

**KENYA ENVIRONMENTAL PERFORMANCE INDEX**  
**AND**  
**THE KENYA ENVIRONMENTAL CRIME AND INCIDENCE**  
**REPORT 2020**

**Prepared for**

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

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## EXECUTIVE SUMMARY

Environmental Performance Index (EPI) has evolved as an important tool for assessing countries and counties' performance in environmental management. The EPI is a performance-oriented composite index designed to supplement the environmental targets set forth in the SDGs. The Kenya Environmental Performance Index (KEPI) is fashioned around the global EPI, as a home-grown EPI, based on local indicators. The first National EPI was successfully prepared in 2018, and will be updated every 2 years. In the 2018 global EPI, Kenya was ranked at position 130/180 up from position 140/180 in 2014, improving from a baseline EPI of 36.99 to 47.25 in 2018. In the latest 2020 EPI release, Kenya was ranked position 132 among 162 countries around the world with a score of 34.7%, a drop from the 2018 status.

NEMA has updated the 2018 EPI, as well as prepared an Environmental Crime Index (ECII). The 2020 KEPI and ECII will both be used as indicators of the national and county levels performance on environmental management, therefore providing environmental policy and plans directions. The objectives of developing the 2020 KEPI include (i) Updating the 2018 KEPI to 2020 KEPI (ii) Preparation of 2020 Environmental Crime Incidence Index for 47 counties & (iii) Training of NEMA and Key stakeholders on EPI.

The KEPI and ECII process was participatory, roping in key government departments and lead agencies at National and county governments in availing time series data and published information that has been used in this study. The KEPI is structured around three policy objectives which have been given different weightings as follows; 1. Environmental Health (**37.87**) 2. Ecosystem Vitality (**34.89**) & 3. Socio Economic Sustainability (**27.23**). The process involved refining of the indicators and criteria used in the previous assessments to make them more robust and responsive. A total of eleven (11) policy categories and twenty-five (25) indicators nested into the policy categories were applied under the three overarching objectives. New indicators added to the 2020 KEPI include Gross Domestic Product (GDP), Human Development Index (HDI) and Environmental Crime and Incidence Index (ECII). Based on the three objective areas, the overall score for the 2020 KEPI was established at 60.62%. This indicates no significant change from the 2018 KEPI score (60.96%).

The process also generated County Environmental Performance Index (CEPI) for 47 counties. Nairobi County emerges as the best in terms of environmental performance with an EPI score of

88.82, followed by Bungoma, Kiambu, Nakuru, Nyeri, Trans-Nzoia, Kajiado, Mombasa, Kirinyaga and Nyandarua forming the top 10 best performing counties. Siaya County emerges as the worst performing in terms of the overall EPI score, at 44.7. Other counties within the bottom ten include Turkana, Marsabit, West Pokot, Tana River, Samburu, Wajir, Mandera, Migori and Elgeyo Marakwet respectively. The counties scored poorly across the three policy objectives.

Under Policy Objective Environmental Health, the best performing counties are Kiambu (45.58), Nairobi (43.96), Mombasa (41.04), Nakuru (40.66) and Nyeri (40.24) out of a possible total score of 54.48. The bottom five counties are Siaya, Turkana, Elgeyo Marakwet, West Pokot and Samburu with scores below 28.

Under the Policy Objective for Ecosystem vitality, Bungoma scores highest (14.69) followed by Trans Nzoia (14.50), Nairobi (14.43), Nyeri (13.49) and Kakamega (13.09) out of a possible total score of 19.31. The least performing counties under this policy objective include Siaya, Kisumu, Migori and Meru with a score of below nine (9).

Under the Policy Objective for Socio-economic, Nairobi is the best performing county (25.44), followed by Bungoma (23.47) out of a possible score of 26.29. Isiolo (9.78), Marsabit (9.49), Lamu (9.26) & Tana River (9.13) are the poorest performing.

Analysis of Environmental Crime and Incidence index reveals that the Number of reported environmental crimes and incidences have been on an upward trend from 2016 (total of 506), peaking in 2018 (810 reported cases) and then declining in 2020 (512 cases). The most common incidences across the years include water pollution, followed by Environmental nuisance and air pollution.

In terms of successfully prosecuted crimes, illegal moving/dumping of waste is the most successfully prosecuted crime, followed by air pollution related crimes. Water pollution crimes have recorded very low numbers of successful prosecution.

Generally, the total ECII score for the country is at 79.13. Environmental Incidences reported to NEMA carries the heaviest weight, scoring 53.87 against a possible maximum score of 62.7. Prosecuted crimes with a total weight of 30.8 scores 20.18, while Natural Resource Management Crimes with a total weight of 6.5 scores 5.8.

The KEPI notes that the low EPI scores indicate the need for greater attention to a spectrum of sustainability requirements, with a high-priority focus on critical issues such as water and sanitation, air and water quality, biodiversity, and climate change mitigation and adaptation

strategies. To Improve KEPI ranking, the National and county governments need to undertake the following

**Environmental Health:** The policy objective looked at Air Quality, Water and Sanitation, and environmental Nuisance. Key areas issues identified include:

- a) Access to clean water currently stands at 59%, with a growth of only four percentage points in the last five years. Top 5 performing counties with access to improved drinking water: Kiambu (82.40%), Nyeri (82.20%), Uasin Gishu (81.30%), Bungoma (80.30%) and Nyandarua (77.30%) while bottom 5 include Samburu (36.70%) Mandera (35.60%) Baringo (34.40%), West Pokot (31.20%) and Narok (28.40%).
- b) According to the 2019 population census, sanitation coverage is at 91.5% which translates to a 40.3% improvement from previous EPI. in terms of household access to improved sanitation services. Top 5 counties with improved sanitation were Murang'a, Nyandarua, Nyeri, Kirinyaga and Vihiga, scoring 99%.
- c) As of 2019, the number of households using wood fuel for cooking stood at 66.7% (KPHC, 2019, Vol IV). There has been a slight improvement in the number of households using wood fuel for cooking from 2018 KEPI where it was 67.54%. The top five counties with the highest number of households using wood fuel for cooking are Turkana (96.5%), Mandera (96.4%), West Pokot (95.8%), Elgeyo Marakwet (95.6%) and Tana River (95%). The number of households using paraffin for lighting has however dropped for 69.5% in 2016 (2018 KEPI) to 16. 5% in 2019.
- d) The statistics depict an over reliance on biomass energy at household level thus exposure to indoor air pollution. There is need to enhance access to clean energy and technologies.
- e) Low access to water from improved sources is a main cause of concern, thus the need to enhance investments in water access infrastructure and managements systems by both county and national governments
- f) Although generally access to sanitation has greatly improved, there is low coverage of sewer systems especially in urban settings, demonstrated by declining sewerage coverage.

Improving performance under Environmental Health Policy objective will require significant investments in sanitation infrastructure, waste management facilities, and air pollution control.

**Ecosystem Vitality:** The objective looked at Livestock and Fisheries, Forests and woodlands, Biodiversity and Habitats, Climate change, Energy, and Water resource management.

- a) The key habitats face challenges of illegal logging, poaching, and forest fires: There is need to improve management of these resources, through strengthening of co-management (community forest associations, Beach Management Units, Community Wildlife associations, and Water Resource User associations) as provided for in the respective policies and laws. There is also need to enhance allocation of resources towards natural resource management.
- b) Government departments and agencies both at counties and national levels should enhance policy implementation, monitoring and reporting functions.
- c) Climate change remains a key threat to environmental conservation and management. There is limited between public investments in climate change adaptation programs, thus the need for government to allocate adequate resources towards climate adaptation as provided for under the Climate Change Action Plan.

**Socio-economic:** Broad indicators under this policy objective include environmental education, governance compliance and enforcement, adoption of environmental policies by MDAs, human development Index and gross domestic product.

- a) The country witnessed a drop in the growth of real Gross Domestic Product (GDP) from 6.3 per cent in 2018 to 5.4 per cent in 2019. Major sectors of decline were in the Agriculture, Forestry and Fishing sectors. This may have implications on the overall environmental quality as it will slow investments in environment and natural resource management sectors.
- b) In general, the percentage national and county governments' allocation towards natural resource management is not commensurate to specific sector requirements for sustainable development. Counties allocating the most resources on E & NRM sectors were Mandera (22.51%), Wajir (19.76%), Kwale (18.41%), Samburu (17.98%) and Baringo (17.13%). Low spenders were Laikipia (4.78%) and Kisumu (5.48%). Investments in these sectors have a direct impact on quality of life, thus the need for county and national government to enhance resource allocation.
- c) The number of MDAs providing reports on the degree of Adoption of Sustainable Environmental Policies (ASEP) decreased from 228 (62.24%) in 2016 to 26 (8.67%) in

2018. This drop was occasioned by the removal of ASEP as a performance contract (PC) target in 2018. The state corporations/government agencies need to integrate environmental sustainability in their operations. There is also need to enhance reporting on environmental sustainability as part of performance contracting.

**Environmental Crime Index:** the crime index is a good indicator of compliance monitoring and enforcement. The ECII considered Environmental Incidences reported to NEMA, Prosecuted Crimes and Natural Resource Management Crime (Forestry crimes & Wildlife crimes).

- a) Under Environmental incidences reported to NEMA, a total of 475 environmental cases (both crimes and incidences) were registered in 2020, indicating a 27% reduction in the total number of cases compared with the previous year (648 cases). Water pollution registered the highest (840 incidences), followed by air pollution (564 cases) and illegal effluent discharge registered, over the past 5 years.
- b) In terms of prosecuted cases, solid waste leads the pack with 1096 cases of illegal waste movement/disposal were successfully prosecuted for the period between 2015 to 2019, followed by air pollution related cases (541 cases), and water pollution (132 water cases)
- c) Natural Resource Management Crimes: a total of 5568 individuals have been arrested on account of various wildlife crimes between the period between 2013 and 2017. Of the number, a total of 4852 cases have successfully been prosecuted in courts.
- d) Generally, there is need for the Incidence Management Unit at NEMA to enhance data collection, through engagement with other lead agencies and stakeholders.
- e) The low number of cases successfully prosecuted points to weakness in collation of evidences of environmental crime, due to inadequate, technical and financial resources as well general apathy. Successful prosecution of environmental crimes can serve as a deterrence.

#### **Data Needs:**

While the KEPI provides a framework for greater analytic rigor in policymaking, it also reveals a number of severe data gaps that limit the analytic scope of the rankings. This calls for the need for enhanced data collection, analysis and reporting by MDAs. This will improve KEPI assessments in the future and provide reliable and consistent time series data on environmental performance. Specific recommendations on data needs include:

- a) NEMA should spearhead the process of establishment of an observatory for key environmental indicators, to act as a database upon which all MDAs and lead agencies can deposit and retrieve data
- b) Relevant MDAs and lead agencies should recognize KEPI process and share data towards the same.

### **Organization of the report**

The KEPI is structured into the following chapters

- i. Chapter One outlines the Introduction which entails the background of the EPI, Goal and Objectives of the Kenya National EPI.
- ii. Chapter Two provides a description of the Methodology adopted in developing the Kenya National EPI
- iii. Chapter Three presents the Kenya National EPI Policy Objectives
- iv. Chapter Four provides the Kenya National EPI issue profiles and Baseline Results
- v. Chapter Five presents a description of the Infrastructure Requirements for Hosting and Sharing the EPI
- vi. Chapter Six presents the Conclusions and Recommendations
- vii. Chapter Seven presents the Reference documents that informed the study
- viii. Chapter Eight provides the annexes

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## LIST OF ABBREVIATIONS

ACA	Athi Catchment Area
AOD	Aerosol Optical Depth
AFA	Agriculture and Food Authority
ASAL	Arid and Semi-arid areas
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CDA	Coast Development Authority
CDE	County Director of Environment
CIDP	County Integrated Development Plan
CITES	Convention on International Trade in Endangered Species
CLTS	Community Led Total Sanitation
COPD	Chronic Obstructive Pulmonary Diseases
DALY	Disability-Adjusted Life Year
DANIDA	Danish International Development Assistance
EA	Environmental Audit
EIA	Environmental Impact Assessment
EDCP	Effluent Discharge Control Plan
EEZ	Exclusive Economic Zone
EMCA	Environmental Management and Coordination Act
ENSDA	Ewaso Nyiro South Development Authority
EPI	Environmental Performance Index
EPP	Emergency Power Producer
ERE	Environmental Risk Exposure
ESI	Environmental Sustainability Index
FAO	Food and Agriculture Authority
GGEF	Green Growth and Employment Program
GEF	Global Environmental Facility
GoK	Government of Kenya
GWh	Gigawatt hour
IUCN	International Union for Conservation of Nature
IPP	Independent Power Producers



JMP	Joint Monitoring Programme (WHO/UNICEF)
K	Potassium
KENGEN	Kenya Electricity Transmission Company
KESSF	Kenya environmental sanitation and hygiene strategic framework
KESHP	Kenya environmental sanitation and hygiene policy
KHSSP	Kenya Health Sector Strategic Plan
KMFRI	Kenya Marine and Fisheries Research Institute
KFS	Kenya Forest Service
KNBS	Kenya National Bureau of Statistics
KVDA	Kerio Valley Development Authority
kWh	Kilowatt hour
KWS	Kenya Wildlife Service
KWTA	Kenya Water Towers Authority
LBDA	Lake Basin Development Authority
LPG	Liquid Petroleum Gas
LVNCA	Lake Victoria North Catchment Area
LVSCA	Lake Victoria South Catchment Area
MDA	Ministries, Departments and Agencies
MENR	Ministry of Environment and Natural Resources
MIS	Malaria Indicator Survey
Mg	Magnesium
MOH	Ministry of Health
MtCO <sub>2e</sub>	Metric Tonnes of Carbon Dioxide Equivalent
MW	Megawatts
NBSAP	National Biodiversity Strategy and Action Plan
NCCAP	National Climate Change Action Plan
NEAP	National Environmental Action Plan
NECC	National Environment Complaints Committee
NEC	National Environment Committee
NEMA	National Environmental Management Authority
NET	National Environment Tribunal
NO <sub>2</sub>	Nitrogen Dioxide

NLP	National Land Policy
NRW	Non-Revenue Water
NUE	Nitrogen Use Efficiency
ODF	Open Defecation Free
PM	Particulate Matter
PTT	Proximity to Target
RVCA	Rift Valley Catchment Area
SDG	Sustainable Development Goal
SLM	Sustainable Land Management
SOE	State of Environment Report
SO <sub>2</sub>	Sulphur Dioxide
TCA	Tana Catchment Area
TOR	Terms of Reference
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children Fund
WHO	World Health Organization
WRA	Water Resources Authority
WRMA	Water Resources Management Authority
YCELP	Yale Centre for Environmental Law and Policy

## DEFINITION OF TERMS

- Acute respiratory infection:** Infection that may interfere with normal breathing. It can affect just your upper respiratory system, which starts at your sinuses and ends at your vocal cords. It can also affect just your lower respiratory system, which starts at your vocal cords and ends at your lungs.
- Adaptation:** Reducing vulnerability to avoid or cushion the impacts of climate change, and enable people to respond to climate risks by moving toward a climate resilient society
- Biomass:** Fuel that is developed from organic materials, a renewable and sustainable source of energy used to create electricity or other forms of power.
- Catchment:** Is any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay, or other body of water.
- Climate Change Resilience** -The capability to maintain competent function and return to some normal range of function even when faced with adverse impact of climate change
- Commercial Area:** Real estate intended for use by for-profit businesses, such as office complexes, shopping malls, service stations and restaurants. It may be purchased outright by a developer for future projects or leased through a real estate broker.
- Crop Residue:** Materials left in an agricultural field or orchard after the crop has been harvested.
- Demand:** The quantity of a commodity or a service that people are willing or able to buy at a certain price.
- Dumpsite:** A piece of land where waste materials are dumped. Garbage dump, rubbish dump, trash dump, waste yard, waste-yard, dump.
- Effluent:** Liquid waste flowing out of a factory, farm, commercial establishment, or a household into a water body such as a river, lake, or lagoon, or a sewer system or reservoir.
- Emission:** Waste discharged into air.
- Economic sustainability:** The ability of an economy to support a defined level of economic production indefinitely
- Environmental sustainability:** The ability of the environment to support a defined level of environmental quality and natural resource extraction rates indefinitely
- Enforcement:** A set of actions that the government or others take to compel or encourage compliance
- Environmental governance:** Comprises of Policies, legislations and institutions that shape how man interact with the environment (Nagi, 2009).
- Monitor:** Observe and check the progress or quality of (something) over a period of time; keep under systematic review.

**Mitigation** Taking actions, where possible, to encourage GHG emissions that are lower than business-as-usual practice; and to reduce the human causes of emissions by moving toward a resource efficient economy that is as low carbon as possible.

**Open Defecation Free:** A situation/condition whereby there exists no exposed human excreta within the community/households (Complete absence of exposed fecal matter).

**Protected area:** A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (IUCN 2008).

**Ramsar Site:** A wetland site designated of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, and coming into force in 1975. It provides for national action and international cooperation regarding the conservation of wetlands, and wise sustainable use of their resources.

**Residential Areas:** A land use pattern in which housing predominates, as opposed to industrial and commercial areas

**Sanitation:** Conditions relating to public health, especially the provision of clean drinking water and adequate sewage disposal.

**Social sustainability:** The ability of a social system, such as a country, family, or organization, to function at a defined level of social wellbeing and harmony indefinitely

**Special Economic Zones:** An area in which business and trade laws are different from rest of the country. SEZs are located within a country's national borders, and their aims include: increased trade, increased investment, job creation and effective administration.

**Yield Potential:** The yield of a cultivar when grown in environments to which it is adapted, with nutrients and water non-limiting and with pests, diseases, weeds, lodging, and other stresses effectively controlled



## INTRODUCTION

### 1.1 BACKGROUND

Environmental Performance Index (EPI) has evolved as an important tool for assessing countries and counties' performance in environmental management. The EPI is a performance-oriented composite index designed to supplement the environmental targets set forth in the SDGs. EPIs are designed to measure national environmental performance with regard to outcome indicators spread across core policy objectives. The targets are based on existing international agreements, scientific evidence on the harmful impacts of pollution on humans and ecosystems, and economically feasible environmental protection strategies. EPI's cover a broad range of key environmental topics such as clean air, potable water, and ecosystem status, each linked to a small number of performance indicators selected according to strict criteria for theoretical logic, policy relevance, measurability, and extent and quality of available data.

The global EPI was jointly developed by the Yale Centre for Environmental, Law and Policy of Yale University and the Centre for International Earth Science Information Network of Columbia University. The global EPI ranks countries' performance on high-priority environmental issues in two areas: (i) Protection of human health and (ii) Protection of ecosystems. The global EPI has been published every two years since 2006. The EPI, developed by Yale Center for Environmental Law and Policy, scores 180 countries on 24 performance indicators across ten issue categories covering environmental health and ecosystem vitality<sup>1</sup>.

In the 2018 global EPI, Kenya was ranked at position 130/180 up from position 140/180 in 2014, improving from a baseline EPI of 36.99 to 47.25 in 2018. In the latest 2020 EPI release, Kenya was ranked position 132 among 162 countries around the world with a score of 34.7%, a drop from the 2018 status.

### 1.2 KENYA ENVIRONMENTAL PERFORMANCE INDEX (KEPI)

As part of its effort towards guaranteeing clean and health environment for all, Kenya has equally adopted the EPI tool to track progress on environmental performance. This is in addition to other tools such as State of Environment (SOE) reports and the National and County Environment Action Plan (N/CEAP). The EPI process is spearheaded by the National Environment Management Authority (NEMA), in line with its core mandate of coordinating and supervising all

<sup>1</sup> Environmental Health aggregates air quality, water and sanitation, heavy metals while Ecosystem Vitality aggregates water resources, agriculture, forests, water resources, biodiversity, climate.

environmental matters country-wide, as well as implementing environmental policies on behalf of the government.

NEMA has adopted an emerging approach and methodology of quantifying and numerically ranking the environmental performance of a range of key indicators of achievement within the state's Environment and Natural resource Management (E&NRM) policies. For the past 2 years, NEMA has embarked on the process of the Kenya Environmental Performance Index (KEPI), a home-grown index, to be used as scientific way of measuring the country's environmental performance based on local indicators. The objective has been to transform the "mind-sets" of different lead agencies (i.e., MDAs and Counties) and private sector to effect a shift from the current brown economic growth trajectory towards a greener economic pathway.

NEMAs KEPI is designed to rank how well the national and county are performing on high-priority environmental issues in three broad policy areas:

- a) Protection of human health from environmental harm including health impacts, air quality, water and sanitation;
- b) Protection of ecosystems including water resources, agriculture, forests, fisheries, biodiversity and habitat, climate and energy and
- c) Ensuring social economic sustainability.

The first KEPI was successfully prepared in 2018. NEMA embarked on a process of updating the 2018 KEPI, as well as preparation of Environmental Crime Index (ECII). The KEPI and ECII will both be used as indicators of the national and county levels performance in implementing environmental management initiatives. Updating the KEPI to 2020 will allow Kenya to achieve a greener development pathway at the national and county level. It will provide an outcome indicator for environment interventions in programs such as the Green Growth and Employment Programme (GGEP), and assess if there have been any improvements. The inclusion of time series data will enable the country track how its performance has changed over time relative to counties and sectors.

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### 1.2.1 GOALS AND OBJECTIVES OF THE KEPI & ECII

The overall goal is to update the 2018 KEPI into a 2020 KEPI and develop the 2020 ECII. The two will be used as indicators in the State of Environment Report (SOER) and will guide the

implementation of environmental management initiatives and mainstreaming of Environmental Action Plans (EAPs) in national and county plans and budgets.

The objectives of KEPI process include:

- a) Updating the 2018 KEPI to 2020 KEPI
- b) Preparation of 2020 Environmental Crime Incidence Index for 47 counties
- c) Develop and update an ECII database
- d) Preparation of 2020 Environmental Crime Incidence Index.
- e) Training of NEMA and Key stakeholders on EPI & ECII

### 1.3 EXPECTED OUTPUTS

The expected output will be both in hard and soft copies of the following:

- The National 2020 KEPI developed including updates of 2020 databases, adding new parameters and trend lines
- The National 2020 ECII developed based on NEMA and County databases
- The 2020 CEPs for all 47 counties updating the established County EPI framework.
- Guidelines on how to develop EPI and ECII for national and county users
- Training/capacity-building undertaken to NEMA staff and other stakeholders on ECII and EPI
- Any improvement recommendations arising from the consultancy assignment.





## 2 METHODOLOGY

### 2.1 THE EPI FRAMEWORK

The EPI framework is informed by the Kenyan context as described in the existing national environment resources and processes, SDGs and multilateral environmental agreements. As a composite index, the KEPI distills data on many aspects of sustainability into a single number. The KEPI borrows from the Global EPI by Yale University and Columbia University and other countries that have adopted the EPI process.

The process was participatory and inclusive, entailing consultations at National and county levels. Due to the prevailing COVID 19 situations in Kenya and globally, most of engagements were conducted virtually through ZOOM platform. The KEPI is structured around three policy objectives; 1. Environmental Health 2. Ecosystem Vitality 3. Socio Economic Sustainability. The Environmental Health objective seeks to measure environmental stresses to human health. The Ecosystem Vitality objective measures ecosystem protection and natural resource management while the Socio-Economic Sustainability objective measures sustainability efforts in place. A total of eleven (11) policy categories and twenty-five (25) indicators nested into the three policy categories were identified.

### 2.2 THE ECII FRAMEWORK

The Environmental Crime and Incidents Index was developed through a participatory and inclusive process that entailed consultants at National and County levels (workshops and virtual meetings) to deliberate on the ECII process. The ECII is structured around three environmental crimes/incidences categories: Environmental Incidents reported to NEMA, prosecuted waste crimes, and natural resource management crime. NEM has an Incident Management Unit database that reports most environmental crimes and incidents in Kenya. Prosecuted Waster Crime delved on the number of court rulings against illegal waste disposal practices. Natural Resource Management Crime looks into crimes around forestry, and wildlife such as illegal logging for forestry and poaching for wildlife.

A total of three environment crime/incident categories with 12 indicators nested into the policy categories were identified under the three overarching objectives.

### 2.3 SCREENING CRITERIA FOR INDICATOR SELECTION

The following screening criterion was used to select the EPI indicators.

- I. Reliability –published data
- II. Approved scientific method of collection
- III. Time series availability
- IV. Completeness in terms of coverage
- V. Relevance -There is a clear relationship between the indicator and the EPI
- VI. Accuracy -The indicator measures what it purports to measure
- VII. Feasibility -Data can be obtained with reasonable and affordable effort
- VIII. Credibility -The indicator has been recommended and is already being used by leading experts and organizations
- IX. Validity -The indicator has been field-tested or used in practice
- X. Distinctiveness–The indicator lacks redundancy and does not measure something already captured under other indicators

Based on the above criteria, the 2020 EPI dropped some of the indicators used in developing the 2018 EPI for various reasons. Some new indicators were also added to the 2020 EPI. The indicators dropped as well as the new ones are provided in the table 2-1.

**Table 2-1 New and dropped indicators from the 2018 EPI**

Indicator	Justification for addition or dropping
Gross Domestic Product (GDP)	Yale 2020 shows a direct correlation of EPI and GDP implying greater GDP greater investment in E&NRM
Human Development Index (HDI)	Is an indication of poverty and the likelihood that people livelihoods are based on what they can derive from NR
Environmental Crime and Incidence Index (ECII)	Analysis of NEMA reported crimes and Incidents register by incident and county
Environmental risk exposure	Dropped because of duplication with other indicators (double counting)
Nitrogen Use Efficiency (NUE)	Dropped because there was no updated data
Invasive Species	Dropped because there was no updated data
Land Degradation	Dropped because there was no updated data
Capacity of Environmental Expertise	No direct impact to EPI
Environment Gender Index	Dropped because there was no updated data

## 2.4 WEIGHTING CRITERIA

The weights assigned on various indicators were computed based on the following parameters.

- a) Population potentially impacted
- b) Area affected
- c) Potential risk to human health
- d) Contribution to GDP and/or local economy
- e) Potential risk to biodiversity
- f) Chance of environmental disaster

Table 2-2 is an illustration of the KEPI Framework including the weight assignment at various levels, while table 2-3 presents framework for ECII.

**Table 2-2 KEPI Framework including the weight assignment at various levels**

Index	Objectives	Policy	Indicators
	<b>Environmental Health (37.87)</b>	Air Quality (21.28)	Indoor Air Pollution (Using Wood Fuel for cooking) (4.68)
			Indoor Air Pollution (Using Wood Fuel for lighting) (3.83)
			Indoor Air Pollution (Using Paraffin for lighting) (4.68)
			Indoor Air Pollution (Using Paraffin for cooking) (3.83)
			Outdoor Air Pollution (Ambient PM 2.5) (4.26)
		Water and Sanitation (12.76)	Access to safe drinking water (6.38)
		Access to Sanitation (6.38)	
	Environmental Nuisance (3.83)	Access to solid waste services (3.83)	
	<b>Ecosystem Vitality (34.89)</b>	Sustainable Water Resources Management (7.66)	Water Stress Index (3.83)
			Waste water treatment (3.83)
		Agriculture, Livestock and Fisheries (2.98)	Fish Stock Exploitation (2.98)
			Forests and woodlands (8.08)
			Forest Cover (3.40)
		Biodiversity and Habitat (5.76)	Terrestrial Protected Area (2.98)
			Marine Protected Areas (2.98)
		Climate Change (6.8)	Climate change Mainstreaming (3.83)
		Green House Gases (GHG) emission per capita (2.98)	
	Energy Efficiency (3.40)	Electricity generated from renewable Sources (3.40)	
	<b>Socioeconomic Sustainability (27.23)</b>	Environmental Education (5.96)	National Literacy Levels
			Tertiary graduates on E&NRM
Governance, Compliance and Enforcement (21.28)		Resource Allocation on Environmental Protection (4.26)	
		Adoption of Sustainable Environmental Performance Indicators by MDAs (4.26)	
		Gross Domestic Product (4.26)	
		Human Development Index (4.68)	
Environmental Crime Index (3.83)			
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

Table 2-3: ECII Indicators

Index	Environmental crimes/incidences Categories	Indicators
ECII	Environmental incidences reported to NEMA (62.7)	Water pollution crimes /incidences (9.5)
		Environmental nuisance (10.1)
		Illegal solid waste disposal incidences (10.1)
		Air pollution incidences (9.5)
		Environmental disasters (6.5)
		illegal mining activities (7.1)
		Unlicensed infrastructure incidences (10.1)
	Prosecuted Waste Crimes (30.8)	Water pollution crimes (9.5)
		Illegal waste movement/dumping crimes (10.7)
		Air pollution crimes (10.7)
	Natural Resource Management Crime (6.5)	Forestry crimes (6.5)
		Wildlife crimes (6.5)

## 2.5 POLICY TARGETS

The Kenya National EPI has adopted high performance benchmarks defined by national policy goals such as Vision 2030 and the Constitution of Kenya, 2010. Both long term and Short-term policy targets documented by various MDAs and line ministries were adopted since. Where national policy targets were found missing, internationally accepted targets and standards from recognized institutions such as Sustainable Development Goals (SDGs) World Health Organization (WHO) and Conventional on Biological Diversity (CBD) were adopted.

The ECII adopted national benchmarks stipulated in the national policy goals such as Vision 2030 and adherence to the Constitution of Kenya 2030. The document was guided by the requirements and need to adhere to stipulated environmental and natural resource management laws of Kenya. The laws include but not limited EMCA1999 amendments of 2015, EIA/EA regulations of 2003, Water Act 2016, Forest Management and Conservation Act no 34 of 2016 among others. As such, all the policy targets and standards were localized to the Kenyan context while in some cases adopting internationally acknowledged targets.

NEMA (Incidents Management Unit (IMU) and her County Directors of Environment (CDEs) provided data on **Environmental Crime Incident Index (ECII)**, derived from the environmental incidence database. The IMU is currently appraising this register as part of a vulnerability and capacity assessment to develop Routine and Rapid Environmental Responses

(RRER) as a means to develop County and national capacity to managed emergency environmental incidents. Like the EPI, but as a standardized national and county performance monitoring tool of key incidents, the ECII shall be a way of managing environmental crimes based on a regular analysis of anthropogenic environmental pressures and fashioned based on NEMA's Incident reporting database.

## 2.6 MATERIALITY THRESHOLDS FOR COUNTY EPIS

Considering the differences in natural resource endowments, physical characteristics, and geography between Counties, material thresholds for certain indicators was introduced. Only the indicators that met the criteria for being relevant in all Counties were included in calculating the County's EPI scores. Table 2-4 presents the indicators which were only used to score national performance but not Counties.

**Table 2-4 Indicators Used in Scoring National EPI**

Indicator	Not evaluated because
Outdoor Air Pollution (Ambient PM 2.5)	There is no data on exposure on the number of populations exposed to PM 2.5 at the county level
Water Stress Index (WSI)	The current Kenya National Water Master Plan 2030 do not have county specific Demand (MCM/ Yr.) and Supply (MCM/ Yr.). Most County Government CIDPs are yet to design county specific water master plans.
Fish stock exploitation (FSI)	Only a few Counties have fresh water and marine bodies under which the indicator was scored
Terrestrial Protected Area (TPA)	Protected areas are mainly catchment based and not available in all counties
Marine Protected Area (MPA)	Protected areas are mainly catchment based and not available in all counties
Climate Change Mainstream (CCM)	No county specific data on % of local public expenditure on climate change mitigation and adaption actions
Carbon (iv) Oxide Gas Emission per Capita	No county data on CO <sub>2</sub> emission per capita
Electricity generated from renewable sources	Different counties have different potentials for renewable energy



### 3 THE KENYA NATIONAL ENVIRONMENT PERFORMANCE INDEX (KEPI) & ENVIRONMENTAL CRIME INDEX POLICY OBJECTIVES

#### 3.1 OVERVIEW

The policy objectives of the KEPI Framework were set based on the national context. Kenya's economy is largely dependent on environmental goods and services. The core of Kenya's poverty and environmental problems lies at the nexus of population growth, inequality, and high dependence on natural resource-based incomes (World Bank 2019). To balance short-term economic gains and long-term sustainable development, Kenya requires measures that can address the tensions that protecting the environment impose on options to reduce poverty, grow the economy, and improve public health.

With regard to population health, main diseases affecting the majority of Kenyans are linked to air and water pollution (GoK, 2014). In terms of environmental health, the most pressing problems are those associated with air and water pollution, water supply and sanitation, waste management, chemical and food safety. These directly cause diseases such as malaria, cholera, typhoid and host of other diseases (National Environment Policy, 2014).

Natural habitats in Kenya house wildlife ecosystems which are important for the tourism sector both in terms of contribution to economy and for employment creation (GoK, 2016). Forestry systems are closely linked to water availability with the term "water towers" being nationally adopted to refer to these ecosystems. Kenya's agricultural sector relies majorly on rain-fed systems with the sector contributing to up to 70% of the country's employment.

From a socio-economic perspective:

- a) Vulnerability of Kenya's ecosystem ensures that any adverse environmental and/or social impacts has an almost instant impact on the economy.
- b) Droughts and floods interrupt economic activity across the country with pastoral communities who rely on livestock for their livelihoods regularly registering loss of human lives and livelihoods.
- c) Resource conflicts in these regions (they occupy almost two thirds of the country) mainly around water and pasture (and lately/likely, oil) have serious security implications to national security and stability (Life & Peace Institute, 2016)



- d) Similarly, gender participation in environmental management is an important factor in Kenya as women are the main victims of environmental hazards (SOE, 2014).

Based on the above, it was considered that the KEPI should have the following three policy objectives; Environmental Health, Ecosystem Vitality and Socio-Economic Sustainability. A total of eleven (11) policy categories and twenty-five (25) indicators nested into the policy categories were identified under the three overarching objectives.

### 3.2 ENVIRONMENTAL HEALTH

Environmental Health measures environmental stresses to human health. There have been concerted efforts across the world to foster people's growth and prosperity in a clean and healthy environment. For instance, the Vision 2030 agenda on sustainable development puts forth goals among them to ensure healthy lives and promote wellbeing for people of all ages (goal 3) and to promote access to clean water and sanitation for all (goal 6). Environmental health captures challenges stemming from air and water quality, waste management and sanitation that directly impact on human health. According to the state of environment report 2014, up to 70% of all reported illnesses are related to the quality of the environment. Globally, child mortality has been widely used to provide an indication of the country's burden of the environmental diseases due to its link to the country's environmental health status and its related infrastructure (EPI 2016). The policy categories identified under the Environmental Health Objective include the following:

- a) Water and Sanitation
- b) Air Quality
- c) Environmental Nuisance

### 3.3 ECOSYSTEM VITALITY

Ecosystems provide services that help in maintaining planetary balances and support human and environmental well-being. Forests for example, are critical in supporting ecological, social, cultural, and economic functions thus contribute directly and indirectly to the national and local economies through revenue generation and wealth creation. It is estimated that forestry contributes to 3.6% of Kenya's GDP, excluding charcoal and direct subsistence uses<sup>2</sup>. Researchers and environmental managers have also increasingly begun to recognize the benefits of other

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<sup>2</sup> Draft National Forest Policy, 2020

ecosystem types. Grasslands and wetlands, for example, provide vital services like carbon sequestration and storage, biodiversity habitat, nutrient cycling, and coastal protection. The concept of ecosystem vitality recognizes the unique interrelationships between flora, fauna and the physical surroundings within which they exist. In Kenya, the most critical ecosystem includes forests, freshwaters, wetlands, coastal and marine, mountains, arid, semi-arid and wildlife (Environment Policy, 2014).

Sustainable use of ecosystem is a fundamental concept highlighted in the Sustainable Development Goals (SDGs) goals 2, 6, 7, 9, 13, 14 and 15. The 2020 KEPI measures ecosystem vitality by considering performance in 8 key policy areas (issues) namely;

- a) Sustainable water resource management
- b) Fisheries resource management
- c) Livestock and Agriculture
- d) Forest and Woodlands,
- e) Biodiversity and Habitat,
- f) Climate Change, and
- g) Energy Efficiency

### 3.4 SOCIO-ECONOMIC SUSTAINABILITY

The concept of sustainability is anchored on the environmental, social and economic pillars. One of the consistent lessons of the EPI is that achieving sustainability requires sufficient economic prosperity to fund public health and environmental infrastructure. The 2020 EPI shows a positive correlation ( $r = 0.80$ ) between environmental performance and country wealth. The 2020 EPI further notes that the wealth-environment relationship is more complicated in regard to Ecosystem Vitality. The inherent tension of sustainable development is that income growth too often comes at the cost of the environment, especially from the exploitation of natural resources and heightened generation of pollutants through material and energy consumption. Thus, there is correlation between country wealth and Ecosystem Vitality.

