engage in several festivals such as Enkipaata (senior boys ceremony), Emuratta (circumcision), Enkiama (marriage), Eunoto (warrior-shaving ceremony)
Samburu	Graves/Cemeteries	Festivals/ceremonies Feeding	The Samburu have the following ceremonies; Beading ceremony, *Muratare e Layiok* (circumcision ritual) Staple food for Samburus –maize, milk and blood ITK on weather patterns ITK is passed on oral literature and practical induction.
Baringo	Graves/Cemeteries		
Turkana	Graves/Cemeteries	Art skills in	ITK around medicinal plants

[34] This clannism is a positive aspect but on the other hand most wars in Garissa are clan based.

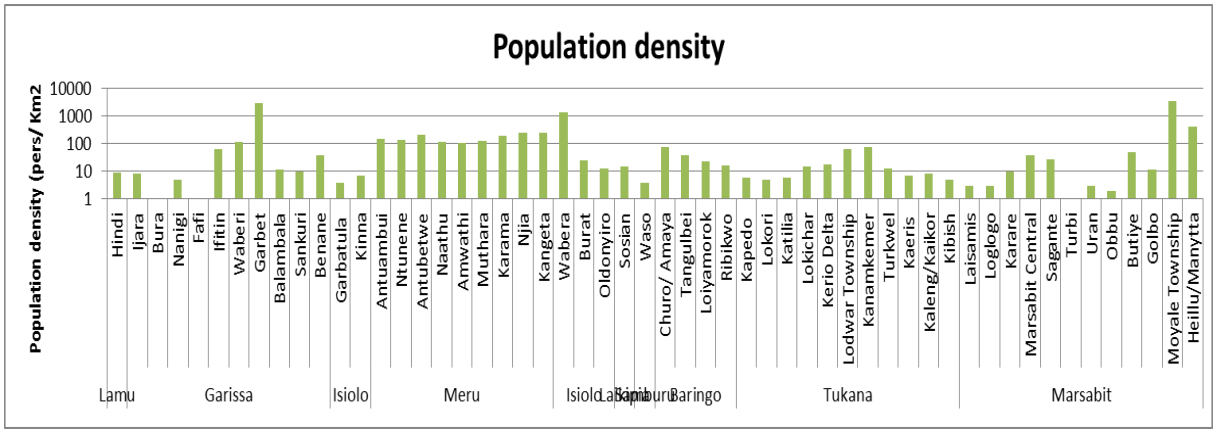
		metalwork, woodcarving, and stone carving, weaving Singing	

5.1.4 Social organisation and settlement patterns

A detailed analysis of settlement patterns for LAPSSET Counties is presented in Fig 5.1 based on data for Wards traversed (KNBS, 2010).

Population distribution: A total of 55 Administrative Wards covering 102,467 square kilometers and accounting for 2.8% of the national population of 44.35 million people will be traversed. Population density within the 55 LAPSSET Wards is quite varied but three patterns are evident:-

- **Pastoral settlements:** These are the most common within the traverse and are characterized by low densities ranging from 1-20 persons per square kilometer;
- **Agro pastoral settlements:** Agro pastoral settlements as encountered at Hindi, Meru (Igembe and Tigania) have most population densities averaging 100 to 250 persons per square Kilometers; and
- **Urban and peri-urban settlements:** These are encountered at Garissa, Isiolo, Moyale and Marsabit and have characteristically high population densities in excess of 1000 persons per square Kilometers with Moyale Township leading at 3422 persons per square kilometer. Displacement impact within urban traverses is likely to be substantial.



Source: KNBS 2010; This Study

Fig 5.1 Administrative and political jurisdictions traversed by the LCIDP

5.2 Livelihood mapping and analysis

A primary distinguishing feature for rural livelihoods world over is reliance on extraction from the natural endowments mainly land and water through fishing, hunter gathering, keeping of domesticated animals and tilling of the land for subsistence purposes with few venturing into trade. From the summary of dominant livelihood systems for landscapes in the entire LCIDP (Table 5.3), it emerges that, with the exception of the two sites of Lamu Mainland and Rift Valley Escarpment at Churo

where fishing and agro-pastoralism dominates, livestock herding is the economic driver for the rest of traverse. From Table 5.3 as well, issues that currently constrain livelihoods in each landscape have been mapped and will be analyzed elsewhere below.

5.2.1 Livelihood systems in Lamu County

An overview of the main resources that anchor livelihoods systems within the Indian Ocean coastline of Lamu were enumerated elsewhere above. These include; - the Indian Ocean coastline which supports fishing based livelihoods, a sub-humid ecology which supports agro-pastoralism and local woodlands that support hunter gathering based livelihoods. Each livelihood system is briefly analyzed below.

(i) Fishing based livelihoods

Other than the mainland areas of Mokowe, Mkunumbi, Witu, Baragoni, Mpeketoni, Kiongoni and Hindi, Lamu County comprises a series of islands numbering over 50 of which, the main ones are Kiungamwini, Siyu, Faza, Mtangwanda, Bori, Shanga, Chundwa, Mbwajumwali, Iyabogi, Kizingitini, Mkokoni, Simambaya and Kiwayuu to the north and Ndau, Pate, Manda and Lamu to the south.

The industry: Fishing is the economic mainstay for Lamu County supporting incomes for 80% of the population (WWF Norway, 2011, 14) of 101,539 people (KNBS 2010). Artisanal fishing in marine areas is the dominant fishing activity accounting for 80 percent of the 2200 metric tonnes of annual catch valued at Kshs. 180 million (Lamu County Government, 2015). And given that, most of the fish caught is exported outside of Lamu, fishing in Lamu is therefore conducted for both commercial and subsistence purposes. Annual fresh water production from the ox-bow lakes of the Tana Delta and Lake Kenyatta is estimated at over 300 metric tonnes accounting for 19 percent of the county's total production with the rest coming aquaculture. As at 2014, Lamu had 28 Fish Landing Sites (FLS)35 some under Beach Management Units (BMUs) overseeing activities of 1500 fisher folk. Though 15 of the FLSs are located on mainland Lamu, with the exception of a small fishing port, none is to be found within vicinity of the Manda Bay site of Lamu Port.

The resource base: The Lamu Archipoelageo comprises of a 130Km long rugged coastline stretching from Dar-es-salaam point in Kiunga to Ras Tenewi in association with over 60 islands separated by numerous mangrove-covered marine channels and estuaries separated from the ocean by coral reef systems (Mwamuye, et al 2013)[36] all of which create conditions quite conducive to fishing. Marine fishing at Lamu therefore, is restricted to the sheltered areas inside the fringing coral reef on account of reliance on old traditional fishing technology which restricts fishers from venturing into the deep sea (Aloo, et al, 2016).[37] The most preferred artisanal fishing gear is gillnets including monofilament nets mainly mounted on dugout canoes tough there is a small fleet of semi-industrial bottom shrimp trawlers restricted to trawlable fishing grounds of the Malindi-Ungwana Bay. Though Kenya has an Exclusive Economic Zone (EEZ) which extends up to 350 nautical miles (nm), this resource remains

[36] Mwamunye eta al, 2013: Determinants of Fishers' Performance in Lamu County, Kenya. International Journal of Business and Commerce Vol. 2, No.8: Apr 2013[01-10]

[37] Aloo et al., 2014, A Review of the Status and Potential of the Coastal and Marine Fisheries Resources in Kenya, International Journal of Marine Science, Vol.4, No.24 1-9 (doi: 10.5376/ijms.2014.04.0024)

under- exploited by the artisanal fishers and continue to be exploited by the Distant Water Fishing Nations (DWFN).

Productivity: Long-term total landings of demersal coral reef fishes averaged 2.11 t/km2/year between 1978 and year 2000 with 2 prominent peaks of 2.98 and 2.9 t/km^2/year in 1982 and 1991 respectively before stabilising at 2.53 t/km^2/year (*Kaunda-Arara, et al, 2003*)[38]. In a recent comprehensive analysis of resilience amongst fisheries (Melita et al, 2016)[39], productivity among fisher folks as indicated by long term average CPUE (catch per unit of effort) was observed to average 4kg/fisher/trip though with high variability. Dermersal fish dominate (46%) the catches with common fish in the landings including: rabbit fish (*Siganus sutor*), variegated emperor (*Lethrinus variegatus*), dash-dot goat fish (*Parupeneus barberinus*), parrot fish (*Sergeant majors*), sweetlips, scavenger, red snapper (*Lutjanus argentimaculatus*), rock cod (*Plectropomus aneolatus*), thumbprint emperor (*Lethrinus harak*), yellow goat fish (*Parupeneus barberinus*), peacock rock cod (*Cephalopholis argus*), pick handle barracuda (*Sphyraena jello*), sailfish and black tip kingfish (*Wakwabi et al. 2003*). Pelagic fish caught along the coast include, King Fish, jacks and tuna, but account for less volume than demersal fish landed (UNEP 1998). Shark and rays are also exploited.

Crustaceans exploited include crabs (widely caught in mangrove areas and beaches along the coast), prawns and spiny rock lobsters, which are exploited commercially (UNEP 1998). Finally octopus has recently become an important fishery; widely exploited along with sea cucumbers and squid *(UNEP, 1998, Malleret-King 1996, McClanahan and Mangi 2001).*

Among other factors, productivity of artisanal fisheries is constrained by reliance on traditional fishing technology which restricts capacity to optimally exploit the available marine fisheries. Traditional technology further exposes fishermen to vagaries of weather in form of the northeast and southeast monsoon seasons (*Maina 2012).* The southeast monsoon season usually lasts 4 months from May to August and is characterized by strong winds and rough seas which restrict fishing thus preventing people from accessing the fisheries and in the process, interfering with incomes of 80% of the population.

Other support resources: Fishing in Lamu relies on presence of extensive sheltered lagoonal fisheries. Other critical resources include:-

Water transport systems: Fishermen utilize the extensive network of marine channels to safely reach and exploit fisheries and deliver catch to the landing sites. In particular, the The Lamu-Faza sea way played by semi-motorized dhows and speedboats is a major transport route linking far flung islands to Lamu Island, the local economic driver. The challenges faced on this route include a black spot near Manda whose severity escalating with the tides following the monsoon winds cycles and hence determine all boat travel and human movement in the archipelago. Blockage of this waterway by port operations is likely to be a major impact from LAPSSET.

Based on review of available information and data, core issues facing the artisanal fisheries in Lamu can be identified as follows:-

Declining fish yields: Many studies investigating the performance of the Lamu and indeed coastal artisanal fisheries failed to reach consensus on the total catch landed annually yet are unanimous on

[38] Kaunda-Arara et al: Long-term trends for coral fish yields in Kenya. Western Indian Ocean J. Mar. Sci. Vol. 2, No. 2, pp. 105–116, 2003

[39] Melita et al, 2016: Artisanal fisheries on Kenya's coral reefs: Decadal trends reveal management needs. Fisheries Research 186 (2017) 177–191

the fact that yield from the fisheries has declined with time. One study even observed that continued decline in marine fisheries production may have been downplayed by the relatively small- 7.4% contribution of marine fisheries (UNEP, 1998) to a sub-sector whose input to agricultural GDP is less than 1% annually (UNEP, 1998).

Yield of marine fisheries is constrained by many factors;- among them a narrow fishery measuring 8500 km^2 equivalent to less than 10% of net productive Lake Victoria Fishery with annual landings in excess of 100,000 MT. Secondly, strong winds associated with prevalence of the South-East Monsoon in March to October occasion rough currently which render the sea inaccessible by local fishing craft such as dugout canoes thereby imposing a seasonal ban on fishing activity and rendering 80% of the population destitute.

Vulnerability: A situation whereby income for 80% of the population are pegged to fishing renders Lamu County quite vulnerable as any small interference with fishing is enough to render them destitute. The situation in Lamu is complicated by the isolated nature of the community on an island that has limited economic activities where the cost of doing business is also high on account of lack of functional road connection to the supply line at Mkowe.

Reliance of the local fishing industry on a constrained domestic market is another compounding factor to vulnerability. The furthest market that Lamu fish can access is Mombasa which is wanting in both variety and quantity and thus offers no motivation for enhanced production.

Table 5.3 Dominant livelihoods within the LCIDP Traverse

Landscape	**Coastal lowlands**		**Garba Tula Plateau**	**Central highlands**			**Rift Valley System**		**L. Turkana basin**		**Isiolo- Moyale**	
	Immediate coastline	Coastal plain to Benane		Meru section	Isiolo Town	Isiolo to Churo	Churo to Nginyang	Tangulbei to Lokori	Lokori-Kakuma	L. Turkana shoreline	Isiolo-Marsabit	Marsabit to Moyale
Main livelihoods	Artisanal Fishing	Pastoralism	Pastoralism	Agro-pastoralism	Pastoralism	Pastoralism	Agro-pastoralism	Pastoralism	Pastoralism	Pastoralism	Pastoralism	Pastoralism
Support /Other livelihoods	Fishing , Hunter gathering, sale of forest produce	Horticulture along Tana River riparian area	Irrigation at Kinna	Rain fed cropping	Wage employment	Hunting		Cattle rustling	Wage employment	Fishing	Trade	Trade
Emerging livelihood systems		Trade	Trade		Trade	Game conservancy	Tourism	Oil based trade	Trade/Oil	Tourism	Game conservancy tourism	
Emerging threats / Concerns	Depletion of fisheries/ competitor from trawlers	Droughts Loss of dry season pasture to irrigation; Overgrazing in riparian areas	Droughts Land degradation	Droughts Subdivision of grazing land , Cattle rustling	Droughts Urbanization, Conflict with elephants	Droughts Land degradation , Cattle rustling, Conflict with elephants	Drought Cattle rustling	Droughts Cattle rustling	Droughts Loss of land to oil blocks Land degradation	Declining fisheries	Droughts Conflict with Elephants , Land degradation	

(ii) Agro-pastoralism

Activities of LAPSSET in Lamu County are mainly confined to the Hindi Division of Lamu West Sub County where the mean annual rainfall of 850mm supports a mixed farming of food/cash crop/livestock livelihood supplemented by fishing and mangrove harvesting (NDMA 2013). Main crops grown in the county include maize, green grams, cowpeas and cassava in combination with coconut, mangoes, coconut, cotton, bixa and simsim. Maize and cowpeas contribute 37 and 20 percent respectively of the food with the rest supplemented by income from fishing and sale of crops and mangrove products.

The major livestock species in the district are goats, sheep, cattle and free range poultry held at an average of 3 TLU per household and contributing about 55 percent to household cash income supplemented by income from sale of crops and mangrove poles.

5.2.3 Potential impact of LAPSSET on livelihoods in Lamu

In depth analysis of potential impact of the LCIDP on local interests including livelihoods is provided in Chapter Eight below. However, for tracking purposes, impacts in Lamu are anticipated as follows:-

- Destruction of fish breeding grounds in the Manda Bay estuaries;
- Blockage of fishermen from accessing fisheries thus compounding impact of the SE Monsoon;
- Potential impact of oil spills on fisheries; and
- Alienation of agricultural land

5.3 Pastoralism

5.3.1 The Kenyan pastoral areas

Kenya's dryland areas (or ASALs – arid and semi-arid lands) make up more than 80% of the country (Fig 5.2) and are home to approximately 4 million pastoralists who constitute 16% of Kenya's population normally straddling national borders with Somalia, Ethiopia, Sudan, Uganda and Tanzania. Pastoralists are divided into various ethnic and linguistic groups, ranging from the large and famous groups like the Maasai and the Somali, who number in excess of half a million people each, to small and so far obscure groups numbering a few thousand (Umar 1997).

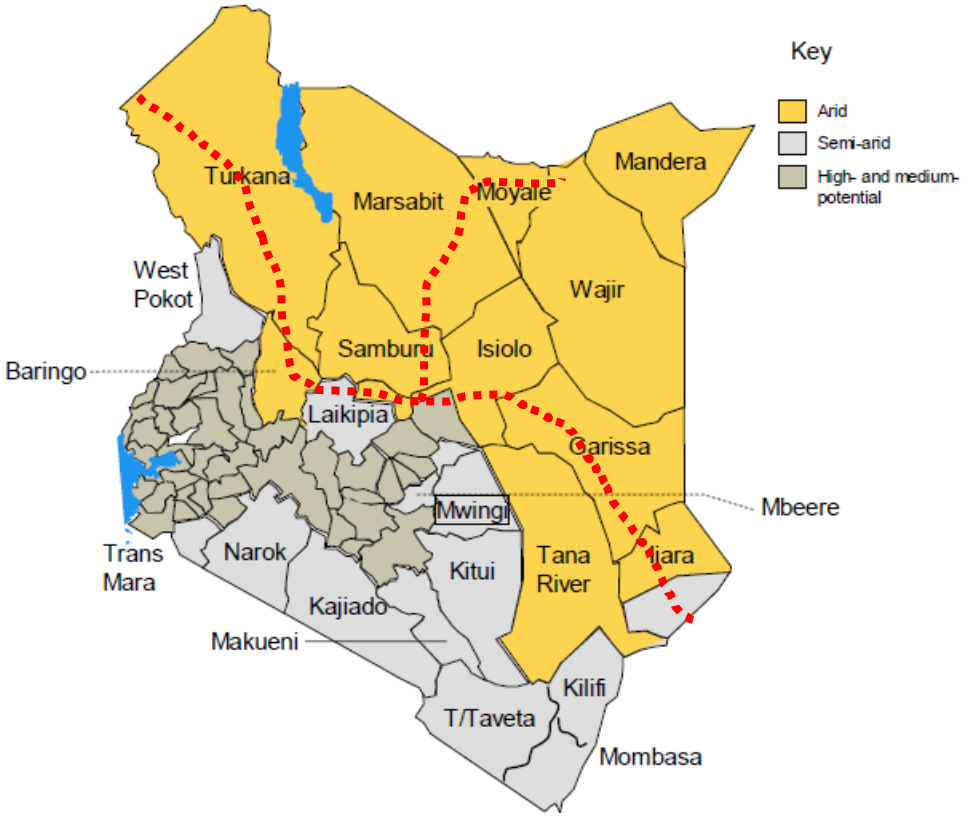


Fig 5.2 The ASAL regions of Kenya

In-spite of its huge potential, contribution of the Livestock sub sector to both Agricultural and National GDP remains low at 17 and 5% respectively mainly on account of Low productivity, inefficient marketing and low value addition where products are exported in semi processed form. Kenya's livestock production accounts for 24% of total agricultural output. Over 70% of the country's livestock worth US$800 million annually (*AU-IBAR in IIED and SOS Sahel 2010*) and 75% of the wildlife are found in the ASALs (*GoK 2005b cited in Orindi et al 2007*). Despite this, pastoralist areas have the highest incidences of poverty and the least access to basic services of any in the country. The highest poverty levels remain in the northern pastoralist districts (in Kirbride and Grahn 2008). Droughts are common in the ASALs, and it has been suggested that they have increased in frequency. The prolonged drought of 2008-9 has been attributed (at least in part) to climate change (Campbell et al 2009).

5.3.2 Limits posed by aridity

Pastoral livelihoods operate within a strict code of conduct and limitation posed by aridity whose dimensions were analyzed in section 4.3 above. Apart Aridity sets limits that have to be strictly observed for life to be possible in ASALs as follows:-

Limits on livelihoods possible: Northwards of Hindi, the agro-ecology becomes more moisture stressed ushering in the Kenyan ASAL belt extending from Lamu to the borders with Somalia, Ethiopia, Sudan and Uganda. The defining characteristics for ASALs is moisture scarcity imposed by aridity and which greatly limits both biological productivity and water availability thus limiting the choices for livelihood to largely livestock production.

Limits on the Carrying Capacity: On account of limiting the range productivity and water resource availability, aridity imposes a limit to the carrying capacity in both space and time which requires that livestock are perennially on the move looking for pasture and water. Communities require flexible access to large areas in the range of 10-12 ha/TLU[40] in search for fodder, water and sometimes, security. Any hindrance to such movement is likely to result in calamities.

Associated with limited carrying capacity is the need for livestock movement. Firstly, livestock need both water and pasture, and most parts of the rangelands have both abundant water and good grazing only at certain times of the year. The rangelands of the Gabra, for example, are located in the very dry and hot lowlands that extend from the fringes of the Chalbi desert in Kenya up to the border with Ethiopia. Here, surface water sources, such as ponds, lakes and rivers, are only found during the wet season, and since there are no permanent sources of water, access to and use of these lands is only possible during the wet season. The Borana plateau, by contrast, is naturally endowed with perennial underground water sources, making it particularly suitable during the dry season and in periods of drought. However, it is unsuitable during the wet season, because some areas become infested with biting flies, ticks and mosquitoes. Most communities thus have a normal seasonal movement, with wet and dry season grazing/watering areas.

5.3.3 The pastoral resource base

Pastures:
An inventory of grazing areas was provided in 4.3 above. The core pastoral resource base is rangelands in form of vast tracts of grazing areas endowed with natural vegetation comprising native grasses and shrubs (*Nalule, 2010*). The range provides a huge variety of grasses, plants and shrubs that are used for livestock grazing and browsing, as well as for medicinal and other purposes. Some of the naturalized herbage grass species commonly found in the Kenyan rangelands include *Themeda triandra, Sporobolus fimbriatus, Cenchrus ciliaris, Digitaria milanjiana, Digitaria abyssinica, Eragrostis cilianensis, Eustachyus paspaloides, Aristida adscensionis, Aristida kenyansis, Panicum maximum, Cynodon spp., Bothriochloa insculpta, Heteropogon contortus,* and others. Some of the naturalized legumes include *Stylosanthes scabra, Macrotyloma axillare, Leucaena leucocephala, and Acacia spp*.
Rangelands are also endowed with a wide range of natural resources, including water sources, forests, salt/mineral licks among others and that animals exploit to produce milk and meat which sustains pastoral communities. Other ASAL products that form part of the livelihood system include honey, gums and resins, wild fruits and berries with the list being long and varying from community to community. A good account of plant products exploited by ASAL communities is provided by *Maundu, et al (2015*).

A core feature of the range resources/ range units is low productivity on account of aridity as illustrated by the case of Isiolo County based on data from the Range Management Handbook.[41] Isiolo's 10 Range Units (Table 5.4) cover an estimated 71.1% of the County's land area of 25336 Km^2. The range units are characterized by low biomass yield with six producing on average less than 0.5 tonnes/ ha annually. The highest yield of 1.8Kg/ha recorded for Nyambeni Unit is still low

[40] Kaye-Zwiebel, E., and E. King. 2014. Kenyan pastoralist societies in transition: varying perceptions of the value of ecosystem services. Ecology and Society 19(3): 17. http://dx.doi.org/10.5751/ES-06753-190317
[41] Herlocker, D. J., Shaabani, S., & Wilkes, S. 1993. Range Management Handbook of Kenya. Vol. II, 5: Isiolo District. Republic of Kenya, Ministry of Livestock Development (MOLD), Range Management Division, Nairobi, Kenya.

compared with observed yields elsewhere - 15 tonnes/year for Rhodes grass[42], 4.91, 3.73 and 22.44 tonnes/ ha for *E. macrostachyus, C. ciliaris and E. superba* [43] and 8.13 tonnes/ ha [44] obtained under field experimental conditions.

Table 5.4: Productivity of Isiolo County range Units

SN	Range Unit	Area Km^2	Productivity (Kg/Ha)		Stocking densities							
			Grass	Shrub layer	Cows	Gazing days	Sheep	Grazing days	Goats	Grazing days	Camels	Grazing days
1	Garb Tula	2970	1687	762	49500	60	212143	80	156316	110	2484	125
2	Nyambeni	1220	1844	854	30500	65	152500	85	87143	115	3097	130
3	Mado gashe	1600	1057	392					17582	90	195	105
4	Ewaso Ng'iro	2225	427	57								
5	Hadado West	810	427	57								
6	Yamicha	1670	427	57								
7	Matokane	2320	427	57								
8	Barchuma	1950	427	57								
9	Kom	1330	427	299					22543	105	2738	120
10	Isiolo	1925	1844	854	24500	65	10780	85	11718	115	10365	130
		18020	899	345	104,500	190	375,423	250	295,301	535	18, 879	610
County herd					101,525		152,164		166,549		101,525	

The Isiolo range resource has divergent carrying capacities for livestock. The County's cattle herd of 101, 525 heads can only be supported for 190 days after which, it has to be out-migrated. The range can support 2.5 times Isiolo's sheep herd of 152,164 for 250 days implying that a herd double the current size can be accommodated year round. Similarly, the range can support 1.8 times the goat herd for 535 days meaning that, a flock double the current herd can be supported round the year by available forage. Quite unfortunately, the available browse can only support about 30% of the county camel herd in an annual grazing cycle.

The implication here is that, Isiolo's available range resources have no capacity to support both the cattle and camel herds, a situation compounded by limitation of grazing and forage in Samburu[45] and Marsabit[46] where none of the 43 Range Units can support respective herds of cattle, sheep, goats and camels for year round grazing (Table 5.5) even in a median rainfall year, let alone a drought year. This explains observed tendency for Isiolo and Samburu livestock to converge at Losesia and then head southwards along Nanyuki road destined for Mt. Kenya Forest.[47] Isiolo's carrying capacity for livestock is likely to be weakened further with development of LAPSSET Corridor and Resort city at

[42] Pasture and Fodder Crops Production Rhodes Grass variety X-Tozi. KARI/e-Mifugo factsheets No. 18/2014. http://www.kalro.org/emimi/sites/default/files/Rhodes%20grass%20x%20Tozi%20factsheet.pdf

[43] Opiyo FO (2007). Land treatment effects on morphometric characteristics of three grass species and economic returns from reseeding in Kitui district, Kenya. MSc Thesis, University of Nairobi, Nairobi, Kenya.

[44] Machogu, c. 2013: A Comparative Study of The Productivity of Brachiaria Hybrid CV. Mulato II and Native Pasture Species in Semi-Arid Rangelands of Kenya. erepository.**uon**bi.ac.ke/.../Machogu_Native%20pasture%20**species**.pdf

[45] Shaabani, S., Welsh, M., Herlocker, D. J., & Walther, D. 1992a. Range Management Handbook of Kenya. Vol. II, 2: Samburu District. Republic of Kenya, Minstry of Livestock Development (MOLD), Range Management Division, Nairobi, Kenya.

[46] Shaabani, S., Welsh, M., Herlocker, D. J., & Walther, D. 1992a. Range Management Handbook of Kenya. Vol. II, 1: Marsabit District. Republic of Kenya, Minstry of Livestock Development (MOLD), Range Management Division, Nairobi, Kenya.

[47] Monica Lengoiboni, 2011: Pastoralists seasonal land rights in land administration: a study of Northern Kenya. phD Thesis, Wegeningen University, Wageningen, Nethrlands.

Kipsing gap both of which will fix additional land from Range Unit 10 (Isiolo) whose land is already lost to the Isiolo Town, Military Installations, the Shaba and Buffalo Springs Game Reserves, Livestock Holding Grounds, among others.

Table 5.5 Cattle hosting capacity for arid counties neighbouring Isiolo

County	**Total range units**	**Cattle hosting capacity (days)**	
		Min	*Max*
Isiolo	10	45	190
Samburu	20	70	190
Marsabit	23	60	140

Source: Range management Handbook[21, 25, 26]

The example of Isiolo serves to illustrate the worrying trend of declining land available for use by pastoralist livestock in Kenya. Further, given that this computation has relied on 20 year old data on range condition and 7 year old livestock census data, conclusions arrived at here may not be representative of actual conditions on the ground particularly considering that the Range Management Team had already raised an alarm over accelerated land degradation in all the nine arid counties. There is chance that some of the range units have been lost to degradation while range condition in others has further deteriorated thus reducing on residency time for all flocks and increasing the need and frequency of seasonal migration which could explain the current pastoralist crises in Kenya.[48]

Computation of range carrying capacity for Isiolo has assumed one continuous range unit accessible by any pastoralist in need but, in reality, each resource is controlled and jealously guarded by different communities eager to secure enough for their livestock. This is the case with Range Unit One-Garbatula which, on account of striding 2 riparian belts;- Tana river and its tributaries Bisanadi, Kinna and Garbatula to the South and Ewaso Ng'iro to the north, commands extensive permanent water and lush riparian woodland pastures making it a convergence point for herds from Turkana, Woriah, and Borana neighbours escaping drought often resulting in occasional bloody conflicts.

Water resources:

A comprehensive mapping of water resources within the arid rangelands was undertaken under auspices of the Range Management Handbook (GOK, 1994) and the same was highlighted in section 4.4 above. Alongside rangelands, sources of potable water for both people and livestock are the second most important resource. Indeed, availability of water within reach determines the level of utilization of range resources and herds are moved as soon as water sources get depleted. Traditionally, surface water in rivers, streams, springs, lakes and dams form the main source of water for all needs. Within the Corridor area, main surface water bodies were highlighted in section 4.4.2. On account of aridity, only the Tana has a continuous flow to the Indian Ocean while all others; - Ewaso Ng'iro, Milgis, Markutan, Suguta, Kerio, Turkwell and Tarash are only permanent in their upper more humid catchments but become ephemeral in the lower more arid reaches. The ephemeral rivers have flows only in the wet season but continue their flow as underground rivers in the dry season from which water is extracted through excavation of shallow wells to the river bed or construction of sand dams.

Dry season-wet season grazing areas:

It takes ingenuity for pastoralists to sustainably operate viable livestock based enterprises for centuries under the highly unpredictable ecology typical of arid lands. Part of the resilience strategy was the practice of designate pasture areas as designated dry season grazing grounds which he community

[48] This analysis was written against a backdrop of a biting drought in January 2017 which occasioned massive death of livestock in Turkana and Baringo Counties.

would fall back to in case of drought of prolonged dry seasons. Under general leadership pf elders supported by the warrior age set, pastoralists would set aside wetlands, mountainous and riparian areas for grazing during the dry season, thus allowing the lowlands to recover from livestock pressure. A similar range utilization pattern is followed by most wildlife species, which move from the dry plains to high moisture areas (Estes, 1991). This forage utilization system gave the rangelands time to recover from the stress of droughts and grazing.