Kenya's vision 2030 aligns its policies, programs and strategies under the political, social and economic pillars that have significant and direct impact on environment and natural resources.

Under this policy objective, the country has assessed the following indicator:

- Environmental Education
- Human Development Index (HDI)
- Gross Domestic product (GDP)

- Governance, Compliance and Enforcement

### 3.5 ENVIRONMENTAL CRIME AND THE ENVIRONMENTAL CRIME INDEX (ECI)

Environmental crimes can be broadly defined as illegal acts which directly harm the environment. In the Kenyan context that might mean an act against the environment that results in the infringement of the right of citizens to a clean and healthy environment. Reference will be made to work undertaken by Interpol under its environmental crimes docket. The latter has prioritized four areas namely fisheries, forestry, pollution, and wildlife crime. Data will also be obtained from UNEP and Europol publications. Development of the ECI is a novel development for the country and the regions.



## 4 THE KENYA NATIONAL ENVIRONMENT PERFORMANCE INDEX (EPI) RESULTS

### 4.1 ENVIRONMENTAL HEALTH

Environmental Health objective/category seeks to assess the environmental health risks associated with exposure to factors namely, contaminated drinking water, poor sanitation, and polluted air and poor solid waste management. This objective adopted in the 2018 KEPI and has also been used in the 2020 global EPI. It gauges a person's risk of getting sick, developing a chronic illness or disability, or dying from exposure to toxic air, foul water, poor waste management, or poor sanitation.

#### 4.1.1 WATER AND SANITATION

This policy area seeks to assess the environmental health risks associated with lack of access to safe drinking water and improved sanitation. Access to reliable, safe water reduces exposure to pollution, disease, and harmful contaminants, thereby promoting health and wellbeing. Access to sanitation is vital for maintaining healthy drinking water supplies, minimizing contact with dangerous bacteria and viruses, and minimizing environmental threats associated with improper waste management.

**Policy Review and Target:** Kenya, under Sustainable Development Goal 6 has committed itself to achieve by 2030 universal and equitable access to safe and affordable water for all; access to adequate and equitable sanitation and hygiene for all and an end to open defecation, paying special attention to the needs of women and girls and those in vulnerable situations. Progress on drinking water, sanitation and hygiene is also critical for the achievement of other targets, including reducing poverty and achieving universal access to basic services (1.1 and 1.2); ending all forms of malnutrition (2.2); ending preventable child deaths, combating neglected tropical diseases and waterborne diseases, and achieving universal health coverage (3.2, 3.3, 3.8 and 3.9); providing safe and inclusive learning environment.

Similarly, the Constitution of Kenya 2010 and Vision 2030 compel the Ministry of Water and Irrigation to strengthen its commitment towards the gradual realization of universal access to safe drinking water. Global targets for access to clean and safe drinking water is 100%. The Ministry of Water and Irrigation (MoWI) mandated to ensure gradual realization of universal access to safe drinking water. Through its water and Sanitation Strategic Plan 2018 –2022, the target is to increase percentage of national population with access to safe water from 60% in 2017 to

80% by 2022, and to increase percentage of national population with access to improved sanitation from 68% in 2017 to 80% by 2022.

#### 4.1.1.1 ACCESS TO SAFE DRINKING WATER

**Definition:** the portion of a country/ County’s population with access to an improved drinking water source as the main water source. Access is defined as at least 20 liters per person per day from an “improved” source within 1 kilometer of the user’s dwelling (WHO 2000).

The World Health Organization (WHO) defines an improved drinking water source as a facility or delivery point that protects water from external contamination particularly fecal contamination. This includes piped water into dwelling, plot or yard; public tap/standpipe; tube well/ borehole; protected dug well; protected spring; and rainwater collection (see Fig 4-1).

**Figure 4-1 JMP service ladder for household drinking water**

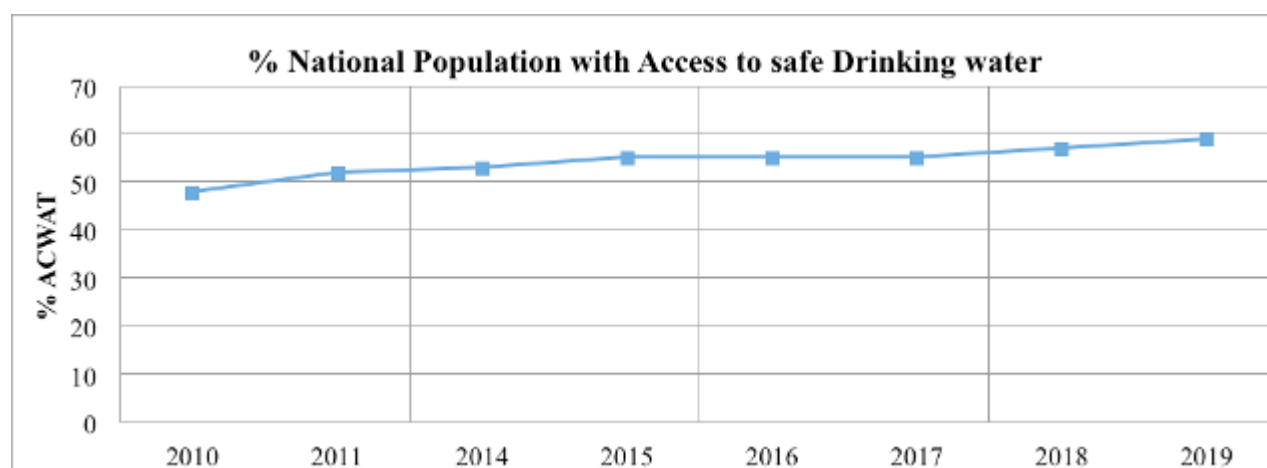
Service level	Definition
<b>Safely managed</b>	Drinking water from an improved water source which is located on premises, available when needed and free of faecal and priority chemical contamination
<b>Basic</b>	Drinking water from an improved source provided collection time is not more than 30 minutes for a roundtrip including queuing
<b>Limited</b>	Drinking water from an improved source where collection time exceeds over 30 minutes for a roundtrip to collect water, including queuing
<b>Unimproved</b>	Drinking water from an unprotected dug well or unprotected spring
<b>No service</b>	Drinking water collected directly from a river, dam, lake, pond, stream, canal or irrigation channel

Source: WHO/UNICEF 2016

## NATIONAL FINDINGS

According to WASREB 2020, Water coverage currently stands at 59%. The trend in coverage has been growing albeit slowly, with a growth of only four percentage points in the last five years (chart 4-1). It is estimated that an average of 200,000 new households have to be served additionally to reach the target of universal access by 2030.

Chart 4-1 Trend in % National Population with Access to Safe Drinking Water



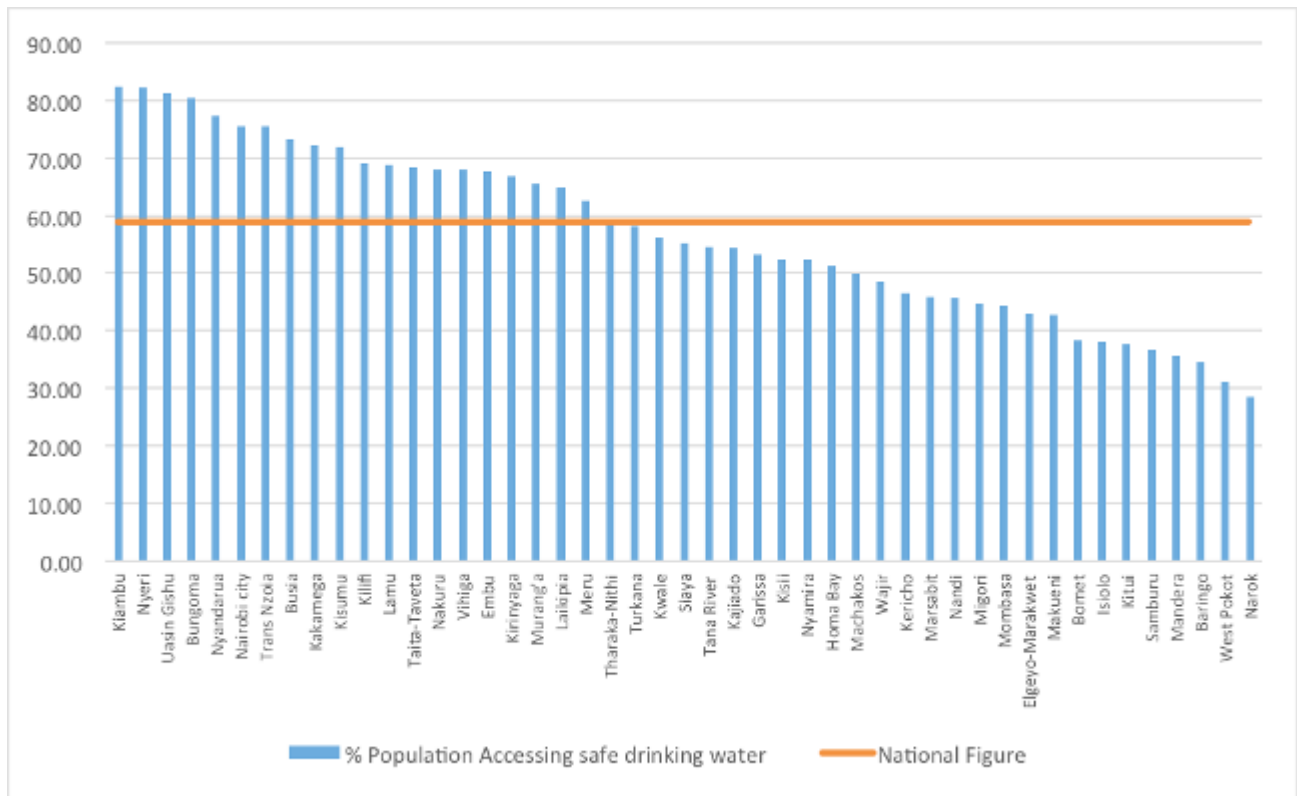
Source: Water Resources Regulatory Board (WASREB Impact Report 12, 2020 pg. 25)

#### RESULTS BY COUNTY: ACCESS TO IMPROVED DRINKING WATER SOURCE 2018-2020

- g) Top 5 performing counties with access to improved drinking water: Kiambu (82.40%), Nyeri (82.20%), Uasin Gishu (81.30%), Bungoma (80.30%) and Nyandarua (77.30%)
- h) Bottom 5 performing counties with access to improved drinking water: Samburu (36.70%) Mandera (35.60%) Baringo (34.40%), West Pokot (31.20%) and Narok (28.40%)
- i) Overall, there is a 5% national (Mean) increase in access to improved drinking water source from 47% in 2018 to 52% in 2020. As in 2018, inequalities persist amongst counties in access to safe drinking water.
- j) The most improved counties in access to drinking water quality are: Vihiga (52%), Nyandarua (34.3%), Kirinyaga (32.9%), Homabay (31.2%), Migori (26.8%), Marsabit (23.8%), Kakamega (22.1%), Elgeyo Marakwet (21.9%), Siaya (21.1%) and Kajiado (19.6%).
- k) The least improved counties in access to drinking water supply are Busia (0.3%), Meru (0.6%), Kisumu (4%), Tana River (4.6%), Kiambu (7.6%), Kilifi (8%), Kitui (8.6%), Turkana and Kwale (9.1% each) and Uasin Gishu (9.3%).
- l) The 20 declining counties are: Bomet (36.8%), Laikipia (23.3%), Isiolo (19.9%), Tharaka Nithi (17.2%), Mandera (14.6%), Kericho (11.5%), Nakuru (11%), Baringo (10.6%). Others are: Mombasa (9.8%), Garissa (8.8%), Taita Taveta (7.7%), Trans-Nzoia (7.6%), Nandi and Nairobi city (5.4% each), Machakos (5.1%), Narok (4.6%), Lamu (4.2%), Bungoma (1.7%), Wajir (1.4%), and Embu (0.3%).

- m) In 2018, the counties recording over 80% household access to safe drinking water included Laikipia, Trans-Nzoia, Bungoma and Nairobi. Counties that then registered poor performance recording less than 40% access in safe drinking water include Kisii, Nyamira, Kajiado, Kirinyaga, Siaya, Narok, Makeni, Kitui, Samburu, Marsabit, Elgeyo Marakwet, West Pokot, Homabay, Migori and Vihiga.
- n) Chart 4.2 and map 4-1 shows the % population accessing safe drinking water by counties.

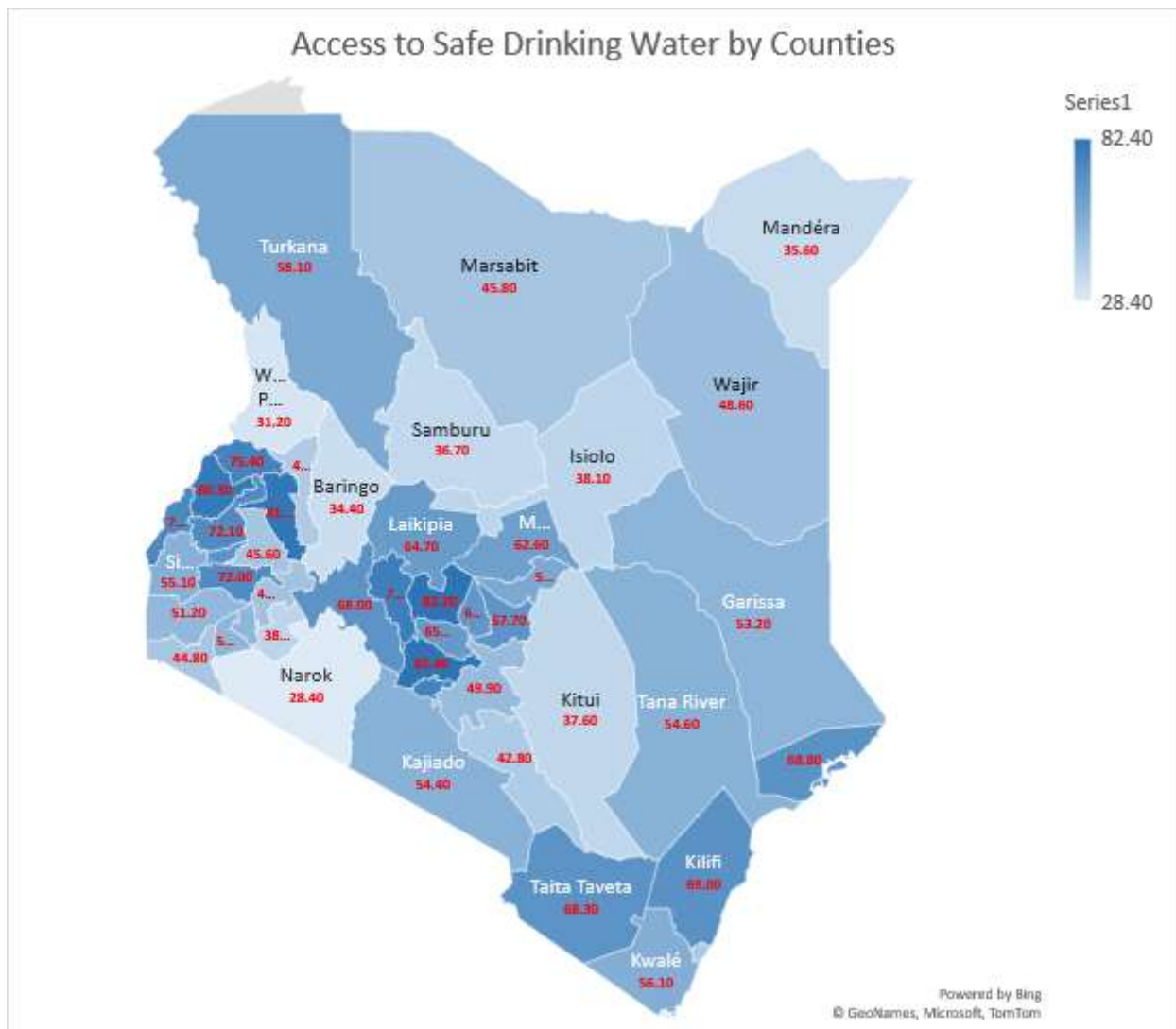
**Chart 4-2 Population Accessing Safe Drinking Water by Counties**



Source: KNBS, National Population Housing Census Vol 4 2019, pg. 300



Map 4-1 Access to Safe Drinking Water by Counties



Source: Prepared using Data from KNBS 2019

## CHALLENGES AND INITIATIVES IN PLACE

As of 2018, the significant challenges affecting access to safe drinking water include the following:

- a. Population growth and high rate of urbanization thus rising demand from domestic, industrial and agricultural sectors
- b. Inadequate sector data for rural areas;
- c. Poor performance of many utilities characterized by low coverage and high non-revenue water (above 40%);

- d. Poor governance practices within the sector, characterized by low investments, and weak co-management models thus inadequate enforcement of water resources regulations and lack of clear mandates for actors in the storage sub-sector
- e. Rampant informal service provision;
- f. Low performance of the storage sub-sector has led to low national storage capacity and many incomplete water storage dams;
- g. Unclear ownership of multi-purpose dams which hinders their sustainability; and
- h. Insufficient sector coordination with the counties and sector planning that is not based on priorities and sector investment plans hence experiencing low self-financing capacity and is dependent on government and development partner funds for investments.

The Ministry of Water and Irrigation is currently focusing on resource mobilization, innovative financing mechanisms and investment planning to gradually achieve universal access by 2030. Some of the initiatives in place towards this mission include pro-poor initiatives by the WSTF aimed at ensuring the progressive realization of the human right to safe drinking water and sanitation for all, in a non-discriminatory manner. Other initiatives by both National and County governments that will enhance access to safe drinking water include: (i) Allocation of more resources by both National and County governments to expand water infrastructure; (ii) Community sensitization programs on water treatment; and (iii) Investing in water harvesting technologies.

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#### 4.1.1.2 ACCESS TO IMPROVED SANITATION

**Definition:** JMP<sup>3</sup> defines improved sanitation facilities are those designed to hygienically separate excreta from human contact.

**Indicator review and Target:** Kenya has a vision of achieving 100% access to basic sanitation services by 2030. The ambitious plan is higher for rural sanitation where the coverage to basic level services stands at 31% (KESP Policy 2016-2030) and requires participation from the communities to ensure open defecation is eliminated and significant progress is made towards achieving universal basic sanitation services. Additionally, access to sanitation services is significantly lower in poorer communities and among vulnerable groups.

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<sup>3</sup> <https://washdata.org/monitoring/sanitation>

## NATIONAL LEVEL RESULTS:

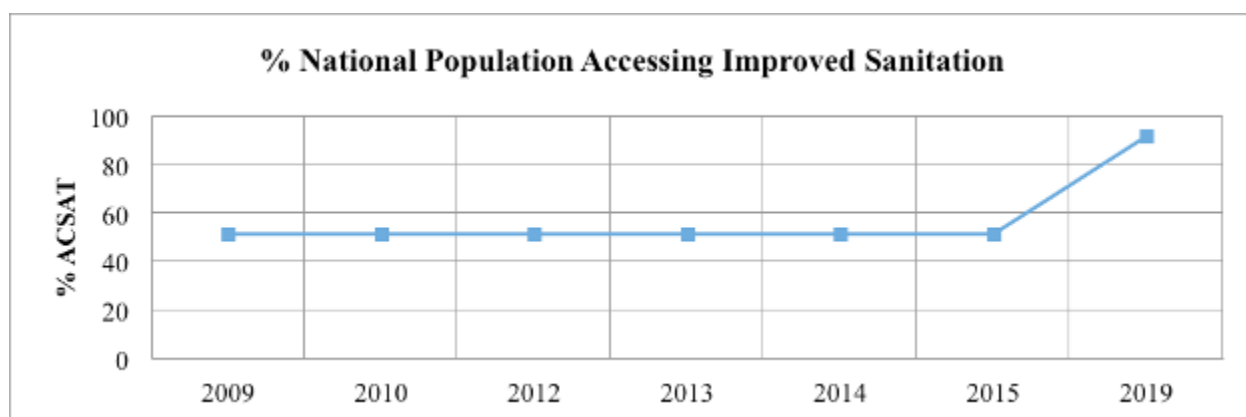
- a) The nation has registered a tremendous improvement of 40.5% in terms of household access to improved sanitation services. (see table 4-1)
- b) The national trend line on access to improved sanitation between 2009 and 2014 remained constant at 51.2%. However, 2019 shows that access to improved sanitation increased by 40.3%. This was attributed to the 2019 national human population and housing census data with which SDG indicators for safe sanitation were tabulated. Table 4-1 & Chart 4-3 show trends in the percentage of national population that have access to improved sanitation.

Table 4-1 National Population that have access to improved sanitation

Year	2009	2010	2012	2013	2014	2015	2019
% population with ACSAT	51.2	51.2	51.2	51.2	51.2	51.3	91.5
EPI Score	51.2	51.2	51.2	51.2	51.2	51.3	91.5

Source: JMP 2017 & KNBS, Population and Housing Census Vol 4. 2019 pg. 310

Chart 4-3 Percentage of National Population with access to improved sanitation



Source: KNBS, Population and Housing Census Vol 4. 2019 pg. 310

## COUNTY LEVEL RESULTS

- a) In 2020, top 5 counties with improved sanitation were Murang'a, Nyandarua, Nyeri, Kirinyaga and Vihiga, scoring 99% as show in table 4-2

**Table 4-2 Top 5 counties with access to improved sanitation**

County	% of HH covered to main Sewer	% of HH using Septic Tank	% of HH using VIP Latrine	% HH using Pit Latrine Covered	% HH using Pit Latrine Uncovered	% HH using Biodigesters	% HH Accessing Improved Sanitation
Murang'a	2.30	4.50	15.8	71.4	5.8	0.1	99.90
Nyandarua	0.30	3.10	17.8	71.8	6.6	- .0	99.60
Nyeri	6.70	7.10	14.0	66.3	5.3	0.1	99.50
Kirinyaga	0.70	8.40	17.9	68.5	3.9	- .0	99.40
Vihiga	0.30	1.30	18.4	70.1	9.1	- .0	99.20

Source: KNBS, Population and Housing Census Vol 4. 2019 pg. 310

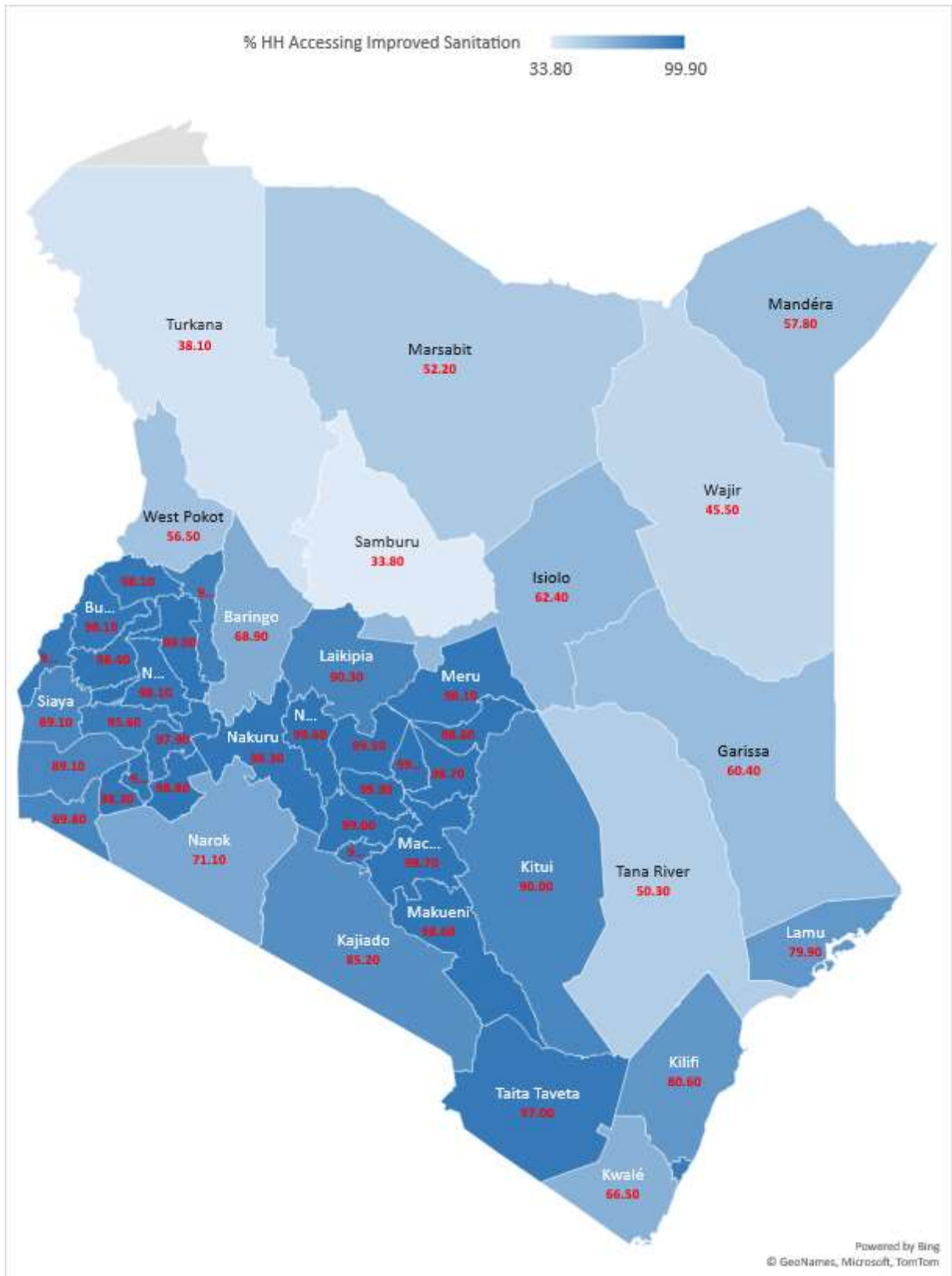
b) The Bottom 5 counties with low access to improved sanitation were Marsabit, Tana River, Wajir, Turkana and Samburu as shown in table 4-3 below. The ASAL counties score on sanitation was generally low. Map 4-2 further provides data on access to sanitation by each county

**Table 4-3 Bottom 5 counties with low access to improved sanitation**

County	% of HH covered to main Sewer	% of HH using Septic Tank	% of HH using VIP Latrine	% HH using Pit Latrine Covered	% HH using Pit Latrine Uncovered	% HH using Biodigesters	% HH Accessing Improved Sanitation
Marsabit	0.10	0.70	5.1	37.0	9.3	- .0	52.20
Tana River	0.80	4.00	4.6	31.7	9.0	0.2	50.30
Wajir	1.70	3.90	2.1	21.6	16.0	0.2	45.50
Turkana	0.40	1.40	3.3	18.9	14.0	0.1	38.10
Samburu	0.40	1.40	4.2	23.6	4.2	- .0	33.80

Source: KNBS, Population and Housing Census Vol 4. 2019 pg. 312

Map 4-2 Access to Improved Sanitation by Counties



Source: KNBS 2019

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## CHALLENGES AND INITIATIVES IN PLACE

WASREB 2020 report notes that access to sewerage services has been declining with a figure of 19% having been recorded in 2010, while the current sewerage coverage stands at 17%. This is attributed to the increase in population, which is not matched by corresponding investment in sewerage services development. All urban areas require some form of water borne system to manage waste water. The national target is 100% coverage for the urban population by 2030 which translates to a required growth in sewer connections of approximately 350,000 which is equivalent to 3.2 million people or 820,000 households annually.

The Kenya Environmental Sanitation and Hygiene Policy (KESHP) outlines different approaches for rural and urban sanitation, but focuses on choices of technology in both settings. For rural areas, the KESHP states, “Households in rural areas shall be expected to own and have access to safe sanitary facilities with at least minor improvements to reduce flies, odors, etc. (at least an upgraded pit latrine), VIP latrines or pour flush latrines connected to a septic tank linked to soak-away pits and/or collection system.

As part of leaving no one behind and reaching vulnerable populations, Kenya has a specific framework for achieving open defecation free (ODF) status in the country. The National ODF Kenya 2020 Campaign Framework 2016/17–2019/20 “aims to eradicate open defecation and to declare 100% villages and Kenya ODF by 2020,” (GoK 2016). The campaign framework operates at the national level, but key to its implementation is the County ODF 2020 Campaign Action Plans that are created by each of Kenya’s 47 counties. The Kenya Environmental Sanitation and Hygiene Strategic Framework, 2016–2020 (KESSEF) targets to increase access to improved rural sanitation facilities by at least 50% and declare 100% of villages ODF by 2020,” and increase access to improved urban sanitation facilities by at least 50% and declare 100% peri-urban and informal settlements ODF by 2020,”

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### 4.1.2 ENVIRONMENTAL NUISANCE

This policy area seeks to assess the environmental health risks associated with inadequate provision of solid waste management facilities mainly within urban areas which results in indiscriminate disposal and unsanitary environments, which threatens the health of urban residents.

**Indicator Review and Target:**

Article 42 in the Constitution of Kenya (COK 2010) acknowledges that every person has the right to a clean and healthy environment. The Kenya Vision 2030 aims, among other things, to make Kenya a nation with a clean, secure and sustainable environment by 2030. One of the strategies identified for realization of the Vision is improving pollution and waste management through design and application of economic incentives. Under Vision 2030, a national framework for solid waste management has been developed.

Sustainable Development Goal 11 strives to “Make cities and human settlements inclusive, safe, resilient and sustainable”. Target 11.6 requires member states to “by 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management”. Goal 12 sets out how to “Ensure sustainable consumption and production patterns”. Target 12.4 aims to “by 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment”. Target 12.5, requires member states to “by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse”.

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#### 4.1.2.1 ACCESS TO SOLID WASTE MANAGEMENT SERVICES

**Definition:** Access to solid waste management services measured as the percentage of total solid wastes generated that is collected and disposed in designated dumpsites.

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### RESULTS

In this indicator, a decline of 19.2% was registered, with only 2 counties improving over the 2018-2020 period. These were: Kajiado (12%) and Nairobi City County (0.8%). Mombasa and Uasin Gishu declined marginally at 3.2%; Machakos at 7.3%; Laikipia at 9.9% and Kisumu at 10%. All others registered a major decline exceeding 10%; with Embu, Kilifi, Garissa, Siaya and Vihiga registering the worst decline of 57%, 47%, 30.5%, 25.4% and 24.8% respectively (Table 4.4).

The 19.2% national and individual county deviations (largely declines) are based on a comparison between the registered 2018 figures and the documented 2020 figures from the

national population census database of 2019. The 2018 figures may have been erroneous or based on assumptions. The KEPI 2018 shows that the lowest served county (Homabay) had a 17% SWM coverage, while counties which registered the highest access to SWM were: Nairobi (80%), Mombasa and Embu (65% each); Kilifi (60%), Kiambu (55%) and Nakuru and Garissa (45%). All the other 38 counties had a 26% SWM coverage; a figure reached using assumptions).

However, the 2020 figures point to a different scenario, showing a negative trend in relation to the 2018 figures as table 4-4. The highest coverage is in Nairobi (80%) while most counties recording below 26%.

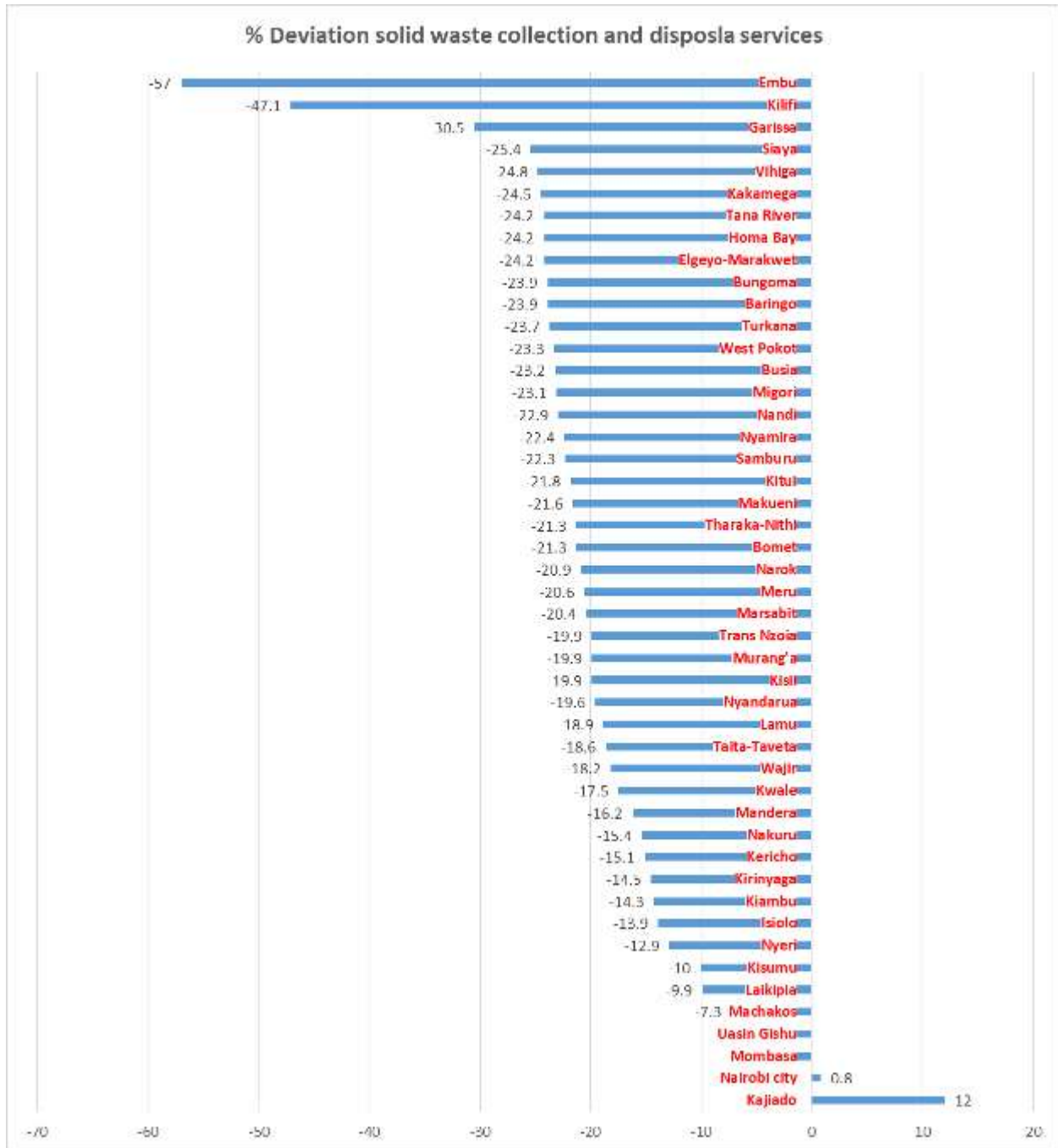
Table 4-4 **Percentage of solid waste that is collected and safely disposed in dumpsite**

County	% solid waste safely disposed in dumpsites			County	% solid waste safely disposed in dumpsites		
	2018	2020	% Deviation		2018	2020	% Deviat
Nairobi city	80.0	80.	0.8	Marsabit	26.0	5.6	-20.4
Mombasa	65.0	61.	-3.2	Meru	26.0	5.4	-20.6
Embu	65.0	8	-57	Narok	26.0	5.1	-20.9
Kilifi	60.0	12.	-47.1	Bomet	26.0	4.7	-21.3
Kiambu	55.0	40.	-14.3	Tharaka-Nithi	26.0	4.7	-21.3
Nakuru	45.0	29.	-15.4	Makueni	26.0	4.4	-21.6
Garissa	45.0	14.	-30.5	Kitui	26.0	4.2	-21.8
Kajiado	26.0	38	12	Samburu	26.0	3.7	-22.3
Uasin Gishu	26.0	22.	-3.2	Nyamira	26.0	3.6	-22.4
Machakos	26.0	18.	-7.3	Nandi	26.0	3.1	-22.9
Laikipia	26.0	16.	-9.9	Migori	26.0	2.9	-23.1
Nyeri	26.0	13.	-12.9	Busia	26.0	2.8	-23.2
Isiolo	26.0	12.	-13.9	West Pokot	26.0	2.7	-23.3
Kirinyaga	26.0	11.	-14.5	Turkana	26.0	2.3	-23.7
Kericho	26.0	10.	-15.1	Baringo	26.0	2.1	-23.9
Mandera	26.0	9.8	-16.2	Bungoma	26.0	2.1	-23.9
Kwale	26.0	8.5	-17.5	Elgeyo-	26.0	1.8	-24.2
Wajir	26.0	7.8	-18.2	Tana River	26.0	1.8	-24.2
Taita-Taveta	26.0	7.4	-18.6	Kakamega	26.0	1.5	-24.5
Lamu	26.0	7.1	-18.9	Vihiga	26.0	1.2	-24.8
Nyandarua	26.0	6.4	-19.6	Siaya	26.0	0.6	-25.4
Kisii	26.0	6.1	-19.9	Kisumu	20.0	10	-10
Murang'a	26.0	6.1	-19.9	Homa Bay	17.0	1.8	-24.2
Trans Nzoia	26.0	6.1	-19.9				
				<b>Mean</b>	<b>30.6</b>	<b>11.4</b>	<b>-19.4</b>

The Chart 4-4 below shows the percentage deviation in access to solid waste management in the counties from the year 2018 – 2020.



Chart 4-4 Percentage deviation in solid waste collection and disposal services in various counties between the years 2018-2020



CHALLENGES AND INITIATIVES IN PLACE

With an urban growth rate of 4.4 percent, waste disposal and management are hampered by increasing urban population and lack of adequate investment in infrastructure to effectively collect and dispose waste. It's estimated that only 40% of the population receive waste management services. The challenges that this waste poses to county governments and communities include: low collection efficiency of waste, inadequate disposal sites, risk of contaminated waste. The consequences include; major impacts on human health, especially for those living near disposal sites, clogged drainage and sewers, waterborne diseases like typhoid, cholera and diarrhea, and increased upper respiratory diseases from open burning of the garbage.

Kenya Nationally Determined Contribution waste is considered a key mitigation sector for the reduction of green gas house emissions. Nationally Appropriate Mitigation Action (NAMA 2016) proposal for a Circular Economy Solid Waste Management Approach for Urban Areas in Kenya was developed by the MENR in 2016. The NAMA concept includes waste sorting, creation of recycling points, recycling of 600 tons of waste per day and composting facilities for organic waste treatment.

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#### 4.1.3 AIR QUALITY

##### **Indicator review and target:**

Air quality defines the state of the air we breathe either indoor (within our houses) or ambient (outside). The national environmental policy 2014 identifies air pollution as a leading cause of respiratory diseases such as chronic obstructive pulmonary disease (COPD), lung cancer, pulmonary heart disease and bronchitis. The effects of outdoor air pollution are amalgamated by those of indoor air pollution. Indoor air refers to the air quality within and around building and structures and relates to the health and comfort of building occupants while outdoor air refers to air quality outside premises

One of the leading sources of Household Air Pollution (HAP) is the use of solid fuels and kerosene in traditional and inefficient/simple stoves such as open fires, which leads to emission of large amounts of pollutants such as particulate matter (PM), carbon monoxide (CO), hydrocarbons, and oxygenated and chlorinated organic compounds. It is estimated that HAP in Kenya claims 21,560 lives per year according to the Ministry of Health. Lower Respiratory infections such as pneumonia and acute bronchitis have been the greatest contributor to HAP related deaths in Kenya. Overall, acute lower respiratory infections are considered the second largest cause of death and are

linked to 26% of all deaths reported in hospitals in Kenya. Other diseases linked to HAP exposure include ischemic heart disease (IHD), chronic obstructive pulmonary diseases (COPD) and stroke (KNBS, 2019). In line with the Sustainable Development Goal number 7 (SDG 7), Kenya has an ambitious target of achieving universal access to modern cooking solutions by 2030. These solutions include LPG, electricity, biogas, bioethanol and improved solid fuel cook stoves (UNDP, 2016).

The set standards of air quality in Kenya are in Environmental Management and Co-ordination (Air Quality) Regulations of 2013. KEPI measured the status of this policy issue using two indicators:

- i. Indoor air pollution, and
- ii. Outdoor Air pollution

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#### 4.1.3.1 INDOOR AIR POLLUTION

**Definition:** Indoor air quality refers to the air quality within and around building and structures, especially as it relates to the health and comfort of building occupants (Hsu A et al., 2016). Indoor air is one of the causative agents of respiratory diseases in Kenya (MOH, 2015). Access to a clean indoor air will limit such kind of acute respiratory diseases. Some of the gases that cause health hazard within a building are: carbon monoxide, radon (a radioactive, colorless, odorless and tasteless gas in smoke) and particulate matter, especially Fine (PM10) and very fine (PM2.5).

Indoor air pollution was measured by the four different sets of indicators; I) percentage of households using wood fuel for cooking, II) percentage of households using wood fuel for lighting, III) percentage of households using paraffin for lighting, and IV) percentage of households using paraffin for cooking. The 2020 KEPI departed from the methodology that was adopted by the 2018 KEPI which measured the status of this indicator using two indicators namely, the percentage of households using wood fuel for cooking and paraffin for lighting.

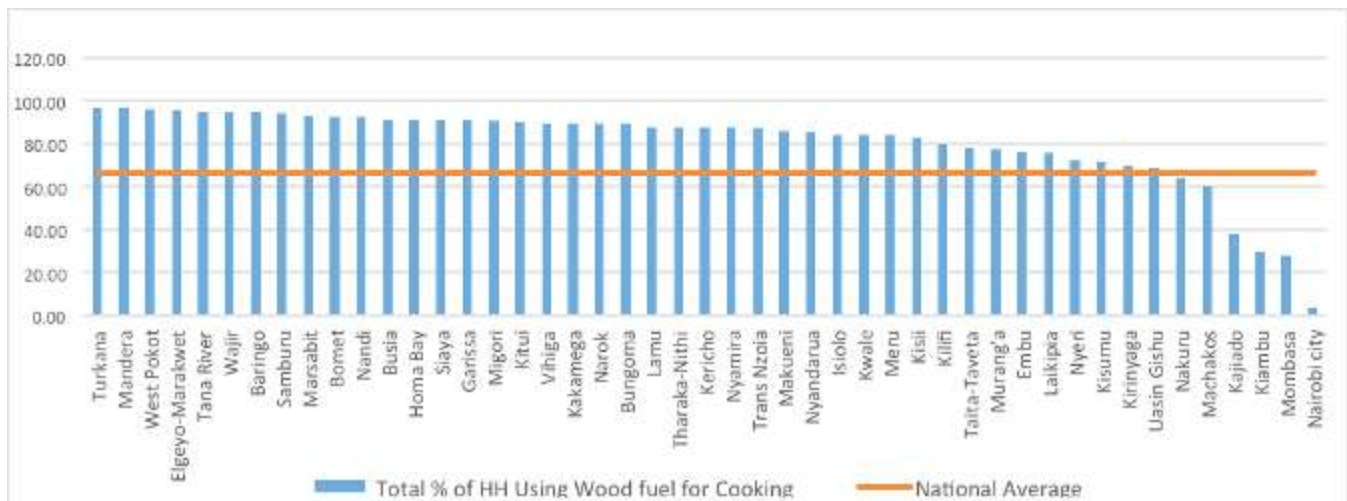
The 2020 EPI provides a measure of the proximity to target of reducing the total number of households using wood fuel for cooking and lighting and those households using paraffin for lighting and cooking to zero (i.e., a measure of HH not using these dirty sources of lighting and cooking).

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#### RESULTS: USE OF WOOD FUEL FOR COOKING:

- a) As of 2019, the number of households using wood fuel for cooking stood at 66.7% (KPHC, 2019, Vol IV). The use of firewood and charcoal for cooking is mainly prevalent in rural areas where they are the primary source of energy for cooking compared to the urban areas where, in most cases, charcoal is used as a secondary source of cooking (KNBS, 2016). There has been a slight improvement in the number of households using wood fuel for cooking from 2018 KEPI where it was 67.54%.
- b) At the county level, the top five counties with the highest number of households using wood fuel for cooking are Turkana (96.5%), Mandera (96.4%), West Pokot (95.8%), Elgeyo Marakwet (95.6%) and Tana River (95%). Nairobi City has the lowest number of households exposed to indoor air pollution through use of wood fuel for cooking at 3.4% (Table 6 below). In 2018, Busia County topped the listed with the highest number of households using wood fuel for cooking at 98% while Nairobi recorded the last at 1.8%.
- c) The most improved counties were Kajiado, Nakuru and Machakos. The number of households using wood fuel for cooking in these counties dropped by 29.1%, 22.1% and 21.7% respectively between 2018 and 2020. In general, a total of 12 counties registered a drop in the number of households using wood fuel for cooking (chart 4-5 & Table 4-5).

**Chart 4-5 Distribution of use of wood fuel for cooking by households in counties**



**Table 4-5 Comparison of the percentage of households using wood fuel for cooking in 2018 and 2020 by counties**

Rank 2020	County	% HH using wood fuel for cooking		% Change	Rank 2020	County	% HH using wood fuel for cooking		% Change
		2020	2018				2020	2018	
1	Turkana	96.50	95.0	+1.5	25	Nyamira	87.80	50.0	+37.8
2	Mandera	96.40	96.0	+0.4	26	Trans Nzoia	87.10	70.0	+17.1
3	West Pokot	95.80	90.0	+5.8	27	Makueni	86.20	85.0	+1.2
4	Elgeyo-Marakwet	95.60	91.0	+4.6	28	Nyandarua	85.60	79.0	+6.6
5	Tana River	95.00	88.0	+6	29	Isiolo	84.40	70.0	+14.4
6	Wajir	94.80	97.0	-2.2	30	Kwale	84.20	80.0	+4.2
7	Baringo	94.70	86.4	+8.3	31	Meru	84.10	86.0	-1.9
8	Samburu	94.10	70.0	+24.1	32	Kisii	82.90	85.7	-2.8
9	Marsabit	93.10	93.0	+0.1	33	Kilifi	80.10	80.0	+0.1
10	Bomet	92.50	91.0	+1.5	34	Taita-Taveta	78.10	75.0	+3.1
11	Nandi	92.30	88.0	+4.3	35	Murang'a	77.40	80.0	-2.6
12	Busia	91.40	98.0	-6.6	36	Embu	76.50	80.0	-3.5
13	Homa Bay	91.30	58.0	+33.3	37	Laikipia	75.70	70.0	+5.7
14	Siaya	91.20	83.0	+8.2	38	Nyeri	72.30	72.0	+0.3
15	Garissa	91.10	79.0	+12.1	39	Kisumu	71.80	60.0	+11.8
16	Migori	90.50	77.0	+13.5	40	Kirinyaga	69.80	68.5	+1.3
17	Kitui	89.90	88.4	+1.5	41	Uasin Gishu	68.50	84.0	-15.5
18	Vihiga	89.70	85.0	+4.7	42	Nakuru	63.50	85.6	-22.1
19	Kakamega	89.70	88.0	+1.7	43	Machakos	60.10	82.0	-21.9
20	Narok	89.40	83.0	+6.4	44	Kajiado	38.10	67.2	-29.1
21	Bungoma	89.30	93.0	-3.7	45	Kiambu	29.40	47.3	-17.9
22	Lamu	87.90	70.0	+17.9	46	Mombasa	27.90	9	+18.9
23	Tharaka-Nithi	87.90	90.0	-2.1	47	Nairobi City	3.40	1.8	+1.6
24	Kericho	87.90	80.0	+7.9					

#### RESULTS: USE OF WOOD FUEL FOR LIGHTING:

- There is relatively small number of households (2.8%) exposed to indoor air pollution through use of wood fuel for lighting. This could be as a result of intensified programs of countrywide cheap solar lighting programs. Furthermore, last mile connectivity program by the national government has also played a pivotal role in reducing the number of people who rely on wood fuel for lighting.
- High use of wood fuel for lighting was registered in the counties of Turkana (49.1%), Samburu (36.3%), West Pokot (31.7%) and Mandera (26.8%). Wood fuel is not used for lighting in Nairobi City, Mombasa and Kiambu (Table 4-6).

Table 4-6 Percentage of households using wood fuel for lighting by counties

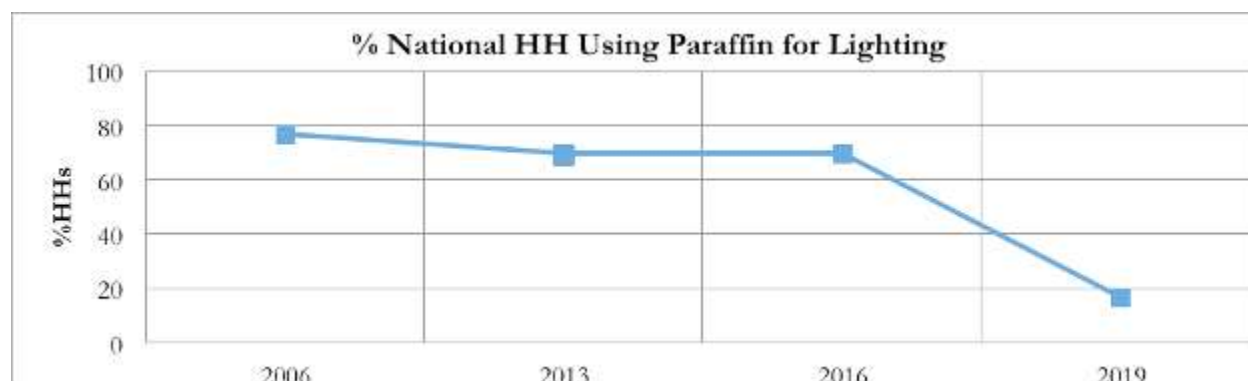
Rank 2020	County	% HH Using wood fuel for lighting	Rank	County	% HH Using wood fuel for lighting
1	Turkana	49.10	25	Trans Nzoia	0.70
2	Samburu	36.30	26	Kisii	0.70
3	West Pokot	31.70	27	Homa Bay	0.60
4	Mandera	26.80	28	Nakuru	0.40
5	Baringo	18.20	29	Embu	0.40
6	Wajir	15.40	30	Kakamega	0.40
7	Marsabit	14.20	31	Busia	0.40
8	Garissa	11.90	32	Uasin Gishu	0.30
9	Elgeyo-Marakwet	9.90	33	Kericho	0.30
10	Tana River	6.80	34	Makueni	0.30
11	Isiolo	6.70	35	Nandi	0.30
12	Narok	5.50	36	Machakos	0.20
13	Laikipia	3.80	37	Kisumu	0.20
14	Tharaka-Nithi	2.10	38	Taita-Taveta	0.20
15	Kitui	1.90	39	Vihiga	0.20
16	Kwale	1.70	40	Siaya	0.20
17	Meru	1.50	41	Nyeri	0.10
18	Lamu	1.40	42	Kirinyaga	0.10
19	Kilifi	1.30	43	Nyandarua	0.10
20	Kajiado	1.00	44	Murang'a	0.10
21	Nyamira	0.90	45	Nairobi city	0.00
22	Bungoma	0.90	46	Mombasa	0.00
23	Bomet	0.80	47	Kiambu	0.00
24	Migori	0.80			

#### RESULTS: USE OF PARAFFIN FOR LIGHTING

- At the national level, the number of households using paraffin for lighting has dropped for 69.5% in 2016 (2018 KEPI) to 16.5% in 2019. This sharp drop in the use of paraffin for lighting could be attributed to the high adoption of solar lamps for lighting particularly in the rural areas, last mile electricity connectivity programs and the high cost of paraffin due to increased tariff (Chart 4-6).
- Counties with the highest exposure to indoor air pollution from the use of paraffin for lighting were Vihiga (37.2%), Nyamira (36.2%), Kwale (36%), Kisii (34.1%) and Kilifi (33.4%). The lowest use of paraffin for lighting was registered in the counties of Wajir (1.6%), Mandera (1.7%), Nairobi City (1.7%), Bomet (91%) had 0%, Garissa (2.4%) and Turkana (2.8%). Compared to 2018 KEPI, Homa Bay (94.2%), Siaya (93.9%), Bungoma (93.3%), Busia (92.8%) and Bomet (91%) had the highest number of households' exposure to indoor air pollution from use of paraffin for lighting while Nairobi (25.7%), Samburu (30%) and Mombasa (38.8%) had the lowest (Table 4-7).
- The highest drop in paraffin use for household lighting was registered in the counties of Bomet, Tana River, Kericho, Narok and Nandi where paraffin used for household lighting

dropped by 82.7%), 77%, 73.8%, 73.1%, 72.6% and 72% respectively. Overall, all counties registered huge improvements in the use of paraffin for household lighting in between 2018 and 2020 (Table 4-7).

**Chart 4-6** Trend in the use of paraffin in Kenya, 20006-2019



Source: Derived from KPHC, 2019, KNBS and SID 2013 and Kenya Socio- Economic Atlas, 2018

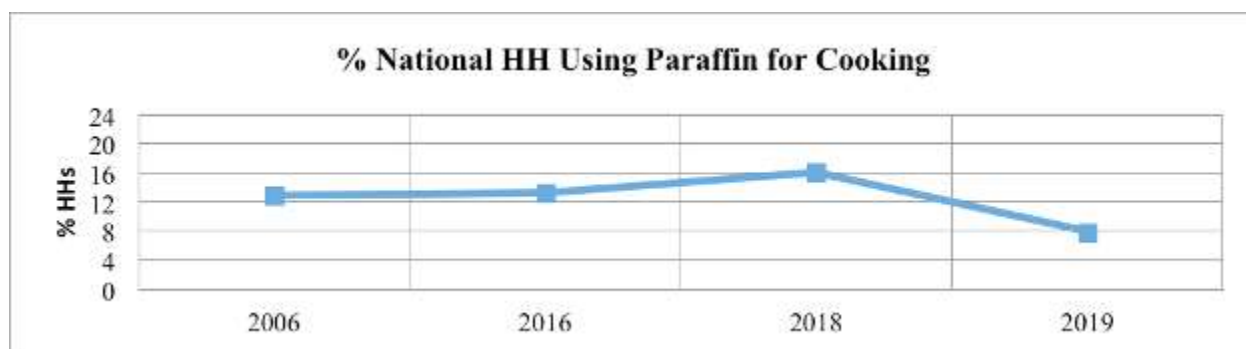
**Table 4-7** Comparison in the use of paraffin for lighting between 2018 and 2020 in counties

Rank 2020	County	% HH using paraffin for lighting		Change	Rank 2020	County	% HH using paraffin for lighting		Change
		2020	2018				2020	2018	
1	Vihiga	37.2	90.6	-53.4	24	Kisumu	18	79.4	-61.4
2	Nyamira	36.1	80.5	-44.4	25	Laikipia	17.8	69.0	-51.2
3	Kwale	36.0	86.2	-50.2	26	Nyeri	16.6	67.5	-50.9
4	Kisii	34.1	89.7	-55.6	27	Kericho	12.4	86.2	-73.8
5	Kilifi	33.4	79.7	-46.3	28	Baringo	11.7	59.4	-47.7
6	Bungoma	30.3	93.3	-63	29	Lamu	11	72.3	-61.3
7	Kakamega	29.6	92.1	-62.5	30	Nakuru	10.4	61.5	-51.1
8	Murang'a	27.3	82.4	-55.1	31	Kajiado	10.1	54.6	-44.5
9	Busia	27.3	92.8	-65.5	32	West Pokot	10	48.8	-38.8
10	Makueni	26.7	88.0	-61.3	33	Narok	9.9	83.0	-73.1
11	Migori	26.6	92.0	-65.4	34	Tana River	9.7	86.7	-77
12	Trans Nzoia	26.2	88.1	-61.9	35	Uasin Gishu	9.6	68.1	-58.5
13	Meru	25.4	77.2	-51.8	36	Mombasa	9.5	38.8	-29.3
14	Siaya	24	93.9	-69.9	37	Samburu	9.1	30.0	-20.9
15	Kitui	23.7	85.5	-61.8	38	Elgeyo-Marakwet	8.7	75.3	-66.6
16	Nyandarua	23.5	81.6	-58.1	39	Bomet	8.3	91.0	-82.7
17	Tharaka-Nithi	22.5	79.6	-57.1	40	Isiolo	7.8	50.4	-42.6
18	Kirinyaga	22.2	78.3	-56.1	41	Marsabit	5.7	35.8	-35.8
19	Homa Bay	21.6	94.2	-72.6	42	Kiambu	5	43.3	-38.3
20	Taita-Taveta	20.6	80.7	-60.1	43	Turkana	2.8	70.0	-67.2
21	Embu	20.2	79.6	-59.4	44	Garissa	2.4	50.0	-47.6
22	Machakos	19.9	78.5	-58.6	45	Nairobi city	1.7	25.7	-24
23	Nandi	19.3	91.3	-72	46	Mandera	1.7	46.3	-44.6
					47	Wajir	1.6	48.2	-46.6

## RESULTS: USE OF PARAFFIN FOR COOKING

- a) Paraffin use for household cooking has been on the decline in Kenya. As of 2019, the percentage of household using paraffin for cooking was 7.8%. This was slightly more than half the number that was using paraffin for household cooking in 2018 (16%) (Chart 4-7). The decline may be attributed to the increased taxation on paraffin pushing up the price to be at par with the price of diesel
- b) Paraffin use for household cooking was highest in the counties of Mombasa (32.1%) and Nairobi (26.5%). Paraffin use for cooking in these counties is dominant in the slums. More than half of the counties recorded very low number, less than 5% of households using paraffin for cooking. This shows that this is not a major problem in these counties (Table 4-8).

Chart 4-7 Trend in % National HH exposed to poor indoor air quality from the use of paraffin for cooking, 2006-2019



Source: Derived from National Household Budget Survey, 2006, 2016; Ministry of Energy, Kenya Household Cooking Study, 2019; 2019 Kenya Population and Housing Census: Volume IV

Table 4-8 Percentage of HH using Paraffin for Cooking by County

Rank 2020	County	% HH Using paraffin for Cooking	Rank 2020	County	% HH Using paraffin for Cooking
1	Mombasa	32.1	24	Kisii	2.2
2	Nairobi city	26.5	25	Siaya	2
3	Kajiado	12.7	26	Nyamira	1.9
4	Kiambu	11.1	27	Lamu	1.6
5	Machakos	11.1	28	Tharaka-Nithi	1.5
6	Kisumu	7.8	29	Busia	1.5



7	Kilifi	7.4	30	Kericho	1.4
8	Taita-Taveta	6.8	31	Homa Bay	1.4
9	Uasin Gishu	5.6	32	Nyandarua	1.3
10	Kirinyaga	5.5	33	Migori	1.3
11	Nakuru	5.4	34	Marsabit	1.1
12	Kwale	5	35	Isiolo	1.1
13	Murang'a	4.7	36	Narok	1.0
14	Makueni	4.6	37	Nandi	1
15	Embu	4	38	Tana River	0.9
16	Nyeri	3.3	39	Bomet	0.8
17	Trans Nzoia	3	40	Garissa	0.7
18	Kitui	2.7	41	West Pokot	0.6
19	Bungoma	2.6	42	Baringo	0.4
20	Vihiga	2.4	43	Turkana	0.4
21	Kakamega	2.4	44	Elgeyo-Marakwet	0.4
22	Laikipia	2.3	345	Samburu	0.3
23	Meru	2.2	46	Mandera	0.3
			47	Wajir	0.3

## CHALLENGES AND INITIATIVES IN PLACE

Indoor air quality is greatly affected by reliance on biomass and other unclean sources of energy and energy technologies. Majority of Kenyans (66%) use wood fuels for cooking. There is therefore need for the country to strengthen existing measures that have been put in place towards making alternative energy sources: accessible, available and affordable to all, as well as enhance access to clean cooking and lighting technologies (solar, biogas, improved cook stoves).

The country has made strides in the lighting segment, currently dominated by connectivity to the national grid (electricity coverage is estimated nationally at 70%) and solar energy for lighting; mostly driven by Innovative financing initiatives to enhance access and affordability by CSOs and Private Sector players.

### 4.1.3.2 OUTDOOR AIR POLLUTION

Outdoor quality is also referred to as ambient air quality. It's associated with dust; burning of trash; vehicular emissions and industrial emissions. Some of the outdoor air pollutants include:

Sulphur dioxide, hydrogen sulphides, CO<sub>2</sub>, CO, Nitrogen Oxide (NO<sub>2</sub>), and Nitrous Oxide. The average percentages of population exceedance of PM 2.5 levels are 10 µg/m<sup>3</sup>, 15 µg/m<sup>3</sup>, 25 µg/m<sup>3</sup>, and 35 µg/m<sup>3</sup> according to World Health Organization's (WHO) of Air quality guidelines and interim I, II, and III targets.

PM 2.5 is a key indicator of ambient air quality. The 2020 KEPI used PM 2.5 indicator based on the percentage of the population exposed to PM<sub>2.5</sub> levels exceeding WHO interim target of 2. This is an annual mean concentration of 25(µg/m<sup>3</sup>) as a health risk factor.

### **Indicator Review and Target**

The State of the Global Air 2020 report, estimates that ambient air pollution was responsible for around 5,000 premature deaths in Kenya in 2019 alone. In 2017, about 19.9 million Kenyans suffered from respiratory ailments that are exacerbated by poor air quality (Economic survey report, 2019).

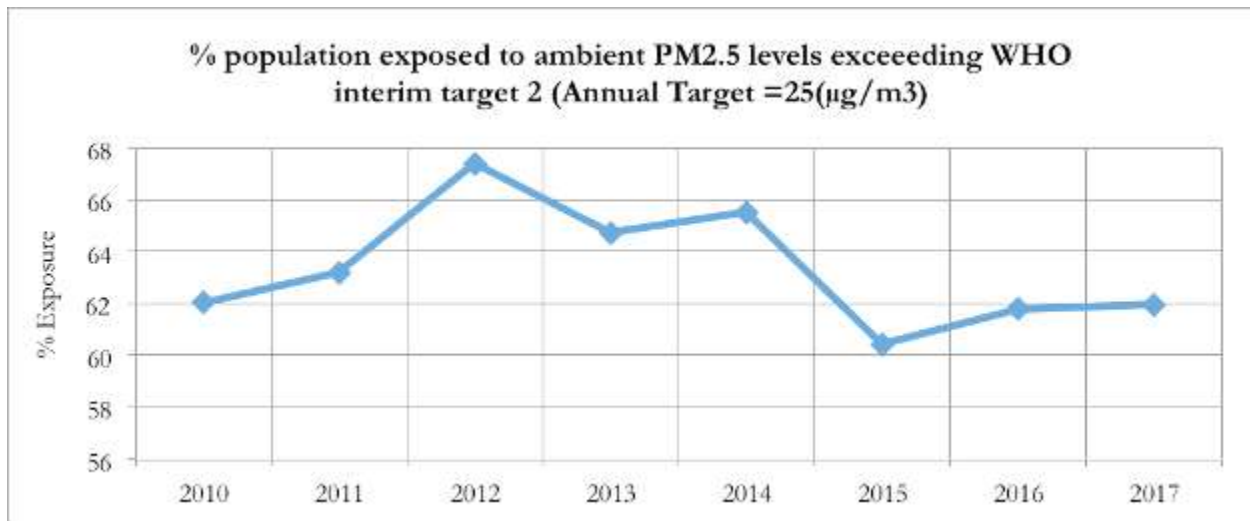
Data for this indicator was obtained from the World Bank website, publicly accessible at <https://data.worldbank.org/indicator/EN.ATM.PM25.MC.T2.ZS?end=2017&locations=KE&start=1990&view=chart>. The EPI score was based the % of population that is not exposed to PM 2.5 levels above WHO interim target 2.

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## RESULTS

- a) There was a slight increase in the number of populations exposed to PM 2.5 levels above WHO interim target 2 from 61.8% in 2016 to 61.98% in 2017 (Chart 4-8).

**Chart 4-8 Trend in % National Population Exposure to ambient PM 2.5 above WHO interim target 2, 2010-2017**



Source: World Bank, 2017

## CHALLENGES AND INITIATIVES IN PLACE

The lack of updated and robust data on outdoor air quality is indicative that the state of air pollution monitoring in Kenya is still lacking. This makes it difficult to conclusively determine the state of ambient air quality. Urbanization has contributed to increased air pollution through vehicular and industrial emissions. Although Air quality Regulations exists, its implementation still remains a challenge. At the county level, only Nairobi City County has developed an Air Quality management action plan in an attempt to address its ambient air quality challenges.

The absence of robust air quality monitoring programs makes it a challenge to track ambient air quality. The national government and County government should acquire the required network of instruments to enhance monitoring and provide long term air quality status and exposure data.

## 4.2 ECOSYSTEM VITALITY

### 4.2.1 SUSTAINABLE WATER RESOURCES MANAGEMENT

Safeguarding clean water resources is an important measure of a country's environmental performance, given the centrality of water to all life and the severity of risks associated with water quality degradation. Water plays a critical role in supporting ecosystem services, ensuring public health, and sustaining productive sectors such as agriculture, mining, manufacturing, and

urban development. Rising water demand coupled with climate change, are affecting the supply and quality of water in the country. The key water resources in Kenya include lakes, rivers, ocean, swamps, springs as well as dams/water pans and groundwater.

Water pollution and inefficient use of water can have long- term impacts on the environment, economy, and public health - underscoring the need for effective wastewater management. Water pollution can occur from various anthropogenic processes, including activities of households, industry, and agricultural processes. It's estimated that 80% of water used ends up as waste water, in most cases, of lower quality. There is therefor need for waste water treatment systems prior to discharge into the environment.

**Indicators:** KEPI utilized three indictors to measure the status of this policy issue. These metrics included Water stress index (WSI), Waste water Treatment (WWT) and water resource governance (WRG).

#### 4.2.1.1 WATER STRESS INDEX (WSI)

**Definition:** Water stress index describes the proportion of a county/country that is water stressed measured as % of water use vs. total water available per county/catchment. If the ratio of use vs. available is <40% indicates adequate water. Any county/catchment with WSI >40% indicates severe water scarcity. Water stress is a qualitative estimate of whether there is abundance or a lack of available freshwater resources. Mueller et al. [2015] define water stress as “the lack of sufficient water to meet human and ecological demands. It measures the country’s ability to meet its water demand based on its available water resources, thus typically shows the relationship between total water use and water availability (Pfister, Verones, & Mutel, 2014). Table 4-10 below provides a snapshot of the criteria that is normally used to assess water stress index level.

**Table 4-9 Score and assessment-scale of Baseline Water Stress**

	Score (%)	Assessment
Level 1	< 10	Low stress
Level 2	10 – 20	Low to medium stress
Level 3	20 – 40	Medium to high stress
Level 4	40 – 80	High stress
Level 5	> 80	Extremely high stress
Arid & low water use Scores as “high stress”		

A Similar indicator that has been widely used to quantify water stress is the Falkenmark water stress indicator (Falkenmark, 1989). This indicator defines water stress as a state where the country's or region's water supply is below 1,700 cubic metres per person; below 1,000 m<sup>3</sup> it is said to be experiencing water scarcity; and below 500 m<sup>3</sup>, absolute water scarcity (Brown & Matlock, 2011). See table 4-10 below for Classification of the Falkenmark indicator.

**Table 4-10 Classification of the Falkenmark indicator**

Score (m <sup>3</sup> /pers/year)	Category
> 1700	No stress
1000 - 1700	Stress
500 - 1000	Scarcity
< 500	Absolute scarcity

**Indicator review and Targets:** KEPI measured WSI by calculating the ratio of water demand (Domestic, Industrial, Irrigation, Livestock, wildlife and fisheries) to the total available water resources (precipitation, surface and ground water). Catchments experiencing <40% water stress were accorded 100% EPI Score. Water demand and supply was assessed for the six major basins namely, Rift Valley Catchment Area (RVCA), Lake Victoria North Catchment Area (LVNCA), Lake Victoria South Catchment Area (LVSCA), Athi Catchment Area (ACA), Tana Catchment Area (TCA) and Tana Catchment Area (TCA).

#### 4.2.1.2 RESULTS

- Water Stress Index (WSI) increased from 36.55% in 2016 to 50.8% in 2020. This may be attributed to increasing demand for domestic, agricultural, and/or industrial.
- Athi catchment Area top the list with a WSI of 182.7%, above the 40% level. Other catchments with high WSI include Tana Catchment (63.4%) and Ewaso Ngiro North Catchment (58.3%).

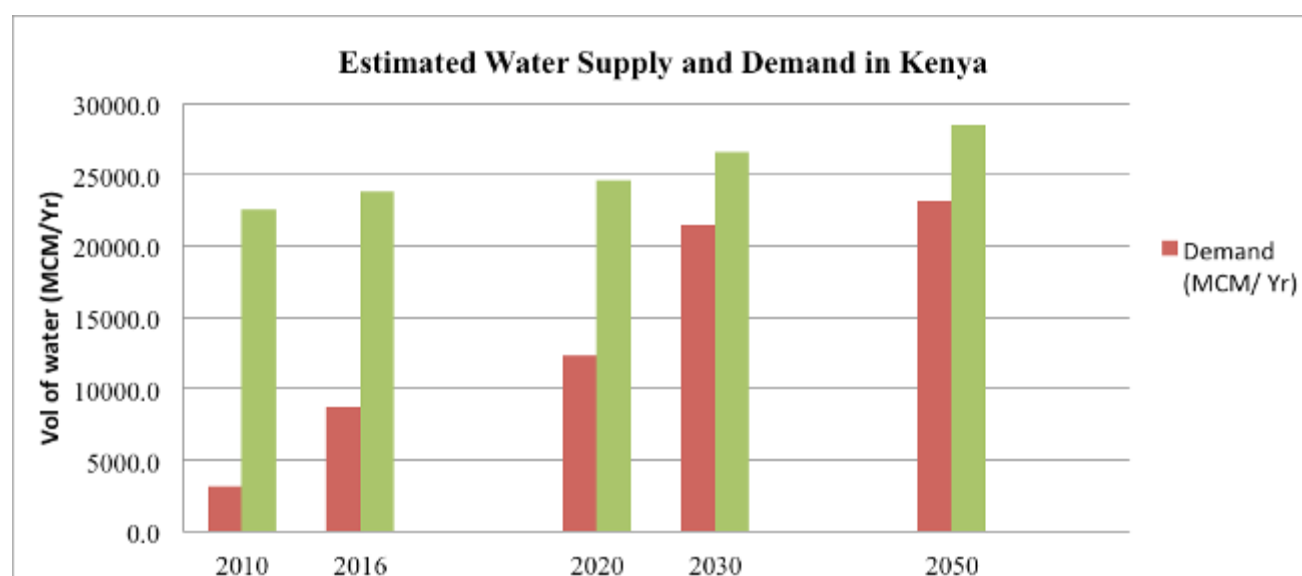
Table 4-11 shows water supply and demand estimation of WSI 2010-2050

**Table 4-11: Water Supply and Demand Estimation of WSI 2010-2050**

Water Stress Index (Unit: %) (and projections)					
Year	2010	2016	2020	2030	2050
Demand (MCM/ Yr.)	3218.0	8693.0	12343.0	21468.0	23141.0
Supply (MCM/ Yr.)	22564.0	23785.0	24599.0	26634.0	28437.0
WSI (%)	14.26	36.55	50.18	80.60	81.38

EPI Score (WSI Vs Target)	280.47	109.44	79.72	49.63	49.15
<b>PTT</b>	<b>100.00</b>	<b>109.44</b>	<b>79.72</b>	<b>49.63</b>	<b>49.15</b>
(Reference: NWMP 2030)					

Chart 4-9 Estimated Water Supply and Demand in Kenya



Source: NWMP 2030

## CHALLENGES AND INITIATIVES IN PLACE

Athi Water Catchment Area has the highest water stress index. This is attributed to fact that the catchment area hosts the two largest cities in Kenya (Nairobi and Mombasa) therefore the water demand is significantly higher relative to other catchments. Athi catchment also receives the lowest amounts when compared to all the other catchments. Based on Leflaive 2012 approach, it is notable that its only ACA that is considered severely water stressed since the withdrawals exceed 40%. The Key drivers to the high-water stress experienced at the catchments include:

- I. High population density characterized by significant economic activities such as manufacturing and processing industries, marine industry and Tourism
- II. Increasing demand from Mega projects such as Galana-Kulalu food security projects.
- III. Catchment degradation, encroachment and cultivation of wetlands.