During the dry season, availability of water other than pasture is the key determinant what decisions to make in which case, a dry season grazing reserve (DSGR) must have permanent water and fodder reserves even under the poorest environmental of conditions i.e. including the absolute peak of the dry season, and are thus irreplaceable as reserves during the cyclical periods of scarcity. Dry season grazing reserves are utilized intensively over long periods, receiving disproportionate grazing pressure in seasons when drought limits herd mobility (Schwartz, 1994). Fig 5.2 below models the utilization patterns for DSGRs. Being a fodder reservoir, ordinarily the DSGRs is expected to command a peak standing crop (PSC) expressed as the net forage stock net productivity (NPP) less proper use factor (*Toxopeus, 1996*) equivalent to recommended maximum level of forage required to ensure sustainability. Sustainable functioning of the DSGR as the Community's lifeline and fall back in times of scarcity is contingent upon this PSC being maintained constant through renewal at the beginning of subsequent cycles.

Peak standing crop (PSC) is the potential total forage available at the beginning of the dry season. For sustainable use, the PSC should not be utilized beyond the proper use factor threshold (*Toxopeus, 1996)* and a reserve equivalent to 45% of the stock should be left un utilised at the end of the dry season (FAO, 2000) to serve as the growing/ productive stock to enable the forage recover adequately during the next rainy season. The peak standing crop at the end of the rainy season is dependent on firstly, the growing stock (prospect use factor), climate and soil condition. Were the growing stock is overused or degraded through over-use; the ability to recover during subsequent rainy seasons is highly compromised.

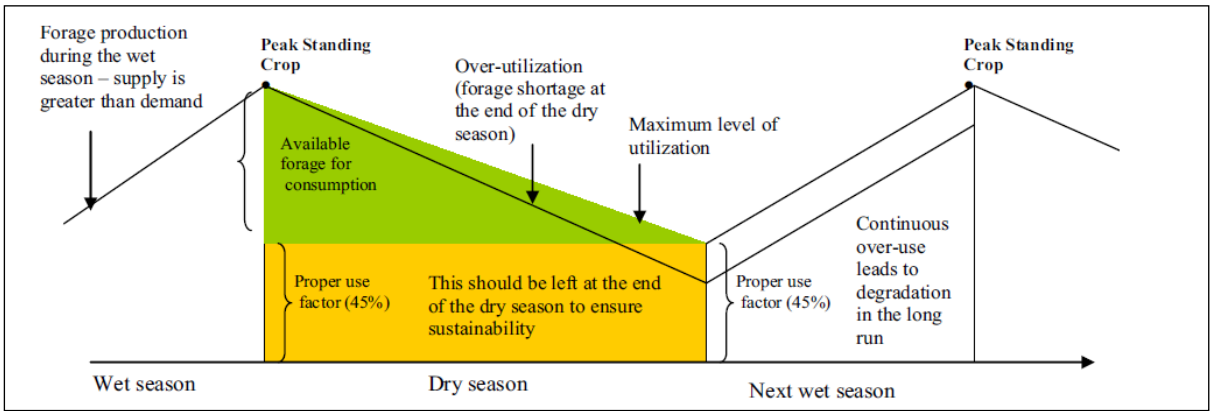


Fig 5.2: The DSGR Model

From an inventory of DSDRs within the LCIDP's influence area of influence, it emerges that, riparian woodlands, hills and montane foot slopes form the main dry season grazing grounds on factors of inaccessibility during rainy season which guarantees fodder availability in dry seasons and plentiful supply of surface water in the dry season which make them naturally attractive as DSGRs. However, based on information accrued from available reports and on the ground investigations for this SEA Study, the integrity of each of the 17 DSGRs compromised by diverse factors, some historical whose overall effect is to undermine their functioning as dry season fall backs. Firstly, on account of historical seasons, the former dry season range has been reduced through land alienation for game

ranching, irrigation, conservation and settlement while remaining portions, unable to cope with increased exploitation pressure either due to increased herds or drought driven over-use have overtime become degraded through overgrazing. In recent times, horticultural farming driven by need to enhance food security especially along the River
Tana and Ewaso Ng'iro riparian belts have further cut down on the available resource whose access is sometimes constrained by conflict.

Table 5.6: Status of DSGRs in the LCIDP Traverse

Landscape	Communities	DSGR	Issues
Coastal lowlands to Benane	Worriah clans	Lamu &Tana River Delta	Land loss to farming and Commercial farming
		River Tana Riparian Reserve	Degradation from overgrazing/ overuse Irrigated horticulture Alienation for conservation: Araware and Rahole nature Reserves
Northern Grazing area in Garba Tula	Borana	Ewaso Ng'iro riparian in Garfasa, Malka Daka, Sericho	Encroachment by small scale irrigation Degradation from overgrazing Conflict
	Borana, meru	Tana River Riparian in Kinna, Bisanadi National Reserve	Official alienation for irrigated agriculture-Kinna and Rapsu Irrigation Schemes Alienation for conservation-Bisanadi Nature Reserve/ Meru National Park
Northern Grazing Area between Kula Mawe and Isiolo	Borana, Turkana, Meru, Worriah	Nyambeni Foot slopes	Encroachment by SS farming
		Ewaso Ng'iro riparian	Alienation for conservation-Nyambeni, Shaba and Buffalo Springs Game Reserves Alienation for Institutions Encroachment by agricultural settlements Conflict and cattle rustling
Highlands section in Isiolo and Laikipia Plateau	Samburu, Laikipia Maasai, Borana	Ewaso Ng'iro Riparian	Degradation from overgrazing Alienation for conservation-Buffalo Springs and Samburu Game reserves Alienation for Livestock Grazing grounds
		Mt. Kenya Foot slopes	Alienation for Game/ Livestock ranching and now horticulture
		Ng'arua Escarpment, Kirisia and Leroghi plateaus	Alienation for conservation: Kisia and Marmanet Forests, Encroachment by Settlements
Rift Valley Escarpment	Samburu, Pokot	Escarpment forest Sukuta Marmar	Alienation for game ranching
		L. Baringo Riparian	Degradation through overgrazing Samburu-Pokot conflict on boundaries. Submergence by rising lake levels
Suguta Valley to Lokori	Pokot Turkana	Highlands in West Pokot	Conflict
Turkana basin	Turkana	Riparian areas of Kerio, Turkwel and L. Turkana	Encroachment by Irrigation, urban settlements and lately mining, Land degradation, Conflict
Lokitipi basin	Turkana Kakuma	Tarash River and Lotikipi Wetlands	Alienation for Kakuma refugee camp Overgrazing in Likipi wetland

	refugees		
Isiolo-Marsabit-Moyale transect	Samburu, Borana, Rendile, Galla and Gabra	Ewaso Ng'iro Riparian	Alienation for conservation-Samuru Game Reserve Alienation for conservancies-Westgate, Kalama
		Matthews and Dottos ranges	Alienation for conservation-Trust land forests and Losai Nature Reserve
		Riparian woodlands on Milgis, Merile and other laggas	Degradation through over-use
		Mt. Marsabit Ecosystem	Alienation for conservation: Mt Marsabit National Park and Nature Reserve Encroachment by agricultural and urban settlements Human wildlife conflict
		Turbi Hills	Incursion by Oromo Liberation Front Encroachment by urban and agricultural settlements

Source: This Study

Thus, while originally, pastoral survival was constrained by blockage of access paths to DSGRs, currently, the fundamental cause of the pastoral crisis which, of necessity manifests during periods of prolonged dry season and drought is this virtual loss of the dry season fall-back resource base.

Livestock genetic resources:
To the pastoralist, the animal means everything:-Through its role as a mediator enabling human beings to extract sustenance from a hostile ecology, livestock is often the sole means to survival in ASAL areas and core to pastoral livelihoods. Traditional pastoralism is typically a subsistence-level production system, with families relying more on milk than meat for nutrition, selling animals to get cash for other economic needs, and building herd sizes to accrue social status, wealth, and risk buffering (Fig 5.3).

Fig 5.4 and Table 5.6 present data on livestock populations within the traverse based on the 2009 Population Census. Goats, sheep, cattle, dromedaries and donkeys are the predominant holdings in the pastoral economies. In terms of absolute numbers, the goats predominates the traverse with a count of 9.3 million followed by sheep and cattle. However, in terms of biomass as expressed in Tropical Livestock Units (TLUs)[49], cattle account for 48.9% followed by camels at 20.8% with goats' emerging a distant third at 13.2% (Table 5.6). To the pastoralists occupying arid lands, the keeping of livestock is both an income and a mobile nutrient bank for food security that also serves social, economic and cultural purposes. Livestock are also a key buffer in withstanding shocks, particularly droughts. Large herd sizes prior to a drought ensure viable herd sizes after a drought despite mortality in which case, the pastoral identity is to favour large herd sizes. Thus, the ASAL belt traversed by LAPSSET commands a total of 6,406,966 TLUs of which 50% is contributed by Turkana. Thus, while ASALs account for 70% of the national livestock resource base, 37% of the national base equivalent to 52.9% of the ASAL livestock population is accounted for by the LAPSSET Corridor Counties which also command 45% of the national camel and donkey population respectively.

[49] *TLU = Tropical Livestock Units where 1 Camel = 1 TLU, Cattle = 0.7 TLU, 1 Sheep or Goat = 0.1 TLU, (*Mwanyambu et al), Donkey =0.5 TLU

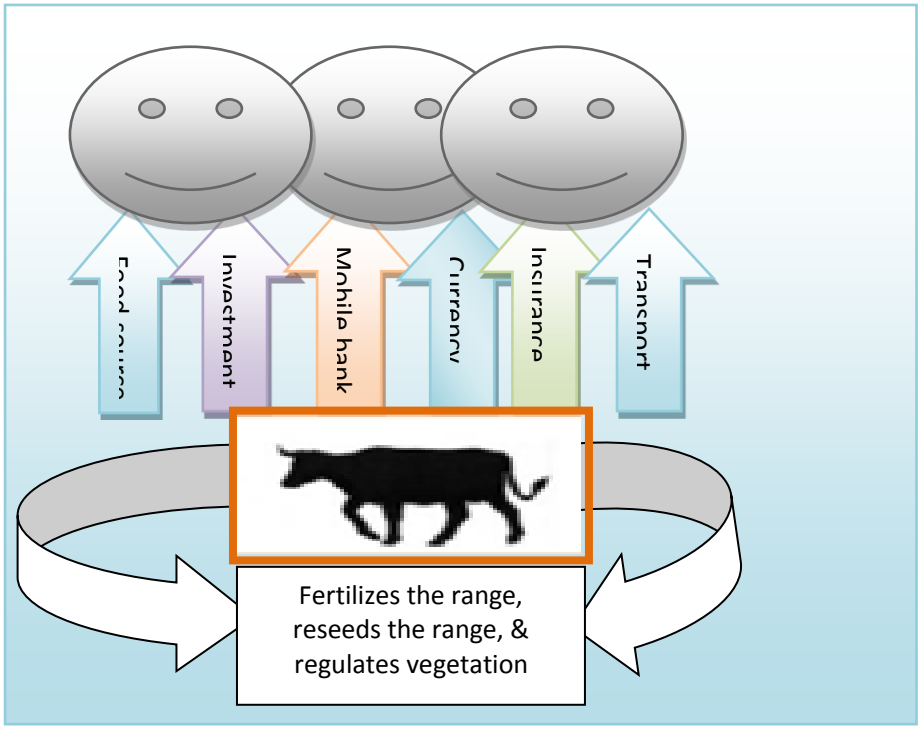
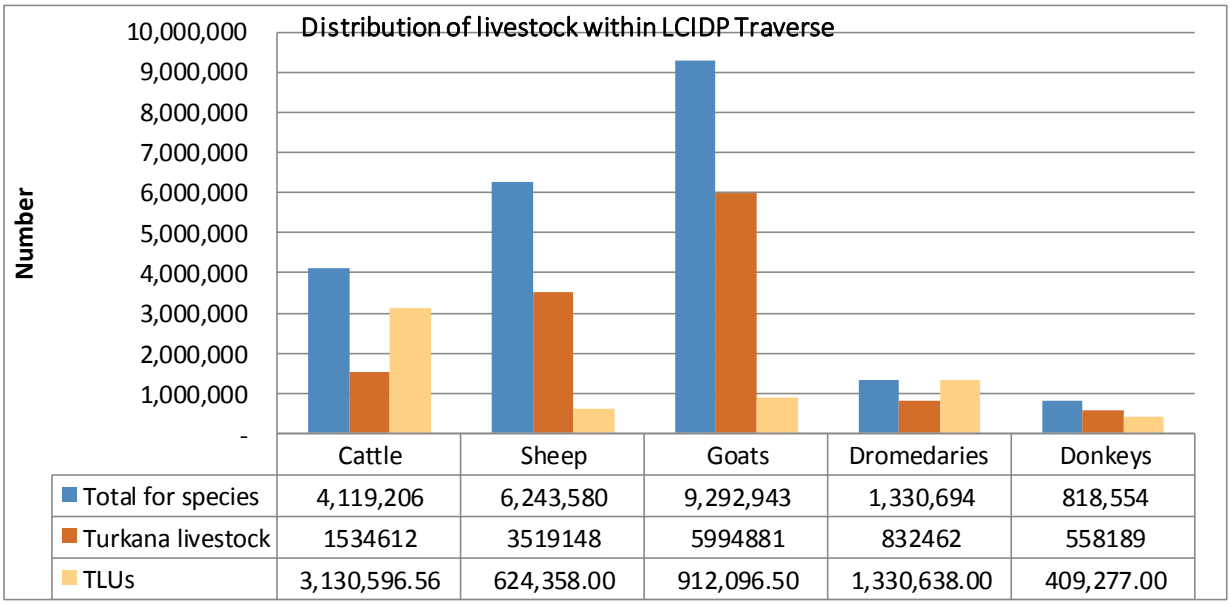


Fig 5.3 Livestock is a one stop investment for pastoralists, simultaneously meeting all needs



	Cattle	Sheep	Goats	Dromedaries	Donkeys
Total for species	4,119,206	6,243,580	9,292,943	1,330,694	818,554
Turkana livestock	1534612	3519148	5994881	832462	558189
TLUs	3,130,596.56	624,358.00	912,096.50	1,330,638.00	409,277.00

Fig 5.4 Population of dominant livestock within the traverse

Given the water stressed nature of pastoral areas, locally and naturally adapted livestock breeds characterised by hardiness, higher disease, parasite and drought resistance, etc. are critical for sustainability. Thus, overtime, pastoralist have selected and accumulated germplasm that is able to survive, grow, reproduce and produce under harsh ecological conditions while withstanding climatic shocks. Part of the pastoral legacy to the region is conferment of such breeds as the Borana Zebu Cattle, Maasai Sheep, Galla goat etc. which have continuously been cross-bred to improve on yield

while retaining the hardy conditions necessary for survival in marginal climate areas. By continuing to propagate indigenous livestock breeds, pastoralists maintain not only genetic diversity but also important indigenous knowledge regarding the health, management and reproduction of livestock.

Table 5.7 Livestock Population in LAPSSET Counties

County	Cattle	Sheep	Goats	Camels	Donkeys	Total TLUs	Human Population	Pa Capita TLUs
Lamu	81,200	15,626	68,178	0	2,572	66,506	123,842	0.6
Garissa	816,616	942,732	1,294,687	261,100	160,000	1,136,473	423,931	4.1
Isiolo	101,525	152,164	166,549	101,525	11,874	210,401	153,875	2.3
Meru North	143,270	82,900	103,800	56	4,600	121,315	292294	0.4
Laikipia	275,000	350,000	400,000	19,800	13,475	294,038	487,934	0.8
Samburu	173,243	742,818	403,955	42,124	27,654	291,898	273,804	1.2
Baringo	523,740	424,886	832,731	13,627	15,190	513,602	679,256	0.8
Turkana	1,534,612	3,519,148	5,994,881	832,462	558,189	3,137,188	1,045,579	0.8
Marsabit	470,000	13,306	28,162	60,000	25,000	405,647	312,698	0.7
Total (LC)	4,119,206	6,243,580	9,292,943	1,330,694	818,554	6,177,068	3,793,213	(1.2)
Total pop (national)	17,467,774	17,129,606	27,740,153	2,971,111		0		
TLU (national)	13,275,508	1,712,960	2,774,015	2,971,111	1,832,519	21,649,855		
TLUs (LC)	2,883,444	624,358	929,294	1,330,694	409,277	6,177,068		
TLUs (% of national)	22	36	33	45	22	29		
TLUs (% by spp)	47	10	15	22	7	100		
Turk pop (% of LC)	37	56	65	63	68	58		
Turk TLUs	1,166,305	351,915	599,488	832,462	279,095	3,229,265		
Turk (% of LC)	37	56	66	63	68	50		

LC=LAPSSET Corridor

Wildlife resources:

ASAL rangelands are home to pastoralists alongside wildlife. According to the Kenya Wildlife Service, more than half of wildlife habitats in the country are outside protected areas, [50] in communal grazing lands where wildlife, people, and livestock all interact and share the same natural resources such as pasture and water (Mwele, 2011) with mixed outcomes. A comprehensive analysis of possible interrelationships between wildlife and pastoralists is provided in Benka (2012).[51] Though wildlife enjoys a high esteem at national level on account of attracting the tourist dollars that drive GDP growth, this sentiment is not shared by grassroots communities who coexist with wildlife and therefore pay the cost in terms of damage to crops especially and killing of big livestock by elephants, loss of small stock to leopards, cheetahs, hyenas and wild dogs, injuries and death to human beings

[50] Ochola, et al 2016: Application of Indigenous Knowledge Systems in Wildlife Management: A Case Study of the Samburu Pastoral Community in Kenya. International Journal of Applied Science and Technology Vol. 6, No. 1; February 2016

[51] Benka, VW, 2012: Human-wildlife conflict, inter-species disease, and justice in a wildlife rich region of Kenya. Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science (School of Natural Resources and Environment) at the University of Michigan.

from elephants among others. In a scenario where such wildlife-induced damages to human property and life are neither controlled nor compensated, negative local attitudes towards conservation and wildlife resources become entrenched (Okello and Wishitemi 2006) and the same is aggravated when local communities do not benefit from wildlife resources and are alienated from wildlife-related economic enterprises such as the lucrative tourism industry. When local communities feel that both the government and conservation stakeholders value wildlife more than their lives, livelihoods or their aspirations, retaliation and opposition to conservation initiatives are often swift and uncompromising. Wildlife suffers retaliatory killing through spearing and poisoning (Wildlife Conservation Action Plan), and is under threat from poaching for commercial or subsistence purposes.

Indigenous Traditional Knowledge:
Overtime, pastoralists have developed a knowledge resource base that enables them to sustainably extract environmental services from a hostile ecology without external input. Consequently, strategies for resource exploitation such as;- maintenance of an optimal balance between pastures, livestock and people; herd manipulation through maximization, herd diversification, species diversification, migration and herd splitting among; reliance on ethnobotany into manage human and animal health; traditional weather prediction and forecasting; raiding and counter raids; among others that are commensurate to the inherent conditions have been adopted.

Goodwill and reciprocity from pastoral neighbours:
A core feature of the rangeland resource is its seamless nature in that, to the pastoral community, the rangeland, water resources, wet and dry season grazing areas, high- and low-quality grazing – together constitute interlinked components of one single physical and economic asset whose different features are 'combined' through herd mobility. Such resources were used continuously and in rotation without any physical limitations as later imposed by colonial administration in the 19th Century. The rangeland as a whole constitutes a communally owned economic resource that must be shared among the different pastoralist ethnic groups and clans living in the area.

In the nineteenth century, the establishment of the international borders between Kenya, Somali, Sudan and Uganda effectively cut this single asset into several blocks but, given that for mobile pastoralists the rangeland is only economically viable when used and managed as a whole, they have continued their seasonal movements, often including movement across the border to access dry and wet season grazing areas and water.

5.3.4 Role of livestock enterprises in pastoral livelihoods

Provision of family sustenance:
Pastoralism is essentially a subsistence level economy in which livestock provides family sustenance supplemented with purchased inputs. The basic pastoral household food basket on average consists of livestock products, grain and grain products, vegetables and sugar. To meet the protein complement therefore, every pastoral household will keep a mix of livestock; camels, sheep, goats, cattle and donkeys in a composition that varies across communities depending on prevailing circumstances.[52] At the barest minimum, a family of eight has been found to generally require a subsistence herd size comprising 20 adult cows, 2 bulls, 7 female and 5 male calves under 1 year old, 4 female and 2 male

[52] **Mwanyumba P M, Wahome R G, MacOpiyo L and Kanyari P 2015:** Pastoralist livelihoods, resources and strategies in Garissa County, Kenya. *Livestock Research for Rural Development. Volume 27, Article #202.* Retrieved January 12, 2017, from http://www.lrrd.org/lrrd27/10/mwan27202.html

calves 1-2 years old and 3 female and 1 male immature.[53] In the case of pastoralists in Garissa County, family herds generate 90% of the milk and dairy products input into the family diet while market accounts for 80-100% of maize meal consumed, beans/pulses, roots and tubers, wheat products, fats and oils. A similar trend was observed amongst Somali and Borana pastoral households located in Isiolo Central sub-county and Kina sub-county, respectively, Isiolo whereby the cost of a household food basket averaged Kshs 721.10[54] in year 2012 prices.

Goats are the highest source of food (50%), followed by sheep (30%), cattle (15%) and camels (5%). Similarly goats are the highest contributors (55%) to household income from livestock, followed by cattle (25%), sheep (15%), and camels (5%). Goats are also the most sold species at 46% and also accounted for 49% of the milking animals.[24] To the pastoralist, livestock produces the proteins required for sustenance and are sold to generate cash income required to purchase calories and other inputs into the family diet and hence directly and indirectly account for the bulk of family nutrition. As such, any situation or action that interferes with the health and productivity of livestock particularly goats, poses a direct threat to family survival. This is particularly the reason why drought has such devastating impact on pastoral livelihoods through either curtailing livestock productivity or decimating the productive resource. A study conducted amongst the Borana of Isiolo County, [55] observed that some households had become destitute on account of losing livestock to drought and raids and were therefore reliant on relief aid from the government and other development agencies. Such pastoral drop-outs are normally the most poverty stricken amongst pastoral communities.

Even when pastoral livestock is migrated away from settlements, a few animals are grazed around to cater for family sustenance while women will often be seen travelling to the herds to pick milk. In particular, sheep and goats were kept nearer to the households, followed by camels while cattle were driven farthest. Livestock species support livelihoods in different ways and their nutrient resource requirements also differs and this determines their association with households. Goats are the most milked and sold animals, and can utilize grass, shrubs, larger forage trees and seed pods from such trees as *Acacia tortillis* which is common in ASALs, hence likely to survive for longer within or near the settlements. Camels also provide milk and transport and depend on browse from shrubs and trees that are resilient to drying and survive degradation better than grass. On the contrary, cattle are largely grazers dependent on grazing which has to be searched for over a wider range.

Contribution to household cash income:
Livestock production is the dominant income earner amongst pastoralists sometimes contributing up to 72% of the total household income through sale of animas and milk. In Ethiopia, livestock based income still remains the single and most important source of livelihoods among pastoralists contributing 89% out of the total income. [56] Amongst pastoralists around Lake Baringo, Livestock was found to contribute 24.9% and 62% of the total income, during wet season, among under Sedentary Agro pastoralists (SAP) and Sedentary Nomadic Pastoralists (SNP) respectively but this

[53] **Horowitz M M 1980** Research priorities in pastoral studies: an agenda for the 1980s. In Galaty J.G., Aronson D., Salzman P.C. and Chouinard A. (Eds), 1980. The future of pastoral peoples. Proceedings of a conference held in Nairobi, Kenya, 4-8 August 1980. Commission on Nomadic Peoples, Canada; IDS/UoN, Nairobi; IDRC, Canada. Pp 81.
[54] Elhadi et al 2015: Role of camel milk in pastoral livelihoods in Kenya: contribution to household diet and income. Pastoralism: Research, Policy and Practice (2015) 5:8 DOI 10.1186/s13570-015-0028-7
[55] A Kagunyu and J. Wanjohi, 2014: Camel rearing replacing cattle production among the Borana community in Isiolo County of Northern Kenya, as climate variability bite. Pastoralism: Research, Policy and Practice 2014 4:13. Springer 2014
[56]Tagesse et al, 2016: Melketo[1], Michelle Bonatti[2], Stefan Sieber[2], Martin Schmidt[3], Jonas Koch[3] Pastoral Households' Livelihood Diversification Strategies: Evidence from Afar Region, northern Ethiopia. www.tropentag.de/2016/abstracts/posters/295.pdf

reduced to 21.9% and 45.9% respectively during the dry season. [57] Amongst the SAP, income from livestock supplemented that from crop production (40.8 and 12.2% in wet and dry season respectively), trade, wage employment, charcoal and bee keeping while among the SNPs, bee keeping and supplemented by livestock production at 15.3 and 13.2% respectively. Amongst the SNP, reliance on charcoal was observed to increase from 4% in wet season to 10.5% in the dry season respectively implying that climatic conditions is a driving force to environmental degradation. Amongst the Samburu, livestock production contributes 85% of income in Pastoral livelihood zones and 60% in Agro pastoral zones[58] while in Garissa; livestock production provides 95% of household income. In Marsabit County, contribution of livestock to household income was computed at 71.9%.[59]

5.4 Status of Well-being within the Corridor

5.4.1 Poverty levels

Data on income levels for pastoral households are not easy to come by. However, going by what is available (Table 5.8), incomes amongst pastoral households are generally low, just slightly above Kshs 94207.90 annually. Allocated amongst a standard household of 5.9 members, this translates to a daily per capita income of Kshs 44 which is inadequate to meet the basic minimum calorie intake. To categorize whether a household is income poor, the absolute and official poverty line (threshold below which people are deemed poor) of KSH 1,562 per month for rural areas is applied based on the Kenya Integrated Household Budget Survey 2005/2006 (KNBS, 2007). When adjusted for inflation for the period 2007 to 2016, poverty lines of Kshs 1,962.10 and 4,690.60 per adult equivalent living in rural and urban areas respectively were obtained.

Table 5.8 Household incomes for LAPSSET Counties

County	Community	Annual HH Income (Kshs)	Pa capita daily income (Kshs)			Ref
		Empirical	Empirical for pastoral households (Kshs)	Official [43] County level data(Kshs)	Official County data (USD)	
Lamu			51.50	93.9	0.90	
Garissa				53.9	0.50	
Isiolo	Borana	141, 478.60	66.60	81.3	0.80	26
Meru North				94.0	0.90	
Pastoral Laikipia				93.9	0.70	
Baringo	Sedentary Nomadic Jemps	62,173.50	29.30	71.0	0.70	29
Samburu[60]	Pastoralists	60,000	28	85.0	0.80	33
Turkana[61]	Turkana	70,000	33	53.9	0.50	32
Marsabit [62]	Pastoralists	137,387	65	68.1	0.70	34

[57] Yazan, et al: 201: Transient Poverty Among Pastoral Households in the Semi-Arid Lowland of Baringo District, Kenya. Ocean Journal of Social Sciences 5(1), 2012

[58] Government of Kenya, 2009: Government of Kenya. (2009). 2008-2012 Garissa district development plan. Government printers, Nairobi, Kenya.

[59] Mburu, S. K 2016: Incomes and Asset Poverty Dynamics and Child Health among Pastoralists in Northern Kenya.- PhD dissertation. Submitted in partial fulfilment of the requirements for the doctorate degree in Economics "Dr. oec. in Economics" to Faculty of Business, Economics and Social Sciences, University of Hohenheim, Germany.

[60] Rufinao, et al, 2013: Transitions in agro-pastoralist systems of East Africa: Impacts on food security and poverty. Agriculture, Ecosystems and Environment 179 (2013) 215–230

[61] Watete et al, 2016: Are there options outside livestock economy? Diversification among households of northern KenyaPastoralism: Research, Policy and Practice (2016) 6:3 DOI 10.1186/s13570-016-0050-4

Mean HH Income		94, 208	44(monthly pa capita of Kshs 1,430)	60.60 (Monthly pa capita of 1,817)	0.7	

Source: Diverse

From table 5.5, a mean daily pa capita income of Kshs 44 equivalent to a monthly income of Kshs 1,430 was computed for pastoral households based on diverse empirical studies. The same is however way below the 2006 national Poverty Index implying that majority of pastoral households in sampled counties subsist below the poverty line. The average, pa capita county level mean monthly household income for Counties traversed by LAPSSET of Kshs 1817 falls in between both the rural and urban poverty indices against which it cuts across. Compared to the empirically derived income levels, official, county- level estimates of poverty appear to grossly underestimate prevalence amongst pastoral households. This notwithstanding, however, prevalence of poverty within the northern Arid Counties remains quite high as documented in Fig 5.4 based on 2009 Census estimates for administrative Wards traversed by the LAPSSET Corridor. Out of 33 wards sampled between Lamu and Nakadok, only 9 have poverty prevalence below 50% with only four falling below the national average of 45.2%.[63] Lowest showing of poverty is recorded for Lamu and Meu North sections of the traverse while Turkana and Marsabit account for the highest prevalence in excess of 80%. In sections below, other dimensions of poverty are documented as a background to the socio-economic interventions targeted under LAPSSET.