The government through the Water Act 2016, has established the Water Harvesting and Storage Authority with among others the following key function: develop a water harvesting policy and

enforce water harvesting strategies. The policy will guide the water sector in putting forth concerted efforts to ensure sustainable withdrawal of both surface and groundwater resources

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#### 4.2.1.3 WASTEWATER TREATMENT (WWT)

**Definition:** This indicator measures the status of the wastewater released into the environment from urban areas and industries. Whereas water quality is affected by natural processes, release of untreated wastewater is the major source of water pollution in Kenya. Wastewater treatment therefore has a huge bearing on ecosystems vitality. Poor water quality negatively affects aquatic life, wildlife populations, portable water supply, and recreational water use among others. Wastewater management is a devolved function; therefore, the responsibility of county governments.

**Indicator and Targets:** WWT was measured as the percentage of population whose waste water is treated through formal sewerage coverage systems. The target for this indicator was set as according to the Sustainable Development Goal (SDG) six (6) and the Kenya Vision 2030 which aim to ensure sustainable sanitation for all by the year 2030. The EPI score for WWT for 2020 was set according to the percentage of population that is covered by formal sewerage systems.

Data on sewerage coverage was obtained from the Water Services Regulatory Board's annual Impact Reports. Specifically, data on sewerage coverage for the year 2016 to 2019, both at the national and county level were obtained from the WASREB Impact Report 12.

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## RESULTS

- a) In Kenya, only about 3.9 million people in some 26 counties have access to formal sewerage services, 61% of whom are in the Nairobi City County. This translates to a national coverage of 17%.
- b) 21 out of the 47 counties do not have formal sewerage systems for managing wastewater (sewerage coverage is shown in table 4-13).
- c) For the 17% coverage, wastewater treatment and fecal sludge treatment services are largely inefficient (JMP, 2019). Therefore, effluent from most of the wastewater treatment works do not meet the national effluent quality standards as set in the Water Quality Regulations.

**Table 4-12 National Trend in Wastewater Treatment: 2010-2019**

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
% Population Served	15	19	17	17	16	15	16	16	16	17
EPI Score	15.0	19.0	17.0	17.0	16.0	15.0	16.0	16.0	16.0	17.0

Source: WASREB Impact Report 12, 2020

- d) The results indicate a slight improvement in sewerage coverage from 16% in the previous year (2018) to 17% in 2019.
- e) According to WASREB Impact Report 12, the number of sewerage connections increased by 4% in the same period. However, there has been a general decline in the national sewerage coverage since the year 2011, which can be explained by three factors;
- i. The population is increasing at a higher rate than that of service expansion,
  - ii. Rapid urbanization, with urban population reported to be growing at 4.3% per annum in Kenya;
  - iii. Inadequate investment in sewerage infrastructure (WASREB, 2020).
- f) In terms of urban coverage, only 32 (15%) out of the 215 towns in Kenya have access to sewerage services. This is an improvement from 28 towns recorded in 2018. The map below gives sanitation coverage by urban centres in Kenya.
- g) The top performing counties in sewerage coverage include Nairobi with coverage of 51% followed closely by Laikipia with 48% coverage. They are followed by Trans Nzoia, Bungoma, Gishu and Nakuru Counties with sewerage coverage of 38%, 36%, 36% and 32% respective. These are the only counties with sewerage coverage above the national coverage of 17%. The average sewerage coverage at the counties stands at 7.9% which is way below the national coverage. The sewerage coverage in counties is shown in the 4-10 below.



Chart 4-10 Sewer Coverage Kenya

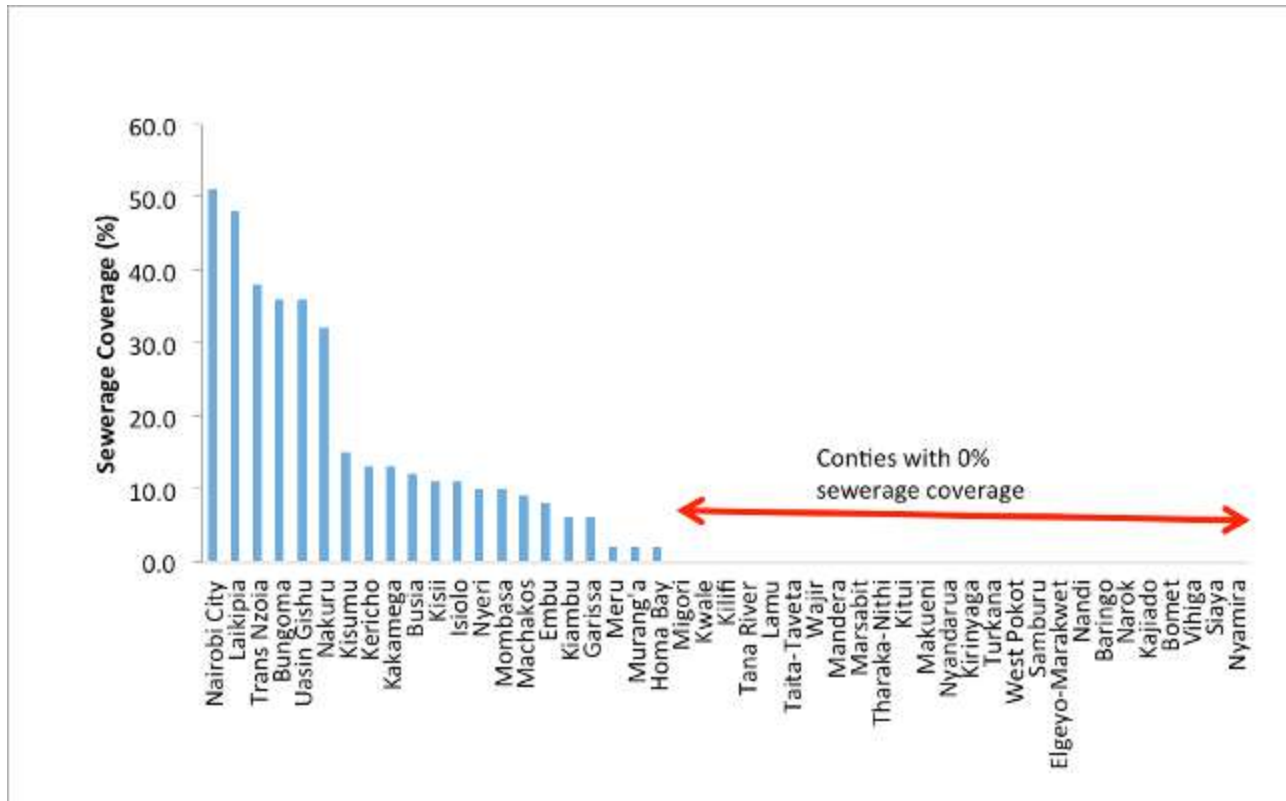


Figure 9: Sewerage coverage in various counties in Kenya (WASREB Impact Report 21, 2020)

Table 4-13 County WWT EPI scores and ranking

Rank	County	EPI Score	Rank	County	EPI Score
1	Nairobi City	51.0	15	Migori	0.0
2	Laikipia	48.0	15	Kwale	0.0
3	Trans Nzoia	38.0	15	Kilifi	0.0
4	Bungoma	36.0	15	Tana River	0.0
4	Uasin Gishu	36.0	15	Lamu	0.0
5	Nakuru	32.0	15	Taita-Taveta	0.0
6	Kisumu	15.0	15	Wajir	0.0
7	Kericho	13.0	15	Mandera	0.0
7	Kakamega	13.0	15	Marsabit	0.0
8	Busia	12.0	15	Tharaka-Nithi	0.0
9	Kisii	11.0	15	Kitui	0.0
9	Isiolo	11.0	15	Makueni	0.0
10	Nyeri	10.0	15	Nyandarua	0.0
10	Mombasa	10.0	15	Kirinyaga	0.0
11	Machakos	9.0	15	Turkana	0.0
12	Embu	8.0	15	West Pokot	0.0
13	Kiambu	6.0	15	Samburu	0.0
13	Garissa	6.0	15	Elgeyo-Marakwet	0.0
14	Meru	2.0	15	Nandi	0.0
14	Murang'a	2.0	15	Baringo	0.0

14	Homa Bay	2.0	15	Narok	0.0
			15	Kajiado	0.0
			15	Bomet	0.0
			15	Vihiga	0.0
			15	Siaya	0.0
			15	Nyamira	0.0

## KEY CHALLENGES AND INITIATIVES IN PLACE

Access to sewerage services has declined over time with the current figure of 17% being lower than the figure reported 10 years ago of 19%. There have been little government efforts to invest in sewerage services – the current investment is below 1% of GDP and 3% of National Budget. Sanitation value chain has also been neglected in terms of service delivery and regulation.

Low reporting on sewerage coverage by service providers has an implication on data validity used in this study. As a result, some counties may be rated as having zero sewerage coverage while in actual sense; there may be some form of coverage. For instance, in the period of 2018/2019, Kitui and Bomet counties did not report on sewerage while their sewerage systems had recently been developed (WASREB, 2020). Since the adoption of a devolved system of governance in 2012, there has been efforts to invest and develop or increase sewerage in the counties. The counties that have sewer projects currently under development include Baringo, Kirinyaga, Mandera, Marsabit, Nyandarua, Tharaka-Nithi, Kajiado and West Pokot. There is need for counties to rethink their sanitation investments strategies by adopting an inclusive approach that will combine both sewerage and non-sewerage approaches.

**Table 4-14 Clarification of the wastewater treatment metric**

<b>What the metric is</b>	<b>What the metric isn't</b>
<i>The percentage of wastewater that undergoes at least primary treatment, normalized by the percentage of the population connected to a municipal wastewater collection system</i>	<ul style="list-style-type: none"> <li>• A measure of total wastewater pollution or generation</li> <li>• A measure of wastewater treatment efficiency or quality</li> <li>• A measure of waste or pollution present in a nation's water supply</li> <li>• A measure of water resource quality, scarcity, or efficiency</li> </ul>

### 4.2.2 AGRICULTURE AND LIVESTOCK

The agriculture sector remains the backbone of the Kenyan economy, contributing about 27.3 per cent of the GDP directly and another 25 percent indirectly through linkages with other sectors. About 75% of industrial raw materials and 60 per cent of export earnings comes from this sector.

It accounts for 65% of the Kenya's total exports. With regards to employment, the sector accounts for 18% of formal employment and employs 60% of the national workforce<sup>4</sup>, and is considered one of the key sectors that will help the country to attain the 10% average GDP growth rate of 10% by the year 2030 (Vision 2030).

KEPI 2020 measured the status of this policy issue by the following indicators:

- a. Fish stocks exploitation

#### 4.2.2.1 FISH STOCKS EXPLOITATION

**Definition:** measured by the percentage of the country's catch in kg/ha/yr. vs. the MSY which is estimated as the highest ever catch (in kg/ha/yr.). The indicator has been calculated separately for the exclusive economic zone (EEZ) and the fresh water fishery, and merged for a combined indicator. Fish stocks can be defined as the total landings/ catch in a year in an exclusive economic zone (EEZ) and freshwater lakes that comprises of species listed as overexploited or collapsed (Hsu A et al., 2014). A fish stock is said to be overexploited when it is harvested at levels that exceed the species' capacity to reproduce and replenish. A stock status is expressed as the ratio between its population biomass (B) - live weight in the ocean-- and the biomass that can produce the maximum sustainable yield (MSY), expressed as  $(B/MSY)$ <sup>5</sup>

The maximum sustainable yield (MSY) for a given fish stock means the highest possible annual catch that can be sustained over time, by keeping the stock at the level producing maximum growth. The UN Food and Agriculture Organization (FAO) categorizes stocks as 'overexploited', 'fully exploited' or 'underexploited' depending on whether the current biomass is less than 40 percent, 40-60 percent, or greater than 60 percent, respectively of the 'pristine' (unfished) biomass (Ye 2011).

#### Indicator review and target:

The national fishery catches have been declining since the 1990s when it increased to almost 200,000 Mt, mainly due to the decline of the Nile perch fishery in Lake Victoria. Marine fish production in Kenya is mainly from the territorial waters and the Exclusive Economic Zone (EEZ), spanning approximately 230,000 Km<sup>2</sup>. It is estimated that marine fisheries sub – sector

<sup>4</sup> National Agricultural Soil Management Policy, 2020

<sup>5</sup> <http://www.oceanhealthindex.org/methodology/components/fisheries-status>

contributes approximately 10% of the total national fishery production, estimated at about 160,000 Mt. However, marine fish stock has been declining, with some of the species such as sharks, the semi-industrial prawn trawl fishery and sea cucumber showing a declining trend. (Table 4-16). The offshore fishery potential is estimated to be between 150,000 - 300,000 mt worth KES 21 - 42 billion.

**Table 4-15 The status of some key commercial fish species in coastal Kenya**

Type of Fish	Indicator species	Status
Small scale reef finfish fisheries	<i>Siganus sutor</i> <i>Leptoscarus vaigiensis</i> <i>Lethrinus lentjan</i>	Overfishing
Tuna and large pelagic species	<i>Katsuwonis pelamis</i> <i>Thunnus albacares</i> <i>Euthynnus affinis</i> <i>Thunnus obesus</i> <i>Xiphias gladius</i> <i>Tetrapturus audix</i>	Katsuwonis pelamis overfished. Other species within MSY.
Shallow water prawn	<i>Penaeus indicus</i> <i>P. monodon</i> <i>P. semisulcatus</i> <i>Metapenaeus monoceros</i>	Uncertain
Shallow water lobster	<i>Panulirus ornatus</i> <i>P. longipes</i> <i>P. versicolor</i> <i>P. homarus</i> <i>P. penicillatus</i>	Optimally exploited
Small and medium pelagics	<i>Rastrelliger kanagurta</i> <i>Sphyræna flavicauda</i> <i>S. jello</i> <i>S. obtusata</i> <i>Hemiramphus far</i>	Overfishing
Small and medium pelagics	<i>Rastrelliger kanagurta</i> <i>Sphyræna flavicauda</i> <i>S. jello</i> <i>S. obtusata</i> <i>Hemiramphus far</i>	Overfishing
Mud crab	<i>Scylla serrata</i>	Optimally exploited
Marine aquarium	<i>Amphiprion allardi</i> <i>A. akallopisos</i> <i>Pomacanthus imperator</i> <i>P. chrysurus</i> <i>P. maculosus</i>	Overfishing of some species
Sea cucumber	<i>Holothuria scabra</i> <i>H. nobilis</i> , <i>H. fuscogilva</i>	Overfished
Octopus	<i>Octopus cyanea</i>	Optimally exploited

Source: Adapted from Kimani *et al*, 2018

The Ministry of Agriculture has developed a raft of policy, regulatory and financing incentives to accelerate transformation of the fisheries sector. The fisheries and aquaculture sector contributes about 0.8% to the Gross Domestic Product (GDP), providing direct employment opportunities to over 500,000 people and supporting over two million people indirectly (KMFRI 2017). Freshwater fish account for close to 98% of Kenya's reported aquaculture production. In 2030, Kenya's population is expected to reach 67 million, translating to a demand of 270 000 MT of fish to maintain its per capita fish consumption at current rate of 4 kg/year, which is still below the to 10 kg/year African average in early 2010s. Farmed fish production in the country would need

to reach 150 000 MT in 2030 in order for its domestic fish supply to satisfy the 270 000 MT fish demand, translating to a 21 percent annual aquaculture growth during 2017–2030 period (KEFRI 2020).

The international target for fish exploitation should be less than 50kg/ha/year and more than 10kg/ha/year. To have safe fishing then exploitation should be in between 10kg/ha/year and 10kg/ha/year but anything below 10kg/ha/year is under exploitation. Kenya's marine and coastal waters maximum sustainable yield is estimated at between 150,000 and 300,000 metric tons, according to the FAO. Under the country's blue economy development strategy planned through 2030, Kenya is inviting private investors to partner with the government in developing relevant fishing infrastructure and support small- and medium-sized fishing companies to modernize their operations.

For purposes of the 2020 EPI measures fish stock exploitation by the percentage of inland and marine catch vs the peak capacity as the MSY. It compares the current catch vs the highest ever (or MSY) of the inland and marine fishery, merged to compare vs the target. <50% was set as the safe level of off take without over-exploitation, and <10% considered a collapsed fishery.

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## RESULTS

Data national fish catch was obtained from the Economic Survey report, 2020 and from FAO. Particularly, we relied on FAO for 2010- 2014 data, publicly available at [http://www.fao.org/fishery/facp/KEN/en#:~:text=Kenya's%20fisheries%20and%20aquaculture%20sector,the%20country's%20GDP%20\(2013\).&text=Total%20fishery%20and%20aquaculture%20production,Victoria%20contributed%20about%2090%20percent](http://www.fao.org/fishery/facp/KEN/en#:~:text=Kenya's%20fisheries%20and%20aquaculture%20sector,the%20country's%20GDP%20(2013).&text=Total%20fishery%20and%20aquaculture%20production,Victoria%20contributed%20about%2090%20percent) while data for 2015-2019 were obtained from Economic Survey Report. It was not possible to compared performance of based on fish stock exploitation as not all the counties have fresh water systems that support fishing.

Kenya has continued to register a decrease in her national fish catch from the year 2015 and now stands at 143.5 metric tons (KNBS, 2020). This is attributed to a fall in in the fresh water catch especially in Lake Victoria, which is the largest contributor to fresh water fish production in Kenya, producing over 90% of the total fresh water catch per year. Fresh water catch reduced from 141.7 thousand metric tons in 2015 to 120.9 thousand metric tons in 2019. The country has

witnessed an irregular pattern of marine catch varying from 22.1 thousand metric tons in 2015 to 22.6 thousand metric tons in 2019. (Table 4-16)

**Table 4-16 Trend in national fish catch in marine and freshwater**

Source of Catch (1000t/yr.)			2010	2012	2013	2014	2015	2016	2017	2018	2019
<b>Total Capture Fishery (M&amp;FW)</b>			<b>140.4</b>	<b>158.7</b>	<b>163.1</b>	<b>168.2</b>	<b>163.8</b>	<b>147.7</b>	<b>135.1</b>	<b>146.7</b>	<b>143.5</b>
	<b>Freshwater</b>		131.9	150.1	154.3	159.2	141.7	123.5	111.8	122.5	120.9
	<b>Marine</b>		8.5	8.6	8.9	9.0	22.1	24.2	23.3	24.2	22.6
<b>Fresh water Area (ha)</b>	<b>11,026</b>	<b>(kg/ha/yr.)</b>	119.63	136.13	139.94	144.39	128.51	112.01	101.40	111.10	109.65
<b>Marine Area (ha)</b>	<b>116,942</b>	<b>(kg/ha/yr.)</b>	0.73	0.74	0.76	0.77	1.89	2.07	1.99	2.07	1.93
<b>Total (FW&amp;M) (ha)</b>	<b>127,968</b>	<b>(kg/ha/yr.)</b>	1.10	1.24	1.27	1.31	1.28	1.15	1.06	1.15	1.12

% Catch vs MSY Total Fishery			2010	2012	2013	2014	2015	2016	2017	2018	2019
<b>Fresh water vs MSY</b>	<b>144.39</b>	<b>% MSY FW</b>	82.85	94.28	96.92	100.00	89.01	77.58	70.23	76.95	75.94
<b>Marine vs MSY</b>	<b>2.07</b>	<b>% MSY M</b>	35.12	35.54	36.78	37.19	91.32	100.00	96.28	100.00	93.39
<b>Total (FW&amp;M)</b>	<b>1.31</b>	<b>% MSY FW&amp;M</b>	83.47	94.35	96.97	100.00	97.38	87.81	80.32	87.22	85.32

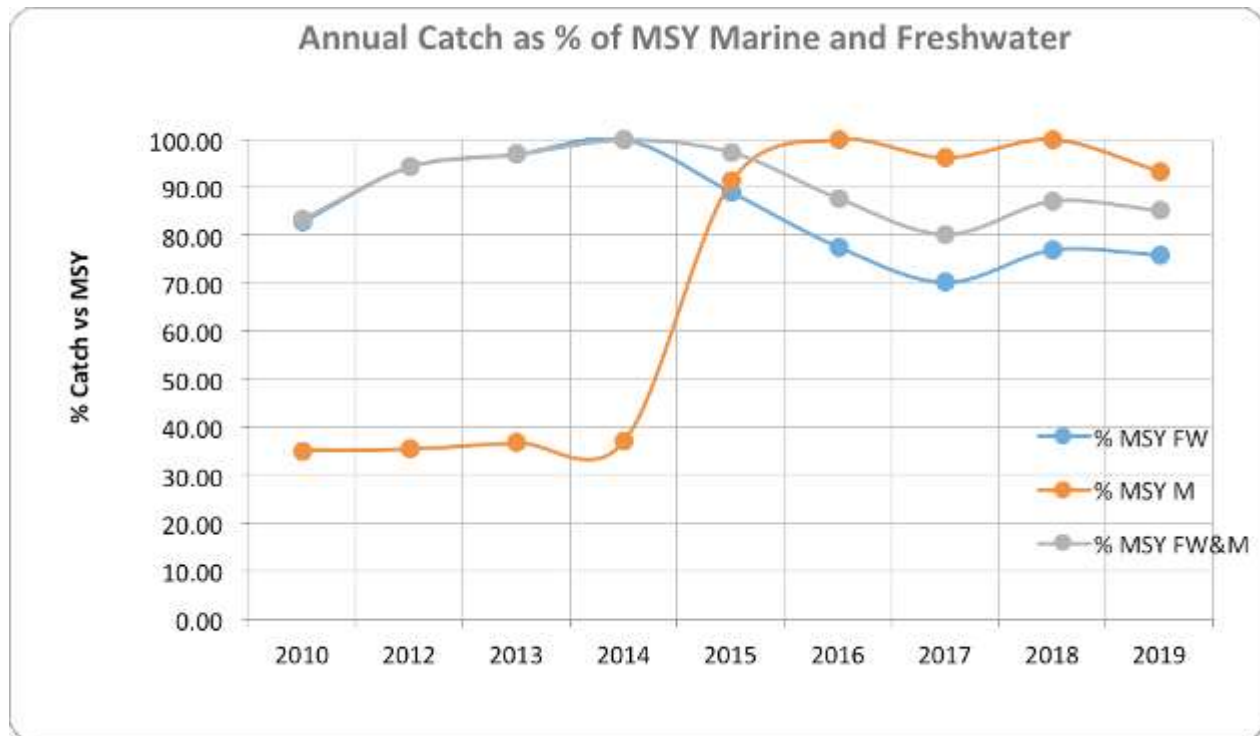
<b>EPI Fresh water (%)</b>	<b>100.0</b>	<b>% vs Target</b>	82.85	94.28	96.92	100.00	89.01	77.58	70.23	76.95	75.94
<b>EPI Marine (%)</b>	<b>100.0</b>	<b>% vs Target</b>	35.12	35.54	36.78	37.19	91.32	100.00	96.28	100.00	93.39
<b>EPI Total (FW &amp; M) (%)</b>	<b>100.0</b>	<b>Average</b>	83.47	94.35	96.97	100.00	97.38	87.81	80.32	87.22	85.32

FAO (2016) & KNBS, 2020

- From the table, fish stock has been on the decrease from the last 5 years.
- Compared to the international standard (where overexploitation is experience when the catch exceeds 50 metric tons per ha and collapsed when below 10 metric tons per ha), it is apparent that fresh water fish stocks have been overexploited while marine fisheries resources have been underexploited.
- Our national fish stock remains underexploited. The current national fish stock exploitation stands at 1.12 kg/ha/yr. However, compared to MSY for fresh water and marine water catch of 144.38 kg/ha/yr., 2.07 kg/ha/yr. and 1.31kg/ha/yr. respectively, exploitation has been within the range.

- d) The national fish stock exploitation stands at 85.32% of MSY<sup>6</sup>. Fish stock exploitation for fresh water fish stands at 75.94% of MSY while that of marine fish is 93.36% (Figure 5). The results show that fresh water fisheries continue to be exploited at a higher rate than marine fisheries.

**Chart 4-11 Trend of fish stock exploitation in Kenya for the period between 2010-2019**



## CHALLENGES AND INITIATIVES IN PLACE

Fisheries is one of the sectors that have been recognized in the Kenya government's economic blueprint, Vision 2030, as having a high potential for spurring national economic growth. Fisheries are also seen as important renewable natural resources that contribute to the food and nutritional security as well as livelihoods of millions of Kenyans. Declining fish stocks due to overfishing and environmental degradation, unreported and unregulated fishing activities, high postharvest losses due to inadequate fish handling and processing capacity and climate change are the main threat to the fisheries sector in Kenya. With increasing food demands from a growing population, the uncertain future of the Kenya's fisheries poses a significant challenge to human nutrition, economic activity, and ecosystem health.

<sup>6</sup> Target for Kenya is 100% vs the MSY; 50% Vs the target shows sustainable exploitation while anything below 10% shows overexploitation.

### 4.2.3 FORESTS AND WOODLANDS

Forests are important drivers of ecological, social, cultural, and economic functions. They support human needs and habitat for wildlife, biodiversity and soil conservation, regulating water flows and sequestering carbon dioxide. In addition, forest ecosystems help in enhancing landscape resilience to climate change. In the country's water towers, for example, forests and trees provide environmental services that include water quality and quantity, reduction of soil erosion, and creation of micro-climatic conditions that maintain and/or improve productivity. In terms of economic contribution, forestry and related activities contributed a total of Ksh 125,642,600,000 in 2019. These benefits thus underscore the need to ensure that forests are sustainably managed. There are four main types of forests in Kenya as shown in the table 4-17 below.

**Table 4-17: Forest types and sub-types in Kenya**

Forest type	Forest sub-types	Approximate area (Ha)	% of total forest area
Western rainforest	Natural forest (mixed indigenous) [Kakamega, Nandi forests]	144,615	3.5
Montane forests	Natural forest (mixed indigenous) which include Mt. Kenya, Aberdares, Mau, Cherangany, Mt. Elgon, Matthews Ranges and Chyulu Hills	1,359,860	32.9
	Bamboo	85,693	2.1
Coastal forest	Natural forest (mixed indigenous trees) [Arabuko sokoke, Dakatcha, Boni, Shimba Hills, Kayas]	295,871	7.2
	Mangroves	48,522	1.2
Dryland forests	Natural forest (mixed indigenous trees) [Hilltops in Eastern and Northern Kenya and Lake Victoria regions]	1,875,316	45.4
	Riverine forest	135,231	3.3
Forest plantations	Public and private forests	186,716	4.5

**Source:** KFS 2013, based on the forest cover mapping of 2013 using 2010 satellite imageries

### INDICATORS

We measured the status of this policy issue using three indicators namely, Tree Cover Loss (TCL), Forest Cover (FOC) and Forest Resource Governance and Management (FRGM). These indicators are discussed as follows:



## TREE COVER LOSS (TCL)

**Definition:** We quantified TCL by the percentage of forest lost from the extent of tree cover in reference to the year of 2000 (base year) within a period of 10 years from 2010. We define Trees cover as any land area as with > 30% canopy cover. Loss of tree cover may occur from: deforestation, encroachment, fire, agriculture, charcoal making and logging within the course of sustainable forestry operations. Similarly, tree cover gain may indicate the growth of trees within natural or managed forests.

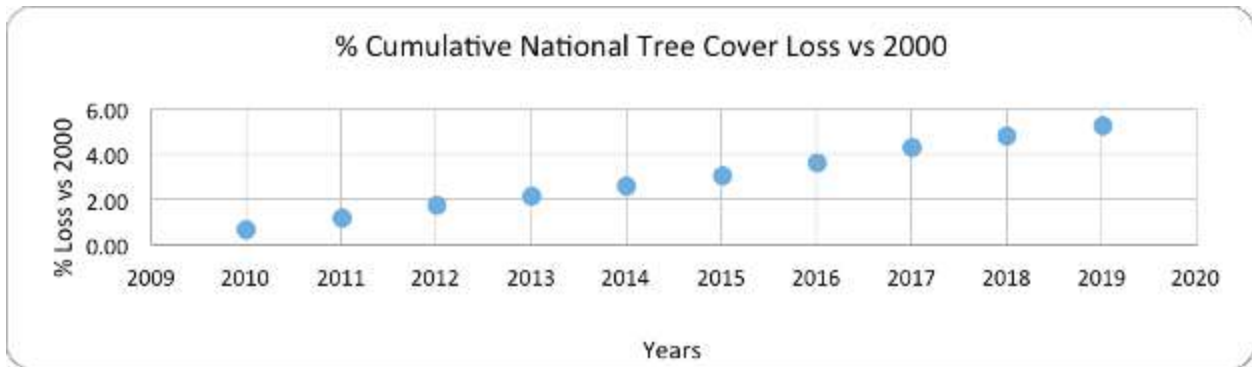
**Indicator Review and Targets:** The policy and regulatory framework that guides the management of forests in Kenya are the Forest Management and conservation Act 2016, Forest Policy 2005, the constitution of Kenya 2010 and the vision 2030. Recently, the Ministry of Environment and Forestry (ME&F) developed the National Strategy for Achieving and Maintaining over 10% Tree Cover by 2022. The 10 percent is the national target for forest cover that is set to be achieved by 2030 according to the Kenya Vision 2030 and the Constitution 2010. According to the strategy, the government has committed to restore 5.1 million ha of degraded landscapes by the year 2030 as a contribution to the Africa Forest Landscape Initiative (AFR100).

The data on tree cover loss come from Global Forest Watch (GFW), an open-source initiative of the World Resources Institute in collaboration with other partner organizations. Tree cover loss data are available from 2001 to 2019 through satellite imagery.

## RESULTS

- a) Kenya's tree cover loss stands at 5.9% when compared to tree cover in the year 2000. In 2019, a total of 15, 950 ha of tree cover was lost. Figure 9 shows a national map of tree cover loss in Kenya
- b) From 2001 to 2019, Kenya lost 342kha of tree cover, equivalent to a 10% decrease in tree cover since 2000, and 107Mt of CO<sub>2</sub> emissions. (Global Forest Watch 2019)
- c) The cumulative tree cover loss in the last 10 years (2010-2019) has been on the rise, reaching over 175,000 ha in 2019 (Figure 10). This loss is however exclusive of the forest cover gain in the same period. This translates to a depletion rate of about 1750 ha per annum. This continuous rise in tree cover loss can be attributed to charcoal burning, illegal logging, overgrazing and encroachment of forests that are experienced in most of our forested land.

Chart 4-12 Cumulative tree cover loss from the year 2010-2019



- a) Narok County continue to record the highest tree cover loss at 67459 ha followed by Nakuru at 30870 ha, Kilifi at 24104 ha and Kwale at 18186 ha.
- b) Wajir and Isiolo counties recorded the lowest tree cover loss.
- c) Compared to tree cover in the year 2000, the highest tree cover loss was recorded in Uasin Gishu at 32.33% while the lowest tree cover lost was recorded in Marsabit and Wajir Counties (Chart 4-13).

Chart 4-13 Percentage Tree Cover Loss in Counties

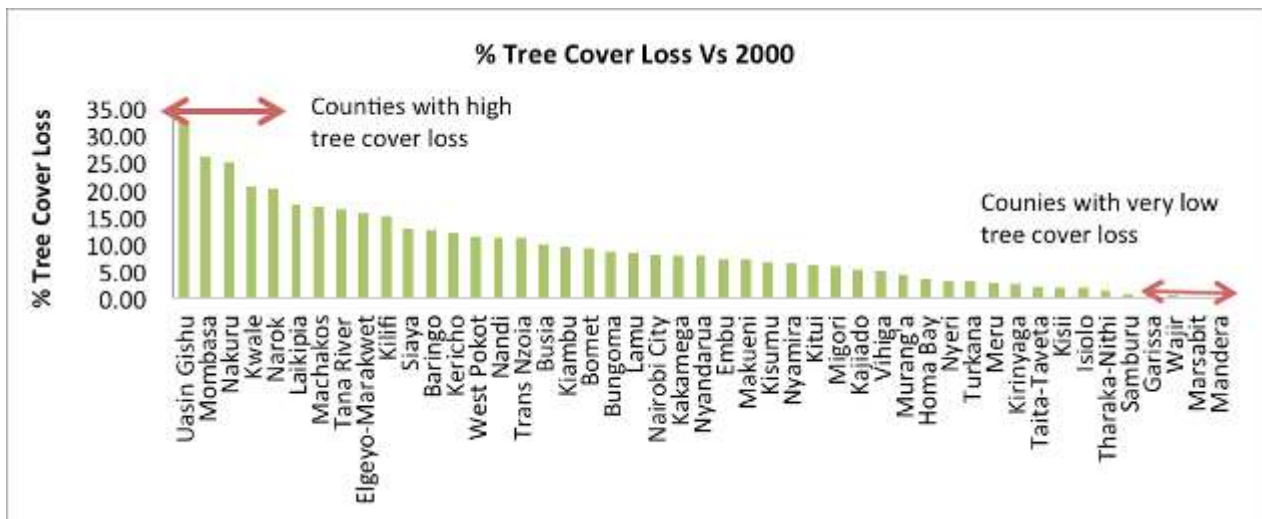


Table 4-18 County TCL EPI scores and ranking

Rank	County	Score	Rank	County	Score
1	Uasin Gishu	32.33	25	Embu	7.06
2	Mombasa	25.95	26	Makueni	6.93
3	Nakuru	25.02	27	Kisumu	6.59
4	Kwale	20.45	28	Nyamira	6.21
5	Narok	20.16	29	Kitui	5.95
6	Laikipia	17.22	30	Migori	5.89
7	Machakos	16.79	31	Kajiado	5.21
8	Tana River	16.29	32	Vihiga	4.95
9	Elgeyo-Marakwet	15.53	33	Murang'a	4.18
10	Kilifi	15.05	34	Homa Bay	3.44
11	Siaya	12.68	35	Nyeri	3.07
12	Baringo	12.50	36	Turkana	2.93
13	Kericho	11.94	37	Meru	2.64
14	West Pokot	11.39	38	Kirinyaga	2.47
15	Nandi	11.15	39	Taita-Taveta	2.10
16	Trans Nzoia	11.07	40	Kisii	1.77
17	Busia	9.95	41	Isiolo	1.71
18	Kiambu	9.37	42	Tharaka-Nithi	1.43
19	Bomet	9.07	43	Samburu	0.66
20	Bungoma	8.53	44	Garissa	0.56
21	Lamu	8.28	45	Wajir	0.31
22	Nairobi City	8.07	46	Marsabit	0.13
23	Kakamega	7.79	47	Mandera	0.00
24	Nyandarua	7.71			

## KEY CHALLENGES AND INITIATIVES IN PLACE

Whereas forests are recognized for their social, economic and environmental importance, deforestation, forest degradation and fragmentation of forests have undermined the ability of forests to deliver these important services. The National Strategy for Achieving and Maintaining Over 10% Tree Cover By 2022 has identified the following key drivers of tree cover loss in Kenya:

- a) Weak forest governance, coordination and collaboration in the management of public, community and private forests;
- b) Increasing population and overreliance on forests for production of wood energy especially for charcoal.
- c) Inadequate land and forest tenure security to support conservation and forest investments especially in community and private forests;
- d) Forest and grassland fires and overgrazing in forest reserves, national parks, game reserves, community and private forests;
- e) Conversion of forest land to agriculture, settlements and infrastructure development arising from lack of implementation of national and county government spatial plans;
- f) Wastage in wood utilization especially in timber conversion and charcoal production; and
- g) Climate change and associated impacts.

To help reverse increasing tree cover loss in Kenya, the government issued a ban on logging

Declining tree cover affects biodiversity and ecosystem services, affecting water towers and leads to declining water cycles in rivers. This in turn increases the pressure on sectors that rely on forests such as energy, wildlife, water, construction and energy. Increasing tree cover by reducing associated losses will require investment by National and County governments in integrated land and forest management, tree planting, enforcement of laws and policy, and alternative energy sources, water tower management and promotion of sustainable agriculture.

**Table 4-19 Clarification on tree covers loss metric**

<b>What the metric is</b>	<b>What the metric isn't</b>
<i>The percentage of forest cover lost in forest areas with over 30% canopy cover, compared to forest cover in the reference year 2000</i>	<ul style="list-style-type: none"> <li>• A measure of human-driven or permanent Deforestation</li> </ul>

## FOREST COVER

**Definition:** Measured forest cover by the percentage of total land area covered in trees of >5m = forest with at least 0.5 ha area, with more than 30% canopy. This does not include

land predominantly under agricultural or urban land use. Forest is determined both by the presence of trees and the absence of other predominant land uses.