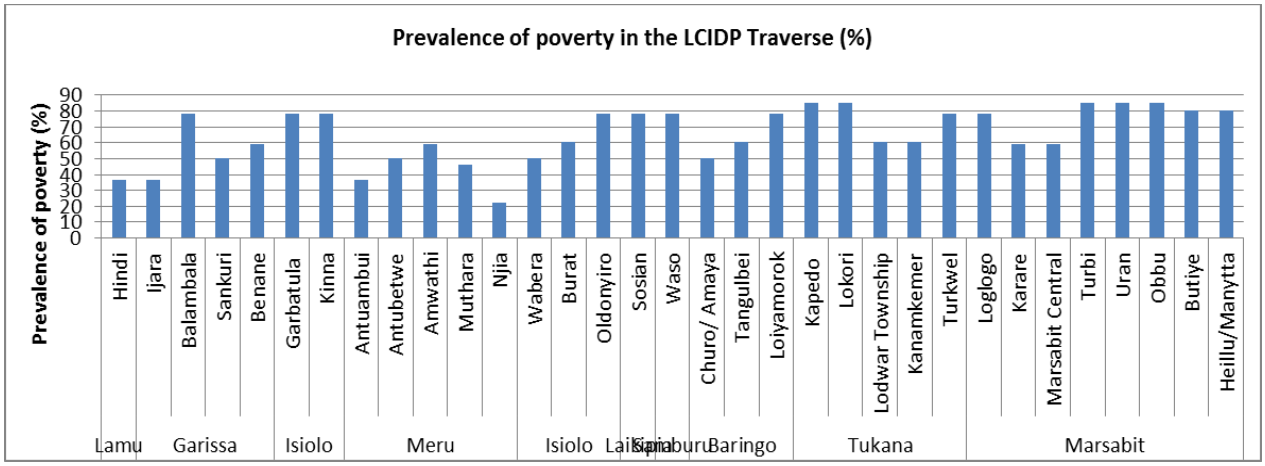


Fig 5.7 Prevalence of Poverty within wards traversed by the LCIDP

5.4.2 Disaggregated Poverty

Towards better understanding of the dimensions of poverty amongst pastoral households, and towards providing a basis for targeting interventions, poverty occurrence has been disaggregated based on application of an asset poverty line[64],[65] whereby , a per capita asset threshold of 4.5+TLU is applied

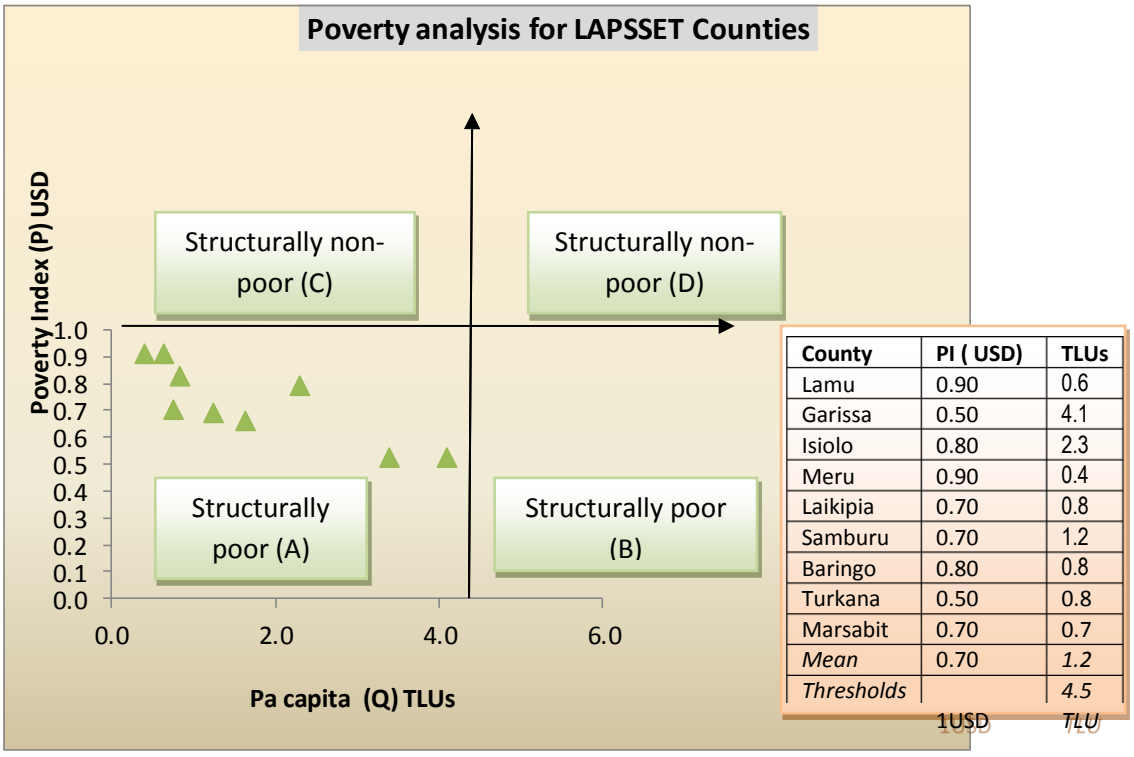
[62] Little, Peter D.; McPeak, John G.; Barrett, Christopher B.; and Kristjanson, Patti, "Challenging Orthodoxies: Understanding Poverty in Pastoral Areas of East Africa" (2011). Economics Faculty Scholarship. Paper 83. http://surface.syr.edu/ecn/8

[63]Kenya National Bureau of Statistics (KNBS) and Society for International Development (SID), 2013: Exploring Kenya's Inequality-Pulling Apart or Pooling Together?,KNBS&SID,2013. www.knbs.or.ke/index.php

[64] Carter, M.R. & Barrett, C.B. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. Journal of Development Studies, 42(2), pp. 178–199.

to delineate between better-off and poor pastoral households[36, 37] (Fig 5.6). Here, the asset poverty line is simply the level of assets that predicts a level of well-being equal to the poverty line. Assuming that the livelihood function does not change overtime a household is stochastically poor if it records income below the poverty line in spite of commanding assets that can marshal the same. Conversely, the household is structurally poor if its stock of assets and corresponding income fall below both the asset poverty line. Movement from ***D*** to ***A*** reflects a structural transition to below the poverty line because of a loss of or decreased returns on assets that causes income to fall this low. In general, movement in the opposite direction (from ***A*** to ***D***) represents a structural shift out of poverty, possibly because of either an accumulation of assets or improved returns on the household's existing assets (Carter and Barrett, 2006; Barrett et al., 2006).More specifically, households with livestock below the 4.5+TLU level are unable to escape poverty even during good times when grazing pastures are adequate.

Application of this analysis to the LAPSSET Corridor Counties based on per capita TLUs alone (Table 5.4 above and Fig 5.6 below), reveals that, pastoral income levels and livestock holdings within the LAPSSET Traverse are below both the Income Poverty Line (1 US dollar per day) and the Asset Poverty Threshold of 4.5TLU. Essentially, households within the traverse are both asset and income poor. This agrees with recent findings in Marsabit County[31] which documented majority of households surveyed to be structurally poor with the proportion rising from 66.8% in 2009 to 69.3% in 2013 primarily through loss of assets thus supporting the general observation that poverty within the pastoral belt of Kenya, poverty is on the increase.



County	PI (USD)	TLUs
Lamu	0.90	0.6
Garissa	0.50	4.1
Isiolo	0.80	2.3
Meru	0.90	0.4
Laikipia	0.70	0.8
Samburu	0.70	1.2
Baringo	0.80	0.8
Turkana	0.50	0.8
Marsabit	0.70	0.7
Mean	0.70	*1.2*
Thresholds		*4.5*

Fig 5.6: Disaggregated Poverty in the LCIDP Traverse

[65] Little, P., McPeak, J., Barrett, C. & Kristjanson, P. (2008). Challenging orthodoxies: Understanding pastoral poverty in East Africa. Development and Change, 39(4), pp. 585– 609

A close scrutiny of Fig 5.6 reveals some upward mobility from structural poverty to stochastically non poor state implying a situation of increasing income without assets possibly on account of diversifying from pastoralism. As well, the Marsabit Study showed a clear decrease in the proportion of structurally non-poor (those with assets and cash income) from 14.3% in 2009 to 9.6% in 2013 implying that the rich segment is decreasing. These results also support previous reports of high occurrence of structural poverty, limited upward structural mobility, and increasing upward stochastic mobility among sampled households in Kenya and South Africa, of observations [66] respectively. Going by observed trends in both asset index and TLU per capita between 2009 and 2013, the majority of households remain structurally poor mainly due to loss of livestock to drought and diseases.

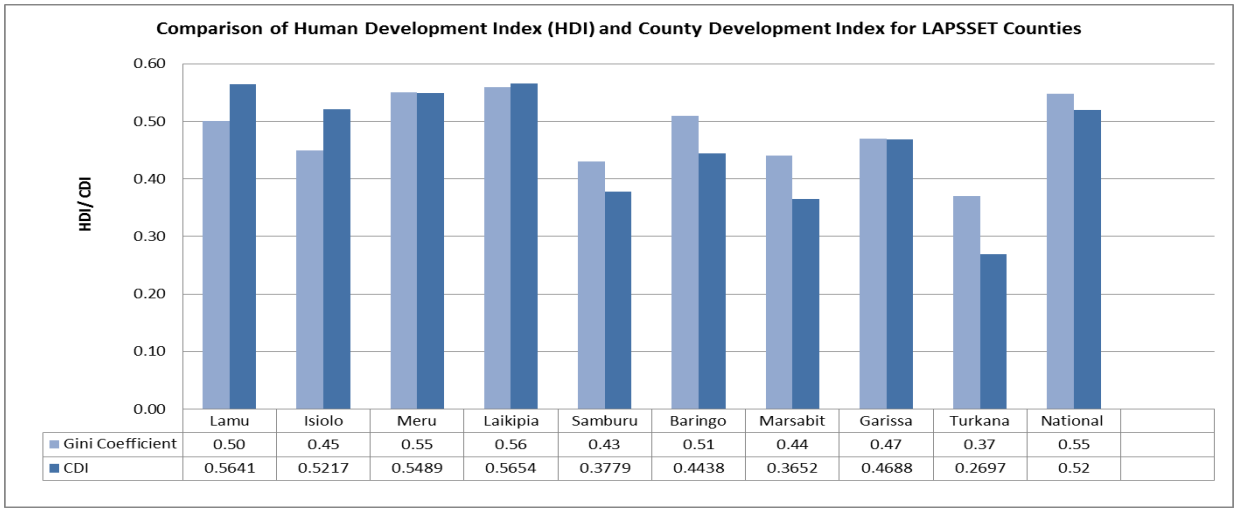
Disaggregation of poverty data reveals another major disadvantage for pastoral communities. On account of prevailing communal land ownership, pastoral communities cannot count land among physical assets with the effect that upward mobility to structural non poor can only be anchored by on livestock, the latter of which remains vulnerable to climatic variability including drought. As such, accumulation of an asset base for pastoralists becomes a daunting task unlike amongst other communities where any maturing individual can count on some land resource amongst their assets. By extension, pastoral communities are denied of the asset base which can be borrowed against as collateral thus denying them equal opportunities to develop. There is probably need to look for legal avenues through which, a share certificate can be issued to individuals in a group-owned community land against which one can borrow for investment.

5.4.3 Dimensions of Poverty in Northern Kenya

Findings on prevalence of poverty as documented above support the long held view that one of the core socio-economic parameters defining Northern Kenya Counties is high prevalence of poverty as manifested by the fact that eighteen of the 20 poorest constituencies in Kenya where 74% - 97% of people live below the poverty line, are in Northern Kenya, the same trend traced at ward level in Fig 5.5 above. According to the UNDP,[67] the arid north of Kenya lacks basic foundations of development given that access to education, health, water, infrastructure, energy, and ICTs which are all critical enablers of growth are well below the national average and this holds the region back. Fig 5.7 compares the Human Development Index (HDI) and the County Development Index (CDI) for Counties traversed by LAPSSET against the national means.

[66] Carter, M. R. and May, J. (2001): One kind of freedom: the dynamics of poverty in post-apartheid South Africa, World Development, 29, pp. 1987–2006.

[67] UNDP, 2015: Human Development Report 2015- Work for Human Development. http://hdr.undp.org/sites/default/files/2015_human_development_report_1.pdf



	Lamu	Isiolo	Meru	Laikipia	Samburu	Baringo	Marsabit	Garissa	Turkana	National
Gini Coefficient	0.50	0.45	0.55	0.56	0.43	0.51	0.44	0.47	0.37	0.55
CDI	0.5641	0.5217	0.5489	0.5654	0.3779	0.4438	0.3652	0.4688	0.2697	0.52

Fig 5.7 compares the Human Development Index
Source: UNDP 2015 [47]

The Human Development Index (HDI) is a composite statistic of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development. The HDI simplifies and captures only part of what human development entails. It does not reflect on inequalities, poverty, human security, empowerment, etc. The HDRO offers the other composite indices as broader proxy on some of the key issues of human development, inequality, gender disparity and human poverty.

On its part, the CDI is tool developed to influence policy decision on targeting of resources. The CRI was developed by the Commission for Revenue Allocation[68] following on the methodology of the HDI as a composite indicator as a criteria that measures the level of development in the 47 counties. Indicators applied in the computation include poverty, water, roads, electricity, sanitation, immunisation, birth deliveries with qualified medical personnel, secondary education and literacy level with the resultant Index being applied to compare counties in terms of human development and the level of marginalisation. Counties with low CDI value are considered less developed (not enjoying basic services) while those with high CDI values emerge more developed or less marginalised.

Avery strong correlation between County HDI and CDI values is evident in Fig 5.7. Further, five of the nine LAPSSET Counties have CDI values below the national mean of 0.52 with Turkana, Marsabit, Samburu and Baringo being among the 10 most marginalised Counties in Kenya. Overall, Turkana is the most marginalised County with a CDI of 0.2697. The Counties of Lamu, Isiolo, Meru and Laikipia have CDIs above the national mean, a position most likely skewed by prevalence of more developed areas within their counties. However, the CDI and CHDI provides very useful datum against which to monitor impact of development of LAPSSET.

[68] CRA, 2012: Creating A County Development Index to identify Marginalised Counties. CRA Working Paper No. 2012/01. http://www.crakenya.org/wp-content/uploads/2013/10/

6.0 The Economic Perspectve

6.1 National Background

LAPSSET is an economic intervention aimed at using a Transport Corridor to promote international development which opening up the traverse counties for investment. While sections above highlighted the biophysical and social baseline preceding LAPSSET, sections below focus on both the national and local economic profile both targeted for transformation by the game Change Corridor. This analysis aims at documenting the economic potential that could be transformed positively by LAPSSET while highlighting the main shocks that require proofing towards securing sustainable growth.

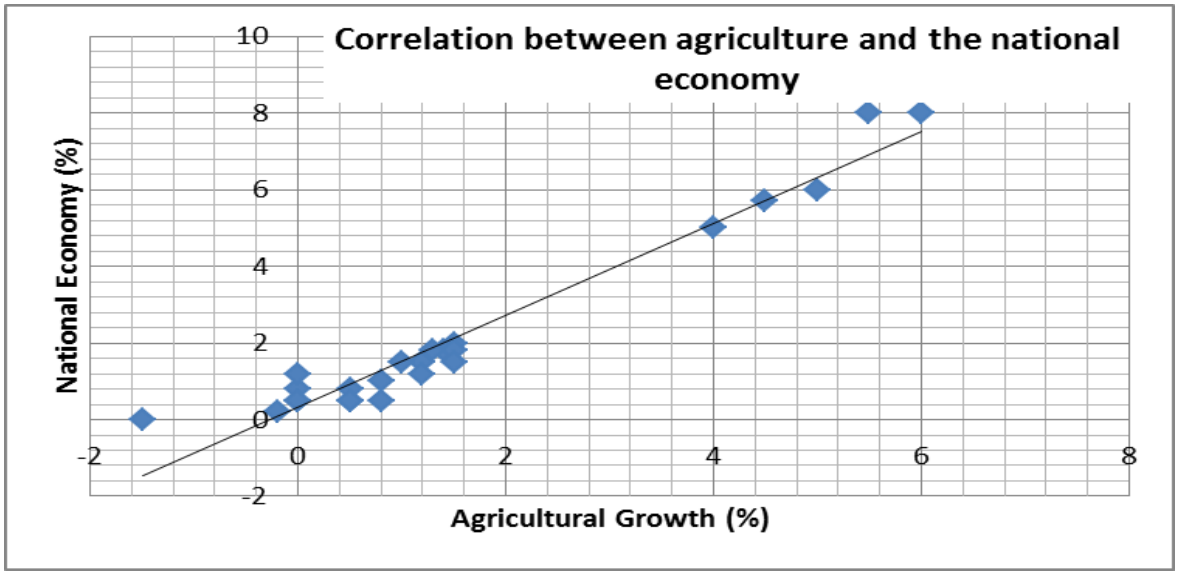
6.1.1 Focus of Economic Analysis

Towards analyzing the impact sustainability of the corridor, regional macro-economic situation, population, employment and economic activities including trade potential will be considered in view to understanding the context within which the corridor is to be implemented. In addition, the oil discoveries in Kenya and Uganda, and existing oil mining in South Sudan are considered in the analysis as it is assumed all will be transported through the corridor's pipeline to Lamu Port.

Economic analysis has targeted both Kenya and the region whose economic potential and activities has potential to impact on viability of the Corridor. The main towns along the Corridor (Lamu-Juba and Isiolo- Moyale routes) are Lokichokio, Lodwar, Maralal, Isiolo, Marsabit, and Moyale while other relevant urban centers include Ijara, Garissa, Wajir, Mandera, Modagashe, Habswein, Archer's Post and Loiyangalani. Other major towns of importance in planning the corridor include Hola, Mwingi, Nanyuki, and Kitale, among others which serve as its important links to the Northern Corridor.

6.1.2 Trends in macro-economic performance

Kenya Economic Structure: The Kenyan economy is dominated by agricultural sector which accounts for over 25 percent of the GDP over the years as shown by Table 6.1. Manufacturing sector comes second with GDP contribution of 10.0 percent. It is important to note that a good number of the manufacturing firms draw their inputs from the agricultural sector as depicted by a 4.0 percent contribution to GDP by food, beverages and tobacco manufacturing sub-sectors. Other sectors which have significant contribution to GDP are construction, transport and storage, wholesale and retail, financial and insurance, and real estate sectors. On this account, Kenya Vision 2030 has identified agriculture as one of the key sectors to deliver the 10 percent annual economic growth rate envisaged under the economic pillar which, among other strategies, requires transformation of smallholder farms from subsistence to innovative, commercially-oriented profitable enterprises to which, pre-market value addition is critical.



Source: This Study

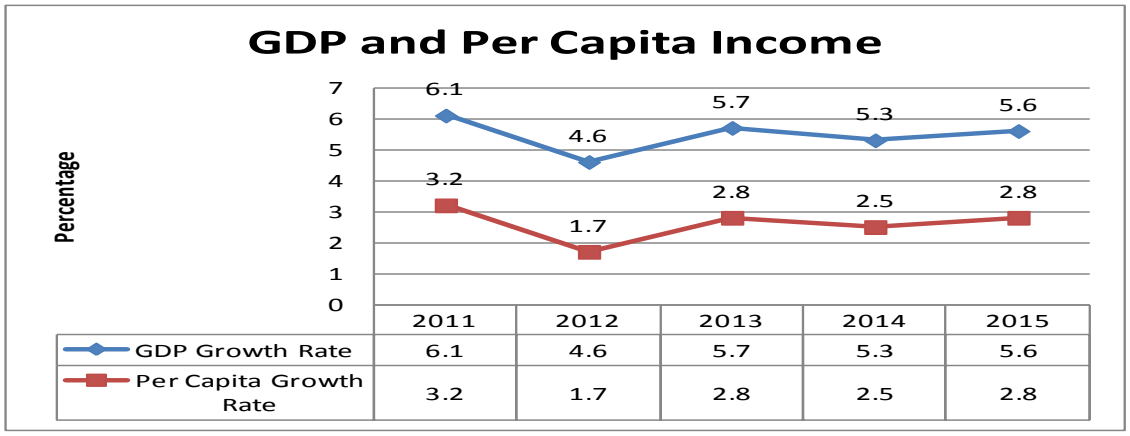
Fig. 6.1: Correlation between growth of Agricultural and National GDP in Kenya

Table 6.1 Sectoral contribution to GDP in Kenya

Sector	Contribution (%) by year				
	2011	2012	2013	2014	2015
Agriculture	26.3	26.3	26.3	27.3	30
Mining and Quarrying	0.9	1.1	0.9	0.8	0.9
Manufacturing	11.8	11	10.5	10	10.3
Electricity Supply	1	1.1	1.1	1	1
Water	0.9	0.9	0.9	0.8	0.8
Construction	4.4	4.5	4.5	4.8	4.8
Trade general	8.1	7.8	8	8	7.5
Transport and Storage	7.1	8	8	8.6	8.3
Hospitality	1.3	1.3	1.2	0.9	0.8
Information and Communication	1.7	1.6	1.5	1.2	0.9
Financial and Insurance	5.7	5.9	6.6	6.8	6.9
Finance	4.9	4.8	5.1	4.8	5.3
Insurance	0.8	1.1	1.5	2	1.6
Real Estate	8.1	8	7.9	7.7	7.6
Professional & Science	1	1	1	1	0.9
Administration and Support	1.3	1.3	1.2	1.1	1
Public Admin and Defense	4.3	4.4	4.4	4.4	4
All economic Activities	89.6	90.1	90.6	91.2	92.6
Taxes on products	10.4	9.9	9.4	8.8	7.4
GDP at Market Prices (%)	100	100	100	100	100

Source: Annual Economic Survey, 2016

GDP and Per Capita Growth Rates: The Kenya economic performance has remained positive but still below the 10.0 percent growth envisaged in the Vision 2030. Real GDP growth declined from 6.1 percent in 2011 to 4.6 percent before stabilizing at above 5.0 percent in starting 2013 (Fig 6.1). On the other hand, the per capita growth rates have remained significantly low. With the population growing at 2.6 percent alongside insignificant growth in real per capita income, poverty remains a real challenge, with 46 percent of the population estimated to be living below the poverty line.



	2011	2012	2013	2014	2015
GDP Growth Rate	6.1	4.6	5.7	5.3	5.6
Per Capita Growth Rate	3.2	1.7	2.8	2.5	2.8

Source: Annual Economic Survey, 2016
Fig 6.1: Trends of per capita income and GDP growth in Kenya

International Trade and Balance of Trade: The main exports by Kenya in terms of value include horticultural products, tea, coffee, clothing, iron and steel, manufactured goods etc. On the other hand, main imports include petroleum products, machinery vehicles, food and food products etc.

Africa has remained the leading destination of Kenyan exports over the years accounting for 41.7 percent of total exports valued at USD 2,421.9 million in 2015. The EAC states accounted for 52.3 percent of the total exports to Africa with Uganda as the leading destination of Kenya's exports over the years. Europe was second destination of Kenya's exports valued at USD 1,459.4 million in 2015. The main exports to Europe include the horticultural products, coffee, tea etc. Major Europe countries consuming Kenya's exports are Netherlands, United Kingdom, Germany, Belgium etc.
Asia follows closely with imports valued at USD 1,307.5Million in 2015 with coffee and tea as the leading exports. Pakistan, United Arab Emirates (UAE) and Afghanistan are the main importers. Although exports to American countries remain low, USA remains the largest exports destination among American countries accounting for over 80 percent of the total exports. Exports to the USA include the articles of apparel and clothing accessories exported under the Africa growth opportunity (AGOA) arrangement.

Asia has dominated as the leading source of the country's imports despite a drop in value of imports from USD 9,901.7 Million in 2014 to USD 9,816.5 Million in 2015. Imports from Asia include petroleum products from Middle East, pharmaceuticals, machineries, motor vehicles etc. Within the Asia region, China is the largest source of the country's imports that expanded significantly from USD 2,486.5 million in 2014 to USD 3,208.1 million in 2015. This can be attributed to imports of construction materials related to the construction of the Standard Gauge Railway (SGR).

Imports from Europe mainly machinery, manufactured goods etc. were valued at USD 2,955.5 million in 2015 with Germany as the leading source of imports among European countries valued at USD 473.81 million in 2015. The United Kingdom is the second largest source of the country's imports valued at USD 429.70 million during the same period.

Table 6.2 Balance of Trade (USD Millions)

Exports	*2011*	*2012*	*2013*	*2014*	*2015*
Western Europe	1,264.0	1,144.1	1,115.9	1,280.4	1,344.6
Eastern Europe	98.4	107.8	117.1	109.3	114.8
Total Europe	*1,362.5*	*1,252.0*	*1,233.0*	*1,389.7*	*1,459.4*
America	275.9	287.4	337.7	456.6	505.9
East African Community	1,371.6	1,349.5	1,249.6	1,258.0	1,267.8
Other African Countries	1,104.5	1,156.4	1,065.2	1,155.7	1,154.1
Total Africa	*2,476.0*	*2,505.9*	*2,314.7*	*2,413.6*	*2,421.9*
Asia	956.1	1,054.6	1,075.6	1,000.2	1,307.5
Australia and Oceania	10.5	18.9	28.6	34.7	34.0
All others N.E.S	45.0	59.7	33.3	77.6	81.7
Grand Total Exports	**5,126.0**	**5,178.5**	**5,022.9**	**5,372.4**	**5,810.5**
Imports	*2011*	*2012*	*2013*	*2014*	*2015*
Western Europe	2,276.0	2,255.4	2,316.0	2,456.5	2,598.3
Eastern Europe	273.5	242.3	390.4	402.9	357.6
Total Europe	*2,549.5*	*2,497.7*	*2,706.4*	*2,859.5*	*2,955.9*
America	791.7	1,192.9	844.8	1,874.8	1,460.6
East African Community	264.3	305.5	287.6	366.3	399.5
Other African Countries	1,248.3	1,102.1	1,190.8	1,095.1	1,091.5
Total Africa	*1,512.5*	*1,407.6*	*1,478.4*	*1,461.4*	*1,491.0*
Asia	8,091.2	8,565.3	8,967.0	9,901.7	9,816.5
Australia and Oceania	30.0	81.1	130.4	75.0	48.2
All Others	32.1	1.3	6.2	10.9	3.4
Grand Total Imports	**13,007.1**	**13,745.9**	**14,133.2**	**16,183.2**	**15,775.6**
Balance of Trade	(7,881.0)	(8,567.4)	(9,110.3)	(10,810.9)	(9,965.1)

Source: Annual Economic Survey, 2016

6.3 Analysis of potential for LCIDP induced economic growth

6.3.1 The Historical perspective:

The LCIDP is the single most important intervention designed and implemented as part of the Kenya Vision 2030 strategy for reducing inequality and re-balancing regional development in Northern towards ensuring that the dream of a just, equitable and prosperous nation is shared by all Kenyans across board. LAPSSET therefore is aimed at redressing regional inequality occasioned by past development strategies which were skewed in favour of Kenya's high-potential areas and which only succeeded in increasing social disparity within the 89% of Kenya described as Arid and Semi-Arid and home to 36% of the national population who currently feel marginalized on account of disproportionately high poverty levels, poor dietary intake, poor access to social infrastructure and basic facilities, high infant mortality, poor enrolment in schools and generally low quality life. This yearning for development and economic transformation is the singularly most important asset in implementing Kenya Vision 2030 flagship projects.

In favouring LAPSSET as an economic enabler, the aim is to unlock the high economic potential that remains unexploited in Northern Kenya. In sections below, an overview of the region's untapped potential is provided.

6.3.2 The Human Capital

Counties of northern Kenya account for 13.6% of national population equivalent to 5.234 million people most of who rely on pastoralism for subsistence. However, on account of aridity and other challenges to pastoralism, 56.3% of the resident population accounting for 7.7% of the national population subsist below the poverty line (Table 6.3.2) and are therefore unable to fully participate in nationhood. Northern Kenya displays many of the characteristics of remote rural areas caught in chronic poverty traps, which face multiple and interlocking forms of disadvantage. Isolation, insecurity, weak economic integration, limited political leverage, and a challenging natural environment combine to produce high levels of risk and vulnerability.

Economic empowerment would bring this population into the mainstream economy as consumers of goods and services, traders, tax payers and other capacities that contribute to earning the National GDP. Indeed, injection of modest capital to eliminate the poverty gap will increase spending by 36% thereby occasioning a 0.2% growth in the GDP. With better targeting, investment in LCIDP Components has potential to address and reverse core drivers of poverty namely unemployment, lack of functional markets, and inadequacy of opportunities for income diversification thus even increasing rural incomes and by extension, purchasing power.

With intensified capacity building, local youths will be equipped with skills required to tap demand for professional services to be created by operation of LAPSSET Corridor infrastructure namely;- oil trade, clearing and forwarding, financial services, convincing, legal advisory services, real estate, environmental consultancy, hospitality, Medicare, utility management, among others which will comprise the middle class with a high quality life anticipated by Vision 2030.

Table 6.3.2 Population and poverty dynamics among Northern Kenya Counties

Population		Poverty dynamics				Projected spending		
County	Pop	% poor	Total poor	Poverty gap (%)	Poverty gap (Kshs)	With poverty gap	At poverty line	Growth
Lamu	101,539	32.3	3279710	15.6	15.6	276807498.7	327970970	51163471
Garissa	623,060	58.9	36698234	18.7	18.7	2983566424	3669823400	686256976
Mandera	1,025,756	85.8	88009865	32.4	32.4	5949466860	8800986480	2851519620
Wajir	661,941	84.2	55735432	31.9	31.9	3795582933	5573543220	1777960287
Marsabit	291,166	75.8	22070383	22.9	22.9	1701626514	2207038280	505411766
Isiolo	143,294	65.5	9385757	19	19	760246317	938575700	178329383
Turkana	855,399	87.5	74847413	29	29	5314166288	7484741250	2170574963
Samburu	223,947	71.4	15989816	17.4	17.4	1320758785	1598981580	278222795
Baringo	555,561	52.2	29000284	11.4	11.4	2569425180	2900028420	330603240
Tana River	240,075	75.6	18149670	46.1	46.1	978267213	1814967000	836699787
West Pokot	512,690	66.3	33991347	16.2	16.2	2848474879	3399134700	550659821
Totals	5,234,428 (13.6%)		2,945,431 (7.7/ 56.3%)			28,498,388,891	38,715,791,000	10,217,402,109 (36%)
Projected GDP Growth								0.2%

6.3.3 The Strategic Position

Kenya's development strategy, Vision 2030 and the Medium Term Plan (MTP) 2008- 2012 identifies infrastructure development as the main pillar in the GOK's quest in transforming Kenya into a globally competitive economy and in expanding intra-regional trade with neighboring countries while enhancing incomes and social welfare in rural areas. Specifically, the LCIDP targets to interlink Northern Kenya to South Sudan and Ethiopia whose vast economic potentials largely remain untapped by Kenya.

The Table 6.3.3 below shows that even without the existence of the corridor, Kenya has been trading with the LAPSSET countries. Uganda is the largest trading partner in Africa with Kenya as well as the among the LAPSSET countries possibly on account of the well developed and functional Northern Corridor linking Mombasa to Uganda. On the other hand, poor infrastructure linking Kenya to South Sudan and Ethiopia on the other hand and political instability in South Sudan and Southern part of Ethiopia has contributed to low trade between Kenya and these countries. It is anticipated that more trade will be realized with the development of road and railway linking Kenya with these two countries. Already, the road linking Ethiopia through Moyale is complete apart from small sections. As a result more traffic and trade flows have been realized in the recent years as shown in the Table below. Subsequently, with the construction of the rail and pipeline from Lamu port, it is expected that most of the Ethiopian imports and exports will use this corridor for transportation. It is further expected that Ethiopia will be importing most of its petroleum and petroleum products from Kenya. Overall, the trade among the LAPSSET countries is expected to improve considerably.