**Indicator Review and Targets:** Forest Conservation and Management Act, 2016 defines a forest as land which is declared or registered as a forest, or woody vegetation growing in close proximity in an area of over 0.5 hectares including a forest in the process of establishment, woodlands, thickets<sup>7</sup>. KFS defines a forest as land with trees capable of occupying a minimum area of 0.5 hectares and trees likely to grow over 2 meters and with a minimum of 15% of canopy cover<sup>8</sup>. The last assessment that was conducted by Kenya Forest Service in 2013 placed the national forest cover at 4.18 million ha, representing 6.99% of the total land area. In 2015, the Global Forest Resources Assessment estimated the national forest cover at 7.2% based on the 2013 basement data (FAO, 2015). The forest cover in Kenya is still below the recommended minimum global standard of 10% (UNFF, 2010), which is also the national target set by the country by 2030 (Vision 2030). Although the long-term goal is to achieve a national forest cover of 10% by 2030, Kenya has set an ambitious goal of achieving this target by the year 2022<sup>9</sup>.

This study has relied on data from World Data Atlas, Knoema (2015) and Economic Survey Reports, 2018 and 2019 to compute the national forest cover for the past 10 years (2009 -2018). The EPI score for national forest cover was computed by measuring the percentage of the total land area covered in trees vs target, where the target is a national forest cover of 10% equivalent to an EPI score of 100%.

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## RESULTS

- a) Kenya's forest cover was estimated at 7.28% of the total land area in 2018 (Economic Survey Report, 2019).
- b) Although forest cover has been increasing from 7.4% in 2010 when the Constitution was promulgated to 7.8% in 2016, the second highest ever recorded forest cover since the year 1990, Kenya witnessed a sharp decrease to about 7.3% in 2017 (Economic Survey Report, 2018). Figure 13 below shows the trend of tree cover in Kenya from 1990 -2019. This reduction in forest cover can be attributed to Illegal logging of indigenous trees, illegal squatters, the changing lifestyle of forest dwelling communities, the abuse of PELIS,

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<sup>7</sup> Forest Conservation and Management Act, 2016, section 2

<sup>8</sup> Taskforce Report on Forest Resources Management and Logging Activities in Kenya, 2018 –Pg. 29

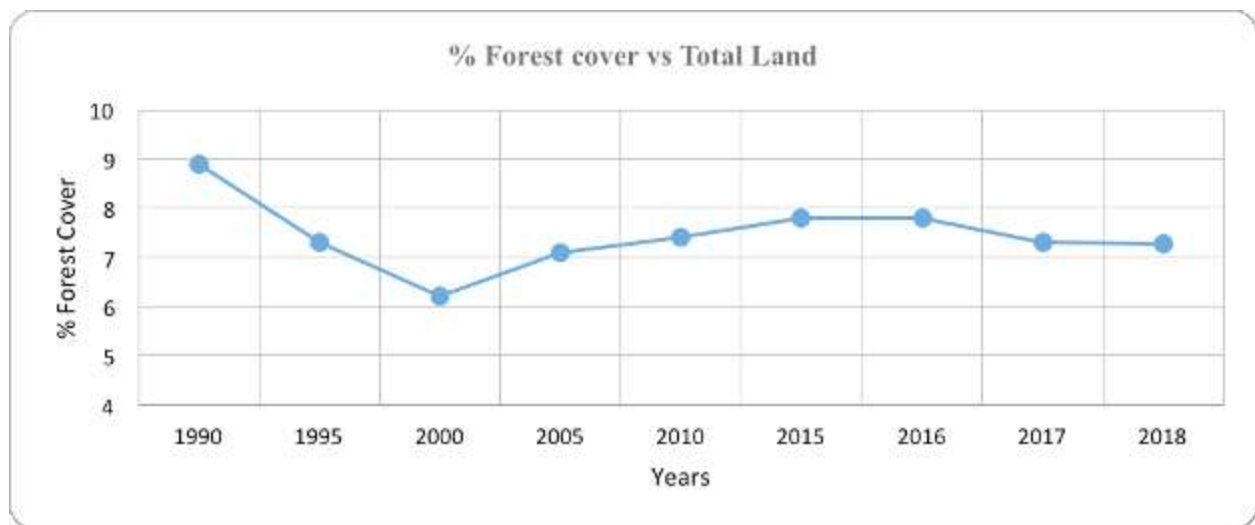
<sup>9</sup> National Strategy for Achieving and Maintaining Over 10% Tree Cover By 2022, 2019.

unclear forest zonation and the introduction of irregular settlements and large-scale public infrastructure developments.

- c) From 2002 to 2019, Kenya lost 45.8kha of humid primary forest, making up 14% of its total tree cover loss in the same time period. Total area of humid primary forest in Kenya decreased by 7.1% in this time period (Global Forest Watch 2019)

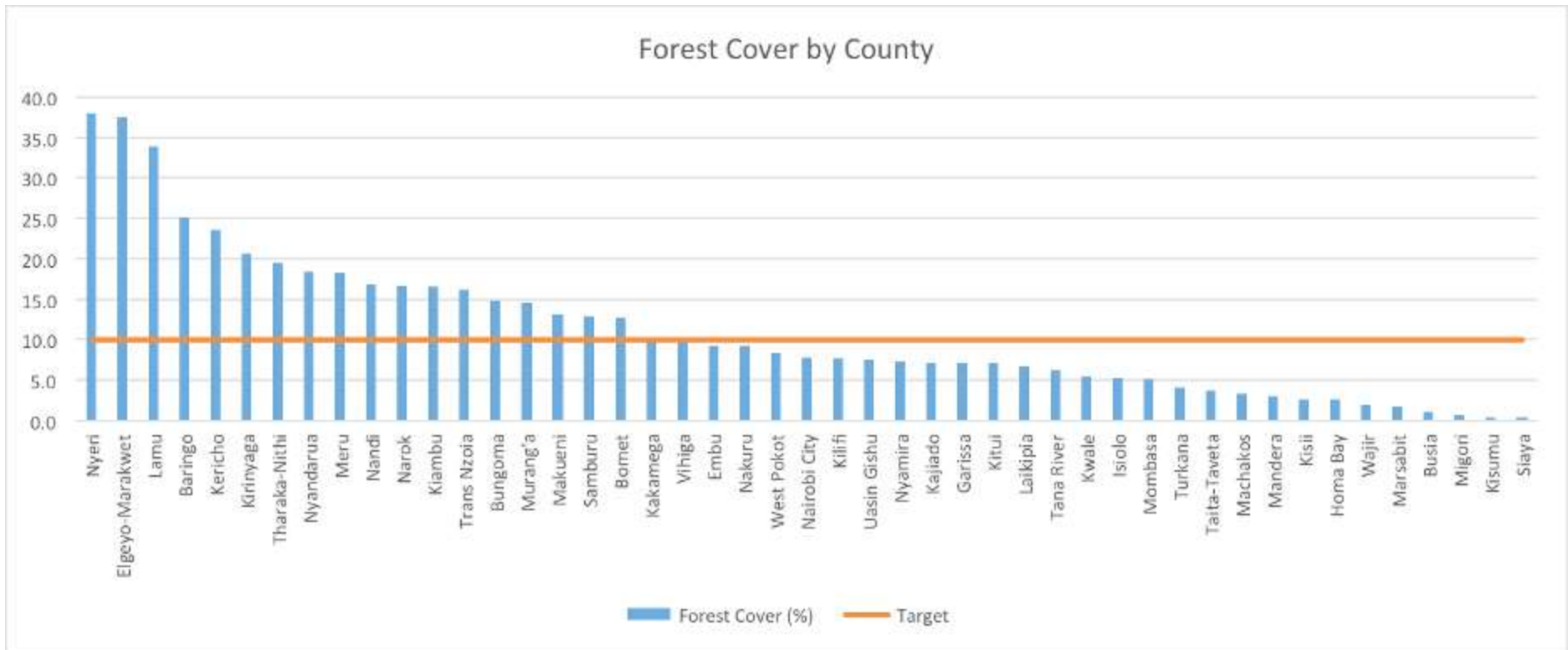
The EPI 2020 score for the national forest cover is thus 72.8% from the national target of 100%.

**Chart 4-14 Trend in forest cover in Kenya, 1990 – 2019**



According to chart 4-15 below, Nyeri is the most forested county in Kenya at 38%. At least 18 counties have attained the UN recommended forest cover of 10%. Top 5 most forest counties include Nyeri (38%), Elgeyo Marakwet (37.5%), Lamu (33.9%) Baringo (25.1%) and Kericho (20.7%). Nonetheless, the bottom 5 least forested counties include Marsabit (1.6%), Busia (1%), Migori (0.6%), Kisumu (0.4%) and Siaya (0.4%).

Chart 4-15 Forest Cover by County



## CHALLENGES AND INITIATIVES IN PLACE

Kenya has witnessed a troubling rate of forests depletion in the recent past. This is estimated at 5,000 hectares per annum, leading to an annual reduction in water availability of approximately 62 million cubic meters. In economic terms, this translates translating to an economic loss to the economy of over USD 19 million<sup>10</sup>. This could potentially rollback the gains made towards attaining the 10% forest cover by 2030 and the Government's Big Four Agenda of food and nutritional security, affordable and decent housing, universal healthcare and manufacturing. For instance, analysis of land-use changes over the period 1990-2015 established that Kenya lost 311,000 ha of forestland. This is exacerbated by the increasing and largely rural population and high dependency on rain-fed agriculture which has led to the expansion of the croplands at the expense of the forestland.

There are several initiatives in place to restore and attain the 10% forest cover in Kenya. Several tree planting initiatives in the major water towers, schools, national parks, are ongoing, with the government planning to plant at least 1.8 billion trees by 2022<sup>11</sup>.

**Table 4-20 Clarification on forest covers metric**

<b>What the metric is</b>	<b>What the metric isn't</b>
<i>The percentage of total land area covered in trees of &gt;5m = forest with at least 0.5 ha area, with more than 30% canopy</i>	<ul style="list-style-type: none"> <li>• <i>A measure of human-driven or permanent deforestation</i></li> <li>• <i>Land predominantly under agricultural or urban land use</i></li> </ul>

<sup>10</sup> Taskforce Report on Forest Resources Management and Logging Activities in Kenya, 2018

<sup>11</sup> National Strategy for Achieving and Maintaining Over 10% Tree Cover By 2022, 2019



#### 4.2.4 BIODIVERSITY AND HABITAT

Biodiversity sustains ecosystem functions and provide ecosystem services that key to sentience of the human well-being. MPA and TPA harbor considerable amount of biological diversity that support human health, provide clean and safe water and air, as well as preservation of cultural values for economic growth and sustenance of livelihoods. Approximately 70% of Kenya's biodiversity are found outside the protected areas.

Terrestrial, Marine and wetlands are important in their provisions of ecosystem goods and services. The Ramsar definition of Wetlands are as 'areas permanently or seasonally flooded by water where plants and animals have become adapted; and include swamps, areas of marsh, peat land, mountain bogs, banks of rivers, vegetation, areas of impeded drainage or brackish, salt or alkaline; including areas of marine water the depth of which at low tide does not exceed six meters. Kenya's wetlands however, currently face challenges stemming from invasive species, pollution, overexploitation, agricultural expansion, settlements and encroachment of people and land use change.'

These indicators were used in determination of Kenya's performance in biodiversity, and habitat category:

- a) Terrestrial protected areas
- b) Marine protected areas

##### 4.2.4.1 TERRESTRIAL PROTECTED AREAS (TPA)

**Definition:** IUCN defines TPA as a clearly defined geographic space, recognized, dedicated and managed through legal and other effective means in order to attain long-term conservation of nature associated with ecosystem services and heritage and cultural values. TPAs are partially or totally protected areas of at least 1,000 hectares and are managed under national authorities as reserves with limited public access, natural monuments, natural reserves, national parks, protected landscape, or wildlife sanctuaries and are mostly managed for sustainable use. National protected areas are determined as a percentage of the total terrestrial area, in which all the nationally designated protected areas have known locations and sizes. As pressure mounts on biodiversity, there is an increasing international commitment to focus on diversity conservation.

Deforestation keys as the major cause of biodiversity loss hence habitat protection is impetus to controlling further losses.

**Policy Review and Target:** Protected areas are key building blocks for both national and international conservation strategies. In essence, they aid efforts to protect world's threatened species and key providers of biological resources and ecosystems services. Sustainable Development Goals (SDGs) goals 14 and 15 notes the significance of both marine and terrestrial protected areas and with reference to the vulnerable animal and plant species.

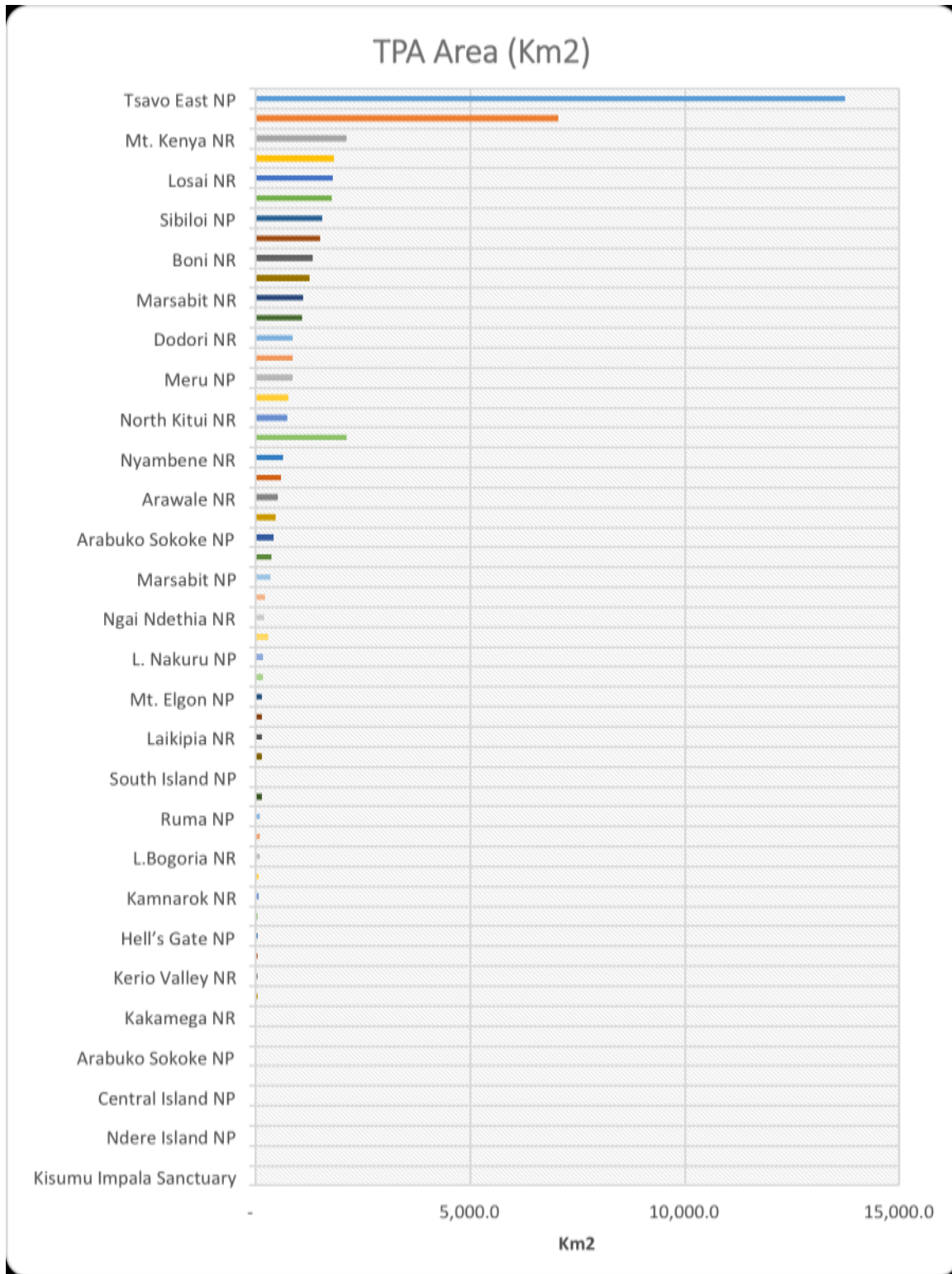
Kenya TPAs are highly diverse and provided key ecosystem goods and services that are key to improving human health, socioeconomic development, and food security. The areas are under immense pressure for overexploitation and replacement of habitats for arable lands and settlement areas. Notably, Kenyan government through the 2013 National Environment Policy takes cognizance of the significance of the threatened biodiversity hotspots and the need to protect them. The policy has measures in place to protect the diverse terrestrial biomes. Both Convention on Biological Diversity (CBD) and the World Database on Protected Areas (WDPA) places national target for TPA at 17% of the total land covered by a nation.

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#### BASELINE RESULTS.

All the Kenya's TPAs are found within the Kenya Wildlife zones. EPI 2020 shows that key terrestrial wildlife zones as identified consisted of the national parks and reserves. Kenya covers a cumulative landmass of 569,140 Km<sup>2</sup> with a total protected area of 48,857.53 Km<sup>2</sup>. Kenyan government is committed to achieving the 17% threshold. The total averaged percentage for the total terrestrial protected areas stands at 8.58%.

Chart 4-16 Total Protected Areas on Kenya



## CHALLENGES AND INITIATIVES IN PLACE

Kenya's total protected terrestrial areas still fall below the threshold mainly due to unresolved encroachment issues. With increased industrialization and economic growth pace currently being witnessed, there is high demand for food, settlement areas, industrial expansion, infrastructural developments and introduction of invasive species which have significantly affected the protection efforts. Kenya Wildlife are mandated to manage and protected TPAs, however, lack of enough personnel makes surveillance and protected difficult. Kenya is currently repossessing grabbed public lands and fencing the TPAs.

### 4.2.5 MARINE PROTECTED AREAS (MPA)

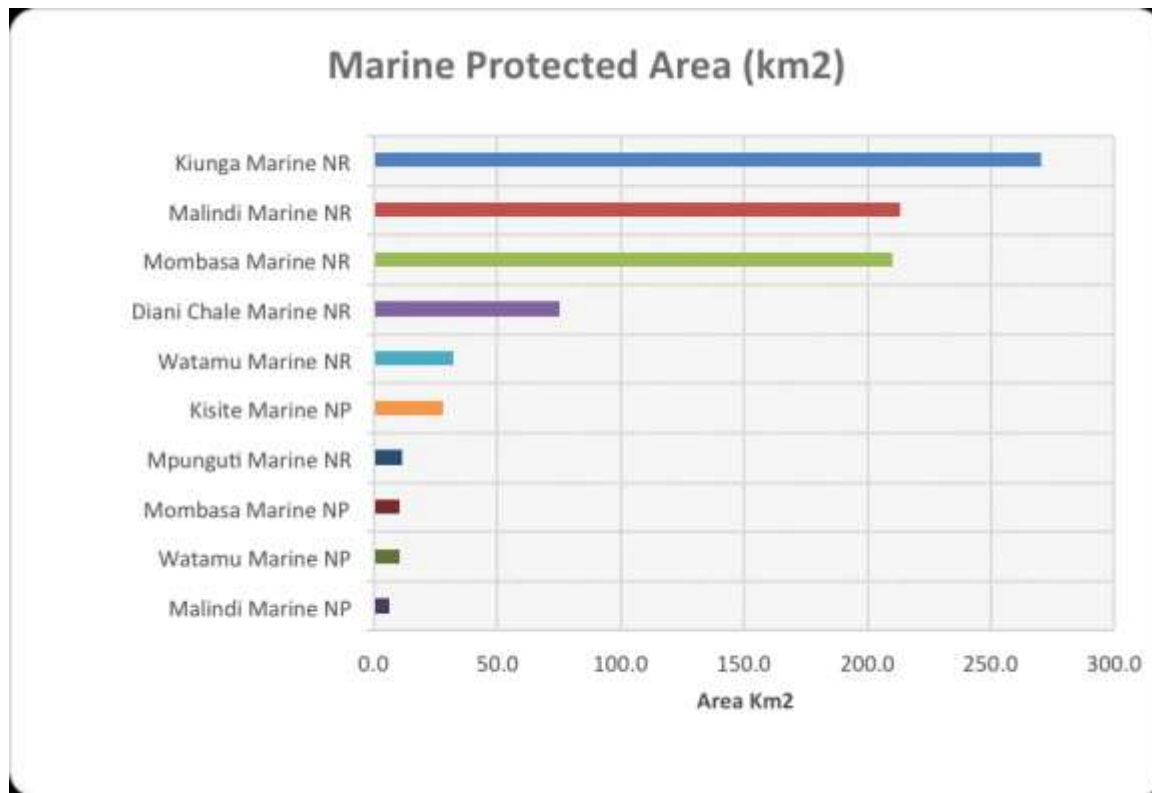
**Definition:** IUCN defines the Marine Protected Areas (MPAs) as clearly defined geographical space, dedicated, recognized and managed through legal and other effective mechanisms to attain long-term conservation of nation associated with ecosystem services and cultural values. Human activities are limited and restricted in MPAs with view of protecting the natural environment. The MPAs as such are tools that are used to conserve the marine environment its biodiversity. Marine ecosystems are considered key as ocean increasingly become under pressure as a result over exploitation of its resources. As fishing pressures increase in fragile ocean ecosystems, MPAs are designed to conserve the marine ecosystems and to ensure that its resources are used sustainably for the sake of the future generations.

**Policy Review and Target:** The Kenyan government through the National environment policy of 2013 gives cognizance of the significance of the marine ecosystem as a key biodiversity resources that should be protected. The policy puts in mechanism that are geared towards the protection of the diverse marine biomes. According to the World Database on Protected Areas, the target for MPAs is pegged at 10% of the total land mass within the EEZ.

## BASELINE RESULTS

The Kenya Wildlife Services (KWS) manages all the MPAs as either national parks or reserves. The total area covered by Marine parks and national reserves under EEZ stands at 116,842 Km<sup>2</sup> with 845Km<sup>2</sup> identified as MPA. CBD places MPA targets at 10% and Kenya's currently stands at 0.74%.

Chart 4-17 Marine Protected Areas Kenya



- NP: National Parks
- NR: National Reserves

#### CHALLENGES AND INITIATIVES IN PLACE

Nearly all the Marine Parks in Kenya are found in the Indian Ocean. The greatest impediment to the accessibility of is the 200 nautical limit of the Kenya's EEZ. Based on the data, protection of the marine life should both be marine and inland waters. The Kenya-Somali coastline legal tussle if further threatening to affect the marine conservation efforts. As Kenya aims to protect a number of inland waters, there will be increased coverage and protection of MPAs

#### 4.2.6 CLIMATE CHANGE

National Climate Change Action Plan (NCCAP) 2018-2022 Kenya is significantly affected by weather-related disasters such as droughts and flooding which have negative impacts on the economy and well-being. Lake Victoria, Tana River drainage basin and coastal settlements are some of the most affected. NCCAP (2018) notes that 2018 long rains between March and May

were the highest recorded since 1950. The social impact of climate change in Kenya is noted in the loss of lives and properties. For instance, NCCAP (2018) avers that there were 183 deaths and displacements of over 225,000 people as a result of floods. Counties further experience upsurge of waterborne diseases such as malaria and dengue fever.

#### 4.2.6.1 CLIMATE CHANGE MAINSTREAMING

**Definition:** The indicator determines the level of climate change mainstreaming at both national and county level by looking at how the County Integrated Development Plans addresses climate changes related issues. Conceptually Climate Change Act of 2016 defines, mainstreaming is the integration of the climate change actions into decision making and implementation of functions by MDAs, state corporations, and county government

The Kenya's Ministry of Environment and Natural Resources performs a review of the climate change mainstreaming in county CIDPs every five years. The analysis is based on:

- a) Climate change related sectorial actions (Agriculture, energy, forestry, water, environmental degradation and disaster preparedness).
- b) Climate change actions that identify how counties assessed the climate change vulnerabilities, effects, mitigation and adaptations considered as key in their CIDPs.

**Policy Target:** There is a global commitment to address the negative impacts of climate change. United Nations Framework Convention on Climate Change became the first global effort to address climate change in 1992 in its commitment to reduce the concentration of Greenhouse gases in the atmosphere. Kenya aims to forgo 30% of its GHG by 2030. Globally its recognized that climate change is increasing the intensity and the frequency of extreme weather conditions such as floods, food security, increased health risks, damaged infrastructure, provision of water and sanitation, and reduced agricultural productivity. As such, SDG 13 demands countries to take urgent action to combat climate change under these targets:

- **Target 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- **Target 13.2:** Integrate climate change measures into national policies, strategies and planning
- **Target 13.3:** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

- **Target 13.a:** Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
- **Target 13.b:** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

In recognizing severity of the impacts of climate change, Kenya developed the National Climate Change Response Strategy of 2010. The strategy had adaptive and mitigation strategies in which Kenya today has National Climate Change Action Plan (NCCAP) which is developed and reviewed after every 5 years. NCCAP (2018-2022) aims to: aims to address climate change challenges through developing goals and measures to achieve a low carbon climate change resilient development. Priorities of the NCCAP (2018-2022) are as highlighted:

- Align climate change actions with the Government's development agenda, including the Big Four.
- Encourage participation of the private sector, civil society, and vulnerable groups within society, including women, older members of society, persons with disabilities, children, youth, and members of minority or marginalized communities.
- Provide the framework to deliver Kenya's Nationally Determined Contribution (NDC) for the five-year period 2018-2022.
- Provide a framework for mainstreaming climate change into sector functions at the national and county level.

The Kenyan Constitution 2010, article 42, provides the basis for the formulation of adaptive and mitigation and legislative, policies and strategies that gives citizens the right to clean and health environment. Moreover, the Vision 2030 have programs that takes into consideration climate change adaptation and mitigation. Recently, Kenya enacted the Climate Change Act of 2016 which gives a regulatory framework to escalate climate change response and defines the roles of both the County and National governments in implementing the Act. Implementation of the act at national and county level is overseen by the Directorate of Climate Change. **Baseline Results:** This

indicator assessed the level to which the government is addressing and meeting its fiscal commitment to the implementation of the climate change mitigation and adaptation by the NDC. As such, it was determined by the percentage of the public expenditure that goes into climate change mitigation and adaptation programs. NDC target 13% of the national expenditure. In 2018, 9.4% of the national expenditure were directed to climate change mitigation and adaptation actions. Table 4-21 below shows national domestic expenditures in Climate Related Activities for FY 2017/2018

**Table 4-21: % National Domestic Public Expenditure in Climate Related Activities for FY2017/2018**

Year	Expenditure (KES Billions)
Domestic Public expenditure on climate related activities	43
Estimated Investment per year	456
% domestic public expenditure	9.43
EPI Score (PPT)	72.54

Source: National Treasury and Planning, 2020)

## CHALLENGES AND INITIATIVES IN PLACE

Kenya is actively industrializing and greater percentage of its development is dependent on the use of fossil fuels which increase levels of GHGs that cause climate change. The resultant impact of the climate change is disruption of the water cycle, land productivity, extreme weather events (Floods and drought) and rising sea levels. The current expenditure on climate change adaptation and mitigation is at 9.4% of the overall domestic investment, which is slightly below the set 13% target by NDC. National and Counties governments to allocate more financial resources to climate related activities, including renewable energy, water and energy saving, climate smart farming, tree planting, rehabilitation of degraded forests, management of GHG.

### 4.2.6.2 CARBON DIOXIDE (CO) EMISSIONS PER CAPITA (CO<sub>2</sub>E)



Kenya's Nationally Determined Contribution (NDC) commits to keeping GHG emissions to 30 percent below 'business-as-usual' by 2030. Population growth and economic development are projected to lead to emissions rising to 140 MtCO<sub>2e</sub> in 2030 under business as usual<sup>12</sup>.

**Policy Review and Target:** Climate Change at this time requires concerted global effort and response strategy. Globally, UNFCCC of 1992 is responsible for actions that are aimed at stabilizing atmospheric concentration of Green House Gases. Kenya has set a target to forgo 30% of the GHGs emissions by 2030.

The most recent global commitment to address climate change and global warming is the 2015 Paris Agreements at COP21. The commitment was aims to limit global warming to between 1.5°C and 2°C. The Paris agreement brought in all nation into a common agreement to undertake radical steps to address climate change and adapt to its inimical impacts. The set targets are as highlighted:

- **Finance:** Developed nations to support vulnerable and less endowed nations on large scale investments that aims at reducing emissions. Finances are further to target adaptation programs and to reduce the impact of changing climate
- **Technology:** full realization of technologies that improves resilience to climate change and reduce GHG emissions. To be realized through creation of a technological framework that gives an overarching guidance to functional technological mechanisms.
- **Capacity-Building:** Acknowledging incapacities of developing nations and helping them deal with some of the challenges caused by climate change. COP21 roots for creation of climate-related capacity building for developing nations and impress on developed countries to escalate support for capacity building actions in developing nations.

The Kenya National Climate Change Response Strategy of 2010 provided a foundation of the development of NCCAP 2018-2022 whose vision is create a low carbon resilient model and development pathways towards the realization of the vision 2030 as a mechanism to attain sustainable development and revert negative impacts of climate change. Moreover, the Kenya Constitution 2010 article 42 provides the rights the clean and healthy environment. The legislative and policy commitment by Kenya to clean and health environment continues to guide Kenya towards sustainable development goals and reduce ecologically related development challenges.

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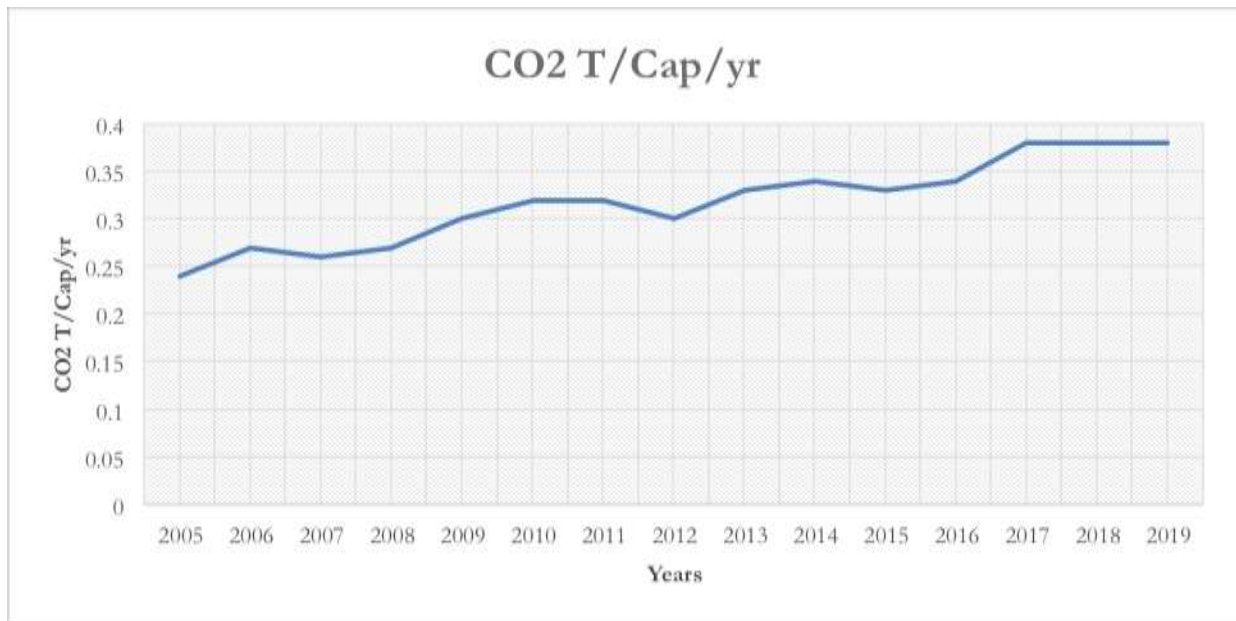
<sup>12</sup> NEMA. 2015. Second National Communication to the United Nations Framework Convention on Climate Change.

World Resource Institute Climate Analysis Indicator 2013 notes that that Agriculture remains the leading contributor of GHG emission in Kenya at 68.2% followed by 55% from the enteric fermentation from livestock. Energy sector cumulatively discharge 31.2% of GHGs emissions. Other fuel combustion and transportation contributing 74.3% of energy emissions. Industrial processes (IP) and waste contributed 4.6% and 1.4%, respectively.

**Baseline Results**

Chart 4-18 shows Kenya’s trend in CO<sub>2</sub> emissions between 2005 and 2019. Kenya has witnessed a stagnated trend in CO<sub>2</sub> emissions at 0.38% between 2017 and 2019. Kenya is among the global nations that have set a target to forgo by 30% its GHG emissions.

**Chart 4-18 CO<sub>2</sub>T/CAP/Yr.**



**Current Initiatives in Place**

NCCAP 2018-2022 and the County CIDPs 2018-2022 shows both the county and national government commitment to reducing the negative impacts of climate changes through the various sectors as highlighted in 4-22.

Table 4-22: NCCAP 2018-2022 Sectoral Action Plans

Sector	Action Plans
<b>1. Disaster Risk (Floods and Drought) Management</b>	Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods.
<b>2. Food and Nutrition Security</b>	Increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low-carbon a manner as possible.
<b>3. Water and the Blue Economy</b>	Enhance resilience of the water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses.
<b>4. Forestry, Wildlife and Tourism</b>	Increase forest cover to 10% of total land area; rehabilitate degraded lands, including rangelands; increase resilience of the wildlife and tourism sector.
<b>5. Health, Sanitation and Human Settlements</b>	Reduce incidence of malaria and other diseases expected to increase because of climate change; promote climate resilient buildings and settlements, including urban centres, ASALs and coastal areas; and encourage climate resilient solid waste management.
<b>6. Manufacturing</b>	Improve energy and resource efficiency in the manufacturing sector.
<b>7. Energy and Transport</b>	Climate-proof energy and transport infrastructure; promote renewable energy development; increase uptake of clean cooking solutions; and develop sustainable transport systems.

#### 4.2.7 ENERGY

Kenya is increasingly embracing the need for cleaner production process that optimizes energy use efficiency. Energy efficiency as defined by the Kenya National Energy Efficiency and Conservation Strategy (KNEECS, 2020) is the optimization of the amount of energy used in the production of goods and services without compromising their quality and quantity. Energy efficient reduced reliance and demand for fossil fuels in the generation of electricity, improved manufacturing competitiveness, improved energy security, lower costs on the end users and the mitigation of climate change through reduced GHGs emissions. Article 69(1) of the Kenyan Constitution 2010 directs that government to ensue sustainable exploitation, utilization, management and conservation of the environment and the natural resources. As such, the article calls on actions that improve energy efficiency.

Kenyan government together with its development partners commits to promote energy efficiency in a number of ways. This includes but not limited to enactment of energy regulations and implementation programs in various institutions. Some of the notable acts are: Energy Act of

2019, The Energy Management Regulations of 2012, Energy (Appliance Energy Performance and Labelling) Regulations of 2016 among others. Through the KNEECS 2020, Kenya aims to come up with strategy that harmonize efforts to improve on energy efficiency. National Electrification Strategy: achieve universal electricity service to all households and businesses by 2022 at acceptable quality of service levels.

**Policy Targets:** Kenya has seen one of the fastest increases in electrification rates within sub-Saharan Africa since 2013: by 2018, 75% of the population had access. The country aims to reach full access by 2022; the grid would be the principal least-cost solution for the majority of the population (mainly in the south) still lacking access. Kenya's total installed large hydropower capacity is 826.23 MW. Small hydro potential is estimated at 3,000MW, of which it is estimated that less than 30MW have been exploited and only 15MW supply the grid is estimated that there is about 7000 to 10 000 megawatts (thermal) untapped geothermal energy beneath the Rift Valley region.

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#### 4.2.7.1 RENEWABLE ENERGY

Access to clean energy has close links with poverty eradications, improved access to clean and safe water, women empowerment, and improved public health. SDG 7 aims at ensuring access to affordable, reliable, sustainable and modern energy for all. Countries are thus implored upon to increase universal access to renewable energies by 2030. The National Energy Efficiency and Conservation Strategy gives a road map for the identification of sections (*Households, buildings, industry, agriculture and transport*) for the realization of energy use efficiency that will transform Kenya into a middle level economy by 2030.

Kenya heavily relies on both renewable and non-renewable energy sources. According to the KNBS 2019, at least 69.8% of households in Kenya have access to electricity which translates to 90.8% of urban and 56.3% of rural households respectively. Solar power is the majority of the connections at 50.4% of the households connected to the national grid while 19.3% rely on the solar system. LPG is the second most used source of energy for cooking at 23.9% (KNBS, 2019). The Energy Act, 2006 sought to increase the rate of energy efficiency and increase to 80% the share of renewable energy in her mix by 2030. Currently the renewable energy contributes to 67% of the Kenya energy needs. The potential for renewable energy still remains high in the Country.