Table 6.3.3 Kenya Value of Trade with LAPSSET Countries

Kenya Value of Trade with LAPSSET Countries (USD. '000')					
Exports	2011	2012	2013	2014	2015
Ethiopia	48,263.40	45,784.69	48,851.15	69,189.73	71,542.46
Uganda	759,539.23	674,501.15	653,619.07	607,826.64	685,739.04
South Sudan	-	179,643.06	166,803.68	198,225.72	170,654.87
Total exports	807,802.63	899,928.90	869,273.90	875,242.09	927,936.37
Imports					
Ethiopia	3,691.49	3,541.22	2,786.31	4,247.64	5,019.01
Uganda	103,371.55	153,228.10	160,858.05	175,494.21	222,836.92
South Sudan	-	146.65	213.04	12,106.99	87.09
Total Imports	107,063.04	156,915.97	163,857.40	191,848.84	227,943.02
Total Trade	914,865.67	1,056,844.87	1,033,131.30	1,067,090.93	1,155,879.39

Source: Annual Economic Survey, 2016

The stable macro-economic environment is very important for planning by the investors. This is witnessed by the Foreign Direct Investment (FDI) being experienced in the country and will further create confidence in investors who will be willing to invest in LAPSSET related projects thus helping in the viability of the corridor.

Brief country-specific highlights on this potential are provided below:

Ethiopia: Kenya shares a 1000 km common border with Ethiopia-the second-most populous country in Sub-Saharan Africa with a population of 97.0 million, and population growth rate of 2.5% in 2014. In 2014, the GDP of Ethiopia was $55.6B and its GDP per capita was $151 then rapidly tripling by 2014 to hit US$550 supported by an average annual growth rate of 10.5% over the same period to become one of the fastest growing economies in Africa aspiring to reach middle income status over

the next decade. Expansion of the services and agricultural sectors account for most of the growth followed by manufacturing, private consumption and public investment. Ethiopia exported US$5.56B and imported US$16.4B, resulting in a negative trade.

A growing Ethiopian economy offers great potential for trade with Kenya. In 2014, trade volume between Kenya and Ethiopia totaled $58million compared to US$837 million for Uganda whose population is only a quarter that of Ethiopia. The Southern and South western regions of Ethiopia falling on the 1000km long common border with and which account for 20% of the national sea freight is naturally part of the Mombasa Port hinterland. However, on account of non- functional land transport linkage, such trade and others from landlocked Ethiopia is transited through Djibouti and other distant ports to the disadvantage of Kenya. Imported refined petroleum volume of 24,910 barrels a day accounting for 15.5% of Ethiopia's external trade worth US$21.98 Billion is transported by truck from Port of Djibouti. Assuming that this oil is handled through the LAPSSET oil pipeline with a US$ 2 levied per barrel would inject an additional Kshs 4.6 billion into the national economy equivalent to 0.08% GDP growth.

According to a 2012 study by Kefyalew Alemayehu and Tarekegn Ayalew, Ethiopia has one of the largest livestock populations in Africa comprised of 27 million cattle, 24 million sheep and 18 million goats which supports annual exports to the tune of 16,877 tonnes of meat and 472,041 head of cattle in a trade that is constrained by lack of exporting routes and ports, illegal live animal trade, shortage of live animals to meet an ever increasing demand in the Middle East Countries. The potential of this trade diverting to the LAPSSET corridor through Moyale is quite real.

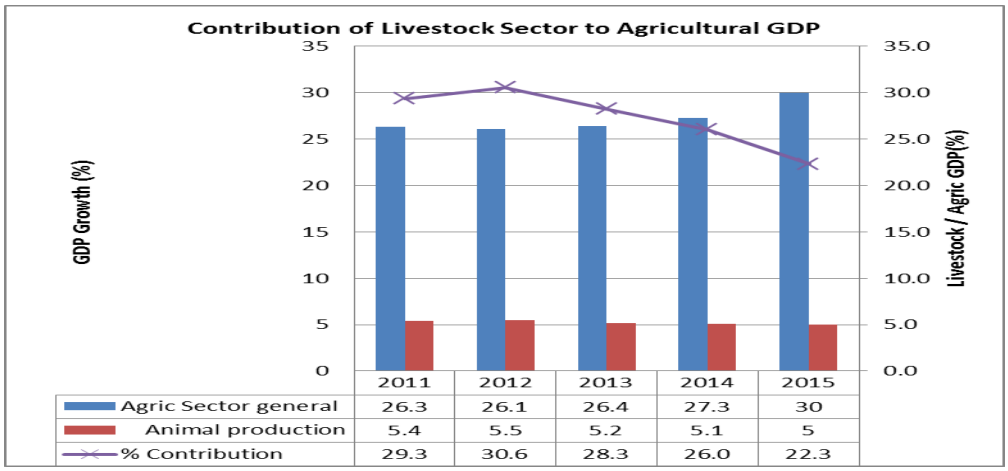
South Sudan: Prior to independence, South Sudan produced 85% of Sudanese oil output and given continued reliance on pipelines, refineries, and the Bashayer port facilities controlled by the north, oil revenues are shared equally between both states with RSS receiving on average US$8billion which accounts for 98% of government revenue. Sudan is a major player in the SS oil industry and on account of being blacklisted by the US government as among state sponsors of terrorism , US oil companies cannot do business with landlocked South Sudan leading to their and virtually non-existence in the SS oil sector currently exporting 66,000 bpd valued at US$16 billion annually. Provision of an alternative export route for SS oil would reduce over reliance on the north while simultaneously allowing participation by other players including American Oil Companies. By extension, part of the US$ 10 processing fee levied on every barrel of SS oil exported through Sudan could accrue to Kenya, in the process, creating a new revenue source worth USD 23.73 million equivalent of 0.2% GDP growth. This is part of the trade volume that Kenya will secure from extension of an oil pipeline to South Sudan while more would be expected from increase in cargo movement and trade across the border.

6.3.4 Livestock Industry

From analysis provided in Table 5.6 and Fig 5.4 above, LAPSSET Corridor Counties command a total of 6,406,966 TLUs equivalent to 37% of the national TLU resource base and this includes 45% of the national camel and donkey population respectively. The sector still remains the main economic driver in the arid counties accounting for the bulk of family sustenance and up to 95% of household income. On a *pro lata* basis, therefore, LAPSSET counties probably account for up to 37% of the livestock sector's contribution to Agricultural and National GDP and should therefore be strategically positioned to ride on the LAPSSET economic game changer wave. Towards this, the Government through ENNDA is developing an abattoir at Isiolo with capacity to process 790 TLUs equivalent to 700 heads of cattle, 100 camel and 2000 shoats daily while a similar one is proposed in Wajir County.

Additionally, the vast Mt. Kenya region milk catchment provides a firm base for export based milk processing targeting South Sudan and Ethiopia where such industries are still nascent.

This notwithstanding, the livestock sector is chronically challenged by a host of factors, key among them being loss of pastoral grazing grounds including dry season grazing reserves, degradation of available pastureland, drought and climate change impacts, diseases, and insecurity among others whose net effect has been to greatly undermine pastoral resilience thus exposing them to drivers of poverty. Per capita livestock holding among all 9 LAPSSET Counties is way below the 4.5+ TLU threshold required for resilience. At national level, contribution of livestock sector to national GDP dropped marginally from 5.5 to 5.0 (Fig 6.2) with corresponding contribution to agricultural GDP dropping 8.3 percentage points from 30.6% in 2012 to 22.3% in 2015. Clearly, livestock value addition as proposed under LAPSSET requires being preceded by stabilization of primary production.



Source: Economic Survey, 2016

Fig 6.2: Contribution of Livestock to Agricultural and National GDP

A direct relationship between LAPSSET and the livestock industry in northern Kenya is not apparent given observations as follows:-

Most livestock is consumed in Nairobi and Mombasa: - The large cities of Nairobi and Mombasa have the highest per capita meat consumption within Kenya consuming an estimated 25.8 kg per person, which would require a monthly supply of approximately 27,839 head of cattle, 71,555 sheep and goats, and 685 camels to Nairobi and 8,178 head of cattle, 21,021 sheep and goats and 201 camels for Mombasa with an estimated annual per capita consumption of 21.2 kg.

Supply chains: Most of the livestock sold in Nairobi and Mombasa comes from pastoral communities, and predominantly from northern Kenya and beyond. The main markets that supply animals are Garissa, Marsabit, Wajir, Mwingi, Isiolo, and Kajiado while some of them coming from northern Kenya originate from across the border in Somalia and Ethiopia, while some of those from the southern corridor come from Tanzania. With most supply routes converging to Nairobi, the potential of the LAPSSET Corridor to support such marketing routes is not clear.

Export markets: Kenya is only a minor exporter of livestock, with the number of head exported never exceeding 7,500 in a given year and mainly to Mauritius and Burundi, which import Kenyan cattle and goats respectively. Export volumes for meat are also quite small, accounting for only 1 per cent of Kenya's meat production in which case, the potential impact of LAPSSET is not quite clear.

Possible entry point for LAPSSET: The potential for LAPSSET to intervene in the livestock industry which is core backbone to the economy of northern counties probably lies in strengthening other initiatives aimed at improving pastoral resilience, productivity and profitability through reduction of vulnerability to drought and other shocks that underpin chronic poverty and inequality typical of arid counties. Core among the strategies is The Common Programme Framework to End Drought Emergencies coordinated by the National Drought Management Authority whose focus is aligned to Sessional Paper No. 8 of 2012 on the National Policy for the Sustainable Development of Northern Kenya and other Arid Lands, the Vision 2030 Development Strategy for Northern Kenya and other Arid Lands and is also consistent with respective sectoral Medium Term Expenditure Framework.

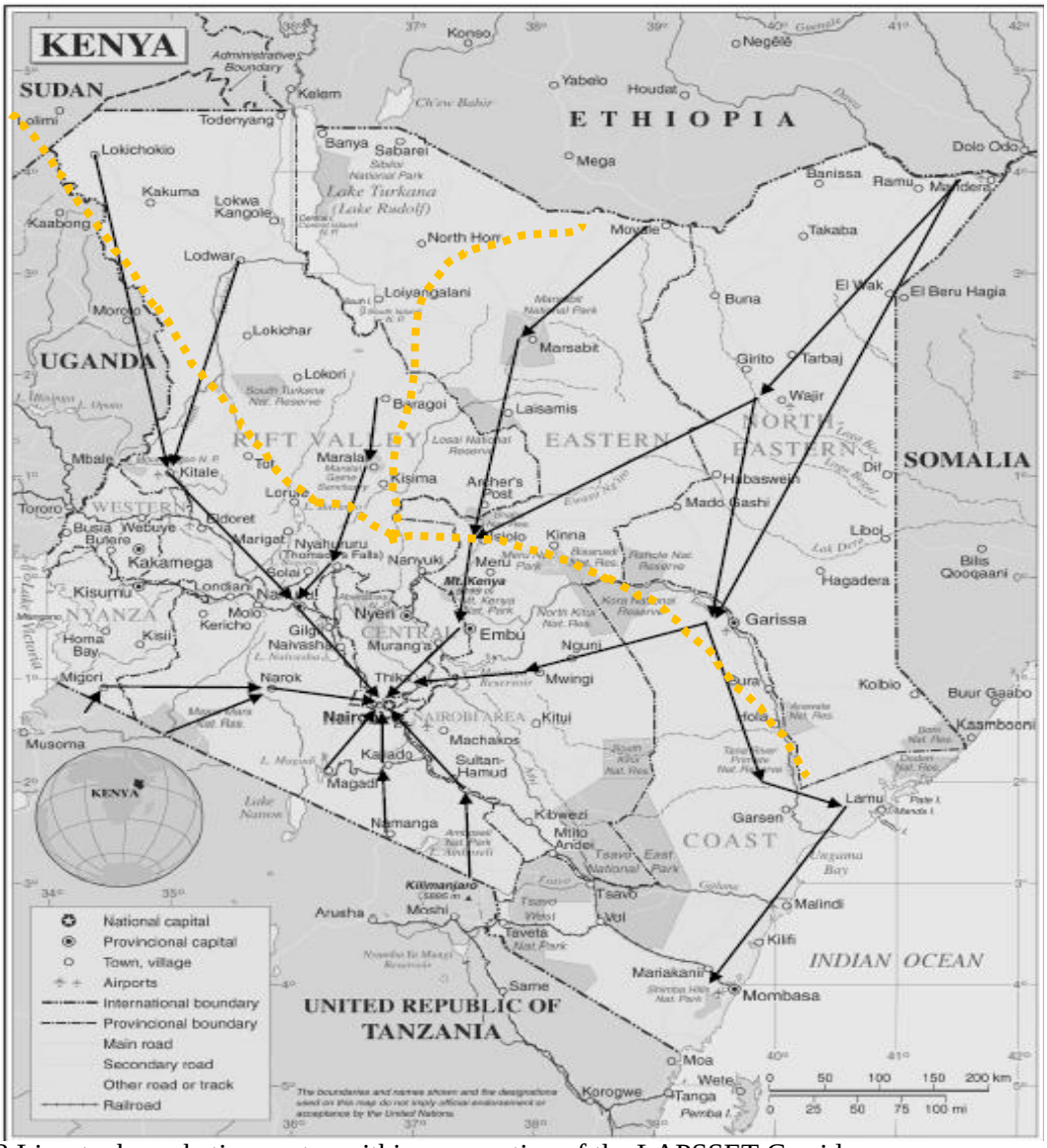


Fig 6.3 Livestock marketing routes within perspective of the LAPSSET Corridor

6.3.5 Tourism

The Laikipia-Isiolo-Samburu tourist circuit traversed by LAPSSET hosts numerous state protected game conservation areas namely; Buffalo Springs National Reserve, Samburu National Reserve, Shaba National Reserve, Nyambene National Reserve all within vicinity of the Mt. Kenya Ecosystem which gives the region a comparative advantage in tourism-Kenya's top foreign exchange earner accounting for 12% of National GDP. As well and in appreciation that over 70% of Kenya's wildlife reside outside protected areas on land occupied by pastoralists, many former group ranches operated purposely for livestock have slowly adopted game conservation as an alternative land use promising even better returns when linked up to the tourist market. In this league is included world-acclaimed private game sanctuaries such as the Lewa, West Gate, Mugie, Ill Ngwesi, Lamunyak, Kalama, Losai among others that have adopted management geared towards environmental conservation as an economic activity. Partnering in this paradigm shift are numerous interests groups such the Ewaso Forum, African Wildlife Foundation, Laikipia Wildlife Foundation, The Nature Conservancy, Northern Rangeland Trust, Save the Elephants, among others.

6.3.6 Natural Wealth

Extensive natural wealth vests within the ASAL counties while new resources with potential for economic exploitation continue to be defined and documented. Brief highlights on the key resources are provided in sections below.

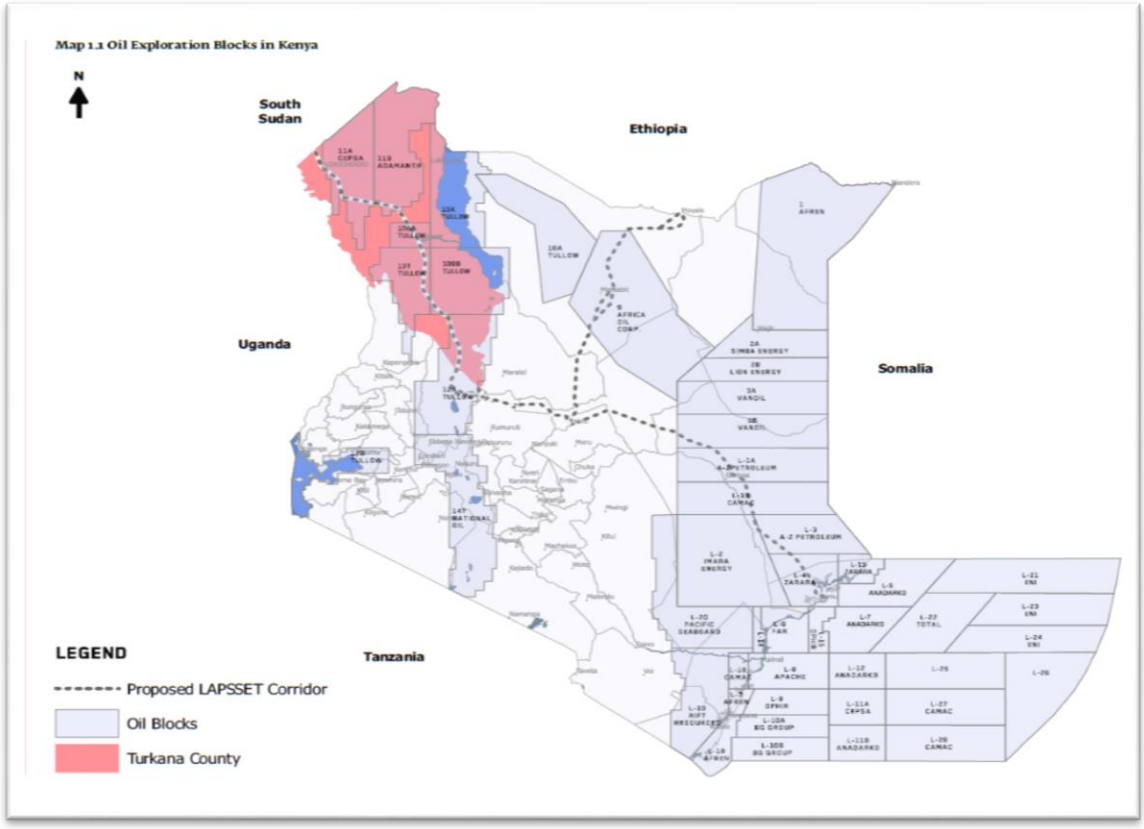
Gums and resins: ASAL rangelands are known to shelter diverse tree and shrub species known for exude gums and resins which have been commercially exploited for export and local use. Myrrh from *Commiphora myrrha* and frankincense (olibanum) from *Boswellia neglecta* and Gum arabic from *Acacia senegarensis* are the main organic products growing naturally on trees from 8 Northern Counties namely Garissa, Isiolo, Mandera, Marsabit, Moyale, Samburu, Turkana and Wajir mainly for trade with China, Hong Kong, Germany, Switzerland, Saudi Arabia, United Arab Emirates, with limited quantities exported to African countries notably DRC, Sudan, Tanzania and Uganda. According to the KRA, a total of 1152.5 tons of gums and resins were exported from Kenya in 2003 which, compares quite unfavourably with the 50,000 plus tonnes exported from Africa in the same period. Sudan, Chad and Nigeria account for 95% of gums and resin export from Africa while Cameroon, Ethiopia, Tanzania and Eritrea share 4.9% of exports leaving other African Countries, Kenya included to share the reminder 0.1%.

Scope of potential production of gums and resins in Kenya remains unknown given the absence of baseline mapping data and non-mainstreaming of the trade into the national economy. However, given that 82.43% of Kenya's land mass (483,840 sq km) comprises of ASALs which is the natural ecological range for gum and resin producing trees, the potential is likely to be large. Collection of gums and resins however has cultural barriers as it is considered to be an occupation of the poor and destitute of society. So long as other sources of livelihood (including relief food) are available, there is no incentive to engage in gum collection. This is one area where advocacy could bear immediate fruit.

Oil and gas: Every passing day brings commercial oil exploitation in Kenya closer to reality; following years of massive oil exploration in 47 Blocks (See Fig 5) spanning the Anza, Mandera, Tertiary Rift and Lamu Basins (NOCK). Indeed, with the exception of the Isiolo-Laikipia section, the LAPSSET Corridor traverses oil exploration blocks including the Lokichar area where Tullow Oil Corporation has reported oil finds to the tune of 1 billion barrels out of which, commercial production from Block 10BB is set to start by September 2017. Evacuation of crude oil from Lokichar is bound

to be constrained since construction of both the LAPSSET Pipeline and the one through Uganda is yet to start.

Indeed, given the massive demand for refined oil in landlocked Ethiopia and the overwhelming evidence of availability of commercial oil deposits in Turkana and neighbouring South Sudan is major justification for investment in LAPSSET.



6.3.7 Opportunity for growth

The imbalance and inequality currently widespread in the ASAL belt presents a huge opportunity for growth. ASALs also have the benefit of vast space which, when carefully planned provides room investment in new growth areas such as commercial ranching, Special economic zones, advanced game conservation for nature based tourism, among others. Strategic investment in the ASALs will benefit the region, particularly in terms of employment creation, while also opening up new economic and investment opportunities for the country as a whole, reducing population pressure in high-density areas and strengthening national cohesion through the intermingling of social groups.

6.4 Linkage to ongoing development Initiatives

6.4.1 Oil prospecting, exploration and production

In early 2012, the Government of Kenya announced the discovery of oil after Tullow Oil Company discovered oil deposits in Lachikar area of Turkana County. Three wells were discovered with an estimated 250 million barrels, at a combined potential flow of 5,000 barrels per day. In 2015, Tullow

drilled nine wells in South Lokichar Basin and conducted five extended tests at Ngamia and Amosing fields. Other oil fields are Epir-1 in North Kerio, Engomo-1 in North Turkana and Emeseki-1 in North Lokichar.

The government is currently planning to start drilling for oil in Turkana County even before the start of construction of the Kenya-Uganda crude oil pipeline. The oil is proposed to be transported through the road from Turkana to Eldoret and loaded onto trains for export as the oil pipeline from Lokichar to Lamu is planned to be built in future.

At national level, oil reserves already existing are valued at about 2,000 trillion, of which if well managed will earn the country foreign exchange as well as saving the foreign exchange from imports of oil which was USD 2,146.95 million in 2015. This will further have positive effects on the Balance of Payments (BoPs), stabilize oil prices and inflation, thus encouraging investments, employment creation, increase household incomes and reduce poverty.

At county level, residents of urban centers such as Lodwar, Lokichar and Lokori have benefited from the job and business opportunities as well as the social investment projects provided by oil companies and their subcontractors. The oil companies have given scholarships and bursaries to the needy and this have turned up to be very popular, although there are persistent rumors that the selection and award process has at times been nepotistic. The communities recognize the support from local non-governmental organizations (NGOs) and, more recently, oil companies in improving access to potable water, but also indicate that the number and quality of water points are insufficient. The same applies to food, which in many rural parts of Turkana County is in short supply and under pressure due to population growth and higher demand from businesses and consumers.

Indications are that the Turkana, on top of pre-existing and increasingly militarized inter-ethnic and cross-border conflicts primarily driven by competition over scarce pasture and water resources, are likely to exacerbate pre-existing tensions and likely result in full-blown violent conflicts among the already marginalized Turkana against local and foreign investors such as Tullow Oil that are now converging at local towns of Lodwar and Lokichar in Turkana, unless effective and timely preventive and corrective action is taken. Already, the local community is complaining of large portion of their pastoral land has been taken for the purpose of oil exploration and are likely not be compensated. The rural villagers and pastoralists are complaining that local (low-skilled) job opportunities were not going to local people and were only short-term. In addition, the community is also accusing the Tullow Oil for allocating jobs and tenders to non-locals. Moreover, there is a general view among local communities that personnel recruitment, procurement and tendering processes, particularly by subcontracting companies, lack clarity and transparency, are often delayed and regularly characterized by nepotism and political interference.

There is also increased concern of increased insecurity and vulnerability, as Kenya Police Reservists (KPRs) – a volunteer security force originally established to protect the communities – leave local communities on their own, and instead they are protecting oil company assets. This has allegedly left local communities, particularly in Turkana South and East, more vulnerable to attacks from the neighbouring Pokot tribe. The same is also reported in north-western Turkana, where communities are now more exposed to attacks from South Sudanese tribes crossing the porous border.

Other key issues include the potential environmental impacts of oil exploration and production on land and water in this ecologically fragile part of Kenya. In addition, there are concerns around health, including the perception that ‘flaring’ (the burning of natural gas produced along with crude oil) causes health problems, as well as the feeling that the increase in prostitution – due to higher

disposable incomes of oil workers – has or will contribute to the spread of sexually transmitted diseases such as HIV/AIDS.

According to the community and county government, the community expectations are poorly managed and there is lack of communication between Tullow and the community. The perception of losing while outsiders come to Turkana and prosper has resulted in community road blocks and even storming of oil sites. To address these issues, several meetings between the Tullow Oil and the local community have been held but the community is still adamant that contiguous issues have not been addressed.

7: Stakeholder Engagement Process

Consultation with stakeholders is a key element of this SEA. Iterative consultations have been carried out during the SEA study in order to identify priority issues that require in-depth analysis during the SEA. Consultations also play a critical role in building environmental constituencies and exploring means of continuously improving beneficial environmental and social effects associated with the implementation of the LCIDP. This Chapter outlines the approach and outcome of the stakeholder analysis and consultations in respect of the Master Plan for the LCIDP.

7.1: Legal Foundation for Stakeholder Consultation in Kenya

7.1.1: Provisions of the National Constitution

Section 35 of the National Constitution 2010 provides for access to information as follows: *35. (1) Every citizen has the right of access to (a) information held by the State; and (b) information held by another person and required for the exercise or protection of any right or fundamental freedom.* Further, Section 69 (1) (d) requires the State to encourage public participation in the management, protection and conservation of the environment, thereby giving legal foundation for stakeholder consultation in environmental assessment process. Stakeholder consultation as conducted for this SEA was partly in fulfilment to above stated legal obligations.

7.1.2: Requirements of EMCA 1999

Legal Notice 101 of June 2003 requires that all environmental assessment process in Kenya to incorporate public consultation. This is a requirement informed by the awareness that stakeholders are largely in the constituency likely to be impacted by proposed developments and it is imperative that they be informed of the project following which they can make informed comments and reactions to the proposed development. It is also important to ensure that all stakeholder concerns as well as aspirations are identified and incorporated in project development, implementation and operation. Against such background, a number of consultations have been undertaken with a cross section of stakeholders to the Master Plan for the proposed Leather Industrial Park. The main objectives of the consultations are:

i. To inform primary, secondary and other stakeholders of the proposed development;
ii. To clarify stakeholder interests and concerns in the Master Plan area;
iii. To better define scope and magnitude of potential impacts of implementing the Master Plan based on stakeholders' feedback.

7.2: Approach to Stakeholder Analysis

7.2.1: Criteria for Stakeholder Identification/Stratification

Stakeholder identification in the SEA applied three core criteria as follows.
(i) Fundamental Right Holders (FRH) to strategic resources in the LCIDP Traverse. Under this category, different groups were identified (Table 7.1 below).

(ii) Legal Mandate Holders (LMH) within target jurisdiction
Stakeholders identified under this category include those in National Government, County Government and State Corporations whose mandates confer jurisdiction over areas targeted for traverse by LAPSSET. From analysis of the legal framework as documented in Chapter Three, diverse statutes are deemed to have over-bearing influence on the LCIDP while simultaneously

conferring specific mandates to respective institutions as shown in Table 7.1 below. In the view of this Study, these institutions are the *bona fide* Legal Mandate Holders for the Master Plan area.

Table 7.1: **Analysis of Stakeholder categories**

Category	Identity	Stake in LAPSSET
Fundamental Rights Holders	Kenyan Citizens	Constitutional right to a Healthy Environment, Right to a good life as anticipated in Kenya Vision 2030
	Pastoral land users and ranchers	Right to ancestral grazing and watering grounds and migratory routes
	Wildlife	Right to migratory corridors, breeding sanctuaries and habitats
	Indigenous communities eg the Goni of Boni Forest, the Laikipia Maasai, etc	Right to traditional livelihoods and lifestyles
	Downstream communities	Access to adequate potable water for livelihood and production
	Fishing based livelihoods	Right to livelihoods
	Other land owners	Right to a clean healthy environment, Right to information
	Pre-existing business interests	Right to a level playing field
Legal Mandate Holders	Ministry of Interior and Coordination of Government	Legal administrative mandate
	3 Regional Development Authorities	Planning mandate for specific river basins based on the shared water resource
	Political representation	Right to information and a voice
	9 County Governments	Planning mandate for Counties
	Road Agencies;- KeNHA, KeRRA, KURA	Planning and management mandate for roads sector
	NEMA	Environmental Regulatory mandate
	WRMA	Regulatory mandate on water quantity and quality
	Water Service Boards, NWCPC	Mandate for bulk water supply
	KFS, KWS	Mandate to conserve fauna and flora
	National Museums of Kenya	Conservation of Cultural Heritage
	Research Institutions	Research mandate
	Elders' Council eg Njuuri Ncheke, Borana Council of Elders, among others	Community Leadership
Other mandate Holders	Common Interest Groups	Diverse thematic Interests eg Conservation, Advocacy, Human Rights,

(iii) Other Mandate Holders within target jurisdiction: Given the diversity of landscapes and sectors traversed, numerous thematic interests groups are encountered along the LCIDP traverse mainly focussed on conservation matters. Many of these were accessed and engaged either on Key Informant Interview basis of through public Fora.

Stages in Stakeholder Engagement: Stakeholder Engagement for this SEA took place at Two Stages namely:-Scoping Stage and Detailed SEA Stage Consultation.

Modalities for engagement: Upon stratification, all stake-holders categories were approached and arrangements for engagement made. Engagements took any participatory methods such as Key

Informant Interviews, Focus Group Discussions and Formal Meetings as the need arose. Details will be unveiled elsewhere below.

Procedure during meetings: All meetings were previously arranged with the target audience so as to give them adequate notice. As a basis for discussion, each meeting started with a brief explanation/ disclosure of the SEA Mission and an overview of LAPSSET to target audiences following which they were invited to give comments on their specific mandates/interests and how they were likely to interface with the proposed development. As will appear, one of the immediate impressions of the encounters is the apparent lack of disclosure of LAPSSET to all constituencies. As such, considerable time was taken explaining the design of LAPSSET and its components.

7.2.1: Outcome of Scoping Stage Consultations

Appendix 7 is entirely devoted to documentation the entire Stakeholder Engagement Process.

Progress in stakeholder Consultations: The diversity of stakeholders currently identified in the LCIDP is provided in Table 7.2 below with the core outcomes from stakeholder engagement at Scoping process provided in Table 7.3 below with a breakdown of activity at County level.