**Baseline:** Kenya's use of renewable energy sources has increased significantly from 69.62% in 2018 to 73.3% in 2019. Geothermal and hydroelectricity are the highest contributors of Kenya's renewable energy at 29.4% and 29.3% respectively.

Table 4-23: Sources of energy in Kenya

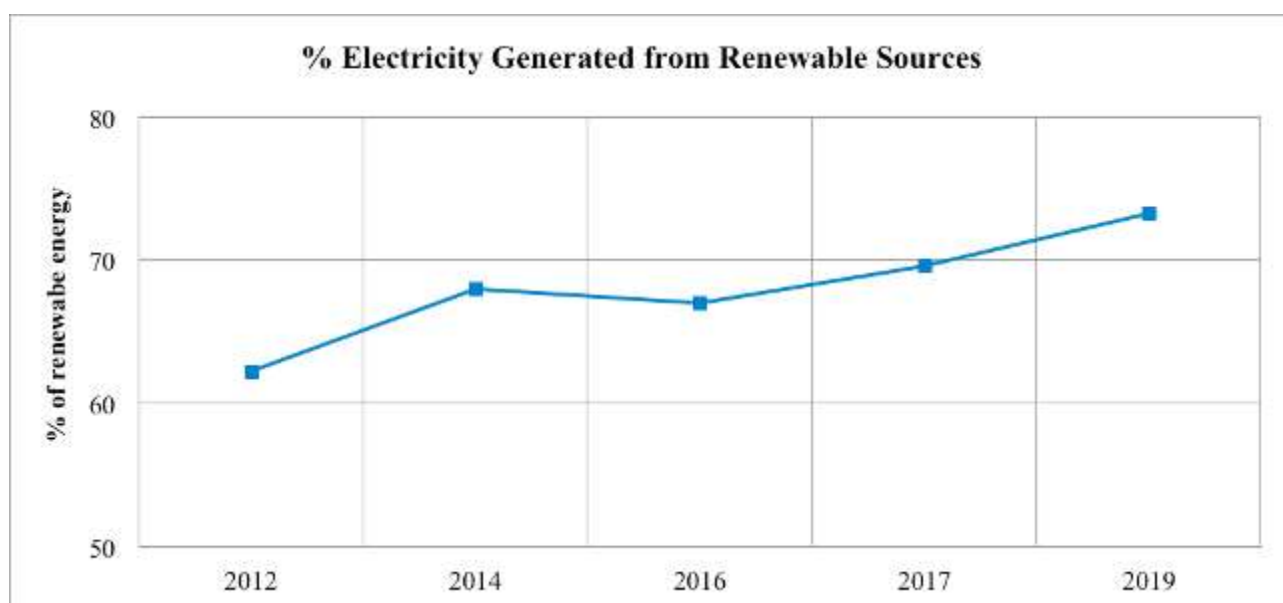
Sources of energy in Kenya															
Sources of electricity power generation		2012		2014		2017		2019		Projected 2022		Projected 2027		Projected 2030	
		MW	%	MW	%	MW	%	MW	%	MW	%	MW	%	MW	%
Renewable Energy Sources	Hydro	816.3	46.21	821	37.78	900	27.3 3	826	29.3	1500	24.8	2500	23.3 5	3000	20.44
	Geothermal	250.4	14.17	593.5	37.78	800	24.3	828	29.4	2000	33.0 7	4000	37.3 6	5450	37.13
	Wind	5.9	0.33	25	1.15	500	15.1 9	335	11.88	900	14.8 8	1200	11.2 1	1500	10.22
	Co-generation/ gasification	26	1.47	38	1.75	50	1.52	28	0.998	100	1.65	300	2.8	600	4.08
	Biogas	0	0	0.155	0.01	2	0.06			5	0.06	6	0.06	10	0.07
	Solar PV	0.5	0.03	1.68	0.78	40	1.22	50	1.77	300	4.96	700	6.54	1200	8.17
	<b>Total</b>	<b>1099</b>	<b>62.2</b>	<b>1478.2</b>	<b>68.01</b>	<b>2292</b>	<b>69.6</b>	<b>2067</b>	<b>73.3</b>	<b>4805</b>	<b>79.5</b>	<b>8706</b>	<b>81.3</b>	<b>11760</b>	<b>80.1</b>
Non-Renewable Sources		667.4	37.79	695.3	31.99	1000	30.3 8	725	25.54	1243	20.5 5	2000	18.6 8	2916	19.89
Grand Total		1766.5	100	2173.48	100	3292	100	2792	98.89	6048	100	10706	100	14676	100

(Reference: Ministry of Energy and Petroleum, 2019)

**Table 4-24: % Electricity Generated from Renewable Sources vs Total Generated**

% Electricity Generated from Renewable Sources vs Total Generated					
Year	2012	2014	2016	2017	2019
% electricity	62.21	68.01	67.00	69.62	73.3
EPI Score	77.7	84.9	83.6	86.9	91.5

(Reference: Ministry of Energy and Petroleum, 2019)

**Chart 4-19 Electricity Generated from Renewable Sources**

Source: Ministry of Energy and Petroleum, 2019

Several programs exist to expand distribution lines, reach remote villages, and maximize the utilization of existing transformers by connecting people within their immediate reach or in informal settlements underneath, often subsidized by DFIs. These have started to make an impact on energy access numbers. Kenya's electrification rate rose from 26% in 2012 to 55% as of mid-2016. Mini-grid capacity is rapidly growing in Kenya, despite uncertainties around geographic territory clauses in distribution tariffs. Kenya has become one of the best-served off-grid populations in the world, featuring some of the most advanced pay-as-you-go solar home system companies and innovative business models for mini-grid development

## 4.3 SOCIO ECONOMIC SUSTAINABILITY

### 4.3.1 ENVIRONMENTAL EDUCATION

Education is important towards changing people's attitude to appreciate environmental concerns. There is therefore a high correlation between the state of environment and education. Environmental education provides appropriate manpower in environmental management and elicits positive mind-sets towards environmental conservation. Education improves the recipient's employment and business prospects and concomitantly makes them less directly reliant on the environment and thereby prevents its overexploitation. The educated populaces are better placed to appreciate contemporary environmental problems such as climate change, to internalize and apply environmental ethics and to be more attuned to environmental considerations when weighing the pros and cons of operational options. Environmental education is not only a tool for informed decision making but also facilitates constructive community engagement. Literacy statistics are therefore important for policy makers to determine how best to reach the populations they serve.

Environmental education is identified as a crucial component for achieving *sustainable development goals* and an essential tool for informed decision-making and constructive community engagement (SDG Goals). The current environmental education programs vary from formal to informal programs. There have been substantial efforts over time to develop curricula for courses on environmental protection, conservation and management.

NEMA has adopted both formal and non-formal approaches to environment education in its outreach efforts (SOE, 2014). NEMA has taken a leading role in curriculum development of environmental education programs adopted by various institutions in partnership with key institutions such as Kenya Institute of Curriculum Development (KICD). Other non-formal education programmes aimed at creating awareness on environmental education geared towards reaching a critical mass of citizens include the following:

- Commemoration of environmental days such as World Day to Combat Desertification, World Environment Day and World Wetland Day
- Preparation of awareness creation materials and posters some which are hoisted on billboards in major towns



- Awareness efforts through media, the NEMA website also provides a platform for sharing critical information on environment aimed at reaching wider audiences

Other organizations contributing to environmental education objectives include line ministries such as the Ministry of Environment and Natural Resources who are actively involved in raising awareness, building resilience and enhancing adaptive capacity to the impacts of climate change. Other partners who have an active role in supporting the public's behavioral changes include the non-governmental organizations and civil society organizations.

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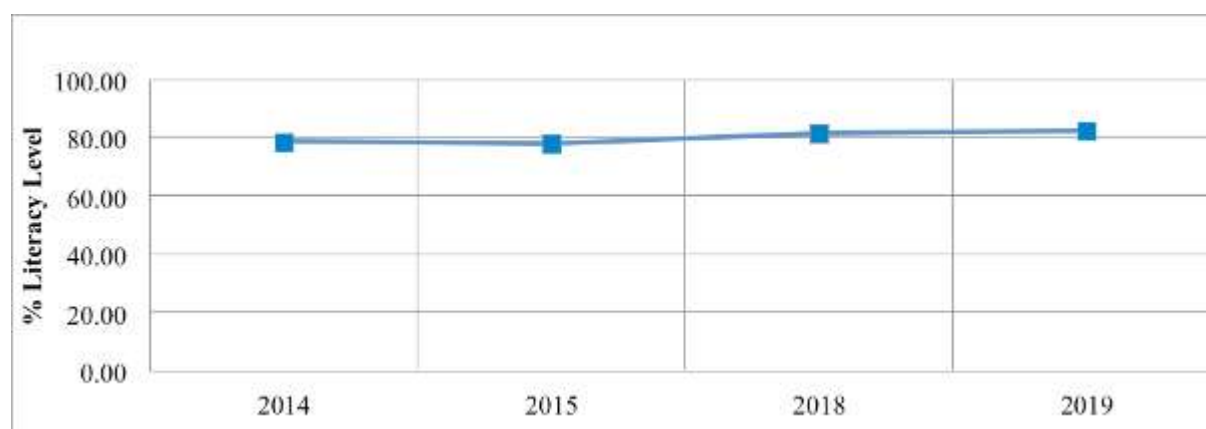
#### 4.3.1.1 LITERACY LEVELS

##### **Definition and Policy Overview**

This indicator seeks to measure the percentage of population who can read and write at age 15 and above. The Constitution of Kenya, 2010 provides for the right to free and compulsory basic education to every citizen. Similarly, education and training have been cited as fundamental to the social transformation envisaged under the social pillar of the Vision 2030. SDG Goal 4 seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Both formal and informal education.

##### **Baseline Results**

Kenya's continued support to free primary and secondary education program is argued to the behind sustained increase in literacy levels between 2014 and 2019. The government of Kenya is increasingly investing in tertiary institutions (including technical and vocational collages). This has have helped reduce competition for limited spaces in institutions for higher learning. It is projected that literacy levels in Kenya is likely to increase as a result of the introduction of Competency Based Curriculum (CBC). See chart 4-20

**Chart 4-20 % National Literacy Level of Population of Age 15 and above in Kenya**

Source: UNESCO Institute for Statistics, 2020; and 2019 Kenya Population and Housing Census (KPHC), Vol III & IV)

Literacy in all of the counties is above 80% except Meru and Lamu whose literacy level is 74.55% and 66.94% respectively. Below the national average of 82%

**Table 4-25: County Literacy Levels for Population of Age of 14 and Above**

Rank	County	Population Above ae 14		% Literacy level	Rank	County	Population above ae 14		% Literacy level
		Total No	Ability to read & write				Total No	Ability to read & write	
1	Kirinyaga	446913	420449	94.08	25	Kakamega	1136679	1031161	90.72
2	Nyeri	549391	514962	93.73	26	Bomet	536631	486013	90.57
3	Embu	431846	404401	93.64	27	Busia	540789	487501	90.15
4	Murang'a	737479	689506	93.50	28	Trans Nzoia	597796	538295	90.05
5	Kiambu	1713876	1601022	93.42	29	Elgeyo Marakwet	276097	248482	90.00
6	Machakos	990788	924874	93.35	30	Kajiado	709616	638269	89.95
7	Tharaka-Nithi	271103	253042	93.34	31	Bungoma	981642	878966	89.54
8	Nyandarua	427934	397667	92.93	32	Kilifi	878615	782895	89.11
9	Nairobi	3130639	2894651	92.46	33	Homa Bay	661463	589282	89.09
10	Makueni	670665	619495	92.37	34	Baringo	389643	344299	88.36
11	Nyamira	386236	355061	91.93	35	Turkana	533220	466854	87.55
12	Vihiga	376421	345902	91.89	36	Kwale	502569	439348	87.42

Rank	County	Population Above ae 14		% Literacy level	Rank	County	Population above ae 14		% Literacy level
		Total No	Ability to read & write				Total No	Ability to read & write	
13	Kitui	726712	667105	91.80	37	Garissa	482945	422087	87.40
14	Nandi	562143	515807	91.76	38	Isiolo	158375	136241	86.02
15	Mombasa	836107	765434	91.55	39	Tana River	171230	147113	85.92
16	Taita-Taveta	232511	212808	91.53	40	Narok	623146	530780	85.18
17	Uasin Gishu	764122	699362	91.52	41	Samburu	166739	141788	85.04
18	Kisii	791336	723765	91.46	42	West Pokot	320434	271109	84.61
19	Nakuru	1,400,118	1275705	91.11	43	Wajir	413117	348553	84.37
20	Kericho	572087	521146	91.10	44	Marsabit	256618	213137	83.06
21	Kisumu	733076	667194	91.01	45	Mandera	419609	342779	81.69
22	Siaya	610589	555453	90.97	46	Meru	1295962	966164	74.55
23	Laikipia	336070	305584	90.93	47	Lamu	122363	81912	66.94
24	Migori	618384	561432	90.79					
	<b>Total</b>	<b>30491844</b>	<b>27424855</b>						
			<b>County Average</b>	<b>89.14</b>					
			<b>National</b>	<b>82</b>					

Source: Refence: KNBS-2019 KHPC Vol III& IV

**Challenges and Initiatives :** There is high possibility of adoption of green technologies and climate change mitigation and adaption. The government of Kenya is keen on investing in education and in enhancing E&NRM materials in the curriculum.

#### 4.3.1.2 Tertiary Level Graduates on Environment and Natural Resource Management

**Indicator Definition:** The indicator defines the percentage of the cumulative number of students graduating in E&NRM courses from tertiary institution. The indicator was assessed by determining students that have graduated with degrees and diplomas in E&NRM courses from tertiary institutions as a proportion of the total number of students graduating from various courses. The E&NRM courses that were considered included: Agriculture, Forestry, Fishery, and Environment.

**Indicator review and Target:** Kenyan government gives cognizance to the significance of environmental education as key to producing a generation of citizens who are aware, knowledgeable, with proactive attitude and skills that are required to manage the environment. The indicator is equally very instrumental in the determination of gender mainstreaming and involvement on environmental and natural resource education as an impetus to better

environmental performance of the nation. Notably, of the 108,219 graduates in E&NRM, 35% were female, an indicator of gender disparity.

**Baseline results:** More female students are graduating from Environment studies, marine ecology and forestry (8450 out of 21,075) compared to those graduating from Agriculture (29,760 out of 87,144) in 2019. E&NRM graduates accounted for 1.8% of the entire student population who attained qualifications in various fields as shown in table 4-27 below.

**Table 4-26: % Cumulative Students Graduating in E&NRM Courses from Tertiary Institutions**

E&NRM Course Cluster	Tertiary Institutions		
	M	F	T
<b>Nos of Student Graduates</b>			
Agriculture (Horticulture, Agribusiness Agric Economics Crop Sciences etc.	57,384	29,760	87,144
Environmental Studies Marine Ecology and Forestry	12,625	8,450	21,075
<b>Total Students (All E&amp;NRM)</b>	70,009	38,210	108,219
<b>Total Students (All subjects)</b>			<b>6,053,933</b>
% of students graduating in E&NRM			1.79
EPI Score (%)			

KNBS- 2019 Kenya Population and Housing Census Vol IV Pg. 160

#### 4.3.2 GOVERNANCE, COMPLIANCE AND ENFORCEMENT

Environmental governance comprises the policies, regulations, practices, and institutions that shape how humans interact with the environment<sup>13</sup>. Good governance provides for participation (directly or through representation); The rule of law and Transparency.

The constitution provides guidelines on environmental governance as well as sector policies and laws, including; agriculture, land, water, forests, urban development, trade and industry among others. All this sector policies and regulations have significant implications on environmental governance. The current sectoral rather than integrated and ecosystem approaches to management of natural resources in some cases, face challenges in comprehensively addressing environmental issues. In addition, weak implementation of the

<sup>13</sup> United Nations Environment Programme, "Environmental governance," available at [https://wedocs.unep.org/bitstream/handle/20.500.11822/7935/Environmental\\_Governance.pdf?sequence=5&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/7935/Environmental_Governance.pdf?sequence=5&isAllowed=y) [Accessed on 05/01/2021]

policies and regulations remain a major issue of concern in Kenya's environment sector but the national Environmental policy (2013) and EMCA-1999, amended 2015 are Kenya's governance framework that coordinates all environmental management activities in the country.

Environmental Compliance occurs when the regulations and standard provisions are adhered to, and the desired behavior is achieved. The approaches to achieve compliance involve four categories; compliance assistance, compliance incentives, compliance monitoring and enforcement. For effective implementation of environmental compliance there is need for harmonizing the four categories of activities. Enforcement includes inspection to find information needed to determine compliance status and to identify violations and legal actions. The following indicators have been used to compute the status of governance, compliance and enforcement.

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#### 4.3.2.1 EXPENDITURE ON ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT (E&NRM) – (EE&NRM)

**Definition:** This indicator seeks to measure the percentage (%) of National/ County budget allocated to environmental protection and natural resource management. The indicator was by aggregating the percentage of expenditure on E&NRM sectors of Agriculture, Forestry, Fishing, Wildlife and Tourism, Mining and Quarrying, Energy, Water supply, sewerage and waste management vs total expenditure on all sectors.

**Indicator review and Target:** The environment and natural resources sector's contribution to the country's Gross Domestic Product (GDP) in the period 2018-2019 recorded at 3.2 per cent. Total Gross Value Added (GVA) from the sector grew by 7.1 per cent from KSh 286.8 billion in 2018 to KSh 307.2 billion in 2019. There was mixed performance of the indicators selected on environment and natural resources billion. Earnings from fish landings decreased from KSh 25.6 billion in 2018 to KSh 23.7 billion in 2019. Total development expenditure on water and related services is projected to increase by 47.3 per cent from KSh 31.1 billion in 2018/19 to KSh 45.8 billion in 2019/20 (Economic Survey, 2020). Table 4-27 below shows the trends in percentage contribution of different sectors to GDP between the years 2013 to 2020.

**Table 4-27 Percentage contribution of different on E&NRM sectors to GDP**

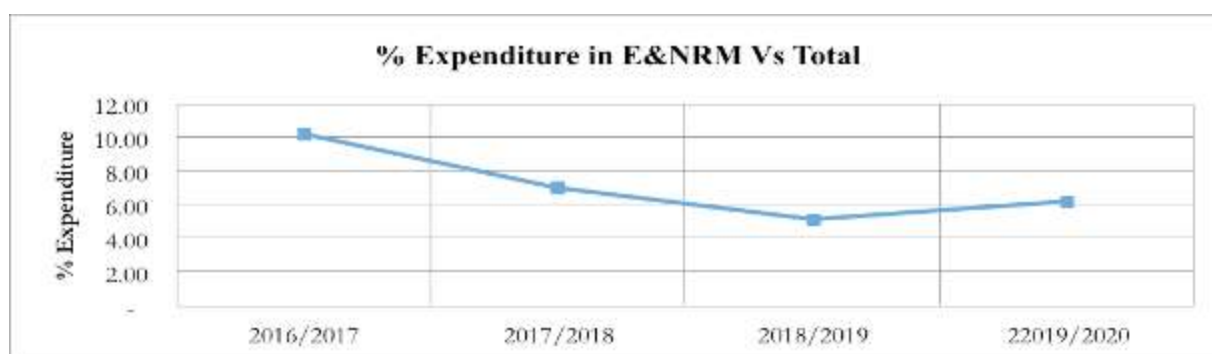
Sector	2013	2014	2015	2016	2017	2018	2019
<b>Agriculture, Forestry &amp; Fishing</b>	26.4	27.5	30.2	32.1	31.5	34.1	34.1
<b>Mining and Quarrying</b>	0.9	0.8	0.9	0.8	0.8	0.8	0.7
<b>Electricity Supply (renewable)</b>	1.1	1	1.4	1.8	1.8	1.7	1.7
<b>Water supply; Sewerage, Waste</b>	0.9	0.8	0.7	0.7	0.7	0.7	0.7
<b>Total Contribution to GDP</b>	<b>29.3</b>	<b>30.1</b>	<b>33.2</b>	<b>35.4</b>	<b>34.8</b>	<b>37.3</b>	<b>37.2</b>

Source: Kenya Economic Survey Report, 2020

## RESULTS

In 2019/2020 FY, KSh 1,51.29 bn was allocated to the on E&NRM sectors of Agriculture, Forestry, Fishing, Wildlife and Tourism, Mining and Quarrying, Energy, Water supply, sewerage and waste management, representing 6.2% of the total expenditure in all the sectors. There is a big disparity in contribution of NRM sector to GDP and the percentage resource allocation to the same. The percentage contribution of NRM sector to GDP was 37.6% in 2020 (Figure xx).

The big spenders in E & NRM sectors at the county level were Mandera (22.51%), Wajir (19.76%), Kwale (18.41%), Samburu (17.98%) and Baringo (17.13%). Low spenders were Laikipia (4.78%) and Kisumu (5.48%). These were the only counties whose expenditure in E & NRM was below the national Average. The average allocation in the counties stood at 11.58% (Chart 4-22)

**Chart 4-21 Expenditure by MDAs in E&NRM Sectors for FY 2015/2016-2018/2019 in Kenya**

Source: Economic Survey Report (2020); Office of the Controller of Budget (2019)

Table 4-28: Percentage Expenditure on E&amp;NRM Sectors by Counties for FY 2019/20

Rank 2020	County	% Expenditure on E&NRM Sectors		Rank 2020	County	% Expenditure on E&NRM Sectors	
		2020				2020	
1	Mandera	22.51		25	Vihiga	10.81	
2	Wajir	19.76		26	Murang'a	10.72	
3	Kwale	18.41		27	Kirinyaga	10.57	
4	Samburu	17.98		28	Nyamira	10.54	
5	Baringo	17.13		29	Isiolo	10.44	
6	Makueni	16.46		30	Migori	10.36	
7	Kitui	15.42		31	Nyandarua	10.35	
8	Elgeyo-Marakwet	15.08		32	Lamu	9.93	
9	Narok	14.94		33	Tharaka-Nithi	9.88	
10	Kilifi	14.57		34	Kericho	9.64	
11	Garissa	14.28		35	Meru	9.34	
12	Uasin Gishu	13.98		36	Marsabit	9.17	
13	Busia	13.81		37	Siaya	8.49	
14	Trans Nzoia	13.79		38	Mombasa	8.06	
15	Kajiado	13.69		39	Tana River	8.05	
16	Nandi	13.28		40	Kiambu	7.80	
17	West Pokot	12.65		41	Nairobi city	7.33	
18	Turkana	12.20		42	Kakamega	7.10	
19	Nyeri	12.14		43	Machakos	6.72	
20	Nakuru	11.60		44	Embu	6.48	
21	Homa bay	11.34		45	Taita-Taveta	6.48	
22	Kisii	11.18		46	Kisumu	5.48	
23	Bomet	11.07		47	Laikipia	4.78	
24	Bungoma	11.04					

#### 4.3.3 ADOPTION OF ENVIRONMENTALLY SUSTAINABLE POLICY BY MDAS (ASEP)

**Definition:** This indicator measures the percentage of MDAs and County governments with 100% adoption of sustainable environmental performance indicators. NEMA developed environmental sustainability performance contract guidelines for all MDAs and County governments that have been updated in the period 2015-2016. The guidelines provide a

framework for environmental sustainability audit report preparation consistent with the provisions of EMCA 1999, Cap 387. NEMA has been providing technical support and capacity building to guide MDAs to adopt their functions. The performance index for the MDAs and County governments is a comprehensive measure of environmental sustainability and seeks to not only measure effort by the MDAs/County government but is also a great measure of environmental commitment towards reducing environmental impacts.

Environmental sustainability performance contract guidelines for MDAs and County government's aims to establish sustainable best practices both in the work place as well as in the sector-based programs that conform to the EMCA regulations on environmental and natural resource management. A performance index for all MDAs is computed by NEMA annually and through quarterly scorecard assessments and annual work-plans. (see table 4-29)



**Table 4-29: Environmental sustainability performance contract guidelines for all MDAs and County governments**

<b>Focal Area</b>	<b>Justification</b>	<b>Areas of Audit</b>	<b>Output/ Indicators</b>
Environmental Sustainability planning	Environmental sustainability involves making decisions and taking action that are in the interests of protecting the natural world, with particular emphasis on preserving the capability of the environment to support human life	Development of an institutional workplace environment policy	Institutional environmental sustainability policy
	Sustainability means “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”	Establishment of structures to address environmental issues	Environmental sustainability committee in place
	Sustainability is not an end goal, but a journey that MDAs should take to improve the social equity, environmental, and economic conditions in their jurisdiction.	Adopting respect for the environment as a core value in the Service Charter	Core value in the service charter
	MDAs should explore the environmental issues within their operations, develop appropriate interventions and document the same in form of environmental sustainability policy	Contribution to preparation of state of environment reports and environment action plan	Inputs to SOE and EAP process on request
		Compliance with the Environmental Impact Assessment and Environmental Audit regulations, (2006)	EIA reports for new projects
		submission of comments during EIA review where applicable	Annual environmental audit reports

			Feedback on EIAs review where applicable
Pollution control	Waste Management Regulations are meant to streamline the segregation, handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source	Compliance with Waste management regulations, 2006	Waste Reducing, reusing and recycling initiatives in place
		Interventions on reducing, reusing, and recycling of waste in the respective institutions	Evidence of contracted NEMA licensed waste handler or facility
		Proof of proper disposal of solid waste, air conditioners, asbestos and E waste among others	Segregation bins
		Installation of waste segregation bins	Environmental Audit Reports
		Submission of annual environmental audit reports where applicable	
	MDAs generate a lot of waste that if not properly handled lead to pollution and increase in waste dumps. Each MDA should demonstrate measures that control, prevents and reduce pollution to the environment		
	Effluent Discharge This entails sustainable use of	Compliance to water quality	License issued by NEMA

<p>water, minimizing wastage and appropriate disposal of effluent. The objective of the water quality regulations is to protect human health and the environment from negative impact of pollution from effluent discharge into the environment. The effective enforcement of the water quality regulations will lead to a marked reduction of water-borne diseases and hence a reduction in the health budget.</p>	regulations, 2006	
	Water recycling, reuse and conservation	licensed Sewerage facilities
	Installation of Septic, soak pit and other sanitary methods of effluent control	Proof of connectivity to main sewers
	Licensing of effluent discharges where applicable	Proof of water conservation measures
	Construction of Sewerage facilities	
<p>Noise and Air pollution This is addressed through activities or interventions towards prevention, control and abatement of air pollution to ensure clean and healthy ambient air. Air pollution sources may be mobile sources (e.g., motor vehicles) and stationary sources (e.g., industries) as outlined in the Environmental Management and Coordination Act, 1999.</p>	Proof of measures to promote compliance to Noise and Excessive vibrations regulations, 2008	Measures to promote compliance to Noise and Excessive vibrations regulations Measures to reduce air pollution
	Proof of measures to reduce air pollution	
<p>Climate change is the worst challenge of our time and is characterized by unpredictable weather patterns such as increased rainfall, temperatures, drought and hunger.</p>	Climate change adaptation and mitigation initiatives such as: Installation of energy saving devices, renewable energy, water	Energy saving devices

Climate change mitigation and adaptation (Refer to the climate change response strategy and action plan)		harvesting	
		Proof of measures to control greenhouse gases	Rain water harvesting structures in place
	Climate mitigation is any action taken to permanently eliminate or reduce the long-term risk and hazards of climate change to human life, property.	Proof of mitigation and adaptation initiatives	Measures to control greenhouse gases
			Mitigation and adaptation initiatives
	Climate change adaptations entail how individuals, groups and natural systems can prepare for and respond to changes in climate or their environment. MDAs should take action to promote mitigation and adaptation to climate change.	Compliance to Controlled substances regulations, 2007; - Importation, use and disposal of Ozone Depleting Substances (ODS)	measures in place on importation, use and disposal of ODS
Environmental	Many ecosystems have been degraded in Kenya over several decades of misuse and overuse.	Compliance to the Conservation of biological diversity and benefit sharing regulations, 2006	Permits to access genetic resources
		Proof of Authority to access genetic resources	

ecological enhancement	Ecological restoration is a valuable endeavor to ensure that degraded and destroyed natural ecosystems will be reestablished to levels where they once existed. The Constitution of Kenya (2010) demands that forest cover in Kenya be increased to at least 10%.	Proof of benefit sharing arrangements on utilization of biological and genetic resources	Evidence of benefit sharing on utilization of biological and genetic resources	
		Activities toward increase of forest cover	No. of trees planted and survived	
Ecosystems such as wetlands are under threat from human activities. This leads to degradation and have to be restored to increase biodiversity, clean water, improve microclimate, improved economy etc.		Compliance to Wetlands, River banks, lakeshores, and seashore management regulations, 2009	EIA Reports	
		Submission of EIA reports for new projects where applicable		
	Some institutions near wetland are likely to be benefitting from the goods and services derived from the wetlands and hence the need to undertake activities toward enhancement of the same		Submission of EA reports	
			Environment management plans for forests, wetlands, coastal zone, Environment significant areas among others	EA reports
			Plant or support tree planting initiatives	
	Restoration of degraded sites	Environment management		

			plans
		Conservation of riparian reserve	No. of surviving trees
			size of degraded lands restored
			Area of riparian reserves secured and conserved
Environmental education and awareness	Environmental awareness entails understanding the fragility of our environment and the importance of its protection. The MDAs need to make all their staff aware of their relationship with the environment from a social, ecological and economic perspective. The same understanding and awareness should be extended to other stakeholders and the local community.	Proof of behavior change among staff	behavior change assessment
		Sensitization of staff and public on environmental sustainability relevant to the institutional mandate	Reduced cost of electricity, water
	Promoting environmental awareness is an easy way to become an environmental steward and participate in creating a brighter future for our	Participation in environmental events with communities and schools	Reduced waste

	children. Environmental awareness evokes the necessity and responsibility of humans to respect, protect, and preserve the natural world from its anthropogenic (caused by humans) afflictions.	Recognition of environmental champions	Evidence of Participation in environmental events
			Evidence of appreciation of environmental sustainability champions
Promoting Environmental protection and conservation through partnerships with stakeholders	Sustainability requires participation of diverse stakeholders. A single institution cannot achieve much and needs to team up with others in joint projects. The MDAs could take advantage of partnerships to profile themselves as a way of giving back to the community through Corporate Social Responsibility (CSR).	Environmental projects and activities undertaken through partnership with stakeholders	Projects and activities undertaken jointly
		Memorandum of understanding	MoUs
		Joint management plans	Joint management plans
		Corporate social responsibility (CSR) on environment	CSR initiatives in place
		Proof of Partnerships with NEMA on Monitoring and inspections to ensure compliance with Environment legislation	Areas of partnerships with NEMA on Monitoring and inspections to ensure compliance with environment legislation

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## RESULTS

The number of MDAs providing reports on the degree of adoption of environmentally Sustainable Policies (ASEP) decreased from 228 (62.24%) in 2016 to 26 (8.67%) in 2018. This drop was occasioned by the removal of ASEP as a performance contract (PC) target in 2018.

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### 4.3.4 HUMAN DEVELOPMENT INDEX (HDI)

**Indicator Definition:** Human Development Index (HDI) indicator measures the country's overall achievement in its social and economic dimensions. The social and economic dimensions of a country are based on the health of people, their level of education attainment and their standard of living. It is assumed that the more developed a country is the better its people will be able to respond to humanitarian needs using their own individual or national resources. This indicator was assessed at the national and county levels against the UNDP set international targets.

**Indicator review and Target:** The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. A long and healthy life is measured by life expectancy. Knowledge level is measured by mean years of schooling among the adult population, which is the average number of years of schooling received in a life-time by people aged 25 years and older; and access to learning and knowledge by expected years of schooling for children of school-entry age, which is the total number of years of schooling a child of school-entry age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. In 2019, Kenya's had an HDI of 0.601 which is below average of the 0.631 which is set in the medium human development group and above average of the 0.547 set for countries in the Sub-Saharan Africa. Globally, Kenya ranked 143 out of 163 countries.

**Baseline Results:** HDI in Kenya has been increasing marginally between 2010 and 2019. The latest 2019 stands at 0.601. Nairobi county has the highest HDI score of 0.64 followed by Kajiado and Nyeri at 0.59 each while Laikipia, Uasin Gishu, Kilifi and Kirinyaga score were at 0.57. Among the bottom five counties included: Mandera and Wajir at 0.42 each, Homa-Bay at 0.41, Tana River at 0.40 and Turkana 0.37. Table 4-30 shows HDI performance between 2010 and 2019.

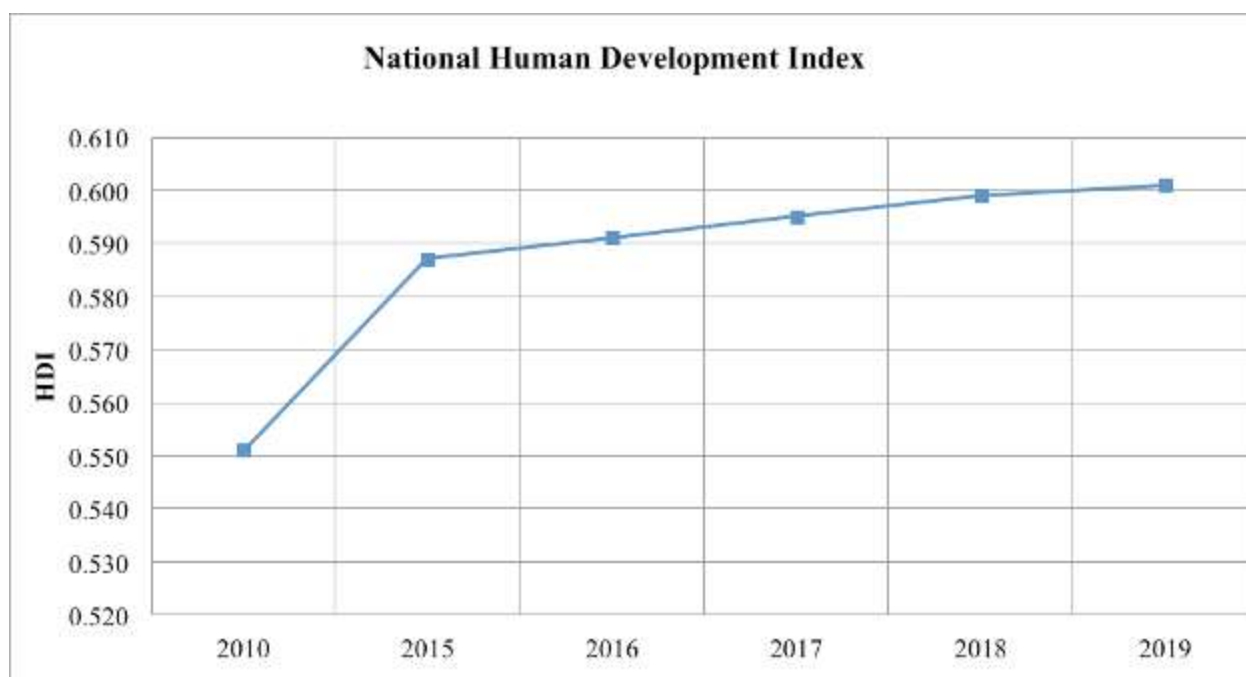


Table 4-30 Kenya's HDI 2010-2019

Year	2010	2015	2016	2017	2018	2019
HDI	0.551	0.587	0.591	0.595	0.599	0.601
EPI Score	55.10	58.70	59.10	59.50	59.90	60.10

Source: UNDP (2020)

Chart 4-22 Trend in Human Development Index (HDI) in Kenya, 2010-2019



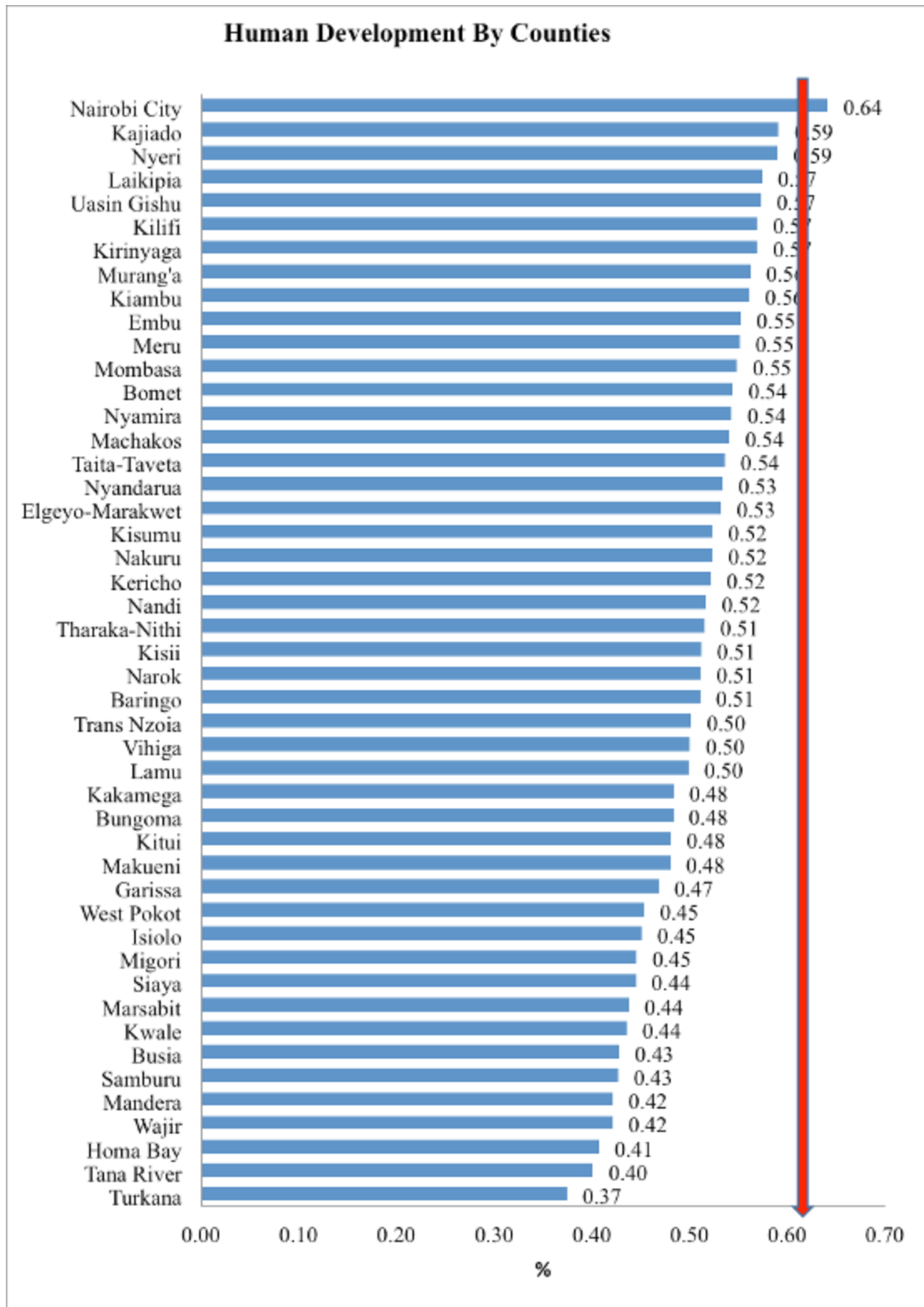
Source: UNDP (2020). The Next Frontier: Human Development and the Anthropocene. Retrieved from: [http://hdr.undp.org/sites/all/themes/hdr\\_theme/country-notes/KEN.pdf](http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/KEN.pdf)

Table 4-31: County Human Development Index

Rank	County	HDI	Rank	County	HDI
1	Nairobi City	0.64	25	Narok	0.51
2	Kajiado	0.59	26	Baringo	0.51
3	Nyeri	0.59	27	Trans Nzoia	0.50
4	Laikipia	0.57	28	Vihiga	0.50
5	Uasin Gishu	0.57	29	Lamu	0.50
6	Kilifi	0.57	30	Kakamega	0.48
7	Kirinyaga	0.57	31	Bungoma	0.48
8	Murang'a	0.56	32	Kitui	0.48
9	Kiambu	0.56	33	Makueni	0.48
10	Embu	0.55	34	Garissa	0.47
11	Meru	0.55	35	West Pokot	0.45
12	Mombasa	0.55	36	Isiolo	0.45
13	Bomet	0.54	37	Migori	0.45
14	Nyamira	0.54	38	Siaya	0.44
15	Machakos	0.54	39	Marsabit	0.44
16	Taita-Taveta	0.54	40	Kwale	0.44
17	Nyandarua	0.53	41	Busia	0.43
18	Elgeyo-Marakwet	0.53	42	Samburu	0.43
19	Kisumu	0.52	43	Mandera	0.42
20	Nakuru	0.52	44	Wajir	0.42
21	Kericho	0.52	45	Homa Bay	0.41
22	Nandi	0.52	46	Tana River	0.40
23	Tharaka-Nithi	0.51	47	Turkana	0.37
24	Kisii	0.51			



Chart 4-23 Human Development Index by County



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#### 4.3.5 GROSS DOMESTIC PRODUCT (GDP)

**Definition:** GDP refers to the monetary value of all the final goods and services produced in a country within a given period of time. It is used to gauge economic performance of a country as it shows how small or big the economy is. GDP is not only composed of goods and services produced for sale in the market, but it also includes some nonmarket production, such as defense or education services provided by the government. To measure the status of this indicator, GDP growth rate was used. In most cases, the growth rate of real GDP is used to give a general indication of how health an economy is.

#### Indicator review and Target

There is a general consensus amongst many studies that there is a positive association between GDP and environmental performance (Dkhili & Dhiab, 2019). For example, a study conducted in Nigeria by Maji found that improved economic performance can slow deforestation and enhance the health of environment (Maji, 2015). Many studies agree that one input of production can be environment (Everett et al., 2010). Sachs & Warner, 1995 argues that natural and geographical infrastructures found in the environment have an influence on economic growth and economic development of a country. It has also been established that although early stages of economic growth can result in pollution increases, this reduces when the income level increases (Grossman & Krueger, 1991).

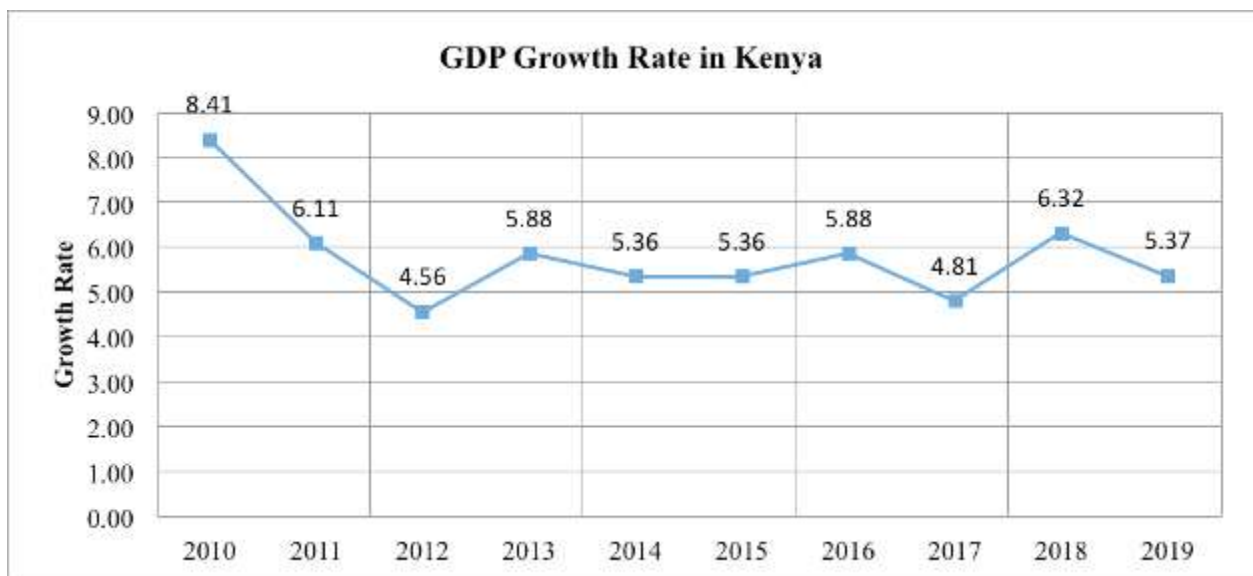
Time series data on DGP growth rate at the national level was obtained from World Bank website publicly available at: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=KE>, while DGP growth rate data for counties was obtained from documents produced by Kenya Bureau of Statistics (KNBS). GDP performance was gauged against the 10% target under the Vision 2030.

#### RESULTS

- a) Kenya witnessed a drop in the growth of real Gross Domestic Product (GDP) from 6.3 per cent in 2018 5.4 per cent in 2019 (chart 4-24). This growth was mainly contributed to by the growth in the service sectors which registered a higher growth compared product – oriented sectors.

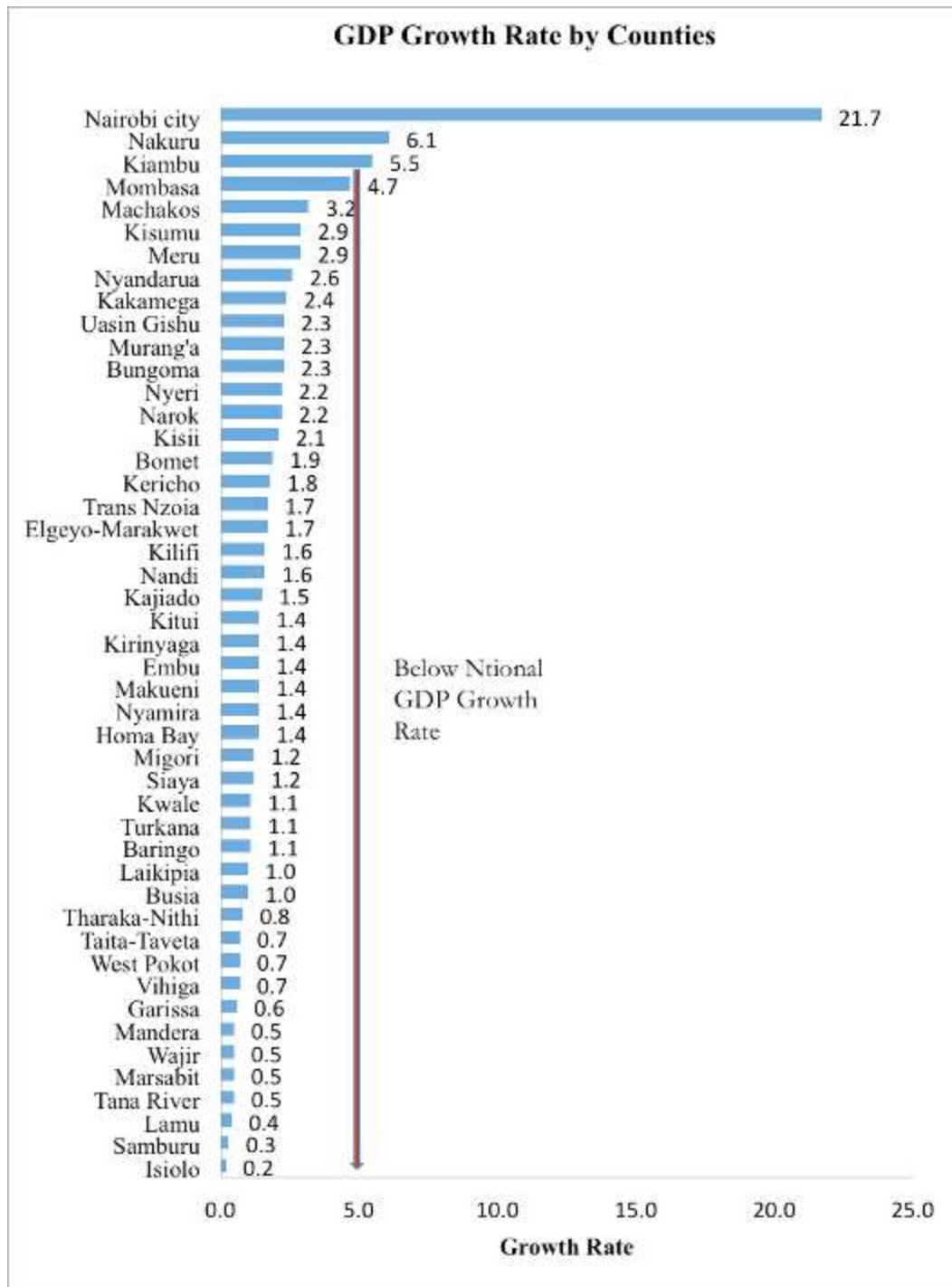
- b) A huge proportion of the slowdown witnessed in the GDP growth rate was recorded in the Agriculture, Forestry and Fishing sectors which dropped from 6.0 per cent growth in 2018 to 3.6 per cent in 2019.
- c) Counties with high GDP growth rate were Nairobi City (21.7%), Nakuru (6.1%), Kiambu (5.5%). These counties registered a GDP growth rate above the national average. The lowest growth rates were recorded in the counties of Isiolo (0.2%), Samburu (0.3%) and Lamu (0.4%). 11 counties recorded GDP growth rate of less than 1% in 2019. This has a huge implication on the overall environmental quality as it will slow investments in environment and natural resource management sectors (Chart 4-25).

**Chart 4-24 Trend in the National DGP growth rate, 2010-2019**



Source: World Bank, 2019

Chart 4-25 GDP Growth Rate by Counties







## 5 THE KENYA NATIONAL ENVIRONMENT CRIME AND INCIDENCE INDEX (ECII) RESULTS

### 5.1 OVERVIEW

Environmental crime may be considered as a grave act against the environment that results in the infringement of the right of citizens to a clean and healthy environment. The act may constitute a crime, if it contravenes laid-down legislation in the various sectors of the environment, such as forestry, water and wildlife.

Environmental crime is a growing concern, leading to the near extinction of valuable wildlife species, and significantly impacting on the biophysical integrity of the planet (Akech, 2006). There are various types of environmental crimes including; wildlife crime (illegal exploitation of the world's wild flora and fauna) and pollution crime (trading and disposal of hazardous wastes or resources in contravention of national and international laws). Other additions include; carbon trade irregularities, water management crimes, smuggling of ozone depleting substances (ODS), illicit trade in hazardous waste; illegal, unregulated, and unreported fishing and illegal logging and the associated trade in stolen timber among others.

According to the INTERPOL-UNEP report 2016, Environmental Crimes are the fourth largest criminal area in the world after drugs, counterfeits and human trafficking. This estimate corresponds to a 26 per cent increase compared to 2014, with rates of such crimes expected to further increase by 5-7 per cent annually.

The ECII has looked at incidences and crimes reported to NEMA, prosecuted cases, and Natural Resource Management Crimes, as summarized in table 5-1

**Table 5-1: Environmental Crimes/Indicator Categories and Indicators**

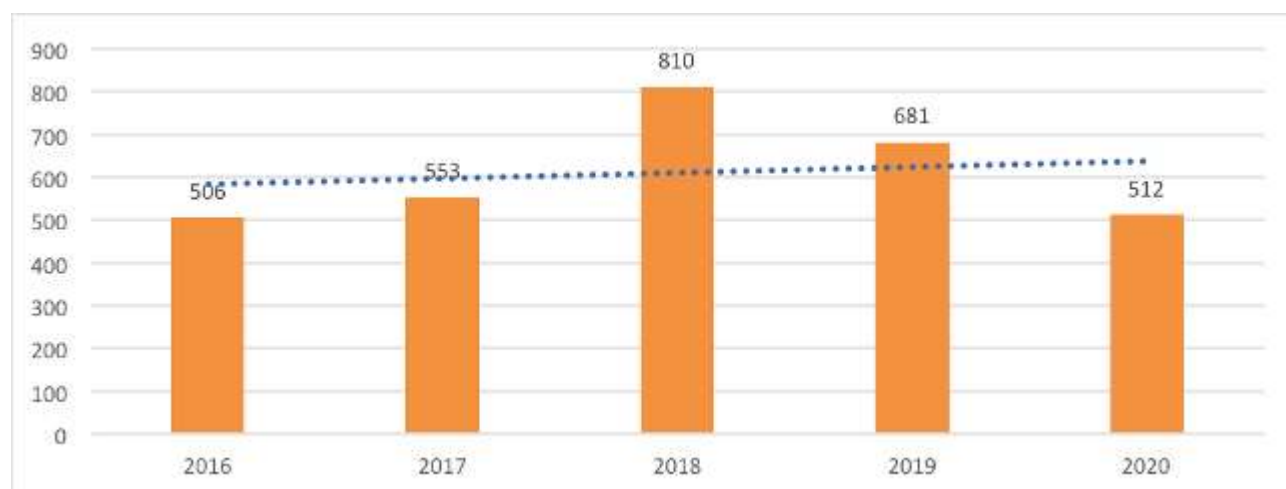
<b>Environmental crimes/incidences Categories</b>	<b>Indicators</b>
	Water pollution crimes /incidences
	Environmental nuisance
	Illegal solid waste disposal incidences
<b>Environmental incidences reported to NEMA</b>	Air pollution incidences
	Environmental disasters

	illegal mining activities
	Unlicensed infrastructure incidences
<b>Prosecuted Waste Crimes</b>	Water pollution crimes
	Illegal waste movement/dumping crimes
	Air pollution crimes
<b>Natural Resource Management Crime</b>	Forestry crimes
	Wildlife crimes

## 5.2 ENVIRONMENTAL INCIDENCES REPORTED TO NEMA

A total of 475 environmental cases (both crimes and incidences) were registered in 2020, indicating a 27% reduction in the total number of cases compared with the previous year in which 648 cases were registered. After an initial increase of the number of cases for two consecutive years, there seems to be a declining trend of the cases since 2018, as shown in the chart 5-1.

**Chart 5-1 Trends in Total Number of Reported Incidences (2016-2020)**



### 5.2.1 TRENDS AND PATTERNS OF ENVIRONMENTAL INCIDENCES

Over the last 5 years, the number of environmental crimes and incidences in Kenya showed an initial upward trend before a decline in the last two years. The 2020 records indicate 475 cases were registered, down from 648 (2019), 766 (2018), 528 (2017) and 455 (2016).

The crime incidences were highest in 2017-18. Across the various crime and incidents categories, there is a similar pattern of an initial increase, a peak in 2018 or thereabouts (only environmental

nuisance category peaked in 2019), before registering a decline thereafter. This is attributable to NEMA and partners support to the various entities and victims

The number of absolute cases changed as follows: 173 decline 2019/2020; 118 decline in 2018/19; 238 increase in 2017/18 and 73 increase in 2016 /17 period. In terms of % changes, these translated to the following: -26.7% in 2019/20; -15.4% in 2018/19; +45.1% in the 2017/18 period and +16.1% in the 2016 / 17 period. The trend thus looks very promising and efforts should be put in to sustain the momentum. See table 5-2

**Table 5-2 Registered Crimes and changes per year**

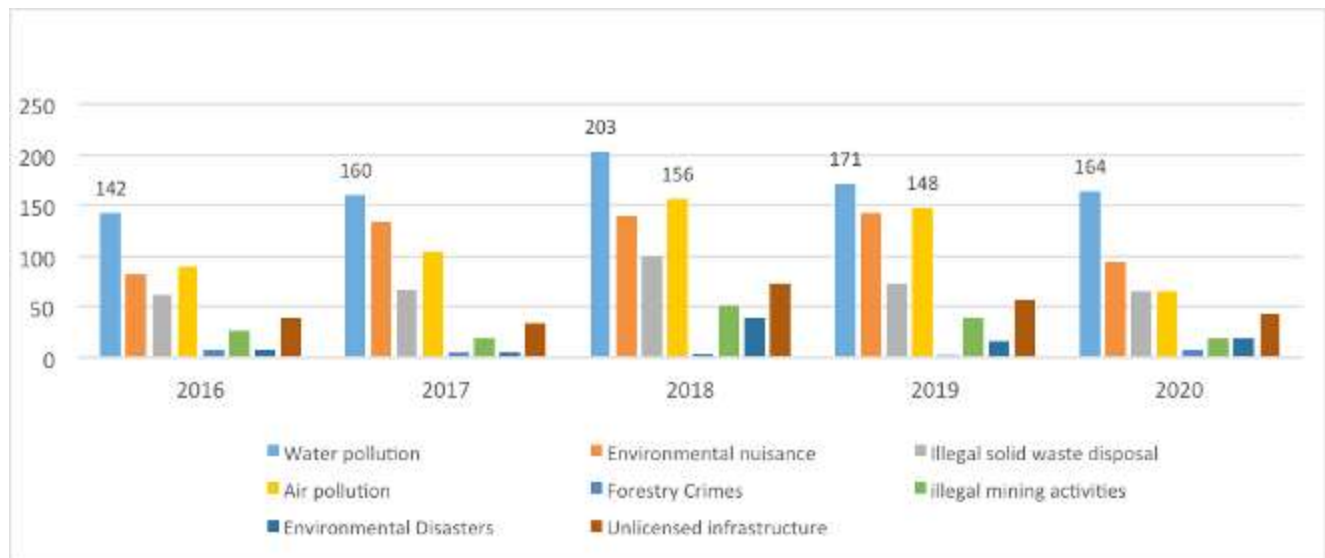
Year	2016-2017	2017-2018	2018-2019	2019-2020
Absolute number of cases	455 to 528	528 to 766	766 to 648	648 to 475
Change in number of cases registered	+73	+238	-118	-173
% change in the number of cases	+16.1	+45.1	-15.4	-26.7
Interpretation	An increase	Major increase	A decline	Major decline

### 5.2.2 INCIDENCES BY TYPE/CATEGORY

The environmental incidences have been broadly categorized into the following: Water pollution (WP), Illegal waste disposal (IWD), Environmental nuisance (EN), unlicensed infrastructure (UI), Air pollution (AP) and impersonation (IM).

- i. Water pollution registered the highest (840 incidences), with a mean annual 168 incidences reported.
- ii. Environmental nuisance category registered 593 incidences in 2020, with a mean annual report of 119.
- iii. Air pollution registered 564 cases with a mean annual 113 incidences over the last 5 years.
- iv. The rest of the categories registered the following cases: illegal solid waste disposal 367 incidences, unlicensed infrastructure: 245, illegal mining: 154; environmental disasters: 85 and forestry crimes: 24. (See chart5-2).

Chart 5-2 Total incidences by Type (2016-2020)

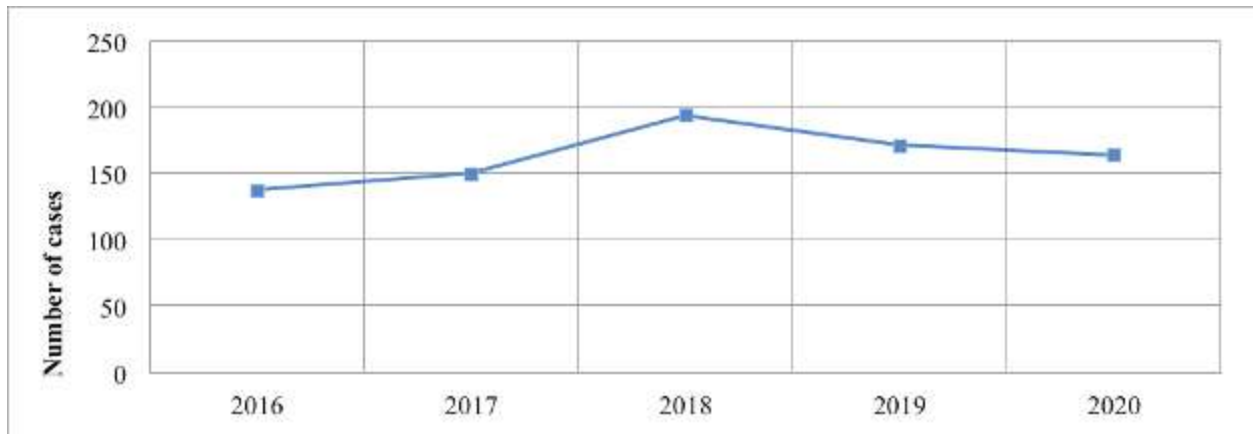


### 1.1 PERFORMANCE OF KEY INDICATORS (ENVIRONMENTAL INCIDENTS REPORTED TO NEMA)

This is discussed under 7 sections of water pollution crimes, environmental nuisance, illegal solid waste disposal, air pollution, environmental disasters, illegal mining, and unlicensed / unauthorized infrastructure.

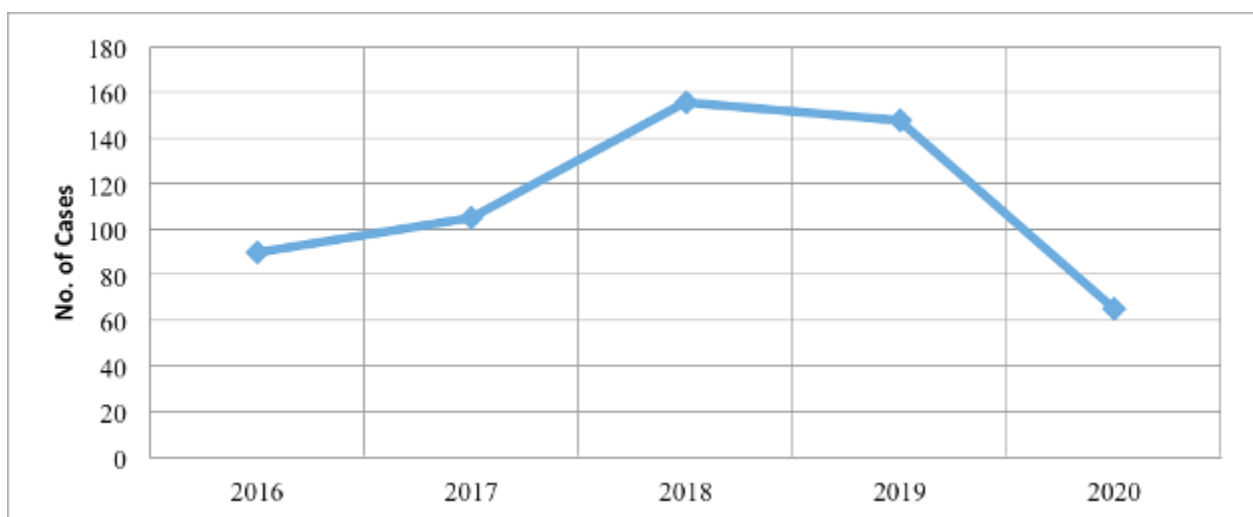
#### 5.2.3 WATER POLLUTION (WP)

This indicator describes the number of reported incidences of water pollution activities as a proportion of the total reported environmental incidences in the NEMA Incidence Management (IMU) Database. This has three elements: illegal effluent discharge, water pollution and sewage outburst / overflow which registered the following number of cases over the years: 164 (2020), 171 (2019), 203 (2018), 160 (2017) and 142 (2016). On the average, illegal effluent discharge registered 105 cases per year; water pollution registered 7 cases annually while 57 cases of sewage outburst were registered annually.

**Chart 5-3 Reported incidences on water pollution activities in Kenya**

#### 5.2.4 AIR POLLUTION (AP)

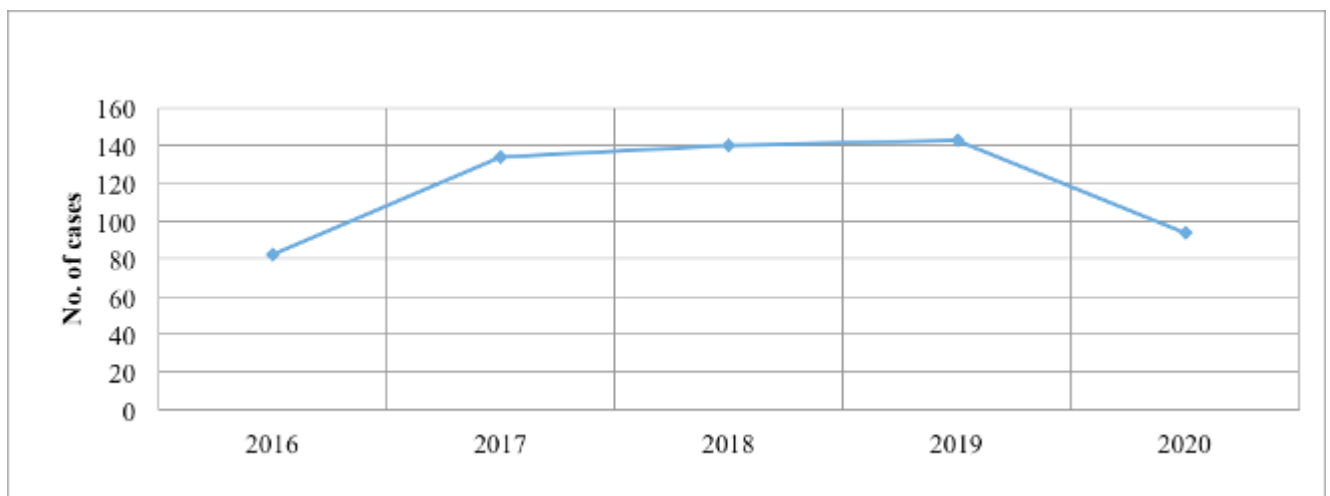
Describes the number of reported incidences on poor air quality as a proportion of the total reported environmental incidences in the NEMA Incidence Management Unit (IMU) Database. This had 5 elements: Smoke / open burning of waste, Dust, unlicensed air pollution, fumes / aerosols and air pollution. These registered the following five-year mean figures over the years 2016-2020: Smoke / open burning of waste (47), Dust (31), unlicensed air pollution (23), fumes / aerosols (8) and air pollution (6). The registered cases changed as follows over the years: 65 (2020), 148 (2019), 156 (2018), 105 (2017) and 90 (2016).

**Chart 5-4 Reported air pollution incidences in Kenya**

#### 5.2.5 ENVIRONMENTAL NUISANCE (EN)

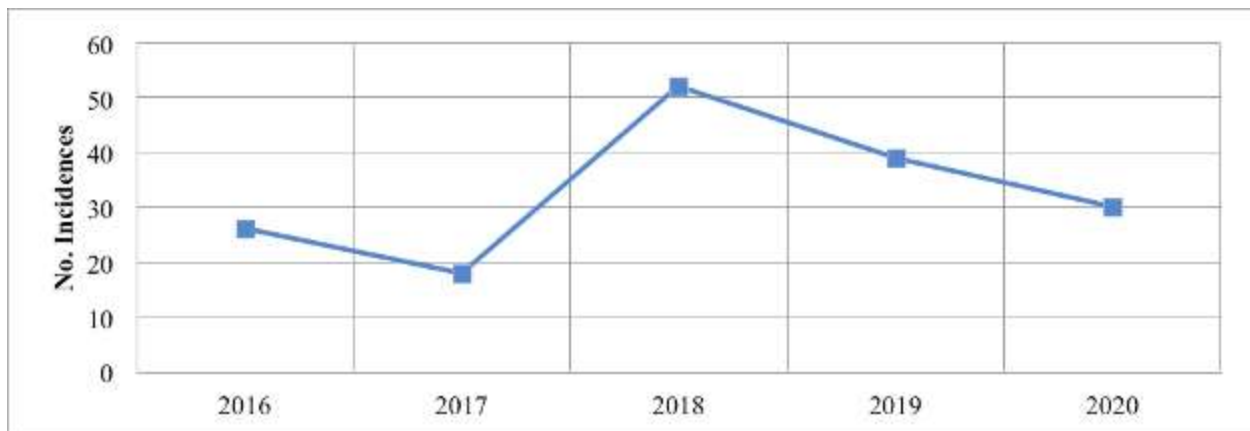
Describes the proportion of reported incidences of environmental nuisance to the total reported environmental incidences in the NEMA Incidence Management (IMU) Database. Environmental nuisance refers to unreasonable interference or like interference with an environmental value caused by odor /smell, noises and light. This had only 2 elements: noise nuisance and odor. Over the years, the following number of nuisance cases were registered: 94 (2020), 143 (2019), 140 (2018), 134 (2017) and 82 (2016). The mean number of nuisance cases registered by category per year were as follows: 66 noise cases and 53 odor cases, totaling 119 per year over the last 5 years.

**Chart 5-5 Reported cases of environmental nuisance in Kenya**



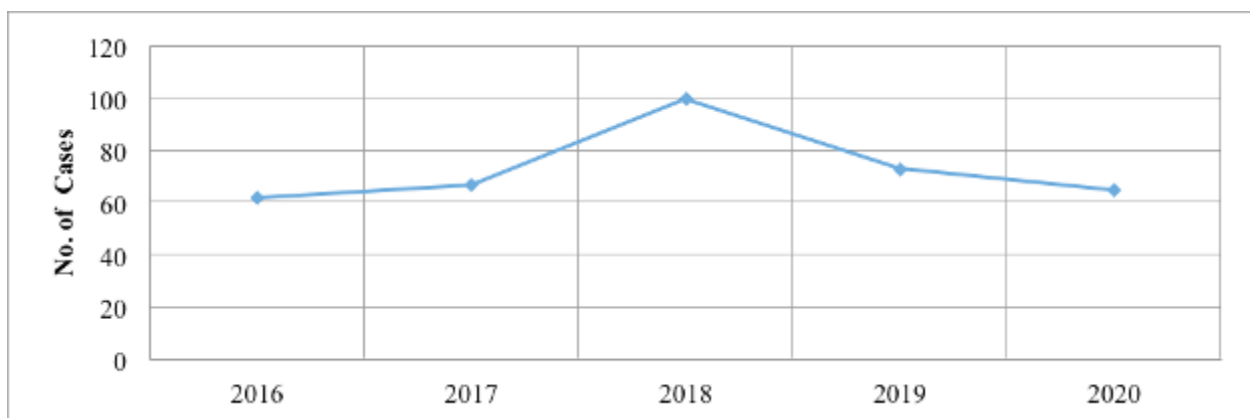
#### 5.2.6 ILLEGAL MINING / ILLEGAL ECONOMIC ACTIVITY / ILLEGAL LIVELIHOOD (IM/IEA/ IL)

Describes the proportion of the number of reported incidences on illegal mining activities to the total reported of environmental incidences in the NEMA Incidence Management (IMU) Database. This comprises 3 elements: illegal mining, quarrying and sand harvesting. Of these, illegal mining is registered once per year; illegal quarrying 12 cases per year while illegal sand harvesting is registered 11 times per year over the last 5 years. A total of the illegal economic activity crimes registered over the years are as follows: 19 in 2020, 39 in 2019, 24 in 2018, 16 in 2017 and 21 in 2016. This means the cases peaked in 2019 and have since been on a declining trend.

**Chart 5-6 Reported incidences of illegal mining activities in Kenya**

#### 5.2.7 ILLEGAL SOLID WASTE DISPOSAL (ISWD):

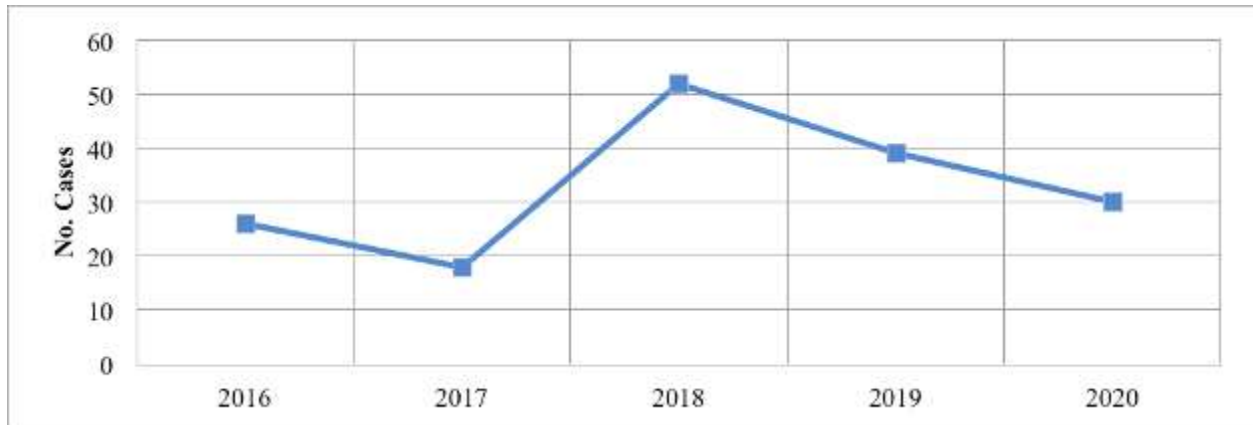
Describes the proportion of documented/reported incidences on disposal/dumping of solid wastes in undesignated places such as roadside, empty plots/land and on the river banks to the total reported environmental incidences in the NEMA Incidence Management (IMU) Database. Three types of wanton dumping have been registered: illegal waste dumping, debris dumping and illegal soil dumping. Of these, 5-year mean annual crimes are as follows: illegal waste dumping (72 per year), debris dumping 0.6 per year, and illegal soil dumping is 0.2 per year. This gives a total mean of 74 illegal dumping cases per year. In terms of trend, 65 cases have been registered in 2020, 73 in 2019, 100 in 2018, 67 in 2017 and 62 in 2016. This means the trends increased and peaked in 2018 before registering a declining trend.