The purpose of Stakeholder meetings at Scoping was to sensitize stakeholders regarding the Scoping Process and get their concurrence on core issues identified for investigation in the detailed SEA. Essentially, it is comments from the Stakeholders at this stage which informed the Terms of Reference for the Detailed SEA Study. .A total of 32 meetings were held in Nairobi and all 8 Counties of traverse during which a total of 150 people were met. It can be reported that all people met were officials within a stakeholder organisation and thus included at least a Focus Group Discussion with all LAPSSET Counties and Key Informant Consultation with all respective County Commissioners and Local NGOs. The outcome of such sensitisation is highlighted in sections below.

Appendix 7.1 provides a documentation of the Scoping Stage engagement inclusive of List of people met, their comments and the material used for stakeholder sensitization.

Outcome of Stakeholder Consultations: Appendix 7.1 provides records of discussions held with diverse stakeholders while core issues emergent are summarised in Table 7.3 below.

Table 7.2: Breakdown of stakeholder consultations by methodology

Mode of engagement	Target Groups	Stakeholder groups met	Nairobi	Lamu	Garissa	Meru	Isiolo	Laikipia	Samburu	Baringo	Turkana	Meetings	Total met
Formal meeting	SEA Steering Committee	LAPSSET	1									1	9
Key Informant Interviews	Line Ministries	GOK Ministries	3	0	0	0	0	0	0	0	0	3	4
		County Commissioners	0	1	1	0	1	1	1	1	1	8	8
Courtesy call	Governors	Meru	0	0	1	0	0	0	0	1	0	2	2
Focus Group Discussions	County Govnts		0	2	1	1	2	1	1	1	5	8	61
	Regional Development Authorities	TARDA	1									1	2
		CDA		0								0	0
		ENNDA					1					1	8
		KVDA								1	0		1
	State Corporations	WRMA		0	2			1	1	1	1	6	6
		KFS		1	1						1	3	3
		KWS		1	1					1	1	2	2

		NEMA		2	1		1	1	1	1	1	8	8
		NMK		1								1	2
		KAA					1					1	2
	Lobby Groups	Laikipia Wildlife Forum						1				1	1
		Giraffe Sanctuary			1							1	1
		CETRAD						1				1	1
		NRT					1					1	7
		AWF	2									0	2
		WWF		1								1	1
		Safe Lamu		1								1	1
		SLEC Group		1								1	1
		LEVCO		1								1	1
		LEPC Group		1								1	1
		Marine Conservation /Kiweni		1								1	1
		Lamu Youth Alliance		1								1	1
		AWF	1									1	5
	Companies	LOWASCO									2	1	3
		Fishtraders									1	1	12
		Boatmakers									2	1	2
	Communities	Fishermen									4	1	4
Total	8	35	7	15	9	1	7	6	4	7	19	37	150

Source: SEA Study Team

From Table 7.3, a total of 10 core issues have been identified and analysed further in sections below towards informing the scope for further investigations during the Detailed SEA stage.

Table 7.3: Summary of emergent stakeholders concerns

Stakeholder group engaged	Comments made	Emergent concern
LCDA- SEA Steering Committee	Observed that Inception report was comprehensive in methodology Recommended that the SEA proceed to next stage subject to revision of Inception Report. Required that the Scoping Report include a clear identification of Stakeholders complete with a clear stakeholder communication methodology	
Line Ministries	There is need to put in place the Community Land Act LAPSSET likely to cause huge strain on food security but presents an huge market There is need for a sound resettlement plan for the communities that are to be affected. Consult TARDA on the High Grand Falls.	Impact on pastoral land Impact on long-term food security Displacement impacts on communities Hydrological impacts of High Grand falls Dam
County Commissioners	Required comprehensive disclosure of LAPSSET	Inadequate disclosure of LAPSSET
County Governments	Required disclosure of LAPSSET before they can participate. Are concerned that decisions always seem to favour Meru. Has boundary disputes with Meru that require resolution.	Inadequate disclosure of LAPSSET. Pre-existing boundary disputes and conflicts

Stakeholder group engaged	Comments made	Emergent concern
	Laikipia are ready for LAPSSET and are looking to market their tourism, agriculture, beef industry through LCIDP Would like large-scale maps showing the traverse through Laikipia for purposes of picking into their spatial plan now in preparation.	Disclosure-linkage to local planning mandates
	Marsabit County Government requested for a Cancer Screening Center to help cope with escalating cases of Cancer. Recommended that LAPSSET invests in small sale community projects which communities could identify with.	Disclosure-Linkage to grassroots groups
ENNDA	Indicated that Authority was responsible for planning for integrated development within ENNDA Basin and had several cross county projects in water, livelihood, etc ENNDA deeply concerned over the status of water management in the basin which is already water scarce. ENNDA would want to see better participation in planning for water demand management	Disclosure-Linkage to local planning mandates Status of water demand management Water monitoring studies for ENNDA basin
NEMA	Introduction of Invasive spp	Impacts on biodiversity-Invasive spp
WRMA	WRMA in Nanyuki is concerned over inadequacy of data on water supply	Water demand management
KWS KFS	KWS is concerned about blockage of wildlife migratory corridors	Impact on wildlife migratory corridors
NMK	Concerned about loss of physical cultural resources	Potential loss of cultural resources
Laikipia Wildlife Forum	LWF is essentially concerned that LAPSSET will create an E-W barrier to wildlife movement through blocking of migratory corridors.	Wildlife migratory corridor Potential to aggravate conflict over access and control of communally owned land
CETRAD	CETRAD concerned that LAPSSET is being superimposed over a complicated plethora of yet to be unresolved communal land ownership pitting communities, County Governments, investors, clans in fierce fight for access and control to land. LAPSSET will create a barrier to migration of both livestock and people especially in Laikipia which was traditionally a N-S migratory corridor especially for pastoralists LAPSSET could aggravate pressure on resources, land, water and woody resources already pressed to the limit. LAPSSET has already triggered influx of land speculators into Laikipia. This will further escalate pressure on nomadic land.	Creation of E-W barrier to N-S movement of pastoralists and wildlife Potential pressure on natural resources-water, land and range resources Potential impacts on land given the influx of speculators
WWF	Wants to be involved substantially in dialogue on potential impacts of LAPSSET in Lamu	Potential impacts on ecosystems and biodiversity
NRT		Impact on Game ranches and Wildlife Migratory Corridors

Source: SEA Study Team

7.2.2: Outcome of the Detailed SEA Consultations

Consultations during the Detailed SEA stage built on consultations already undertaken in the Scoping stage. Proceedings of consultations at both Scoping and Detailed SEA stages is summarised in sections below.

Scope and Focus of Detailed SEA Stage Consultations: Consultations during the Detailed SEA Stage were issues- based focussing on investigation of concerns arising from the Scoping Stage and was carried out in conformity with NEMA's direction. Consultations also sought to partly contribute to addressing core issues identified at the Scoping Stage including:

i) Comprehensive documentation of the receiving environment to better define;
   - Ecological potential and carrying capacity.
   - Livelihood systems and economically strategic resources,
   - Local production systems including value addition,
   - Ecologically sensitive resources,
   - Socio-economic profiles,
   - Issues pertaining to land availability for the Masterplan,

ii) Comprehensive documentation of the Master Plan including interaction with prevailing baseline, current and planned infrastructure,
iii) Comprehensive investigation of current status of soil, water and air pollution
iv) Comprehensive analysis of water resource base in the area followed by modelling of future demand supply scenarios
v) Inventory of all stakeholders by legal mandate, capacity and interests,
vi) Participatory assessment of alternative models to the Masterplan,
vii) Identification of measures to further in-build sustainability and flexibility into the selected model of Masterplan,
viii) Consensus building on the selected model
ix) Modalities for environmental and social management within the Masterplan
x) Other considerations

Outcome of Detailed SEA Stage Consultations: Appendix 7.2 documents the proceeding on the detailed SEA Stage Consultation. A total of 47 meetings were held mainly speaking and listening to grassroots communities all the way from Lamu to Lodwar.

(i) Issues from Community Level Meetings:-

Community land cannot be sold: Essentially, from the 15 meetings held with communities along the traverse, the core issue that emerged was modalities for accessing and acquiring land. All communities were clear that land is owned communally and as such, it cannot be sold to anybody. Most communities are however ready to enter into lease agreements with LAPSSET on pre-negotiated terms, inclusive of being compensated with a communal facility such as hospital, water project, irrigation project, school among others.

Cash compensation for land: The exception to this position was the community at Ijara who claimed that their community land was already informally parcelled out into family bocks in which case, compensation was only due to families. There was however no consensus on this.

Need for additional consultations: The Borana Community at Kinna was of the view that, even though they support LAPSSET, they need further consultation (both internal and with LAPSSET) on the matter. The community would give a date for a follow-up meeting once they internalise the matter.

Traverse through dry season grazing grounds: The Borana Community was clear that LAPSSET should not traverse dry season grazing grounds as this would impair their livelihoods. They demanded that LAPSSET be preceded by a survey to identify and isolate all dry season grazing resources.
Non recognition for individual encroachers: The Borana Community at Isiolo indicated being aware of some community members who have attempted to alienate and acquire community part of community land within the traverse. It was resolved that the community would not be party to such claims and would reject any negotiation that recognized such theft of communal property.

Compensation for private property: From the meeting at Nginyang, the question of compensation for private developments on communally owned land was raised. It was recommended that, all private investment on land be compensated in cash to the rightful owners.

Legal recognition in compensation for land: The Turkana community at Kapendo were apprehensive about their neighbours to the south in Baringo, who claim Kapendo to be part of their territory complete with administrative units under Pokot East Sub County. The demanded that they be recognised as the rightful owners of the community land during negotiation with LAPSSET.

Table 7.4: Scope of Meetings at Detailed SEA Stage

Nature of meetings	Tally	Agenda	Attendance	
County Consultative Workshops	8	To disclose LAPSSET to County Leadership	488	
Meeting with Borana Council of Elders	1	To address concerns of the Borana regarding LAPSSET	47	
Meeting with Isiolo County Governor	1	To discuss collaboration between LAPSSET and Isiolo CG	31	
Inter-faith Group Meeting at Isiolo	1	To explain LAPSSET to Religious Leaders	53	
County level Public Hearing meetings	15	To obtain the concerns of grassroots communities regarding LAPSSET	1252	A memorandum was received from the Gabbra Community at Moyale
Focus Group Discussion with Boni Elders at Msumarini	1	To better understand their concerns as a minority	8	
Key Informant Interview with Game Warden at Masalani	1	To understand the Hirola Antelope case	1	
Key Informant Interview with Senior warden-Samburu County	1	To better understand wildlife issues in Samburu	1	
Key Informant Interview with NEMA-Samburu	1	To understand environmental concerns	1	
Key Informant Interviews with all Sub-County Commissioners	8	To understand core issues at SC Level	8	
Key Informant Interview with the NDMA	2	To understand how well LAPSSET is attuned in drought mitigation	2	

Nature of meetings	Tally	Agenda	Attendance	
Key Informant Interview with the Forester Masalani	1	To understand range management in Ijara	1	
Key Informant Interview with the Forester Marsabit	1	To better understand the Marsabit Ecosystem	1	
Focus Group Discussion with KWS Marsabit	1	Better understand wildlife issues in Marsabit	2	
Key Interview with Prof. Emeritus Schwartz (telecom)	1	Better understand Range Management Issues	1	Copies of the Range Management Handbook obtained
Meeting with Tullow Oil at Lokori	1		2	
Telephone conversation with Dr. Akulot at Kapendo	1		1	
Meeting with security Team at Kapendo	1		3	
Totals	47		1871	

Respect for cultural property: The Turkana community at Kapendo observed that, they rely on advise from leaders in traditional faith system whose operating bases are shrines. Each age set also have their different shrines which, together with communal burial grounds should be isolated from LAPSSET activities.

Compensation for communal property: Still from Kapendo, there was complaint that as aligned, the LAPSSET corridor will replace the only boarding High School and an airstrip. They demanded that all property displaced by LAPSSET to be replaced in kind with better.

The precedent set by other projects: Communities in Moyale and Nakukulas (Turkana) were worried that they would not be compensated by LAPSSET given that previous agreements with KETRACO (Power Inter-connector) and Tullow Oil (lease of oil blocks) had not been honoured. They were assured that a RAP would be prepared to guide resolution of all issues.

(ii) Issues emergent from other consultations:

Issues from the Consultative Forum with Isiolo Governor and County Assembly: The Governor and his team lamented that though they were willing to collaborate and support LAPSSET, the Isiolo County Government was at a loss as they lacked information about LAPSSET. It was complained that the County Government had not been given basic information even on the alignment, location of essential facilities such as the railway station, oil depot, Dry Port among others which made it difficult to plan for LAPSSET or capture in the County Spatial Plan.

On his part, the County Assembly Speaker lamented what he saw as an attempt to push LAPSSET into the Mt. Kenya area given its deliberate south eastern alignment at Kula Mawe so as to approach Isiolo Town. He argued for a distinction between Isiolo County and Isolo Town in which case, a northern orientation of the Corridor towards Merti would be more beneficial to the larger County and would avoid traverse through Kipsing Gap which was an important wildlife conservation area. He made a passionate plea for the Resort City to be relocated from Kipsing which is a wildlife conservation area.

The capacity of local indigenous youth to participate in LAPSSET given the low literacy levels was also discussed. Isiolo wondered how come the Scholarship programme was only covering Lamu County. The LCDA pledges to upscale the same to other areas immediately.

The Memorandum from residents of Butiye and Sessi Locations of Moyale Sub County: The Borana Community of Butiye and Sessi Locations of Moyale Sub County presented the SEA Team with a memorandum (Appendix 7.6) pointing out complaints against LAPSSET as follows:-

1. Lack of Consultation and Information about LAPSSET
2. Violation of Indigenous Right to land
3. Impact on the Environment
4. Potential to Trigger Insecurity
5. Potential to Displace Important facilities:
    - 11 Mosques
    - 7 Churches
    - Graveyards and Cemeteries
    - 3 Health Centers
    - 6 Guest Houses
    - 10 operating offices
    - 7 Shopping Centers/Markets
    - Farms and grazing lands

The content of this memorandum was brought to the attention of LAPSSET who moved to convene a meeting in Moyale to resolve the matter. The Memorandum however went to confirm the general complaint of lack of awareness on LAPSSET at the level of critical stakeholders and grassroots groups.

The meeting with National Drought Management Authority: The SEA Team held a meeting with the NDMA with a view to understanding the potential impact of LAPSSET on drought management in northern Kenya. It was clarified that by providing transport infrastructure, LAPSSET was indeed contributing to the Second Pillar of the Ending Drought Emergencies (EDE) namely provision of climate proved infrastructure necessary in drought mitigation.

7.3: Core outcomes from the Stakeholder Consultation Process

From the Stakeholder Engagement Process, many vital lessons with crucial impact on the success of LAPSSET as summarised below. These concerns have directly informed the selection and prioritisation of concerns and the outcome reported in Chapter Nine below.

Public Disclosure of LAPSSET: Without exception all stakeholders engaged complained of lacking information about LAPSSET. It was in reaction to this that the series if County Level Workshops and Community Level Public Hearing meetings were held under auspices of this SEA in all Counties. It was however recommended that the same process be adopted and intensified by LCDA.

Issue of Land: This issue was emotively discussed in all the Community level meetings. Communities are apprehensive that their land is being alienated. Communities want protection for their land. Communities want LAPSSET to negotiate with them before acquiring the land.

The issue of Wildlife: Stakeholders in Wildlife are concerned that LAPSSET is traversing critical wildlife habitats in Ijara, Isiolo, Laikipia, Samburu and Marsabit which host vast populations of wildlife outside protected areas with some endangered species such as Hirola antelope, Elephant, Wild dog, Grevy's Zebra among others. The corridor should realign to avoid high density migratory corridors and provide modalities for traffic separation to allow free movement of wildlife.

The issue of water: This issue came out forcefully during meetings at Laikipia and with ENNDA where the sad state of Ewaso Ng'iro River dues to over abstraction was highlighted. It was highly recommended for the pace of LAPSSET development to be pegged to development of water storage infrastructure. The question of Isiolo Mega dam and Crocodile Jaws dams remain contentious as downstream communities see them as attempts to further deny them of water through storage of floods.

Support for LCIDP: The stakeholder engagement process brought out one fact:- LAPSSET enjoys overwhelming support nationally. Many County governments are proceeding to make plans on how to partner with LAPSSET. Their core requirement is data and information to facilitate capture of the same in the County Spatial Plans and revised CIDPs.

8.0 Analysis of Alternatives

8.1 Approach to Analysis of Alternatives

Analysis of alternatives sought to explore other options in achieving the Vision 20230 Strategy of (i) Attracting Foreign Direct Investment, (ii) Manufacturing for Export, and (iii) Employment creation towards achieving the Vision of *a globally competitive Kenya with high quality of life* with least social and environmental costs. For Programme Level initiatives such as the LCIDP, selection of alternatives is limited to two options (Table 8.1) namely:-

- Programme alternatives;
- Priority alternatives

Table 8.1: Criteria in analysis of alternative for different PPPs

Alternative scenarios	Level of PPP under consideration			
	Policy	Plan	Programme	Project
	Comprehensive development Scenarios Comprehensive Strategic Alternatives	Development Scenarios Strategic Alternatives Land Use Alternatives	Programme alternatives Priority alternatives	Location, route alternatives Technical application alternatives n Implementation alternatives
Scenario One				
Scenario Two				

Source: This Study

The basic objective of LAPSSET was to open up the Northern Eastern parts of Kenya and improve connectivity with the neighbouring countries of Southern Sudan and Ethiopia. It main constituents are the standard gauge railway, the highway, and the oil pipeline to evacuate newly found oil in Kenya and also to distribute imported oil.

8.2 Key considerations in Evaluations in alternative alignment for the LCIDP

Selection of the current alignment of LCIDP was informed by evaluations as follows:-

Combined corridor or separate corridors: There was an alternative of having separate or combined corridors for each of the 3 main LAPSSET sub-components, namely:- rail, road and pipeline. However, due to the long timelines and land management inefficiencies experienced when seeking for wayleaves, it was thought best to have a common corridor for all the tree components. The three would also seek to have interlinkages between each other and have some synergy among other complementary investments.

Width of corridor: In view of the inefficiencies and timelines for acquiring wayleaves aforementioned, there was consideration of having a 5 km wayleave or 500 metres one, with other widths in between considered. The 500 metres way leave was however found sufficient to accommodate the three sub-components and leave room for other investments e.g. internet cables.

Routing of the corridor and location of other infrastructure: This was the main consideration among the alternatives as the routing had a myriad of possibilities and lots of vested interests. The main considerations for the routing included:

Natural conditions: These included the geography, geology and hydrology: Geography determines the need and extent for structures like bridges, with terrain being key for the railway which requires gentle gradients of 1.0-1.5%. Soils were also important as they determine the structural designs. Hydrology and drainage is also important as it is important to avoid swamps and water bodies, and also consider issues such as flooding.

Existing infrastructure and infrastructure development: Being a transport corridor, LAPSSET requires connecting with the existing and ongoing infrastructure for better connectivity. As such routing considered the existing corridors especially the A2 highway of Nairobi-Isiolo-Merille-Moyale; the East African Transport Corridor No.3" that runs from Birahamulo in Northern Tanzania through Mwanza and Musoma in Tanzania before crossing into Kenya through Sirari/Isebania on the Kenya-Tanzania border before passing through Kisumu, Kakamega, Webuye, Lodwar and Lokichokio in Kenya and on to Nadapal on the Kenya-Southern Sudan border; 8 road between Kibwezi on the A109 road (linking Nairobi and the port of Mombasa) with Isiolo; and how LAPSSET would connect to them.

Natural resources: This was mainly for the newly discovered wealth in terms of oil in Turkana, and coal in Mwingi and how these would be evacuated to the port and other major towns.

Existing and potential economic activities: This is in light of opening up North-eastern Kenya and linking the corridor to key economic activities that would be boosted by LAPSSET and also justify the investment in the corridor. This is in terms of mining, irrigation, tourism, and livestock.

Environmental considerations: This was in view of the corridor avoiding traversing of ecologically sensitive areas such as national parks, reserves and privately run conservancies. This is due to the potential impacts especially with regards to restriction of movement and noise on wildlife, and the prospect of impacting on their habitats. Other important considerations were those off historical and cultural heritage sites along the proposed corridor.

Displacement of persons: The routing also considered the displacement of persons or communities especially around towns and urban centers. The route with least displacements was preferred.

Cost Effectiveness: The viability of the corridor is tied to its costs which ate tied to the ease of construction, length of the proposed alignment, number of major crossings, land acquisition costs and expected operational costs once the route is operational.

Land Acquisition and Future Expansion: Ease of land acquisition in Kenya is key to the success of a project. This is due to speculators and the dynamics of compensation. The corridor, though mainly traversing community land also cuts across private and public land especially around towns.

Design consideration: the 3 components each have specific requirements which also influenced the route selection as shown in Table 8.1 below:

Table 8.1 Design Considerations in Corridor Route Planning

Component	Features	Design Requirements
Railway	High speed passenger and freight train	Horizontal curvature > 2,000m - Gradient < 1.0% *Above requirements are based on maximum speed of 120km/hour for freight train and 160 km/hour for passenger train. Modifications may be made in mountainous areas.
Highway	High speed road with free access	Less constraint in alignment
Pipeline	Transport of hazardous liquids Operated in high pressure Mostly buried underground	Less constraint in alignment Cannot be installed together with railway and highway in tunnels.

In summary, the following sequence was used for routing and network analysis:

i. Identify existing roads;
ii. Identify existing plans by others;
iii. Establish network options;
iv. Sectioning Sub-corridor;
v. Setting route options and comparison in each sub-corridor;
vi. Setting route entire corridor plan options by integrating sub-corridors;
vii. Site Reconnaissance; and
viii. Network Analysis on advantages and disadvantages

The corridor was divided in two sub-corridors. Further, sub-corridor to South Sudan was subdivided into four segments for ease of analysis.

Sub-corridor to South Sudan (Lamu – Isiolo - Nakodok)

Segment	Approximate Distance (Km)
Segment-1: Lamu-Garissa	250
Segment-2: Garissa-Isiolo	280
Segment-3: Isiolo-Lodwar	470
Segment-4: Lodwar-Nakodok	240
Sub-corridor to Ethiopia (Segment 5 – Isiolo to Moyale)	470

Nairobi Corridor Link (Isiolo – Nairobi) 250

8.2 Key considerations in Programme Alternatives

The route selection process was done for each segment with most considerations being on the basis of the following objectives:

i. Utilization of existing corridors and roads with other engineering factors;
ii. Possibility of having a long straight continuous stretch (Shortest distance within the segment);
iii. Least number of stream, road, and railroad crossings;
iv. Ease of achieving design standards from the selected route;
v. Accessibility by the existing roads;
vi. Ease of construction with least grading (cutting and filling);
vii. Satisfaction of other stakeholders requirements e.g. Route to serve specific areas and towns;
viii. Slope of terrain; and
ix. Existing laws and regulations on wetlands, game reserves and military bases etc.

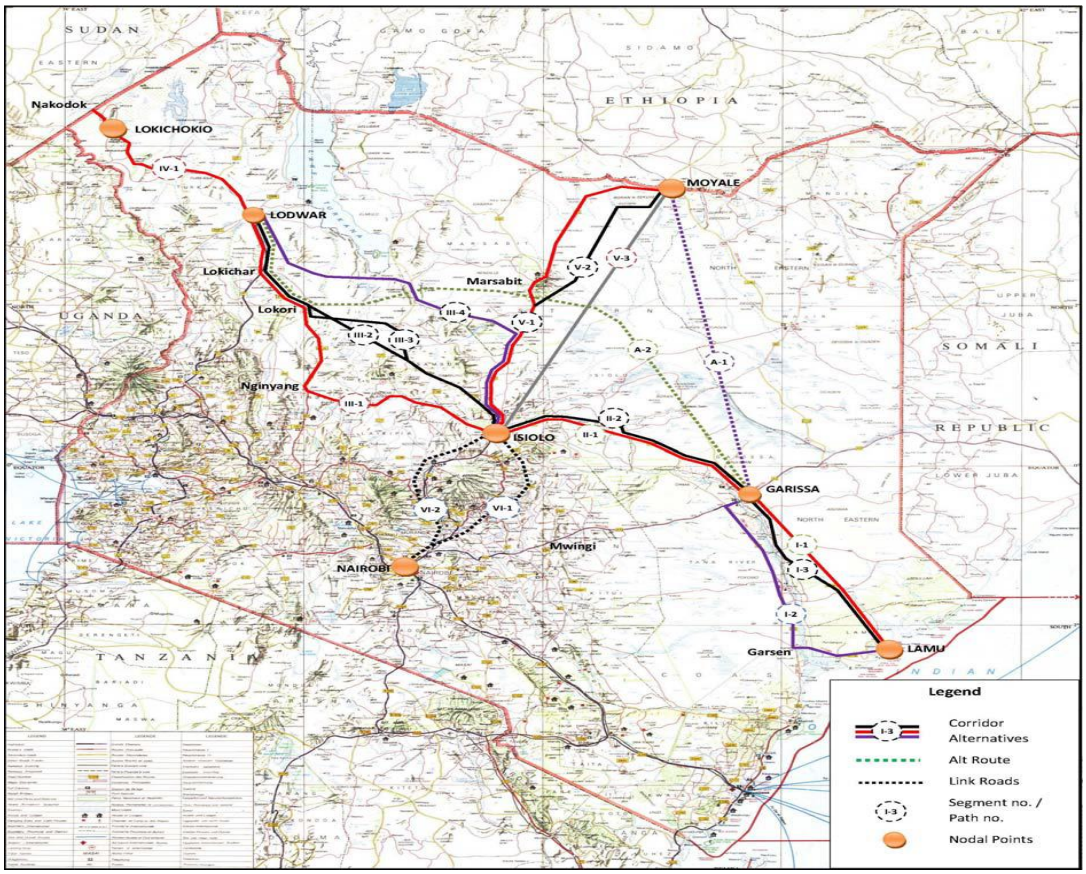


Figure 8.1 :Alternatives considered for each segment

8.3 Analysis of the No action alternative

The "no action" or no project alternative would maintain the *status quo* of the situation in the Northern Eastern parts of Kenya which have lagged behind in development has the highest poverty levels in the whole country. The areas thus need to be opened up.

The no action alternative would also mean that newly found natural wealth would remain non-utilized and where exploited, would be difficult to evacuate to the port of Mombasa for onward export or for use in the rest of the country.

The high poverty levels would mean that the communities there continued exploiting the fragile natural resource base, leading to more environmental degradation and more poverty, with the cycle becoming ever more vicious.

This makes the no project alternative both expensive and unacceptable to the local communities. For these reasons, this alternative was rejected in favor of the current project design.

9.0 Impact Prediction and Analysis

9.1 Basis for Impact Assessment

Chapters 4 through to 7 above have documented the environmental and social baseline preceding development of the LCIDP to set the background for impact analysis - the most critical outcome of an Integrated Impact Assessment Process including SEAs. It is the outcome of impact assessment that informs decision making on the future direction of a PPP in which case, a full proof system for impact prediction and analysis is fundamental to the integrity of a SRA process. Impact analysis as unveiled in this Chapter was approached at different levels namely:-

- Screening for compatibility/ relevance to GoK Planning Goals at National, Regional and County levels;
- Screening against international standards for sustainable development; and
- Screening against stated stakeholder concerns and interests.

9.1.1 Screening procedure

Fundamental to screening is identification of appropriate tools. Screening for LAPSSET therefore, applied an array of tools whose criteria represent the broad range of interests from diverse stakeholder categories. Given the vast geographic and thematic spread of LAPSSET, quite a huge array of stakeholders has vested interests and care was taken to bring on board all interests deemed relevant to the LCIDP based on the extensive mapping as reported in Chapter Five above. As a strategy, the entire corridor and proposed investment portfolio that make up LAPSSET have been screened against parameters that define the operating environment to firstly gauge out how the project blends with pre-existing mandates, local and international standards and to map out discordant aspects that would require resolution towards achieving technical viability, economic sustainability and social acceptability in project development. The basis for screening is a checklist of issues/criteria from tools that define the operating environment for LAPSSET namely:-

- International Standards for sustainable development;
- National policy Blue Prints and Sectoral Masterplans;
- Regional Development Mandates and standards;
- County Government Planning Tools;
- Pre-existing concerns;
- Concerns of Fundamental Rights Holders; and
- Stated priorities/ Action Plans at grassroots levels.

The perceived outcome of the interaction between the LCIDP and respective criteria was either recorded as harmony where positive or caution where a negative outcome was identified.

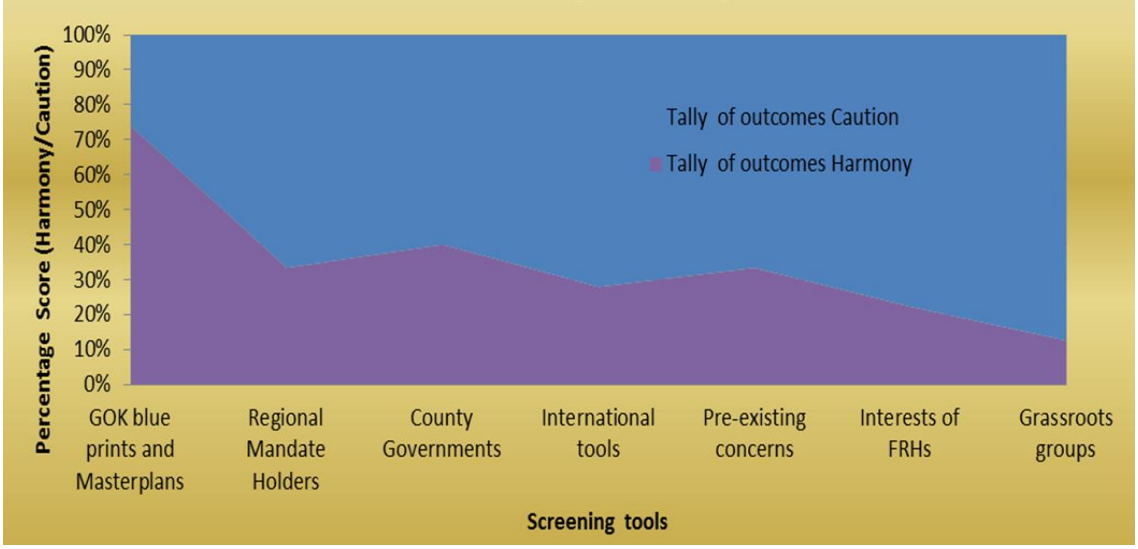
9.1.2 Outcome of the screening process

A total of 194 Criteria obtained from 83 diverse tools were applied in the Screening whose detailed outcome is provided Appendix 8.1 and summarised in both tabular and graphic form in Table 9.1 and Fig 9.1 below. Essentially, screened against the 194 criteria, a total return of 127 negative (caution) outputs equivalent to 65.5 % of all outcomes was observed against 67 positive outcomes. LAPSSET scores very poorly against grassroots groups and Fundamental Rights Holder Interests at 87.5% and 77.8% caution respectively. By implication, the bulk of adverse impacts are anticipated to accrue at both stakeholder levels. In sections below, the salient concerns under each stakeholder category are highlighted.

Table 9.1: The depth and Scope of Screening

Planning level	Total tools	Total Criteria	Tally of outcomes		
			Harmony	Caution	% Caution
International tools	23	43	12	31	72.1
GOK blue prints and Masterplans	23	37	25	12	32.4
Regional Mandate Holders	11	21	7	14	66.7
County Governments	13	20	8	12	60.0
Pre-existing concerns	7	24	8	16	66.7
Interests of FRHs	6	9	2	7	77.8
Grassroots groups	0	40	5	35	87.5
Totals	83	194	67	127	65.5

Source: This Study



Source: This Study

Fig 9.1 Broad-based screening of the LCIDP against diverse criteria

9.2 Highlights of core concerns

9.2.1 Screening against International Standards

A total of 23 International standards with a total of 43 criteria were applied in screening the LCIDP for sustainability. These include;- Sustainable Development Goals, World Bank Safeguard Policies, the IGGAD Charter and 18 International Agreements to which Kenya is signatory. On account of being aligned to Kenya Vision 2030, LAPSSET scores positively (harmony) against 12 of the 17 SDGs but triggers all World Bank Safeguard Polices. However, on account of potential impacts on the sea and coastline at Lamu and the potential to displace rangeland ecosystems, the LCIDP triggers adverse impacts (caution) on Marine Pollution, Marine Biodiversity, Terrestrial biodiversity (flora and fauna), climate change and desertification among others. These impacts are further analysed in sections below.

9.2.2 Screening for harmony with Gok Policy Blue Prints and Masterplans

Being a flagship under the Economic Pillar of Vision 2030, LAPSSET is highly attuned to Vision 2030, the MTEP II, and The Vision 2030 Version for Northern Kenya and the Common Framework Policy for Ending Draught Emergencies (EDEs). Overall, LAPSSET scores highest (67.6%) against the GoK policy blue prints with which it resonates quite well. However, when screened against National Sectoral Masterplans with a conservation bias such as NEAP, National Water Masterplan (2030), Kenya Forestry Masterplan 2020, Food and Nutritional Security Policy, KWS Strategic Plan, National Policy on Groundwater Development, National Museums Strategic Plan, National Biodiversity Masterplan etc., the Project is likely to trigger numerous adverse outcomes on account of potential degradation of protected areas, fragmentation of ecosystems and habitats for endangered fauna, degradation of surface and groundwater among others. Detailed analysis is provided in 9.2 below.

9.2.3 Screening against Regional Mandates

Included here are the Regional Development Authorities (CDA, TARDA, ENNDA and KWDA) and regional jurisdictions of National Agencies. While LAPSSET is largely in harmony with regional planning goals such as proposed large-scale agriculture in the Tana Delta under TARDA, proposed modern Abattoir in Wajir by ENNDA and the High Grand Falls Multi-Purpose Dam proposed by TARDA, there is less harmony with the Catchment Management Strategies for Tana, ENNDA and Rift Valley where the conflict is on potential catchment degradation, non-sustainable strain on both surface and groundwater. LAPSSET is also likely to adversely trigger the Integrated Coastal Zone Management Action Plan for Kenya prepared by NEMA on account of alienating 16 kilometres of mangrove laced coastline.

9.2.4 County Governments

The screening tool applied in respective of County Governments is the 5-year County Integrated Development Plan (CIDP) prepared by all County Governments under the County Governments Act 2012 since 2013 and the yet to be prepared County Spatial Plans whose aspirations are expressed in Chapter Three of each CIDP. Respective CIDPs were analysed for provisions made to interface with both the LAPSSET Corridor components and proposed growth areas which essentially are the economic drivers The Core finding is that all CIDPs express the need to align with and support LAPSSET alongside other Vision 2030 flagships. The fundamental weakness is that none of the County Governments has put in motion plans towards meeting the development opportunities and challenges anticipated from LAPSSET. Indeed, none of the Counties has attempted to plan development control within both the proposed Economic Corridors and Growth areas associated with LAPSSET.

9.2.5 Screening against pre-existing Concerns

Many concerns predate LAPSSET. Land degradation, dying pastoral livelihoods, insecurity, human wildlife conflict, conflicts over resources, crime, dwindling water resource base etc. among others enumerated at Scoping Stage are some of the core dynamics at play within the traverse and which could either be mitigated or aggravated by LAPSSET. As currently conceived, implementation of LAPSSET is likely to aggravate majority of pre-existing concerns to the tune of 66.7% adverse score implying possibility that quality of life within trouble hotspots will deteriorate. This represents the opportunity available for LAPSSET to turn around local felt needs and challenges. A comprehensive treatment of each concern is provided in 9.3 below.

9.2.6 Screening against Interests of Fundamental Right Holders

Chapter Six above identified six broad categories of FRH including Kenyan citizenry, Indigenous Communities & Pastoral Livelihoods, Fishing based livelihoods, Land owners, cultural heritage, wildlife, downstream communities among others. Table 9.2 below provides an analysis of the potential interplaying of the LCIDP with such rights.

The LCIDP has a huge merit - it will enable investments required to generate resources needed towards uplifting the quality of life for Kenyans as espoused in the Sustainable development goals. However, FRH could also incur huge costs associated with degradation, reduced access to productive resources; and ecosystems, dilution of cultural heritage, fragmentation of habitats among others whose long-term impact is to undermine resilience thus making them more vulnerable to climatic and other natural shocks. Section 8.4 below provides a deeper analysis of the possible impact of LAPSSET on strategic resources.

Table 9.2 Analysis for harmony with pre-existing fundamental rights

Interest Group	Stake	Potential impact of LCIDP activities	Status
Kenyan Citizens	Constitutional Right to a	Could introduce environmental	Caution

	Healthy Environment	degradation	
	Right to adequate supply of quality water to meet their needs	LCIDP could exert pressure on available water resources	Caution
	Right to sustainable development	Will promote economic growth and contribute to social welfare of Kenyans	Harmony
	Right to cultural heritage which is their defining feature	Cultural dilution due to influx of new communities	Caution
	Archaeological heritage	Potential loss due to investment	Caution
Downstream Communities	Right to supply of adequate clean water	Will exert pressure on quality and quantity of water resources	Caution
Indigenous and Pastoral communities	Right to customary grazing territories and ecosystem services	Partial loss pastures land and ecosystem services.	Caution
	Right to traditional free range movement	Creation of a physical barrier	Caution
Landowners	Constitutional Right to access, own and use land	Dispossession of land and means to livelihoods	Caution
Fishing Communities	Access to traditional fisheries	Partial loss of access to traditional fisheries	Caution
Wildlife	Inherent Right to habitats	Loss of habitat from Mangrove forests, ASAL bushlands, swamps, riparian belts, grasslands etc	Caution

9.2.7 Screening against interests of grassroots groups

Grassroots groups are many, diverse and multi-tired, bringing together anybody with interest on resources primarily within the ecosystems traversed but also within those adjoining ecosystems. The primary interest here is land and land based resources as the primary means to livelihood and investment, ecosystem resources including water, wildlife sanctuaries, migratory corridors, coastline ecosystems and fisheries, pre-existing investments, oil sector investments, among many others all of which will be impacted by LAPSSET.

Screened against such diverse but fundamental grassroots interests, LAPSSET scores the poorest with adverse outcomes accounting for 87.5% of all possible impacts. And given that, most of the interests here are centered on primary livelihoods, any destabilization is likely to achieve the exact opposite of LAPSSET and indeed vision 2030 goals.

9.2.8 The Emerging Scenario

In sections above, the LCIDP was screened for potential impact on diverse stakeholder interests either as expressed in local planning tools, international safeguards or local felt needs. From Fig. 9.1, the project scored very highly on potential to address local planning goals but overwhelmingly poorly against international safeguards and local felt needs. Clearly, there are lots of issues that need resolution upstream of project implementation which calls for a clear understanding of stakeholder concerns that would stand in the way of LAPSSET.

In sections below, the scope, depth and dimensions of issues emerging as being critical in the successful development of LAPSSET are analysed to pave way for formulation of an issues-based mitigation strategy.

9.3 Core Stakeholder Concerns in LAPSSET

9.3.1 Prioritisation of stakeholder concerns

Analysis of issues for this SEA has largely relied on collation of concerns (published, written or verbal) as obtained from stakeholder categories through the process schematically illustrated in Fig 9.2 below. Numerous issues received underwent preliminary screening and grouping to yield 20 thematic issues considered to represent the main stakeholder interests in LAPSSET. All 20 issues underwent further cross referencing against screening tools with the frequency of trigger helping to rank each issue in terms of importance. The resultant ranking is presented graphically in Fig 9.2 with its *Jar of Issues*.

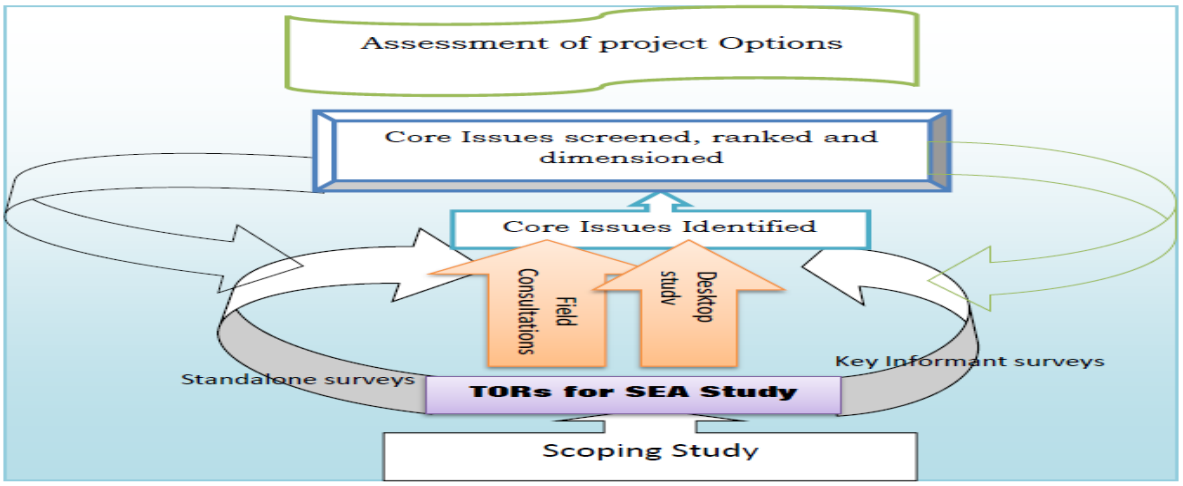


Fig. 9.3 Schematic process followed in identification of core concerns in LAPSSET

Clearly, land, rangeland ecosystems, biodiversity, water resources, and access to resources, livelihood security and food security are the most critical concerns associated with development of LAPSSET. Others in that order are conflicts, access to services, climate change, marine resources and HIV/AIDS with relevance to over 40 stakeholders. In the view of this SEA, land and land based resources, water and livelihoods stand out as the most critical costs in developing and operating LAPSSET and by extension hold the key to unlocking the strategic impact of the project. A clear understanding of the scope and depth of these and other concerns, their inter-linkage, cumulative tendency and footprint is pivotal to the formulation of a viable mitigation strategy required to secure anticipated economic goals of the project. In sections below, each concern is analysed for significance in line with Annex Three of the SEA Guidelines.

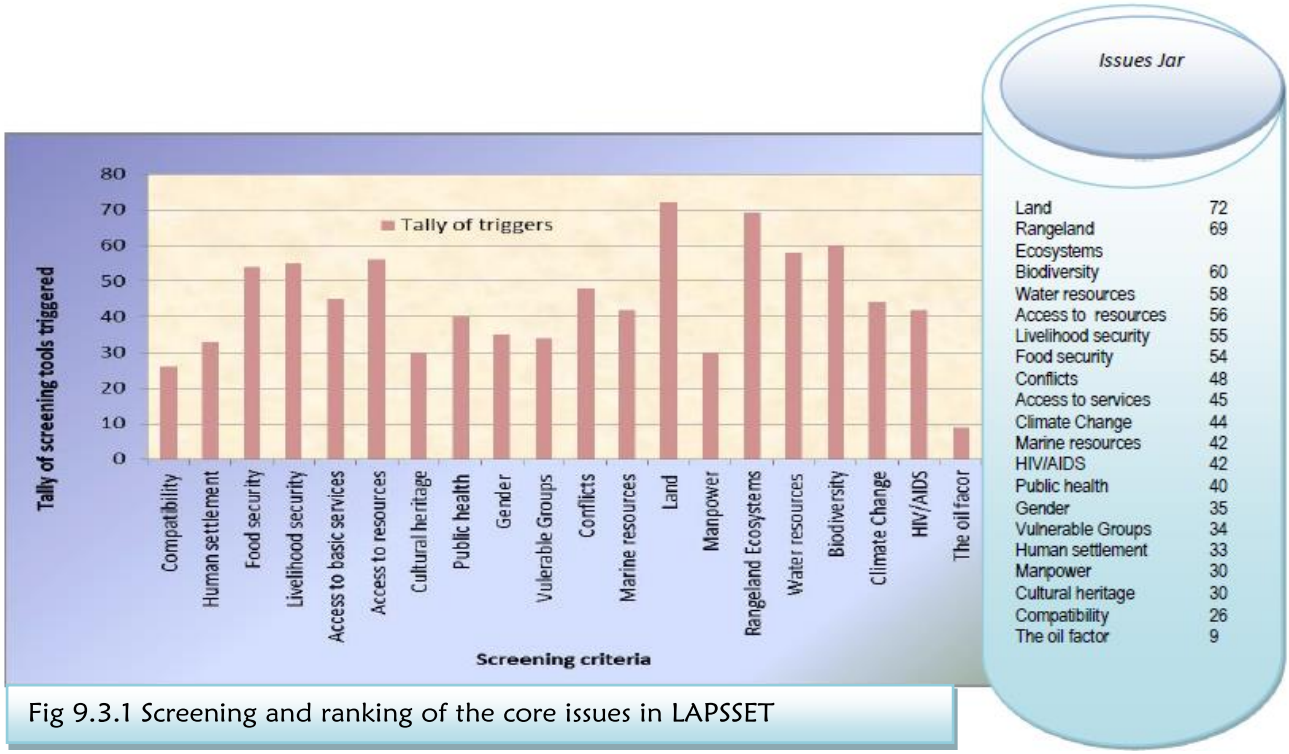


Fig 9.3.1 Screening and ranking of the core issues in LAPSSET

9.3.2 Approach to analysis for significance

Criteria for Analysis

Analysis of concerns in this Study has largely been informed by Annex Three of the SEA Guidelines which stipulates criteria as follows:-

1. The characteristics of plans and programmes, having regard, in particular, to

- The degree to which the policy, plan, or programme (PPP) sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions by allocating resources;
- The degree to which the PPP influences other PPP including those in a hierarchy;
- The relevance of the PPP for the integration of environmental considerations in particular with a view to promoting sustainable development;
- Environmental problems relevant to the PPP; and
- The relevance of the PPP for the implementation of legislation on the environment, e.g., PPPs linked to waste-management or water protection.

2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to:-

(i) Impact Characteristics namely:

- The probability, duration, frequency and reversibility of the effects;
- The cumulative nature of the effects;
- The trans-boundary nature of the effects;
- The risks to human health or the environment (e.g., due to accidents);
- The magnitude and spatial extent of the effects (i.e., geographical area and size of the population likely to be affected);

(ii) Importance / Recognition / Value / Vulnerability:

- The value and vulnerability of the area likely to be affected due to:
  - ✓ Special natural characteristics or cultural heritage;
  - ✓ Exceeded environmental quality standards or limit values;
  - ✓ Intensive land use;
- The effects on areas or landscapes, which have a recognized national, community or international protection status.

The NEMA (SEA Guidelines) Criteria have also been supplemented by other tools and data sets such as the State of the Environment Reports, Findings of Independent Research Studies, and Standards of other competent organizations.

The template approach for impact analysis

LAPSSET is a 1200 kms long linear infrastructure programme with major spatial components comprising the Lamu Port, Oil refinery, Special Economic Zones, Railway termini, Airports, Resort Cities, Growth areas, Dry Ports, Oil Depots among others all of which span diverse and numerous landscapes and ecological zones, in the process triggering diverse concerns and effects. A generalised (programme scale) description of concerns runs a huge risk of downplaying locally critical dimensions and significance thus introducing potential weaknesses in the mitigation programme. As a strategy, analysis of significance for this SEA has applied a template approach whereby each concern is traced through sections and components of the LAPSSET programme, in the process, taking account of local dimensions and sensitivities. Ultimately, a matrix capturing

the full spectrum of concerns for the programme, prevalence and local sensitivities has been assembled to bring out the entire social and environmental weight of the programme.

Matrices on analysis for significance are provided in Appendix 9.1 for (i) the infrastructure corridor alone and (ii) Appendix 9.2 for the infrastructure and economic corridors combined.

Dimensioning of Concerns

From application of NEMA Criteria and other authorities, a multi-tied approach to analysis for significance was applied whereby each concern was analysed for primary, secondary, cumulative and ultimate effects as outlined in Appendices 9.1 and 9.2. It turned out that, concerns originally identified as primary to the LCIDP (Fig 9.3.1) turned out to be secondary impacts deriving from others. Thus, concerns such as livelihood security, food security, vulnerability, biodiversity etc. are secondary impacts emanating from loss of productive land and ranges resources as a result of land acquisition for LAPSSET.

Prevailing baseline and trends
These were analysed in Chapters Four and Five above. Chapter Seven on stakeholder engagement alos highlights the baseline situation and trends regarding community perception to LAPSSET.

9.4 The Land Factor in LAPSSET

9.4.1 The likely scenarios

LAPSSET will probably only directly affect a 500 m strip of land which will be alienated for corridor development. However, such a minor land use change is likely occasion drastic and far reaching consequences especially on adjoining land use and economic alignment within and beyond all affected counties leading to drastic change in the future direction in local socio-economic development. Indeed, economic transformation of northern Kenya as anticipated of LAPSSET could see all land adjoining the Corridor and beyond changing completely as new land use systems more aligned to commercial activity are adopted to take advantage of the Corridor. These are the impacts explored below. As well, all new development on land will have drastic impact on other resources such as water, pastures, conservation etc.

Potential scenarios resulting from land alienation for the LAPSSET Corridor are analysed at three levels namely: - Strategic Impacts, Direct short to medium term impacts and cumulative impacts.

9.4.2 Strategic Impacts

Realignment of land-use along the corridor and beyond:
The most drastic long-term impact of land alienation for LAPSSET is land use transformation along the Corridor and beyond. As happened, with development of the Uganda railway, currently extensive use of land for pastoralism is likely to slowly be replaced by aggressive, capital intensive commercial

investments to take advantage of modern transport infrastructure in form of airport, road and railway. In this regard, the Garba Tula-Nginyang-Marsabit triangle where attempts to introduce commercial horticulture for export has been constrained by increasing distance from Nairobi and poor state of roads, is likely to see more horticulture developing to take advantage of Isiolo Airport and the new highway. The vast riparian grazing belt of the Tana River riparian belt in Garissa is likely to come under more horticulture, further fragmenting both dry season grazing grounds and wildlife habitats.

In the new economic order, all intersection points such as Garissa, Kinna, Ndumuru, Isiolo, Oldonyiro, Sukutar Marmar, Nginyang, Lokori and Lokichar where the New Highway will intercept existing highways and feeder roads will immediately develop into urban centres providing services to road users and this will occasional further land use transformation. Under this category, Ngingang is poised to assume a new role as the point where the Northern Corridor will be linked to the LAPSSET Corridor. As well, Garissa deserves mention as the common transit point for three neighbouring countries of South Sudan, Ethiopia and Somali, and by extension, the diaspora accessed through Lamu Port.

Erosion of pastoral resilience:
Land use change in response to LAPSSET will take place mainly at the expense of pastoralism which, in spite of providing livelihood for 15% of the national population and hosting 37% of the national livestock herd which contributes to the 5% of National GDP earned from livestock, have continued to lose grazing territories to ranching, conservation, horticulture and urbanization; will lose additional land especially to large-scale commercial horticulture, hospitality, industrial belts and real estate. Pastoralists especially in southern Kenya are yet to recover from shocks of early 20th century when in 1904 and 1913, they lost 50 to 70% of their territory to create white settlers farms for large-scale commercial ranches in Laikipia and have continued to lose more to conservation and urbanization especially in the Ngong area of Kajiado. Remaining pastoral territory have been degraded through sustained overgrazing and is currently bare earth devoid of grass cover already undergoing irreversible denudation through gully and sheet erosion. Many grazing units within Laikipia's Doldol and Mukogondo areas, Samburu Plateau and Lokichar and Lokori in Turkana are undergoing accelerated degradation which renders them useless for livestock production. Today, despite their resilient social-ecological adaptive strategies, pastoralists' systems are failing to meet households' livelihood needs and maintain ecological resources. With additional loss of grazing land to commercialization as anticipated from LAPSSET, remaining pastoral land will come under increased grazing and denudation pressure ultimately eroding their capacity to recover and support livestock production. In the estimation of this study, huge proportions of the ASAL territories currently under pastoral land have completely been lost to desertification. The indicator trend here is that, the camel which is able to survive through browsing on trees has systematically replaced cattle as pastoralists adapt to both climate change and land degradation impacts. The Study by *Ogutu eta al observed a many-fold (450–17896%)* increase in camel population (1977-2013) in Kitui, Laikipia and West Pokot counties and, to a lesser extent (89–119%), in Baringo, Garissa and Samburu counties, signifying increasing and widespread adoption of camels in these counties.[69]

[69] Ogutu et al, 2016: Extreme Wildlife Declines and Concurrent Increase in Livestock Numbers in Kenya: What Are the Causes?: PLoS One v.11(9); 2016.

Reduced land productivity will erode pastoral resilience, increase their vulnerability to drought whose frequency is said to be on the increase and ultimately, some could drop out of pastoralism in favour of settlement along the corridor to live on famine relief and wage employment. By so doing, they will join the league of pastoral dropouts who are recognised as being among the poorest in Kenya. Critical indicators on this trend include the fact that eighteen of the 20 poorest constituencies in Kenya, where 74% - 97% of people live below the poverty line, are in Northern Kenya.[70] Most residents of the 8 LAPSSET counties analysed for this SEA Study were observed to subsist below the per capita poverty line of 1 USD per day while the average per capita livestock holding of 1.2 TLU is well below the per capital livestock threshold of 4.5+TLUs required for resilience against drought are both indicative of structural poverty mainly on account of having lost animals to drought. *The PARIMA household study, 2000-2002* recorded cases of stockless pastoralists making up to 50-70% of northern Kenya communities studied.[71] Most pastoral households are currently hanging on this balance.

Plate 9.1 Denudation process in the Dol dol, area of Laikipia

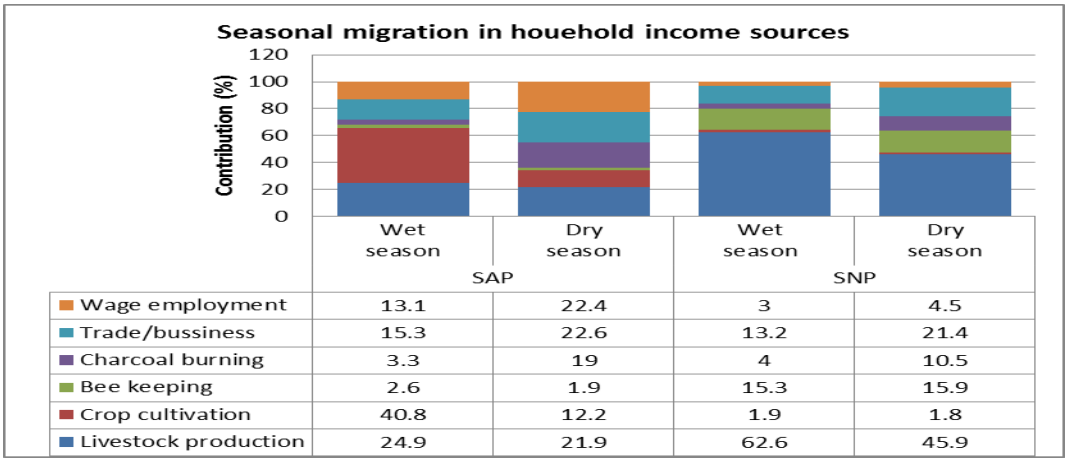
Environmental implications in pastoral dropouts:

Without animal assets to produce food for their own consumption, stockless households are highly dependent on cash earnings to survive and end up working in towns as unskilled labourers (often in food-for-work schemes) or pursue petty trade in firewood, charcoal, and illicit brews. In a study investigating household income patterns amongst agro-pastoralists and semi-nomadic pastoralists, it was observed that

[70] Republic of Kenya, 2008: 'Constituency Report on Well-Being in Kenya'. The constituencies are Turkana Central, Turkana South, North Horr, Saku, Wajir North, Wajir South, Mandera Central, Turkana North, Mandera East, Garsen, Galole, Wajir West, Samburu West, Mandera West, Laisamis, Wajir East, Dujis and Ijara.

[71] Little, Peter D.; McPeak, John G.; Barrett, Christopher B.; and Kristjanson, Patti, "Challenging Orthodoxies: Understanding Poverty in Pastoral Areas of East Africa" (2011). Economics Faculty Scholarship. Paper 83. http://surface.syr.edu/ecn/83

households normally fall back to trade, charcoal making and honey trade as a coping strategy in dry seasons with the contribution of charcoal rising from 3.3 to 19% (Fig 9.4) and a corresponding increase in cash income of Kshs 3914 in one season alone[72]. At an assumed farm gate price of Kshs 600 per bag of *Acacia tortilis* charcoal, that income would require 150 Kg or 6.5 bags of charcoal each weighing 20kg which, at a conversion rate (tons to volume) of 1.4 and applying an efficiency factor of 15% implies an additional 9 trees carbonised by each household seasonally. Assuming that a third of the 1.54 million households resident in the arid counties engage in charcoal making seasonally, a total of 14.1 million trees equivalent to 28,128 ha of closed canopy forests are cleared seasonally with a double output annually. Indeed, this is already the trend in places such as Maji ya Chumvi between Voi and Mombasa and in many other places including Turkana implying that, the cost of pushing pastoralists into poverty is likely to manifest in loss of the national vegetation cover and by extension, the carbon sequestration capacity with very clear consequences to mankind.



	SAP Wet season	SAP Dry season	SNP Wet season	SNP Dry season
Wage employment	13.1	22.4	3	4.5
Trade/bussiness	15.3	22.6	13.2	21.4
Charcoal burning	3.3	19	4	10.5
Bee keeping	2.6	1.9	15.3	15.9
Crop cultivation	40.8	12.2	1.9	1.8
Livestock production	24.9	21.9	62.6	45.9

Fig. 9.4: Seasonal migration in household income among pastoralists

Costs to the taxpayer:

On its part, the government will be called up to commit huge resources in cushioning pastoral households against drought and associated shocks. Some of the economic gains earned from LAPSSET could well be eroded through increased dependency by the 15% of the national population resident within the ASALs. LAPSSET is superimposing on a scenario marked by increasing drought frequency and severity. On account of degradation, every drought and prolonged dry spell leaves behind weakened land whose ability to recover and restore carrying capacity is greatly eroded thus undermining capacity to host flocks for prolonged periods. A trend is emerging whereby water and fodder trucking are increasingly becoming part of the emergency relief basket to pastoralists with attendant skyrocketing of the emergency assistance budget (Fig. 5.5).

[72] Yazan et al: 2012: Transient Poverty among Pastoral Households in the Semi-Arid Lowland of Baringo District, Kenya. Ozean Journal of Social Sciences 5(1), 2012

The real costs for developing LAPSSET will manifest in the accelerated erosion of productive capacity of ASAL lands through denudation and attendant burden on both the environment and the tax payer.

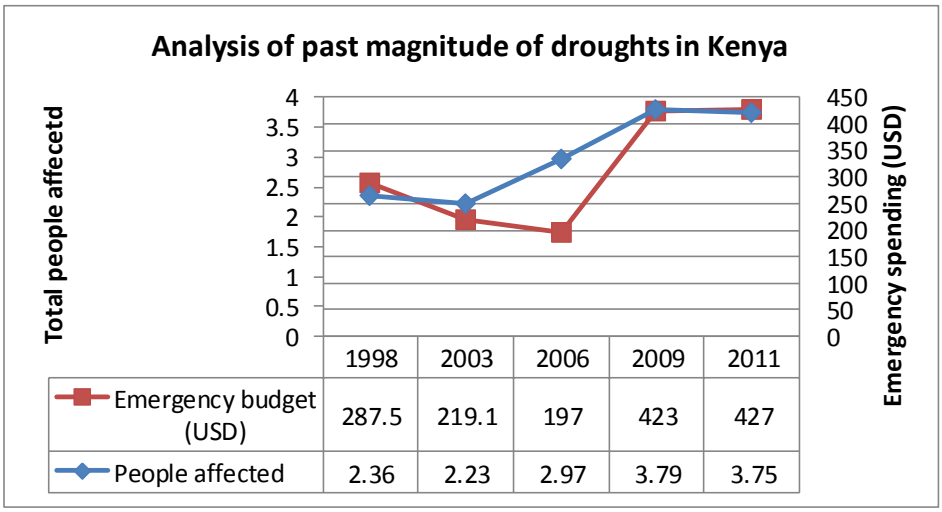


Fig 9.5: Analysis of past prevalence and magnitude of droughts in Kenya

Implications to national harmony, peace and integration:
Other than aridity, conflict manifesting either as ordinary crime and thuggery, fights of resources and boundary disputes (Table 9.4 below) is the other salient feature of the northern. Cattle rustling which towers high above all others in terms of frequency and geographic spread (it spans Isiolo, Laikipia, Samburu, Baringo and Turkana counties) is reported to be graduating from culturally motivated moranism to commercial scale operations relying on sophisticated weaponry and logistical support. This same self-renewing culture could easily transform and upgrade to target sabotage of the Corridor through theft and vandalism especially on the isolated, lonely section between Chemulingot and Lokori through Kapendo.