**Chart 5-7 Reported incidences on illegal solid waste dumping/disposal in Kenya**

#### 5.2.8 ENVIRONMENTAL DISASTERS (ED):

Describes the proportion of the number of reported incidences on environmental disasters to the total reported cases of environmental crimes and incidences in the NEMA Incidence Management (IMU) Database.

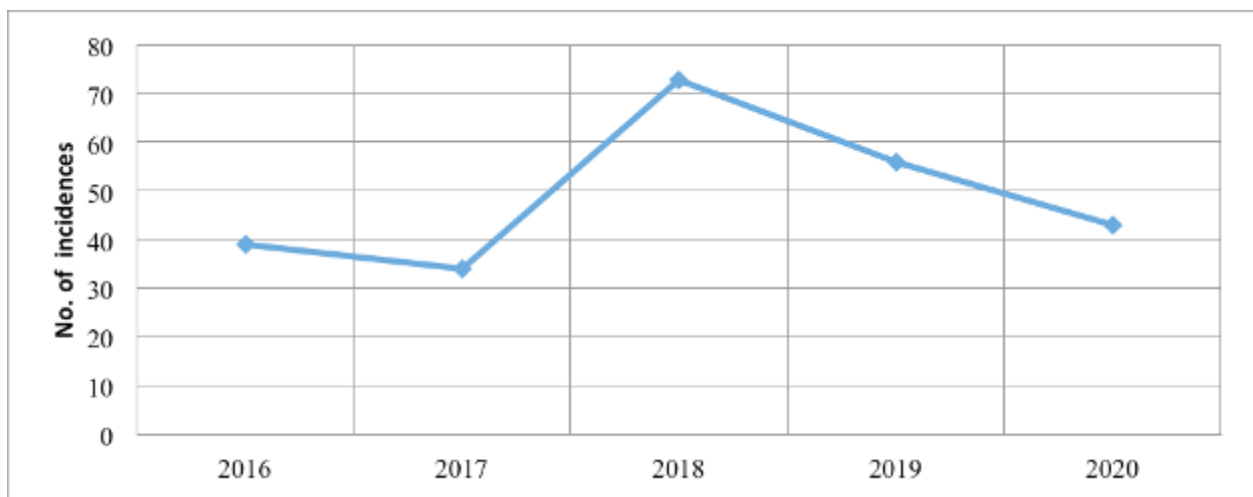
**Chart 5-8 Reported incidences on environmental disasters in Kenya**



#### 5.2.9 UNLICENSED INFRASTRUCTURE / ILLEGAL INFRASTRUCTURE (UI):

Describes the number of reported incidents of illegal structures and construction activities as a proportion of the total reported environmental incidences in the NEMA incidence Management Unit (IMU) Database. The following were numbers of illegal infrastructure reported by year: 43 (2020, 56 (2019), 73 (2018), 34 (2017 and 39 (2016). As is the general trend, this indicator seems to have peaked in the 2018 period before taking a descending trend.

**Chart 5-9 Reported cases of unlicensed infrastructure in Kenya**



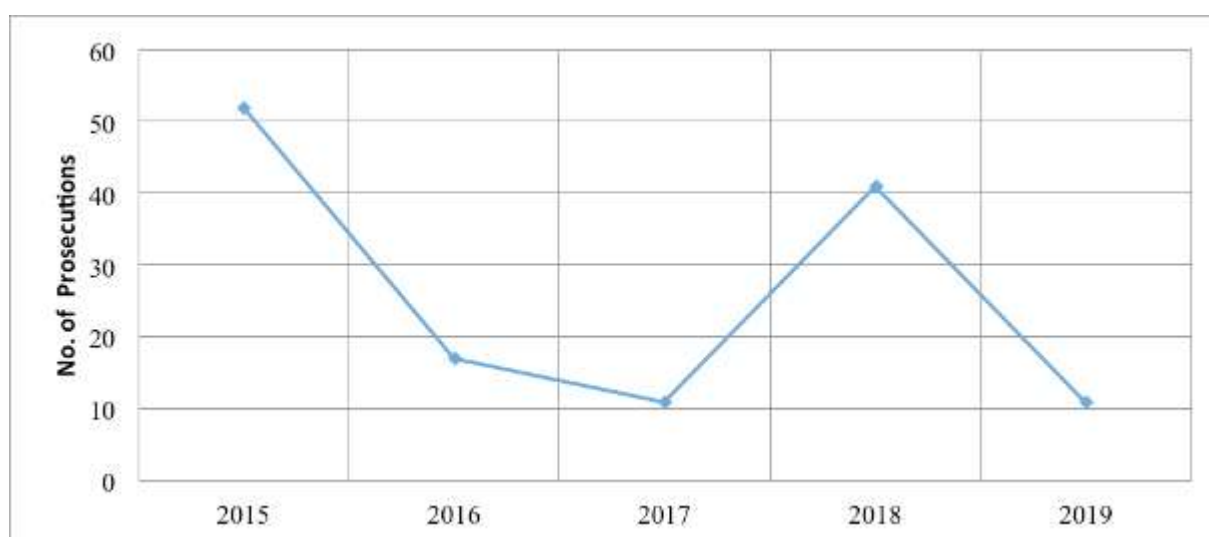


### 5.3 ENVIRONMENTAL CRIMES: PROSECUTED CASES

#### 5.3.1 WATER POLLUTION

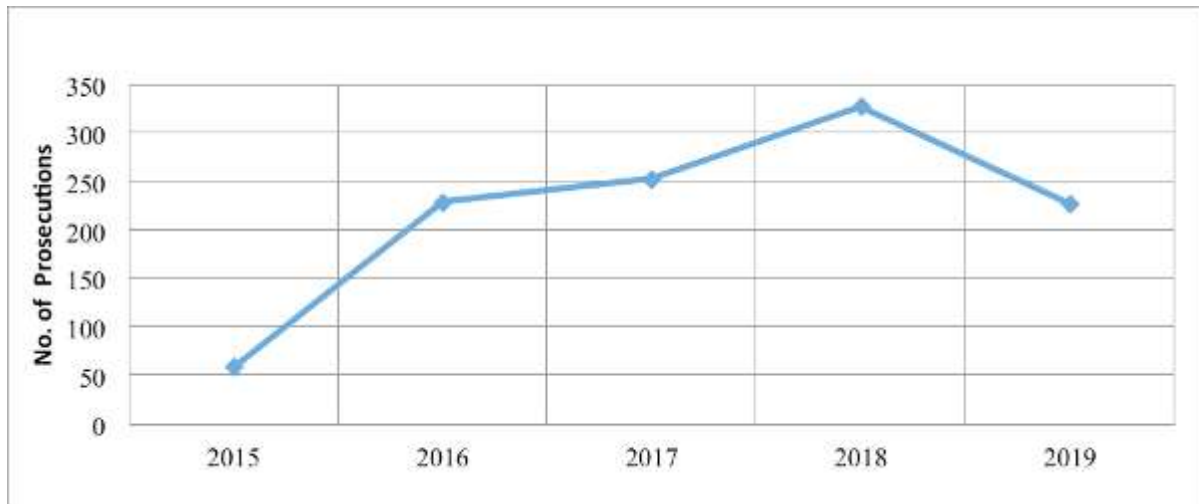
The indicator describes the number of prosecuted cases on water pollution activities as a proportion of the total prosecuted cases of waste crimes. The environmental crimes index for the indicator is a proximity to target (PTT) measure of the percentage of prosecuted cases of water pollution, where the target is to achieve zero water pollution crimes. A total of 132 water pollution related cases were prosecuted between 2015 and 2019. Chart 5-10 below shows the trend in the number of prosecuted water pollution cases in Kenya.

**Chart 5-10 Prosecuted cases on water pollution in Kenya**



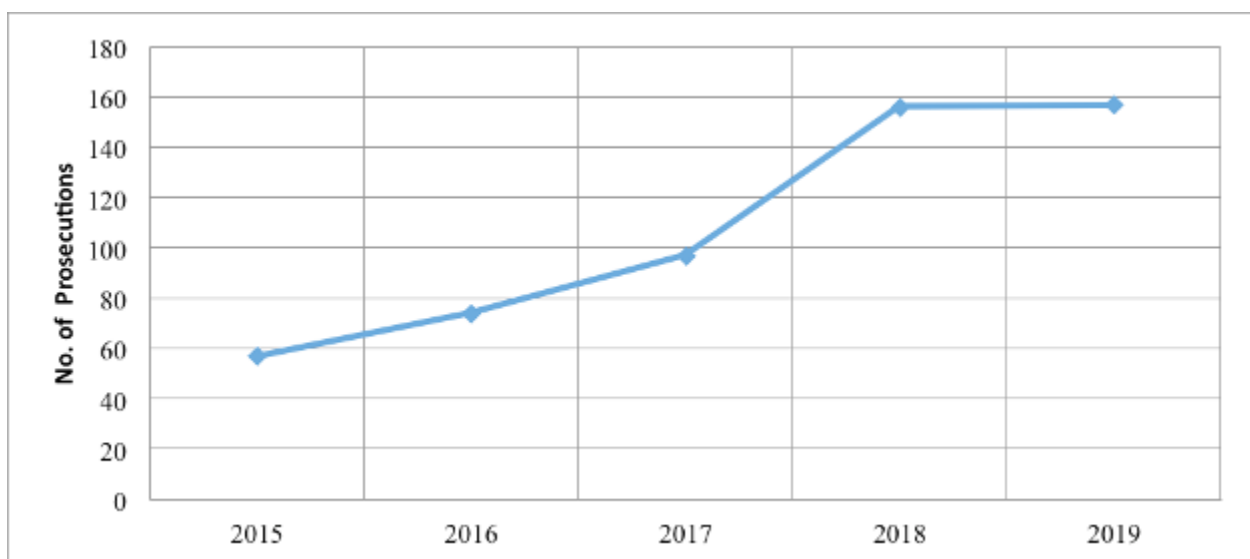
#### 5.3.2 ILLEGAL SOLID WASTE DISPOSAL CRIMES

The indicator is measured by the number of prosecuted cases on illegal waste movement/dumping as a proportion of total prosecuted cases of waste crimes. The crime index for the indicator is a proximity to target score of the percentage of prosecuted cases on illegal waste movement/dumping. The indicator target is to achieve zero cases of illegal waste movement/dumping. 1096 cases of illegal waste movement/disposal were successfully prosecuted for the period between 2015 to 2019. The chart 5-11 below.

**Chart 5-11 Prosecuted cases on illegal waste movement/dumping in Kenya**

### 5.3.3 AIR POLLUTION CASES

The indicator describes the number of prosecuted cases on air pollution as a proportion of the total prosecuted waste crime cases. The crime index for the indicator is a proximity to target score of the percentage of prosecuted air pollution related cases. The indicator target is to achieve zero cases of air pollution. A total of 541 air pollution related cases were successfully prosecuted for the period between 2015 to 2019. The chart 5-12 below.

**Chart 5-12 Prosecuted cases on air pollution crimes in Kenya**

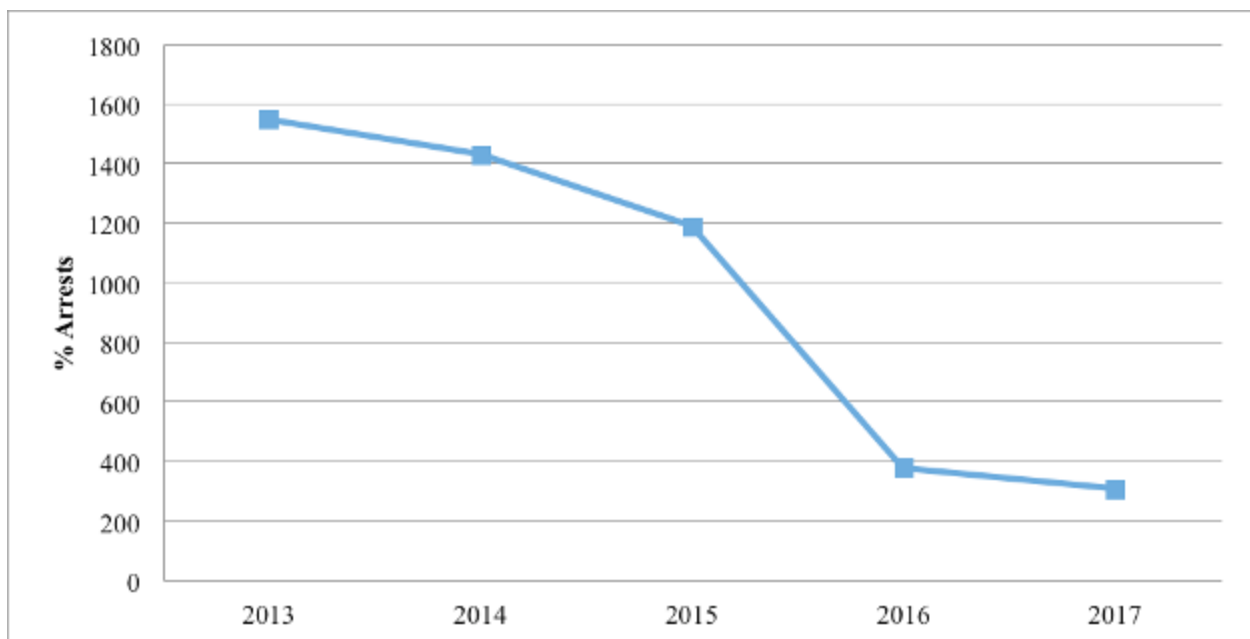
## 1.2 NATURAL RESOURCE RELATED CRIMES PROSECUTED CASES

Natural resource related crimes comprise crimes committed in the fisheries, forestry and wildlife sectors. However, the status crimes related to natural resource management was measured using the wildlife crimes.

### 5.3.4 WILDLIFE CRIMES

The indicator measures the number of prosecutions made on wildlife related crimes as a proportion of the total number of wildlife related arrests. The crime index for the indicator is a proximity to target (PTT) of the percentage of prosecutions on wildlife crimes. The indicator target is to achieve 100 per cent prosecutions of wildlife related crimes. A total of 5568 individuals have been arrested on account of various wildlife crimes between the period between 2013 and 2017. Of the number, a total of 4852 cases have successfully been prosecuted in courts. The analysis show that the prosecution rate is at 87% for the five-year period. The chart 5-13.

**Chart 5-13 Number of Prosecutions in Wildlife Crime Cases in Kenya**



#### 5.4 ENVIRONMENTAL CRIME AND INCIDENTS INDEX

In determining the ECI index, weighting was done for each broad indicator, then a performance score was assigned to each indicator, and from the product of the individual weight and the % performance, the ECI index for each was computed. For instance, the three broad crime and incidence categories identified as follows: environmental incidences reported to NEMA was weighted at 62.7; prosecuted waste crimes at 30.8, and natural resources management crimes weighted at 6.5.

The overall environmental crime score for Kenya was 79.13 comprising the following: 5.08% for natural resource crimes (wildlife); 20.18% for waste crimes (comprising water pollution, illegal waste movement / dumping crimes and air pollution crimes); and 53.87% for environmental incidences reported to NEMA (comprising water pollution incidences, environmental nuisance, illegal solid waste dumping, air pollution incidences, environmental disasters, illegal mining and unlicensed infrastructure incidents). Of these indicators, the ones which contributed most to the index are: environmental nuisance / air pollution and illegal solid waste dumping incidences (25.26%); environmental disasters and mining (12.96%); unlicensed infrastructure (9.21%), Water pollution crimes (9.20%). Each of the remaining environmental crimes and incidents registered less than 6.5%. This rating might improve in the future if compliance and successful prosecution is done. The section below describes each indicator / crime / incident to some details.

Table 5-3 Scoring of ECII

Environmental crimes/incidences Categories	Policy Weight (%)	Indicator	Indicator Weight (%)	Current Status	ECII Score (PPT)	Indicator Score (%)	Policy Score (%)	Objective Score (%)
Environmental incidences reported to NEMA	62.7	<a href="#">Water pollution crimes /incidences</a>	9.5	32.0	68.0	6.43	6.43	53.87
		<a href="#">Environmental nuisance</a>	10.1	18.4	81.6	8.21	25.26	
		<a href="#">Illegal solid waste disposal incidences</a>	10.1	12.7	87.3	8.78		
		<a href="#">Air pollution incidences</a>	9.5	12.7	87.3	8.27		
		<a href="#">Environmental disasters</a>	6.5	3.5	96.5	6.28	12.96	
		<a href="#">illegal mining</a>	7.1	5.9	94.1	6.68		
		<a href="#">Unlicensed infrastructure incidences</a>	10.1	8.4	91.6	9.21	9.21	
Prosecuted waste crimes	30.8	<a href="#">Water pollution crimes</a>	9.5	2.8	97.2	9.20	9.20	20.18
		<a href="#">Illegal waste movement/dumping crimes</a>	10.7	57.3	42.7	4.55	10.97	
		<a href="#">Air pollution crimes</a>	10.7	39.6	60.4	6.43		
Natural Resource Management Crimes	6.5	<a href="#">Forestry crimes</a>	6.5	0.0	0.0	0.00	5.08	5.08
		<a href="#">Wildlife crimes</a>	6.5	21.9	78.1	5.08		
						79.13	79.13	79.13



## 6 OVERALL NATIONAL AND COUNTY EPI SCORING

### 6.1 OVERALL NATIONAL AND COUNTY EPI SCORING

National EPI Scoring has been done based on an aggregate of the three policy objective areas, summarized in table 6-1. The overall KEPI score is 60.62 almost similar to the previous KEPI score of 60.96. The scores for the three policy objectives in 2018, have been weighed against possible maximum score per policy objective. Environmental health and Ecosystem vitality recorded best performance of 24.94% and 23.58 respectively. However, environmental vitality score reduced significantly between 2018 and 2020.

Socioeconomic sustainability improved from 8.65 in 2018 to 12.10 in 2020. Overall, there was a slight drop (0.34) in the EPI score between 2018 and 2020 as shown.

**Table 6-1: National EPI Scoring in 2018, 2020 and the score for 2020**

Policy	2018 score	2020 score	Maximum Score	Possible
Environmental Health	19.35	24.94	37.87	
Ecosystem vitality	34.97	23.58	34.89	
Socio-economic sustainability	8.65	12.10	27.33	
Total Score	60.96	60.62	100	

It's important to note that the performance of the three policy areas are highly interlinked. The pursuit of economic prosperity manifested in industrialization and urbanization often means more pollution and other strains on ecosystem vitality, especially from emissions to air and water.

The country has made attempts towards mobilizing communities to protect natural resources and human well-being through friendly laws that allow for co-management models. However, it's equally important to note that indicators of good governance including commitment to the rule of law, enhanced monitoring and enforcement of regulations will have a key role in achieving high EPI scores, highlighting the importance of managing economic and environmental issues with a commitment to analytic rigor and carefully constructed policies.

Previous EPI reports and studies, have shown a positive correlation ( $r = 0.80$ ) between environmental performance and country wealth (EPI 2020). Achieving sustainability requires sufficient economic prosperity to fund public health and environmental infrastructure, especially for issues within the Environmental Health policy objective, which require significant investments in sanitation infrastructure, waste management facilities, and air emission control technologies.

A breakdown of EPI policy scores at National level reveals that water and sanitation is the best performing indicator, due to great improvements noted in access to sanitation in the country. Air quality scores 14.34 out of a possible maximum score of 21. This may be due to lack of a robust monitoring infrastructure for air quality. Reveals

Governance, Compliance and Enforcement scores very poorly (9/21) showing weaknesses in compliance and enforcements, as well as socio-economic challenges that have contributed to great inequalities, and low GDPs. Table 6-2 summarizes the policy scores under EPI

**Table 6-2 EPI Policy Scores**

Policy	EPI Score	Possible Score
Air Quality	14.34	21.28
Water and Sanitation	9.61	12.77
Environmental Nuisance	1.00	3.83
Sustainable Water Resources Management	4.00	7.66
Agriculture, Livestock and Fisheries	2.54	2.98
Forests and woodlands	6.68	8.09
Biodiversity and Habitat	2.40	5.96
Climate Change	6.21	4.84
Energy	3.11	3.40
Environmental Education	2.99	5.96
Governance, Compliance and Enforcement	9.12	21.28

A breakdown of specific indicators under the policy reveals indoor air pollution from using paraffin and using wood fuel to be the highest scoring indicator. Table 6-3 below shows EPI indicator scores



Table 6-3: National EPI Indicators Score

Indicator	Score
Indoor Air Pollution (Using Wood Fuel for Lighting)	97.20
Indoor Air Pollution (Using Paraffin for Cooking)	92.20
Electricity Generated from Renewable Sources	91.50
Access to Sanitation	91.50
Tree Cover Loss	89.70
Fish Stock Exploitation	85.32
Indoor Air Pollution (Using Paraffin for lighting)	83.50
Literacy Levels	82.40
Water Stress Index	79.72
Environmental Crimes Index	79.11
Forest Cover	72.90
Terrestrial Protected Areas (TPA)	72.71
Climate Change Mainstreaming	72.54
Green House Gas Emissions (CO <sub>2</sub> e) per year	69.34
Human Development Index	60.10
Access to Safe Drinking Water	59.00
Gross Domestic Product	53.66
Average Exposure to ambient PM <sub>&lt;2.5</sub>	38.02
Indoor Air Pollution (Using Wood Fuel for Cooking)	33.30
Access to Solid Waste Services	26.00
Wastewater Treatment	24.60
Tertiary Level Graduates from E&NRM	16.63
Expenditure on E&NRM	16.63
Marine Protected Areas (MPA)	8.00
Adoption of Environmental Sustainability Policy by MDAs	6.67

The indicators that had more than 90% included: Indoor Air Pollution (Using Wood Fuel for Lighting), Indoor Air Pollution (Using Paraffin for Cooking, Access to Sanitation and Electricity Generated from Renewable Sources. Though there was a commendable performance on water stress index, respective county governments are yet to develop a water resource master plan that determines water resource availability, supply and demand. Various counties have specific water-use demand and supply. Similarly, counties are yet to allocate budgetary funds for climate

change adaptation or if this is being done then these expenditures are not reported being reported in the county treasuries.

Bottom five performing indicators were: Marine Protected Areas, Adoption of Environmental Sustainability Policy by MDAs, and Expenditure on E&NRM, Wastewater Treatment and Tertiary Level Graduates from E&NRM.

EPI is largely a new area that NEMA and Kenya aims to use to gauge adherence to environmental laws and best practices.

The KEPI also evaluated all the 47 counties based on County indicators agreed upon with stakeholders. Nairobi county emerges as the best in terms of environmental performance with an EPI score of 88.82, followed by Bungoma, Bungoma, Kiambu, Nakuru, Nyeri, Trans-Nzoia, Kajiado, Mombasa, Kirinyaga and Nyandarua forming the top 10 best performing counties.

Siaya county emerges as the worst performing in terms of KEPI score, scoring 44.7. Other counties within the bottom ten include Turkana, Marsabit, West Pokot, Tana River, Samburu, Wajir, Mandera, Migori and Elgeyo Marakwet. The low score can be attributed to low scores across the three policy objectives.

**Table 6-4: Ranking of EPI by counties**

Rank	County	EPI	Rank	County	EPI	Rank	County	EPI
1.	Nairobi City	83.82	17	Kericho	59.69	33	Narok	54.30
2.	Bungoma	75.04	18	Tharaka-Nithi	59.48	34	Baringo	53.63
3.	Kiambu	72.70	19	Bomet	58.72	35	Homa Bay	52.88
4.	Nakuru	67.03	20	Vihiga	58.63	36	Kwale	52.23
5.	Nyeri	66.65	21	Makueni	58.53	37	Isiolo	52.18
6.	Trans Nzoia	63.64	22	Machakos	58.34	38	Elgeyo-Marakwet	51.47
7.	Kajiado	63.58	23	Kilifi	58.00	39	Migori	50.81
8.	Mombasa	63.46	24	Nyamira	57.37	40	Mandera	49.94
9.	Kirinyaga	63.01	25	Kisumu	57.02	41	Wajir	49.68
10.	Nyandarua	62.82	26	Taita-Taveta	56.90	42	Samburu	49.17
11.	Murang'a	61.98	27	Meru	56.09	43	Tana River	49.04
12.	Embu	61.20	28	Lamu	55.68	44	West Pokot	48.66
13.	Kakamega	60.29	29	Kitui	55.28	45	Marsabit	47.63
14.	Nandi	60.08	30	Kisii	55.24	46	Turkana	46.92
15.	Laikipia	59.92	31	Garissa	55.21	47	Siaya	44.71
16.	Uasin Gishu	59.91	32	Busia	54.78			





## 7 INFRASTRUCTURE REQUIREMENTS FOR HOSTING AND SHARING THE EPI

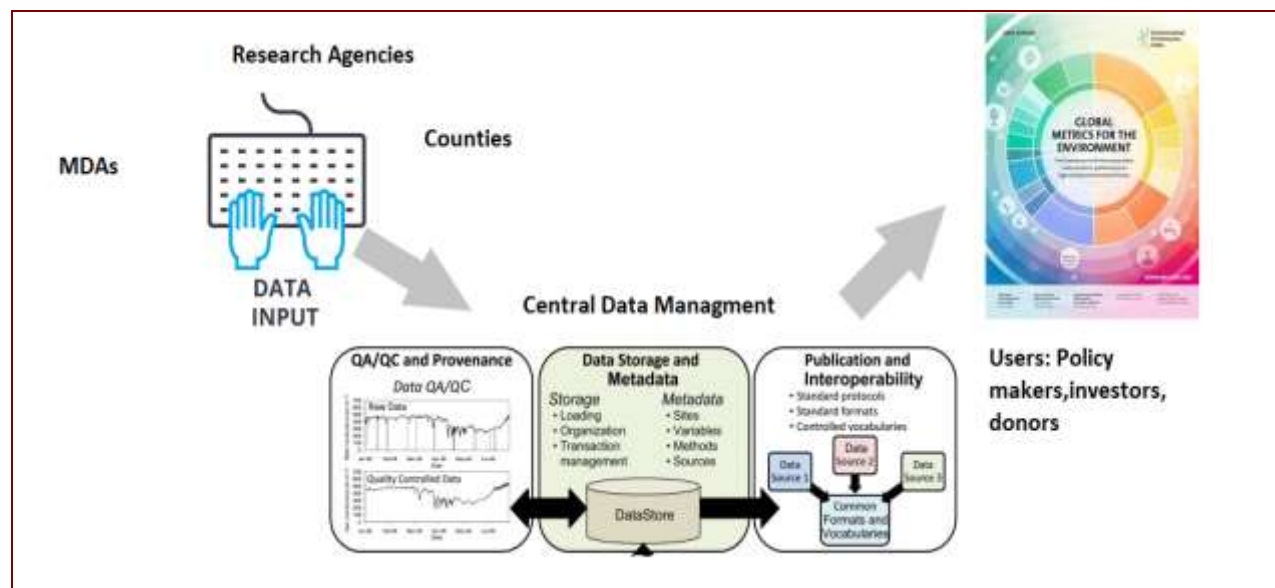
### 7.1 GENERAL OVERVIEW

The Kenya National EPI requires the necessary platform, systems/structures, skills, hardware and software to enable it to function. These systems would require to be put in place, not only by NEMA, but also by all partners involved in data collection, management, analysis and transmission. The Kenya National EPI has three distinct levels of stakeholders namely:

- a) On the input side (input users)
- b) Central process or management side
- c) Consumption side or the users of the system output.

On the input side, specific institutions are mandated to capture and collect, clean, analyze and transform data into the required format and thereafter transmit the same. The EPI central information processing system collates synthesizes and transforms the information received from a system of input stakeholders into an index. It also stores this information for research, review and retrieval purposes by the public, policy makers and/or other stakeholders who are the consumers of the information. Each of the three levels requires specific infrastructure in place for their functionality. Figure 18 schematically summarizes the layout for KEPI infrastructural system envisaged under the study.

Figure 7-1 Infrastructure layout for KEPI



7.2 EXISTING ICT INFRASTRUCTURE SYSTEMS AT NEMA

The National Environmental Management Authority, NEMA has in place a Knowledge Management System which is adequate for hosting and sharing the KEPI information. An interface should be created within the Knowledge Management platform to the EPI data base to enable for integration of the EPI into the overall knowledge management system. The details of the minimum specifications required for hosting and sharing the Kenya National EPI versus the specifications of the knowledge management system in place are provided in Table 7-1

Table 7-1 National EPI versus the specifications of the knowledge management system

System Component	Minimum Specifications	Analysis of the Knowledge Management System in Place
Main Server	16 Core processor, 32/16 GB RAM, RAID 1, SSD caching, 2TB HDD	The RAM size in place is 128GB. The server meets the requirement whereby RAM should be greater than 16GB
Server Computer (PC/Mac)	Intel® Core™ i5-6200U Processor Dual-Core 6GB RAM 300GB Hard Drive	<ul style="list-style-type: none"> <li>The RAM size on the server meets the expectation i.e., greater than 6GB</li> <li>The database for EPI would require average 100 megabytes (MB) every two (2) years. 500GB is available for the Knowledge Management System. Therefore, if 50GB is set aside for the EPI, the space will be available for</li> </ul>

		<p>the next millennium.</p> <ul style="list-style-type: none"> <li>• The processor speed is server standard</li> </ul>
Software	<p>Windows Operating system (Windows 7 and above) Antivirus software for windows (Internet security) Ubuntu server</p>	<ul style="list-style-type: none"> <li>• The network speed is over 20Mbps which is well acceptable.</li> <li>• SSL certificate and firewall are in place. However, it is recommended that the firewall should be updated.</li> <li>• The software in operation is Microsoft SharePoint 2013, therefore satisfies the criteria</li> </ul>
Backup (backup server)	<p>16 Core processor, 32/16 GB RAM, RAID 1, SSD caching, 2TB HDD or above</p>	<ul style="list-style-type: none"> <li>• The backup system in place meets the requirements.</li> </ul>

#### 7.2.1 EXISTING ICT INFRASTRUCTURE SYSTEMS IN DIFFERENT AGENCIES

Overall, most line ministries and agencies expected to provide data for the Kenya National EPI were found to have adequate infrastructure (IT department, knowledgeable staff, monitoring equipment where applicable) in place at national level though most lacked adequate human and financial capacity to collect reliable data at County levels. It is recommended that NEMA should develop a Memorandum of Understanding (MOU) or Memorandum of Association (MOA) with these agencies and line ministries that will enhance functional integration of institutional data repository feeding into the established system for the Kenya National EPI at NEMA. Table 7-2 presents a summary of infrastructure needs and recommendations for various key stakeholders.

**Table 7-2 summary of infrastructure needs and recommendations for various key stakeholders**

Stakeholder	Data Requirements	Infrastructure needs	Recommendations
National Environment Management Authority (NEMA)	<ul style="list-style-type: none"> <li>• Access to solid waste services</li> <li>• Outdoor Air Pollution</li> <li>• Governance Compliance and Enforcement</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate equipment for monitoring outdoor air pollution</li> <li>• Lack of adequately trained staff for monitoring outdoor air pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of an air pollution monitoring unit</li> <li>• Recruitment of trained staff for monitoring outdoor air pollution</li> </ul>
Kenya Wildlife Service	<ul style="list-style-type: none"> <li>• Species Protection</li> <li>• Habitat Protection</li> <li>• Invasive Species</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels</li> <li>• Irregular monitoring due to inadequate human and financial capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> <li>• Creation of a dedicated fund for monitoring species and habitat protection</li> </ul>
Water Resources Authority (WRA)	<ul style="list-style-type: none"> <li>• Water Stress Index</li> <li>• Waste water treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels Irregular monitoring due to inadequate human and financial capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> <li>• Creation of a dedicated fund for monitoring species and habitat protection</li> </ul>
Ministry of Environment	<ul style="list-style-type: none"> <li>• Data on climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> </ul>
Ministry of Agriculture	<ul style="list-style-type: none"> <li>• Fish Stocks</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> </ul>
Ministry of Energy	<ul style="list-style-type: none"> <li>• Electricity from renewable Energy</li> <li>• CO2 emissions per Capita</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> </ul>
County Governments	<ul style="list-style-type: none"> <li>• Solid waste access</li> <li>• Access to safe drinking water</li> <li>• Access to sanitation</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of adequate capacity at County levels</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of staff capacity at County levels</li> </ul>





## 8 CONCLUSIONS AND RECOMMENDATIONS

### 8.1 CONCLUSION

Credible data provided in a timely manner is an invaluable asset to decision making process. Public policy should be based on reliable and quality information. The Kenya National EPI, 2020 represents a comprehensive and a simple reporting system on the state of the environment. The information has been presented in a manner that is easy to understand and digest and targets key stakeholders responsible for resource allocation and public policy. With continuous improvement, the EPI is a powerful tool for the development and implementation of effective policies needed to achieve sustainable and balanced development not only at the national level but also within the devolved government units. The EPI borrows heavily from the best practices around the globe including the global EPI processes and methods, the DPTSIR approach, NEMAs SOE among others. It is meant to complement existing systems and processes and is hoped to be an integral part of the SOE reporting framework in future. It is hoped that the versatility of the index will be a useful property that assists counties begin to evaluate themselves in the context of the national and global goals set. Counties can now continue to compare how their environmental and sectoral interventions fit within the national framework. It must however be noted that this being the first national EPI, several gaps do exist that will need to be polished over time through the establishment of the necessary infrastructure and systems. For instance, there is still too much reliance on global data sources some of which have been collected and analyzed based on satellite imagery. The margin of error from such data sources may be significant thereby affecting their usability for important policy decisions.

### 8.2 RECOMMENDATIONS

To Improve KEPI ranking, the National and county governments need to undertake the following

**Environmental Health:** The policy objective looked at Air Quality, Water and Sanitation, and environmental Nuisance. Key areas issues identified include:

- a) Over reliance on Biomass for cooking and lighting. There is need to enhance access to clean cooking fuels and energy
- b) Poor Solid Waste Management: Invest in proper solid waste management systems

- c) Low access to water from Improved Sources: Enhance investments in water access infrastructure and managements systems by both county and National governments.
- d) Although generally access to sanitation has greatly improved, there is low coverage of sewer facilities especially in urban settings, demonstrated by declining sewerage coverage.

Improving performance under Environmental Health policy objective will require significant investments in sanitation infrastructure, waste management facilities, and air emission control technologies.

**Ecosystem vitality:** The objective looked at Livestock and Fisheries, Forests and woodlands, Biodiversity and Habitats, Climate change, Energy, and water resource management.,

- d) The key habitats face challenges of illegal logging, poaching, and forest fires: There is need to improve management of these resources, through strengthening of co-management (community forest associations, Beach Management Units, Community Wildlife associations, and Water Resource User associations), and allocation of adequate resources towards resource management.
- e) Climate change remains a key threat to environmental conservation and management. There is disparity between public investments in climate change adaptation, as compared to the climate risks. There is need for government to allocate adequate resources towards climate adaptation as provided for under the Climate change Action Plan.

**Socio-economic:** Broad indicators under this policy objective include environmental education, governance compliance and enforcement.

- d) The state corporations/government agencies need to integrate environmental sustainability in their operations. The rate of reporting has been low, since environmental sustainability has not been included in performance contracting. There is therefore need to make environmental sustainability a key indicator of general performance of the cooperation's.
- e) Investments in environment and Natural resource management (environment. Agriculture, fisheries and blue economy, forestry, water and sanitation, tourism & wildlife, livestock, and mining) has remained proportionally low compared to GDP. The sectors have a direct

impact on quality of life, thus the need for county and national government to increase investments in these sectors.

**Data Needs:**

While the KEPI provides a framework for greater analytic rigor in policymaking, it also reveals a number of severe data gaps that limit the analytic scope of the rankings. This calls for the need for better data collection, reporting, and verification across a range of environmental issues. This will improve KEPI assessments in the future.

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