By far however, displacement of communities from traditional riparian pastures to give way to investments deemed mutually exclusive to mobile pastoralism is likely to deflect pressure to remaining resources with competing groups striving to gain control thus creating fertile grounds for armed conflict. In this case, expansion of on-going irrigation development within lower Ewaso Ng'iro basin between Malka Daka and Sericho, and along the basins of Kerio and Turkwel Rivers has potential to escalate conflict over remaining dry season grazing.

Table 9.4 Summary of conflict hotspots in the LCIDP Traverse

Category of conflict	Manifestation	Hotspots
Crime	Banditry along transport routes	Mado gashe to Isiolo Road, Wamba-Barsalinga-Kisima Rd, Isiolo-Kisima-Oldonyiro road, Rumuruti-Maralal road
	Cattle rustling	Northern Grazing Area, Samburu-Laikipia-Baringo boundaries, Nginyang-Kapendo-Lomelo-Lokori transect, et.
	Sporadic, soft target attacks associated with Al Shabab sympathisers	Garissa County
Conflict over space and resources	Inter-and intra-community attacks and counter attacks	Isiolo Triangle, Garba Tula along Ewaso Ng'iro River, Laikipia North pitting herders against ranchers, Ol Moran pitting herders against cultivators, Yamicha triangle
	Human-Wildlife Conflict	Human casualties and property damage by elephants, loss of small stock to leopards, hyenas and cheetahs. Retaliatory attacks, poisoning and hunting of wildlife
Boundary disputes	Court cases	Kinna: Borana community claims on grazing land in Igembe East Ward, many others
	Sporadic attacks and counter attacks	Laikipia-Samburu-Baringo Triangle: Claims over Lntungai Conservancy land
		Kapendo area: Pokot community claims on Turkana East Territory
	Political conflicts	Meru and Isiolo County boundary dispute around Isiolo Town

Source: This Study

9.4.3 Other land related concerns

Impact on livelihood security:

Loss of land as a factor of production especially in agro-pastoral systems has potential to reduce food and livelihood resilience thus making victims more vulnerable to poverty. Simultaneously, a 50 Km wide corridor consuming an entire riparian area has potential to annihilate the entire communal dry season grazing ground, destroying forest sources that supply drought coping products such as pods, herbal remedies and supplements thus reducing pastoral resilience to drought and famine and causing them to sink deeper to poverty. Other services whose access can be curtailed by land loss include housing and shelter, social services inclusive of cemeteries, traditional shrines etc. The whole of the River Tana riparian reserve is a dry season grazing ground whose loss to the Corridor would have far-reaching consequences to local community groups.

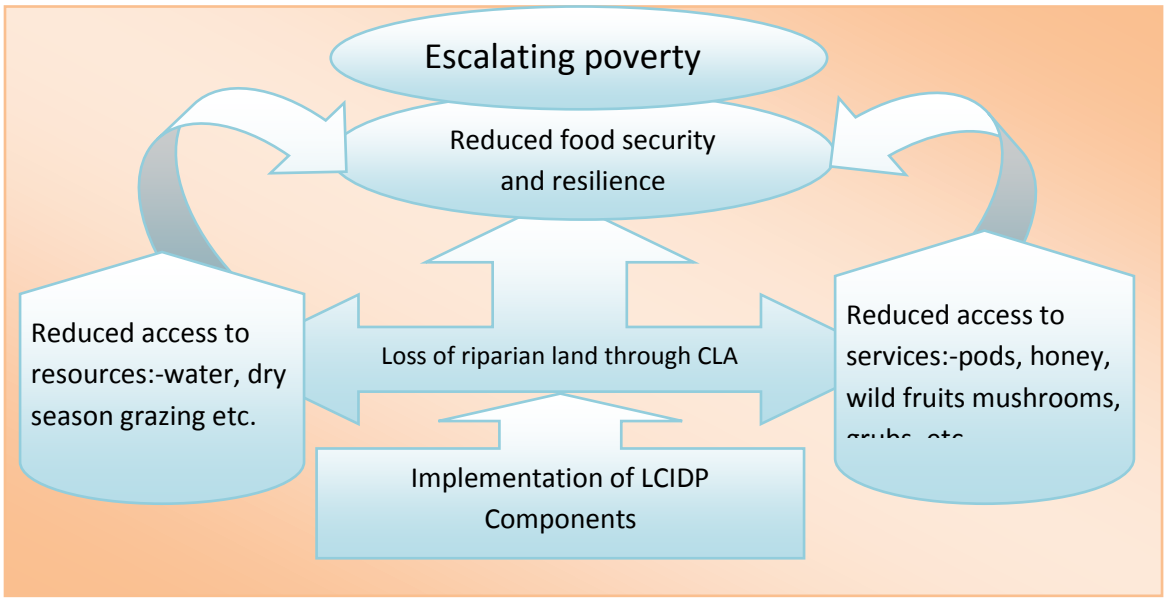


Fig 9.6 Impact separation mechanism

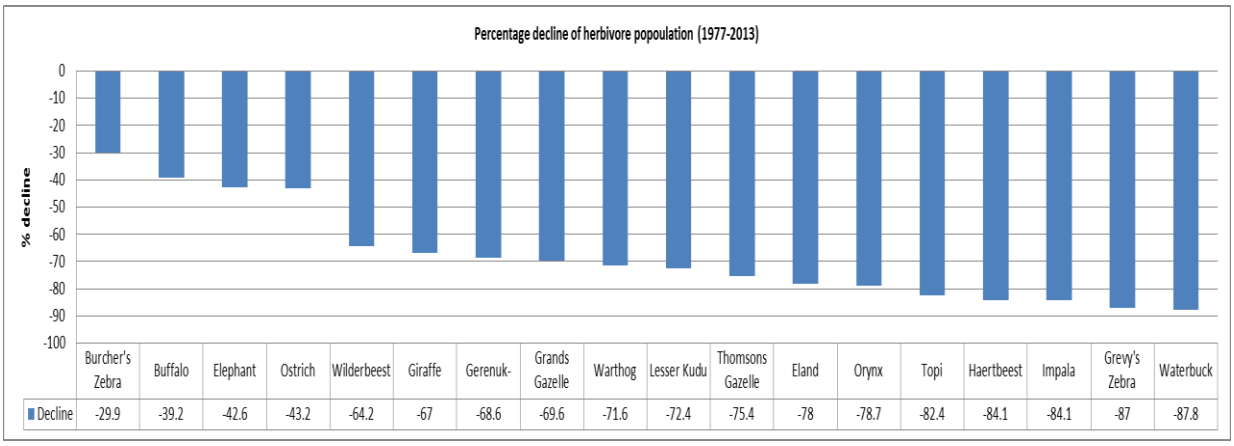
9.4 Concerns pertaining to rangelands and terrestrial biodiversity

The Silent Disaster in Kenya

Rangelands in Kenya are crucially strategic as the principal habitat for wildlife-a major attraction factor in the tourism industry which is the second leading foreign income earner to the national economy. Out of three major rangelands to be traversed by LAPSSET, the Laikipia-Samburu ecosystem stands out in terms of holding the second largest wildlife population and diversity in Kenya. A major concern currently is that LAPSSET is being developed against the backdrop of massive decline in the national wildlife resource base. Between 1977 and 2016, Kenya lost on average 68.1% of her wild herbivores with very severe declines of over 70% being reported for waterbuck *(Kobus ellipsiprymnus); Grevy's zebra (Equus grevyi); Impala (Aepyceros melampus); hartebeest (Alcelaphus buselaphus); Topi (Damaliscus lunatus korrigum); Oryx (Oryx gazelle beisa); Eland (Taurotragus oryx); Thomson's gazelle; Warthog (Pharcoerus africanus) and Lesser kudu (Tragelaphus imbermbis).* Severe losses of between 60–70% were reported for wildebeest, *giraffe (Giraffa cemelopardalis), gerenuk (Litocranius walleri), Grant's gazelle (Gazella granti), Burchell's zebra, buffalo (Syncerus caffer), elephant (Loxodonta africana)* and ostrich *(Struthio camelus)* falling in the third category at 30–50%.

The baffling question is that, wildlife loss seems to be higher in wildlife friendly habitats including protected areas bringing into sharp focus, the efficacy of current policies and strategies in wildlife management. Indeed, the observed severe decline (87%) for Grevy's zebra which by 1986 was IUCN

Endangered (under criterion C1+2a(i))73 on account of an observed population reduction of 54% (from an estimated 5,800 in the late 1980s) raises serious doubts regarding the future of wildlife in Kenya. Kenyan rangelands which host over 70% of wildlife in privately owned land outside of protected areas are currently undergoing accelerated degradation and are likely to experience land-use realignment in response to market forces attracted by the LAPSSET Corridor. Scenarios likely to emerge are analysed briefly below.



	Burcher's Zebra	Buffalo	Elephant	Ostrich	Wilderbeest	Giraffe	Gerenuk-	Grands Gazelle	Warthog	Lesser Kudu	Thomsons Gazelle	Eland	Orynx	Topi	Haertbeest	Impala	Grevy's Zebra	Waterbuck
Decline	-29.9	-39.2	-42.6	-43.2	-64.2	-67	-68.6	-69.6	-71.6	-72.4	-75.4	-78	-78.7	-82.4	-84.1	-84.1	-87	-87.8

Fig 9.7 Observed decline in wildlife populations (1997-2013)

The painful lesson

Commenting on observed drastic decline of wildlife population especially in protected areas, David Western states that such trend is indicative of major policy failure. To date, Kenyan wildlife faces a myriad problems key among them being fragmentation of habitats either through official confinement in protected areas, land use change, blockage of access to habitats, killing, competition with livestock for depleting fodder and forage among others all which are indicative of very unhealthy co-existence. Previous conservation strategies that seemed to place wildlife above human life only succeeded in building resentment whose results are manifesting now.

Decreasing range and size of wildlife habitat required to maintain Minimum Viable Populations:

Section 9.3.2 above addressed the possible impacts of land alienation on pastoral livelihoods who share the same ecology and resources with wildlife. This section analyses the possible impact of hiving off of 1290 Km strip of land 1796 Km2 in area from wildlife habitats. While development of such land into a transport corridor will directly reduce the amount of habitat available for wildlife and pose direct and long-term consequences to wildlife during operation, it is the anticipated realignment in land-use that should pose the greatest threat to long-term survival. Many authors investigating the question of declining wildlife populations are agreed that habitat loss through encroachment, conversion, fragmentation, blockage of migratory corridors are largely to blame for creating the negative wildlife dynamics

[73] Rubenstein, et al: 2016. *Equus grevyi*. The IUCN Red List of Threatened Species 2016. www.iucnredlist.org/details/7950/0

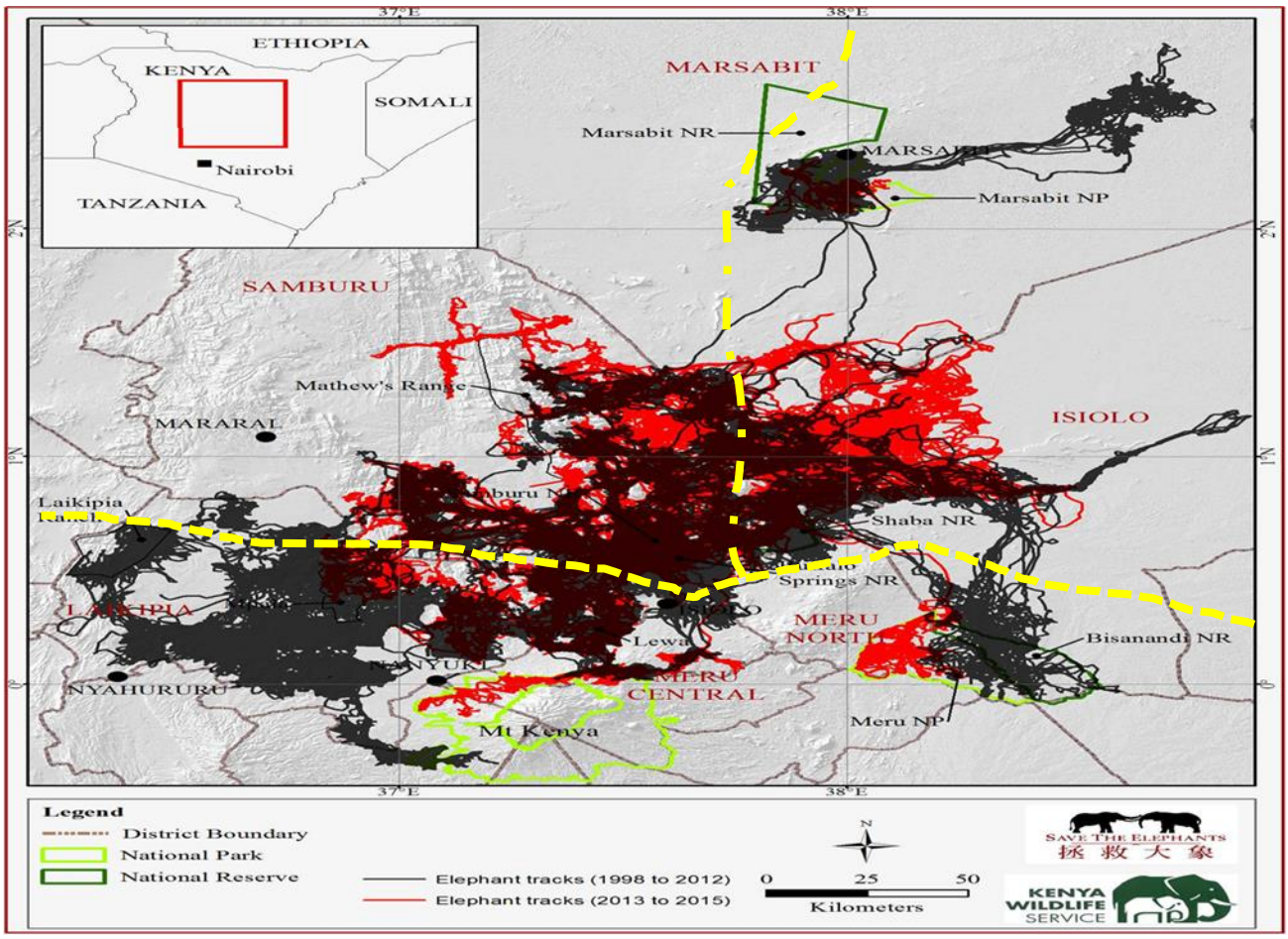
reported.74 Non-controlled commercialization of land along the corridor is likely to reduce the territory and rage available for wildlife, block access routes to water, forage and salt licks, block seasonal migratory corridors and possibly escalate human wildlife conflicts. Such reduction in wildlife territory has potential to reduce the habitat required by diverse species for purposes of maintaining the minimum viable populations required for survival with disastrous consequences. Critical hotspots for this are identified as follows:-

Table 9.5: Summary of wildlife hotspots in the LCIDP Traverse

Section	Concerns
Hindi-Ijara-Garissa	Fragmentation of critical habitat for the critically endangered Hirola antelop and associated wild dogs which are endangered around the Arwale nature reserve and conservancies Blockage of watering paths for the Roschids Giraffe accessing River Tana watering Points. Loss of woodland habitat for Buffaloes from the Boni Forest Nature reserve
Garissa-Benane- Kula Mawe	Fragmentation of habitat around Rahole National Reserve
	Fragmentation of the vast Meru Conservation area whose nucleus is Meru National Park and Bisanadi National Reserve
Isiolo Archers Post (Ngaremara area)	Blockage of Elephant Migratory corridor between Lewa Conservancy-Bufallo Springs, Samburu and Shaba game reserves
Isiolo-Seleolipi	Blockage of the Kirimon Elephant Migratory Corridor
Isiolo-Oldonyiro-Kirisia Forest	Blockage of major elephant migratory corridor
Loosai and Mt. Marsabit Nature Reserves	Blockage of Elephant Migratory Corridor to and from Marsabit National Park

Source: This Study

[74] Western, D. Russell, S., & Cuthill, I. (2009). The Status of Wildlife in Protected Areas Compared to Non-Protected Areas of Kenya. PLoS ONE, 4(7), e6140. http://doi.org/10.1371/journal.pone.0006140



Source: KWS

Plate 9.1: Elephant Migratory Corridors in the Maru-Isiolo-Laikipia-Samburu-Marsabit landscape

Other agents of change within the ASAL

Rangelands in Kenya are synonymous with pastoralism and wildlife. Rangelands in Kenya host over 70% of the protected wildlife reserves and parks and also 70% of wildlife which is reputed to reside outside of the protected areas. Essentially therefore, the rangelands could well account for over 90% of the Kenyan terrestrial wildlife heritage. Degradation of the rangelands is tantamount to signing off this heritage yet, another quite worrying trend in the ASALs currently is the rapid expansion Mesquite (*Prosopis juliflora)* locally christened Mathenge. *Prosopis juliflora* is a native of Mexico and was first introduced to the Afar Region of Ethiopia in the 1970s with good intention, and has been in Kenya since the 1980s. The tree has since gone out of control on account of its ability to withstand high temperature, drought, and saline soils which make it an aggressive coloniser and though it could have some economic merits, in places where irrigated land and rangeland pastures for both livestock and wildlife are valued, it should be kept at bay. Within the LAPSSET traverse, the weed generously occurs in Masalani, Bura East, Garrisa, Isiolo Town,

Marigat/ Nginyang, Lodwar, Kakuma and Marsabit where it is normally introduced in river sand and later on spread by goats upon feeding on the ponds. As such, with movements of river sand associated with construction activity in LAPSSET, the probability of its introduction and eventual spread into pastureland is quite real. Eventually, this is a tree with potential to colonise and change entire landscapes with disastrous effects on both wildlife and livestock.

9.6 Concerns pertaining to water resources

9.6.1: The water crises in Kenya

With regard to water, the main concern is centered on availability given the observed trend of demand to outstrip supply by year 2030 and beyond. Assessed against the Falkenmark indicator- perhaps the most widely used measure of water stress which applies a Water Barrier Differentiation Index (*Falkenmark 1989)*[75] to categorise countries by status of water availability, Kenya is categorised as water scarce based on a national average per capita access of 586m^3 (Table 9.6). The same scenario obtains in the ENNCA and RVCA while the TCA is at Stress level reflecting a slightly better position. The fact that, the national water resource base indicates a per capital annual water supply of 589.3 M^3 for the ENNCA is quite unsettling given observed actual water scarcity on the ground as reflected by seasonal lack of surface water, reliance of non-conventional sources such as river bed wells and increasing distances travelled to reach water.[76] This is indicative of a resource that is present but not available where and when people need it. It is also indicative of the situation whereby most surface water is abstracted and diverted within the upper and middle catchment leaving dry river beds downstream.

Table 9.6: Demand vs supply model for Kenya up to 2030 (MCM)

[75] Falkenmark. "The massive water scarcity threatening Africa-why isn't it being addressed." Ambio 18, no. 2 (1989): 112-118.

[76] During the time of drought in January 2011, the drying of water pans and dams in Wajir and Mandera is reputed to have increased trekking distances for livestock to an average of 15 km to 20 km and up to 40 km compared to the norm of 5 km to 10 Km (NWMP 2030).

Catchment area	2010				2030			
	Population (10^6)	Water resource (MCM)	pca (m3)	Category	Population (10^6)	Water resource (MCM)	pca (m3)	Category
LVNC	6.96	4742	681.3	Scarcity	12.36	5077	410.8	Absolute scarcity
LVSC	7.37	4976	675.2	Scarcity	12.72	5937	466.7	Absolute scarcity
RVCA	4.86	2559	526.5	Scarcity	7.45	3147	422.4	Absolute scarcity
ACA	9.79	1503	153.5	Absolute scarcity	20.54	1634	79.6	Absolute scarcity**
TCA	5.73	6533	1140.1	Stress	10.37	7828	754.9	Scarcity
ENNCA	3.82	2251	589.3	Scarcity	4.40 (6.60)	3011	684.3 (456.8)	Scarcity (Absolute scarcity)
National	3.853	22564	585.6	Scarcity	63.44	26634	419.8	Absolute scarcity

Come year 2030 and on account of projected population growth, the national water availability situation will drop to **absolute scarcity** in spite of all measures recommended to beef up annual water supply from 22,564 MCM to 26,634 MCM. The optimistic scenario presented by NWMP 2030 should be approached with caution given that; i) water availability in 2030 is pegged to the success of a proposed aggressive infrastructural development plan which has own challenges, ii) some of the proposed supply interventions such as trans-boundary imports from the Omo River of Southern Ethiopia are beyond Kenya's Control and may not materialise. Clearly, a very cautious approach to development will be required.

The NWMP 2030 projects the water availability situation for ENNCA to remain at Scarcity mainly on account of the very low population growth of 0.58 million projected for this catchment. However, given that demand computations in the NWMP 2030 failed to capture potential impact of LAPSSET[77] (Section 4.4.7 above) inclusive of the population influx attracted by the road and pipeline, a Scarcity rating as reflected for ENNCA (Table 9.6) is a gross underestimation of the actual situation and the same applies to the RVCA where growth associated with both LAPSSET and oil production have not be allocated for. This notwithstanding, the entire traverse is water scarce and super-imposition of LAPSSET onto such a system has grave implication as follows:-

Continued collapse of downstream ecosystems: Systematic recession/ drying of the Ewaso Ng'iro River downstream of Archer's Post (Section 4.4.8) above is clear enough signal that this river cannot afford any further direct withdrawal of river water. A situation whereby communities, flocks and even wildlife are left exposed to death on account of artificial shortage of river water calls for immediate restitution. Indeed, the situation calls for a review of future investments pending resolution/ restoration of the Compensation Flow (Q80) provided for in law which currently has been diverted elsewhere. Deaths associated with drought should be the very loud signal that the upper ceiling of water abstraction has long been surpassed in which case, national priority should focus on equitable provision of water to all arid living communities as a basic right before venturing into investments.

[77] The Republic of Kenya, 2013: The Project on the Development of the National Water Master Plan 2030. Water Resources Management Authority, Nairobi.

Disruption of hydrological balance through flood harnessing schemes: Provision of water in the NWMP 2030 targets Proposed damming of the Ewaso Ng'iro River at Kihooto, Archers Post, Crocodile jaws among others sites to intercept and store flood water for both domestic supply and irrigation is likely to reduce the amount of flood waters arriving at the Lorian swamp to recharge the Merti Aquifer which is currently exploited possibly beyond recharge at Dadaab. Swarenski and Murdoff describe the extensive 200Km long fresh-water zone of the Merti aquifer as following alignment of the Ewaso Ng'iro and Lak Dera extending south-eastward from Habaswein to Liboi at a width ranging from 20 to 90 km and widening towards the Kenya border with Somalia, near Liboi. Thus, in an area of approximately 10,000 km^2 water of good quality can be obtained in one of the chief economic assets of northern Kenya. Seepage losses from the Ewaso Ng'iro, upstream from Sericho, where it normally goes dry, have been considered a major source of recharge to the Merti aquifer. Howard Humphries and Sons (1958)[78] in a report to the Government of Kenya estimated losses for different reaches of the river from Melka Bulfayo, near Merti, where it leaves its bedrock channel, to Habaswein. The estimated losses were heaviest in the upstream area and averaged about 180,000 m^3/d, or about 1,000 $(m^3/d)/km$ of stream channel. It is believed that such channel losses potentially contributes to groundwater recharge and its withdrawal through damming implies loss of this vital ecological service.

Floods also sustain Lorian Swamp ecosystem which provides water and feed for livestock in the dry season thus providing a fall-back position to herds who utilise surrounding rangelands in the dry season. Without the wetlands, the drier uplands would have more limited value because herders would not have the nearby feed and water reserves to accommodate them during the dry season.

The vain hope in flood harnessing reservoirs: Flood harnessing and storage has been fronted as a solutions to water supply challenges worldwide Indeed, the NWMP 203 proposes a total of 59 dams towards meeting the year 2030 water demand. Yet, dam planning and development will take place against the backdrop of accelerated soil erosion countrywide which has left the land badly denuded by gullies and the rivers heavy laden with sediment load. Interception of this sediment load accounts for drastic loss of reservoir volume as already reserved for the 1560 MCM capacity dam commissioned in 1981 and was observed to have lost 215.3 MCM (13.59%)[79] of design storage capacity thus cutting down its economic life to 217 years. As early as 1986, the Tana at High Grand falls had the highest annual sediment load recorded for any river nationally at 36.6 Million Tonnes, while the Ewaso Ng'iro at Archers Post recorded 2.933 Million Tonnes annually[80]. Such background has probably deteriorated overtime given observed accelerated soil erosion nationally implying that most dams will silt-up and loose design storage capacities within years of commissioning. Any investments attracted by the previously tapping on the reservoirs will shift focus to others sources, possibly exacerbating pressure. Investment in reservoirs for flood storage especially in the Ewaso Ng'iro basin is only viable when

[79] Bunyasi et al, 2013: Sustainable Catchment Management- Assessment of Sedimentation of Masinga Reservoir And its Implication on the Dam's Hydropower Generation Capacity. International Journal of Humanities and Social Science Vol. 3 No. 9; May 2013.

[80] Nippon Koei, 2003: Feasibility Study in the Masterplan for Water Supply in the Ewaso Ngiro North River Catchment. ENNDA Hq, Isiolo.

preceded by aggressive catchment conservation programmes to cut down on the sediment load entering rivers.

Table 9.7: Past sediment loads on selected Kenyan Rivers

Drainage Basin	**River**	**Area (Km^2)**	**Annual sediment load (ton/annum)**	**Sediment yield ($t/Km^2/year$)**
Tana River	Sagana	90	3,220	35.7
	Nairobi	119	4,800	40.3
	Sagana	501	44,900	89.6
	Amboni	473	30,020	63.5
	Tana/Sagana	2650	896,830	338.4
	Chania	517	65,060	125.8
	Thika	331	128,270	387.5
	Thiba	1,970	151,930	77.1
	Tana/Kamburu	9,520	486,660	51.1
	Tana/Grand Falls	17,400	36,594,660	2,103.1
	Tana Garissa	31,700	12,063,710	380.6
	Kalundu	25	13,860	554.4
Ewaso Nyiro	Ewaso Narok	58	15,820	272.6
	Equator	157	2,460	15.6
	Pesi	135	1,280	9.5
	Ewaso Narok	878	1,700	1.9
	Ewaso Ng'iro	405	24,910	61.5
	Burgaret	98	1,770	18.8
	Ngobit	256	9,780	38.2
	Nanyuki	68	3,770	55.5
	Ontulili	61	5,390	88.4
	Kongone	14	1,680	120
	Sirimon	62	800	12.9
	Teleswani	36	4,400	122.2
	Timau	64	12,790	199.9
	Liki	184	2,800	15.2
	Ewaso Ng'iro (Archer's Post)	15,300	2,933,180	191.7

Possible drawdown on aquifers: The strategy of NWMP 2030 in the ENNCA is to favour exploitation of groundwater to supplement surface water to the tune of 16-25% in supplying private and communal consumers not covered by schemes particularly in the lower catchment. While such development is inevitable, extreme caution is required to protect the Merti Aquifer whose recharge is still unclear in spite of numerous research studies on the same.

Plate 9.2: The Ewaso Ng'iro at Archer's Post

9.7 Possible impacts on aquatic environments

Two aquatic sites are likely to interact with LAPSSET interventions namely i) the Manda Bay site of Lamu Port on the Indian Ocean and, ii) the Lake Turkana coastline at Eliye Springs and Islands within the lake. Core concerns as follows:-

Manda Bay site of Lamu Port

Habitat degradation and loss*:* Environmental concerns in form of loss of habitat for marine organisms have already manifested through clearing of mangroves and dredging of the continental shelf in port construction. The resource already cleared was part of breeding and nesting grounds for sea turtles listed in the IUCN Red List data on account of over exploitation. In the impression of this study, the entire mangrove coastline formed by the Lamu Archipelago is vast with over 50,000ha in which case, the proposed long-term clearing of 16 Kilometers (500 hectares) for port construction will easily be compensated for by other sites. However, each unit of mangrove forest cleared will be compensated with planting elsewhere in the immediate vicinity. Additionally, clearing for port development should be phased and only on need basis to retain as much ecological insurance as possible. The ESIA Study and Licence already issued for this part of LAPSSET has adequate detail on the requisite mitigation activities.

Operation stage impacts: Operation stage impacts include general hazards associated with ports inclusive of oil and chemical spills, marine accidents and general pollution from port operations should be resolved as per conditions of the EIA License already issued.

Social concerns: Part of the long-term social impacts of the port is threat to close of the Mkanda Channel and Faza waterway to small craft thereby cutting off communication between Lamu and other islands and even interfering with fishing activity which provides income for 80% of Lamu residents. This would

entirely ruin the local economy since both fishing and water transport are the main source of employment for locals. Other social concerns are associated with proposed massive land acquisition for the port, special economic zone, metropolis, oil refinery, new airport and resort city whose ultimate impact is to remove the means to livelihood for local subsistence operators who have no chance of participating in the new economic order on account of low literacy levels. Driving people into poverty should be avoided at any cost which calls for a nodal approach to development of the Port and metropolis with a view to integrating the local production systems into the new markets created by port operations thereby cushioning all from economic shocks. Prompt and just compensation for all displacement will enable beneficiaries to invest in activities that are relevant to the new economic order hence creating a win-win situation. Compensation is therefore paramount to mitigation of social impacts.

Concerns on fishing livelihoods: Low productivity of artisanal fisheries as highlighted in section 5.2.1 raises great concern of the fishing industry at Lamu to effectively contribute economic growth aspired to under Vision 2030. So long as local fisher-fork are unable to venture into the deep sea to exploit the rich fisheries of the Exclusive Economic Zone on account of reliance to traditional fishing technology, their effort will remain at subsistence level at the expense of economic growth and prosperity. A new opportunity can be availed through provision of a fishing port as part of the Port development. The Lamu Port should in build a fully-fledged Fishing Port with capacity for processing all fish to penetrate premium markets with waste going into fertilizer. With local fishermen being facilitated to exploit the deep sea whereby the catch will find a ready market in the Fishing Port, the port will have effected an economic transformation.

Potential to overload capacity of Lamu Town: Development and operation of the Lamu Port without simultaneous expansion of services such as water and housing at the mainland is likely to overload the delicate balance of resource supply at Lamu Island with detrimental effects. The immediate casualty is likely to be a drawdown of Shela Aquifer whose current capacity has been demonstrated to be inadequate to host extra exploitation pressure and whose depletion will essentially close down Lamu Town. Clearly, the effort by LCDA in infrastructure development should be complemented by County Governments and utility providers in planning for development of essential services and facilitating.

An issue of concern currently pertains to water provision in operation of the new port currently under construction.

Lake Turkana

Turkana's aquatic ecosystem is vulnerable on several fronts; - i) coastline and islands from tourism development, ii) pollution from oil production and handling within the basin and iii) exploitation of lake waters.

Turkana Resort City: The Eliye Spring site proposed for development of the Resort City fall in the Alia Bay between the mouths of the Kerio River to the South and Turkwel River to the North and is characterised by fresh water springs possibly recharges upstream by both rivers. Development further

targets the South Island located in the lake but protected as a World Heritage site on account of three criteria namely:-

- **Criterion (viii):** The geology and fossil record represents major stages of earth history including records of life represented by hominid discoveries, presence of recent geological process represented by volcanic erosional and sedimentary land forms. This property's main geological features stem from the Pliocene and Holocene periods (4million to 10,000 years old). It has been very valuable in the reconstruction of the paleo-environment of the entire Lake Turkana Basin. The Kobi Fora deposits contain pre-human, mammalian, molluscan and other fossil remains and have contributed more to the understanding of human ancestry and paleo-environment than any other site in the world.

- **Criterion (x):** The property features diverse habitats resulting from ecological changes over time and ranging from terrestrial and aquatic, desert to grasslands and is inhabited by diverse fauna. In situ conservation within the protected areas includes threatened species particularly the reticulated giraffe, lions and gravy zebras and has over 350 recorded species of aquatic and terrestrial birds. The island parks are the breeding habitats of the Nile crocodile, *Crocodylus niloticus*, the hippopotamus amphibious and several snake species. Furthermore, the lake is an important flyway passage and stop over for Palearctic migrant birds, with the South Island Park also being designated as an important bird area under Birdlife International. The protected area around Lake Turkana provides a large and valuable laboratory for the study of plant and animal communities.

The challenge here is to ensure development that is compatible with local livelihood systems and conservation needs which underlines the indispensability of an EIA process as part of the planning for the Resort City.

Potential pollution from the oil industry: Potential concerns from proposed Oil/LAPSSET interface are analyzed under the Oil factor in 9.8.11 below.

Exploitation of the lake waters: Uncertainty surrounds the future of L. Turkana following plans by the Ethiopian Government to dam the Omo River and further divert waters to support irrigation projects in spite of the river supplying 90% of water inflow into the lake. Over 99% of inflow into this lake is lost through evaporation and if this is not replenished from the Omo River, the lake level will drop causing salinity levels to escalate upwards with disastrous impacts on the flora and fauna ultimately affecting fisheries which is the main means to livelihood at Kalokor market where a fish processing factory once operated.

9.8 Other emergent concerns

Other concerns associated with implementation of LAPSSET are collated in matrix form in Table 9.8 below.

Table 9.8 Other concerns associated with LAPSSET implementation

Concern	*Trends/ Sensitivity*	*Impact from LAPSSET*
Conflicts	See appendix 6.1	Will escalate upwards
Climate change	Drought frequency increasing	Land use realignment will increase drought severity
HIV /AIDS	Increasing	Influx of new comers will escalate infection rates
Public Health	Increasing	Similar effect
Gender Concerns	Poor mainstreaming in local culture	Cultural dilution may bring change
Vulnerable Groups	All are increasingly vulnerable to drought	Effects could escalate
Human Settlement	Already addressed under land	
Manpower	Low illiteracy could bar locals from participating in LAPSSET	Need to intervene in capacity building
Cultural heritage	Main focus is Lamu Town	Limited impact since Lamu Island is not directly impacted by LAPSSET
Compatibility	LAPPSET is quite compatible with GoK planning framework but not conflicts with local aspirations	Incompatibility will manifest at implementation hence need for mitigation.
Oil factor	Communities antagonistic on claims of un kept promises	Similar impact could accrue from LAPSSET

10. The Environmental and Social Management Plan

10.1 Overview

This SEA Study conducted in line with the National Guidelines for SEA sought to clarify how attuned LAPSSET will is to full deliver on its stated goal of opening up northern Kenya for economic transformation. From an intensive study programme that reviewed numerous reports and documents, conducted numerous field investigations including public hearing meetings with communities, workshops with technical managers, interviews with leaders and interests groups, the observation is that, the project has a vast potential to positively impact and transform local economies while tapping on vast developing international markets across the borders. However, observed sad state of deterioration of the local resource base that has left local communities poor and highly vulnerable to drought and poverty, implementation of LAPSSET should be preceded by targeted action at policy, legal and strategic level to secure local resources and stabilize livelihoods to create a suitable foundation for delivering the anticipated change. In sections below, an outline of requisite measures is provided.

10.2 Summary of core concerns in the LCIDP

10.2.1 Pre-existing concerns

LAPSSET has been conceived as part of Government strategy to redress and eliminate socio-economic imbalances that make the northern Counties markedly different from the rest of down Kenya. LAPSSET is therefore designed to operationalize GOK policy objectives as set out in Kenya Vision 2030 and its elaborated version focussing on ASAL areas and amplifying the GOK Policy paper on ASALs. The core defining feature of northern Kenya is extreme poverty which has been cultivated by historical factors that have rendered pastoral livelihoods very vulnerable to drought. Recurrent drought today is the principal deterrent to national GDP growth on account of consuming resources that would otherwise be invested in new growth frontiers.

In the view of this SEA, achievement of economic transformation goals for northern Kenya will face challenges from pre-existing concerns whose priority resolution is necessary to create a favourable environment for implementation of LAPSSET. Five pre-concerns have been identified as follows:-

i. Increasing structural poverty as households continue loosing assets to drought;
ii. Declining land productivity on account of accelerated erosion;
iii. Declining productivity of other livelihood systems;
iv. The declining water resource base; and
v. Escalating loss of wildlife populations.

10.2.2 Emergent concerns

Implementation of the LCIDP is likely to occasion concerns as follows:-

i. Realignment of the land resource base to the disadvantage of pastoral livelihoods and wildlife;
ii. Continued habitat loss and threatened survival of wildlife;
iii. Escalate pressure on water resources at the expense of pre-existing livelihoods and downstream ecosystems;
iv. Marginalization of fishing-based livelihoods and aquatic habitats; and
v. Erosion of the cultural heritage.

Essentially, the ten concerns provided the template on which this ESMP is designed and amplified. Mitigation action at Policy, Legislative, Strategic and operation level for pre-existing and emergent concerns are unveiled in matrix form in Table 10 below. Brief highlights for each are provided in sections below.

10.3 Mitigation for Pre-existing Concerns

10.3.1 Mitigation of growing poverty in pastoral systems (Table 10.1)

Poverty alleviation has been an obsession and focal point of the government of Kenya since independence days, and the same has been elaborated in all National Development Plans and policy blue-prints since independence (*cf Omiti, et al (2002)*,[81] *Alila, P.O. and Njeru, E.H.N*).[82] The apex of government commitment to bridging national inequality and poverty was the adoption in 2008 of Vision 2030 development blue-print currently in its second Medium Term Expenditure Plan (MTEP) which sought to consolidate and build on gains achieved through past initiatives such as;- the National Poverty Eradication Plan (1999-2015); Poverty Reduction Strategy Paper (PRSP) 2000-2003; Millennium Development Goals (2000-2015); Economic Recovery Strategy (ERS) for Employment and Wealth Creation (2003-2007); among others. Further, adoption of a devolved system of government in line with the National Constitution 2010 was meant to allow for local prioritization of development planning and resource allocation and the same is being supplemented by continuing initiative such as the Equalization Fund.

Essentially therefore, poverty eradication is a pre-existing development goal and also a major motivation for development of LAPSSET. This SEA therefore, will focus on cushioning communities from being driven deeper into poverty by LAPSSET rather than eradicating poverty which is already the focus of initiatives outlined above. Engagement of the SEA Study on this matter is restricted to only identifying action required to rebuild resilience of target communities as precursor to their participation in LAPSSET induced economic growth.

[81] OMiti, et al, 2002: Poverty Reduction Efforts in Kenya: Institutions, Capacity and Policy. Discussion Paper No. 033/2002. Institute of Policy Analysis and Research http://www.ipar.or.ke

[82] Patrick O. Alila and Enos H. N. Njeru, 2005: Policy-based Approaches to Poverty Reduction in Kenya: Strategies and Civil Society Engagement. Nairobi: UNDP; 2005.

Proposed measures are outlined in table 10.1 below.

Policy level measures: In the review of this SEA, degradation of pastoral lands which is their only available economic resource has attained catastrophic proportions and is actually a national disaster requiring redress at all levels. The lack of policy guidelines that hold land owners accountable for degradation is identified as the main enabler to the vicious cycle about which a lot has been written. Policy intervention is required to set guidelines for grazing land management with a view to in-building accountability on the part of Community and Individual land owners. Under the new policy dispensation, land owners will be required to develop grazing land management plans clearing pegging stocking to the carrying capacity. Such management plans will require approval by respective range management authorities at County Level and will be attract annual returns to facilitate auditing. The same policy will allow for locally recognised institutional set-ups to oversee implementation of the management plans to ensure that land owners remain accountable for land conservation all the time.

Legislative level Action Plan: Implementation of the Grazing Land Management Policy will require legal, strategic and other backup. Legal intervention is particularly crucial to provide a framework for policy implementation including institutional, incentive and enforcement frameworks. Thus, under the proposed, it will be a statutory requirement for all land owners to develop land management plans to be implemented under supervision by relevant range management authorities. Alternatively, similar effect can be achieved through issues of grazing management rules by NEMA under EMCA 1999. For a start, the Guidelines on Livestock Rearing issued by NEMA[83] (see below under strategic interventions) could be gazetted to allow for legal enforcement.

Strategy level Action Plan: Strategic level activities are aimed at operationalizing the policy objectives as stated. The principal action will be to guide and supervise land owners in developing and implementing Grazing Land Management Plans (GLMPs). The requirement here is for County Governments to build capacity through sensitization and formulation of guidelines to enable land owners to develop and adopt use of GLMPs in agribusiness. Tentative guidelines which could form the basis for action have been provided by NEMA as follows:-

- Delineating rangelands according to agro-ecological zones e.g. rainfall, altitude;
- Keep the most appropriate species and breeds for each ecological zone;
- Ensure that stocking levels are within the carrying capacity set for each ecological zone - (Ha/livestock unit);
- Ensure that the siting, distribution and density of water points is done in consultation with relevant stakeholders after doing an EIA;
- Rehabilitate degraded rangelands with appropriate technology e.g. reseeding, soil conservation among others;

[83] National Environment Management Authority, 2011: Integrated National Land use Guidelines for Sustained Societal Attributes – Infrastructure, Environmental Resources and Public Safety. NEMA Head Office, Nairobi

- Set aside blocks for seed bulking and pasture conservation;
- Control the use of fire in rangeland management (frequency of burning, intensity);
- Promote harmonious co-existence between livestock and wildlife (e.g. avoid fencing off migratory corridors and buffer zones);
- Ensure the ranch size is not smaller than the minimum recommended size of a commercially viable ranch for a given ecological zone;
- Encourage rotational grazing (wet season and dry season grazing areas) through regulated grazing procedures developed by grazing committees;
- Ensure siting of livestock handling facilities (markets, holding grounds, dips, routes that animals follow on their way to markets etc.) is done in consultation with the local communities and DEC;
- Locate livestock and human water points in consultation with public health officers and the DEC;
- Control human settlements near watering points;
- Develop conflict resolution mechanism by forming natural resource committees and ensure adequate facilitation;
- Develop early warning and disaster management systems;
- Encourage the location of processing facilities in livestock rearing areas;
- Inventorize, map and register community grazing areas;
- Carry out EIA for ranch development.
- Encourage electronic tagging of animals to discourage cattle rustling.

Table 10.1 Capacity building for land restoration

Clause	Activity level	Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requisite action
10.1.1	Policy level	Set policy goals and guidelines on grazing land management control	Appreciate ASAL degradation as a national disaster	State Department of Livestock Production	July 2017		State Dept. of Livestock production
10.1.2			Peg stocking levels to carrying capacity				
10.1.3				County Governments			
10.1.4	Legislative level	Provide legal framework for grazing land management control	Statutory requirement for approved land management plans (similar to EIA)	NEMA can gazette guidelines or County Assemblies can gazette rules			
10.1.5			Legal requirement for	NEMA			

			external audit of stocking				
10.1.6			Legal provision for traditional institutions	County Governments			
10.1.7			Legal Incentive to invest in Community Land	Provided for individual interest in community land	NLC		
10.1.8	Strategic level	Develop and implement Grazing Land Management Plans aligned to CIDPs	Create awareness on land users	County Governments and other stakeholders			LCDA to forge closer collaboration with CGs
10.1.9			Introduce land suitability matching				
10.1.10			Peg stocking to land capacity				
10.1.11			Develop guidelines for Land Management Plans				
10.1.12			Provide incentives for grazing land management				
10.1.13			Set timelines for implementation				
10.1.2		Restocking programme for successful GLMPs	Rebuild TLU base for households	County Governments			
10.1.14		Mainstream pastoral production into LAPSSET	Identify and develop more opportunities for	LCDA			

In line with the NEMA guidelines, formulation of GLMPs should be preceded by based evaluation of the land condition to prescribe requisite action and investment as necessary. Given the massive requirement for rehabilitation in most the pastoral belt, there would be need for reorganisation of grazing patterns through creation of feeding/ fattening lots where livestock can be concentrated while allowing time for land to rehabilitate and recover. Simultaneously, County Governments or Regional Development Authorities could use the range rehabilitation programmes to engage all able-bodied people in gainful employment following the Model of the Tennessee Valley Development Authority[84]. Whatever approach is followed however, pastoral lands are in dire need for rehabilitation and healing as a precursor to investment in capital intensive water harvesting infrastructure.

[84] Tennessee Development Authority - en.wikipedia.org/wiki/Tennessee _ Valley _ Authority

Land rehabilitation and healing should ultimately translate into improved living conditions for owners manifested through stabilised household food security, higher incomes and productivity which would require re-building of productive assets through a restocking programme spearheaded and managed by County Governments. Range restocking should be pegged to success in adoption of GLMPs including land rehabilitation.

Ultimately, increasing productivity of pastoral economies upon adoption of market-oriented land management will require anchorage through market development and support which underlines the need to link land restoration programmes to the LAPSSET Growth Areas Strategy.

Timelines in land restoration programme: A major goal of the pastoral land restoration programme is primarily to rebuild pastoral resilience while also establishing capacity for participation in LAPSSET. The challenge, therefore, is to synchronize pastoral economic production to the commissioning of relevant LAPSSET infrastructure such as the abattoir, highway and railway and this creates the sense of urgency. For the abattoir soon to be commissioned at Isiolo to operate at full capacity and create demand for a second one as proposed at Wajir, range rehabilitation should commence immediately. Indeed the on-going 2016/17 drought should serve as the clearest signal on the need to take affirmative action in pastoral land rehabilitation.

The need for stakeholder mobilization and coordination: Analysis of actions required towards range restoration highlight the critical importance of stakeholder participation in that, as yet, LAPSSET lacks a clear mechanism for engaging with County Governments who hold the legal mandate for agricultural land management and would be expected to spearhead the range rehabilitation programme, amongst others. Action is required as follows:-

- The LCDA to develop in-house capacity for stakeholder engagement; and
- The LCDA to develop a time bound Action Plan for implementation of the non-infrastructure component.

So far, all effort has been directed to rolling the Infrastructure component

10.3.2 Measures to cushion pastoralists (Table 10.1)

Actions are proposed at all levels as follows:

Policy Level Action Plan: The stated goal of LAPSSET is to open Northern Kenya for economic development, which in the view of this SEA is understood to mean transforming both the land and the livelihoods. Yet, a question that this SEA has had to contend with is whether pastoralists themselves want to change with all indications pointing to the opposite. As such, there is need to amend the policy goals of LAPSSET to embrace development within the context of empowering rather than transforming pastoral economies. The proposal here is policy intervention to allow for development control which fully recognises and allows for preservation of pastoral territories.

Table 10.2 Towards mitigating impact of land realignment

Clause	Activity level	Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requisite action
10.2.1	Policy Level	Policy to provide for development control along traverse	Set out different development zones inclusive of land reserved for pastoral use.	State Department of Physical Planning			
10.2.2	Legislative level	Legal framework for development control along LAPSSET traverse	Development control as part of County Spatial Plans	County Governments to legislate rules through County Assemblies			
10.2.4	Strategic level	Same as in clauses 10.1.8 to 10.1.14 above					

With regard to pastoralism, the Draft National Land Use Policy observes that Arid and Semi-arid areas are threatened by land fragmentation, resource conflicts, reduced productivity, and loss of species, desertification and sedentrization resulting in loss of livestock during droughts. To protect the natural resource and environment in the Pastoral/ASALs, the DNLUP calls for Government intervention thus:-

i. Recognize pastoralism as a legitimate land use and production system by establishing suitable methods of defining and registering land rights in pastoral areas while allowing pastoralists to maintain their unique land systems and livelihoods;
ii. Ensure that all land uses and practices under pastoral tenure conform to the principles of sustainable resource management;
iii. Promote the formulation and implementation of an integrated land use plan for ASALs;
iv. Conduct surveys to determine the carrying capacity of land in ASALs;
v. Provide technologies for surface water storage;
vi. Facilitate incorporation of indigenous knowledge and the participation of local communities in infrastructural development in pastoral areas;
vii. Establish flexible and negotiated mechanism for cross boundary access to protected areas, water, pasture and salt licks among different stakeholders for mutual benefit; and
viii. Formulate and implement an integrated land use framework for ASAL areas

With regard to rangelands, the DNLUP requires the Government to:-

i. Study and update the carrying capacity of rangelands;
ii. Establish mechanisms for enforcing adherence to the optimum stocking rates for each area;
iii. Establish a framework for livestock management in rangelands including provision of water, pasture and fodder development; and

iv. Discourage open access to grazing land among the pastoralists by promoting development of Communal grazing management plans.

This SEA fully aligns to proposals in the DNLUP.

Legislative Level Action: The intervention here is to ensure legal backing development controls within the Traverse areas. Zoning along the traverse will be captured in the County Spatial Plans and backed up by rules to be legislated by County Assemblies.

Strategic Action Plan: County Governments to include zoning of Traverse within their CSPs with attention being given to land reservation for pastoral and wildlife use.

Time frame: County Governments are in the process of developing respective CSPs and this provides an opportunity for development control to be mainstreamed into this activity. Data on the exact location and dimensions of the traverse need however to be shared with County Governments.

10.3.3 Measures to cushion fishing based livelihoods

Lamu Port: Measures here are aimed at integrating fishing into LAPSSET Activities in Lamu while cushioning the same from marginalization by the new economic order. Table 10.3 has the details.

Table 10.3 Towards restoring productivity of fishing based livelihoods

Clause	Activity level	Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requisite action
10.3.1	Strategic level	LAPSSET to adopt policy of developing Fishing Industry at Lamu	To cushion Fishing livelihoods from marginalization by Lamu Port Activities	LCDA			
10.3.2		A Fishing Port to be included in Lamu Port Complex	To create a stable market for local fish	LCDA, Lamu CG			
10.3.3		Capacity building for deep seas fishing	Facilitate exploitation of EEC by local fishermen	LCDA, LCG, KPA			
10.3.4		Provision of secure navigation passage (e.g. Ferry service) in the Faza waterway	Ensure non interrupted communication between Lamu and the Islands	LCDA,			

Lake Turkana: Lake Turkana provides a vast fishery which could be developed and exploited commercially as a value chain. Further, given population influx to Turkana by speculators attracted by the Oil Industry, demand for fish is bound to increase hence providing an opportunity to anchor livelihoods. The County Government should take advantage of this opportunity to build capacity for commercial

fishing especially towards Todonyang where the fisheries are richer owing to nutrient supply at the Omo Delta.

10.4: Measures to resolve water resource concerns (Table 10.4)

Legislative action is required to reign in current water diversion tendencies that over exploit water resources upstream leave downstream communities destitute. Indeed, the Water Act 2016 has adequate provision for this and would only require implementation. Under Articles 24 and 25, the Water Act 2016 makes provision for establishment of Basin Committees to serve advisory mandates on water management in respective basins. This offers a window of opportunities for downstream communities to have a voice in management of water resources. This said, recovery of diverted waters will require more than just legal provision to take effect.

Table 10.4 Towards restoring the water resource base

Resolution of pre-existing concerns							
Clause	Activity level	Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requisite action
10.4.1	Legislation	Legislation to peg new development to water availability	Enforce article 12 and 20 of Water Act 2016	WRMA, ENNDA			
10.4.2		Legal action to release water upstream for downstream users	Enforce article 12 and 20 of Water Act 2016	WRMA			
10.4.3		Legal protection of agricultural catchments	Enforce Articles 22, 27 and 28 of the Water Act 2016	WRMA			
10.4.4		Legal enforcement of rainwater harvesting	Enforce Section 32 of the Water Act 2016	Proposed WHA			
10.4.5	Strategic level	NWMP 2030 should be subjected to a SEA process	To allow for public scrutiny of all proposals	WRMA			
Resolution of anticipated concerns							
Clause	Concern	Proposed Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requi site action
10.4.6	Escalating pressure on available water	Policy to peg investment to available water (clause 10.4.1 above)	To secure water rights for downstream users	WRMA	Upon coming to effect of Water Act 2016		
10.4.7	Ecological costs of reduced delivery of flood waters to Lorian Swamp	Flood modelling at Lorian swamp to precede all dam design to determine contribution from	Ensure that enough floods are available to recharge both the swamp and aquifer	WRMA to supervise	Ditto		

		other sources					
10.4.8	Hydrological costs of reduced delivery of flood waters to Merti Aquifer	Reservoir design to allow for release of both floods and Q80	Ensure continued flow to support downstream processes	WRMA	Ditto		
10.4.9	Possible drawdown on aquifers	Enforce articles 10,12, 20,21, 23, 28 of the Water Act 2016	Ensure withdrawal does not exceed recharge potential	WRMA	Ditto		

10.5 Measures to resolve pre-existing concerns in wildlife (Table 10.5)

Saving of Kenyan wildlife from extinction will require very decisive action at all levels.

Policy level intervention: The fact that Kenya nearly lost 70% of wild herbivores in about 40 years is a national disaster probably indicative of mass failure of polices and strategies tried so far. Policy intervention is required to create space for wildlife in the minds of all Kenyans and phase out the current scenario of wildlife being fugitive in their own territories. Secondly, policies and strategies that target to confine wildlife within protected areas are also doomed to fail given that wildlife is mobile and requires using different habitats at difference times of the year. The whole concept requires re-engineering with a view to creating mutually acceptable corridors for use by wildlife when accessing diverse habitats and this will require identification and commitment of land for the purpose. The same policy thinking will require permeating the whole realm of benefit sharing in wildlife conservation as a way of cushioning landowners from losses incurred from hosting wildlife. Time has come when regulated harvesting of certain wildlife species should be allowed as a way of creating ownership for wildlife. In any case, close to 70% of wildlife alongside with its 40 year production has probably been harvested illegally without benefitting those that host wildlife on their land. These are matters that require policy direction.

Legal intervention: There is need to review current wildlife legislation to give effect to proposed policy intervention including re-organisation of land to create game corridors, game cropping and harvesting and enhance accountability in dealing with wildlife.

Time frame: Intervention in mitigation of wildlife decline cannot afford further delays. Species previously declared endangered are among those recording the highest rate of decline underlines the need for urgent action. The LCDA should initiate discussion at appropriate levels of government using the validated SEA Study as the basis for discussion.

Table 10.5 Towards mitigating loss of wildlife

Clause	Activity level	Action	Goals	Mandate Holder	Time-frame	Monitoring Criteria	Requisite action
10.4.1	Policy Level	Review policy strategies in	Declare wildlife loss a national disaster	KWS	Upon Validation		LCDA to initiate

		wildlife management			of SEA Study		discussion at appropriate levels of GOK based on the Validated SEA Report
10.4.2			Make all land owners beneficiaries of wildlife conservation	KWS	Ditto		
10.4.3			Review land policy to allow flexibility in wildlife movement	NLC	Ditto		
10.4.4	Legislative level	Legal Incentive to invest in wildlife conservation	Provide for wildlife cropping and trophy hunting under licence	KWS	Ditto		
10.4.5		Zoning of land to identify and secure game migratory corridors	Ensure pastoral resources are protected in the national and County Spatial Plans	SDPP, CGs	Ditto		

10.6 Mitigation of potential LAPSSET impacts on wildlife (Table 10.6)

Preservation of wildlife habitat in the coastal lowlands: The entire Corridor between Bura East and Benane traverses close to the River Tana flood plain which is a crucial dry season watering reserve for diverse wildlife. Development of a busy transport corridor almost aligned to the riparian reserve will create a major barrier for wildlife trying to access the water. The section of the Corridor in this area will require to be pushed 10 Km eastwards to stay clear of the riparian reserve.

As aligned, the LCIDP passes in close proximity of the Arawale and Rahole National Reserves both of which were created for conservation of the endemic and endangered Hirola antelope and provide breeding sanctuaries for elephants. Creation of a 500m wide corridor at the boundary of the game reserves is likely to fragment the ecological range of the Hirola and leave it more vulnerable.

Table 10.6 Towards mitigating impact on wildlife habitat

Clause	Concern	Action	Goals	Respon sibility	Time-frame	Monitoring Criteria	Requisite action
10.6.1	Strategic	Zoning of land to isolate and gazette game migratory corridors within traverse	Ensure that game migratory routes enjoy security of tenure. Clause 1.28 above	CGs	Detailed Design of Componen ts	Design review reports	Design review for the LCIDP

10.6.2	level Strategic level	Review and stagger Port development to allow room for compensatory recreation of mangrove stands	Adopt phased approach to minimize environmental and socio-economic shocks in port and corridor development	LCDA	Ditto		
10.6.3		Realign LCIDP between Hindi and Benane to maintain at least 10 Km buffer with Arawale and Rahole national Reserves	To avoid habitat fragmentation	LCDA	Ditto		
10.6.4		Realign LCIDP to avoid game migratory corridors in the Waso Ecosystem	Avoid traverse through Isiolo Town, Kipsing and Laikipia wildlife territories	LCDA	Ditto		
10.6.5		Reroute corridor to Archer's post from Kula Mawe and locate main depos at Kula Mawe and Archers Post	As above	LCDA	Ditto		
10.6.6		Relocate Resort City from Kipsing to West Gate, Kalama or Kinna areas	As above	LCDA	Ditto		
10.6.7		Disaggregate Corridor to avoid road traverse through Kipsing and Laikipia in favour of Samburu	As above	LCDA	Ditto		
10.6.8	Implementation level	Subject all investments to public scrutiny during EIA process		LCDA	Ditto		
10.6.9		ESMPs for on-going investments to be updated in		LCDA	Ditto		

		light of this SEA					

Re-alignment of the Corridor to avoid Isiolo Town: In light of observed decline of the national wildlife resource base, mainly on account of habitat fragmentation, focussed action is needed to forestall similar impact from the LCIDP which calls for minor realignment mainly to avoid known game corridors. Firstly, there is need for the entire corridor to stay clear of Isiolo Town and its environs so as to escalating conflict at Isiolo Town, Ngaremara and Kipsing elephant corridors. The proposal is to reroute the Corridor north-eastwards at Kula Mawe so as to connect Archers Post directly. Both Kulamawe and Archer's Post have space for expansion and are devoid of boundary disputes which make then ideal as designated termini for the railway, oil pipelines and the highway.

Relocation of Resort City from Kipsing to Igembe North or Kula Mawe: There is need to relocate the resort city from Kipsing Gap which is a major elephant sanctuary and migratory corridor in favour of a site at either Kula Mawe or Igembe North where space is available. Development of the Isiolo Metropolis at Kula Mawe would bring it within reach of the Tana River catchment and its vast water resource base.

The need to avoid traversing through Laikipia: The LCIDP as aligned in Laikipia would traverse and fragment important game sanctuaries including the Laikipia Nature Reserve, Mugie and moist woodlands in Ol Moran Division which are important for diverse wildlife. The proposal is to map and identify a suitable route through Samburu provided that adequate physical measures such as overpasses and underpasses are provided to separate wildlife traffic from motorised traffic.

Timeframe for Mitigation: Most components of LAPSSET are at diverse stages of design which affords them good opportunity to accommodate proposed realignments. For components such as the Isiolo-Moyale road which is already completed, the respective ESMPs will be reviewed in light of the SEA findings.

10.7: The question of local participation in LAPSSET

Observed low literacy levels could constrain effective participation of local communities in LAPSSET in spite of costs incurred in terms of land acquisition and loss of livelihoods. A scenario whereby jobs and opportunities associated with LAPSSET appear to benefit newcomers at the expense of locals can be violently resented as already happens elsewhere and is a potential source of conflict. There is need for concerted effort by stakeholders to fast track skills building and upgrading programmes to empower local youth in readiness for opportunities to be availed by LAPSSET. Local businessmen also need to be protected to ensure first priority in business borrowing the example of Dadaab Refugee Camp.

10.8: Pubic Disclosure of LAPSSET

This SEA observed a generally poor disclosure of LAPSSET at all stakeholder levels. The situation is particularly worse within County Governments who not only control land targeted by LAPSSET but are legally required to plan for accommodation of LAPSSET growth within jurisdiction. On an urgent need basis, the LCDA should roll out a work plan for mobilization of the non-infrastructure component so as to link up with respective stakeholders. Further, the SH engagement already initiated as part of this SEA Study should be adopted and expanded by LCDA more so at grassroots level.

10.9: Modalities for Environmental and Social Mitigation
Action is called in as follows;

iv) All components of LAPSSET will be preceded by full ESIA studies in line with EMC(A) 2015. EIA Licenses issued before this SEA will be amended to capture issued raised herein.
v) All displacement will be resolved through Resettlement Action Plans prepared in full consultation with stakeholders. Concerns raised in Chapter Seven to be resolved in the RAPs. This to include resolution of all outstanding compensation.
vi) Where doubts on the Impact of components more so with regard to water and Wildlife, the pre-cautionary approach to be adopted.