NAIROBI CITY COUNTY
Better City, Better Life

CLIMATE ACTION PLAN 2020-2050

www.nairobi.go.ke

Document Purpose

The document presents, in a detailed and strategic structure, the efforts that Nairobi City County Government (NCCG) intends to carry out to reduce greenhouse gas (GHG) emissions and strengthen resilience and the capacity to adapt to the related climatic impacts. With this Climate Action Plan (CAP), Nairobi offers a road-map for making informed decisions and understanding where and how to achieve the largest and most economical emission reductions in line with other city and national policies, strategies and planning. The plan includes an inventory of existing emissions and scenarios of future emissions, targets for reducing these emissions and the mitigation and adaptation actions analysed and prioritized, in addition to the elements to compose an implementation strategy, including necessary resources and financing mechanisms.

Document Information

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TABLE OF CONTENTS

vi

CLIMATE ACTION IN NAIROBI

01 1

List of Figures

List of Boxes

List of Tables

Letter from the Governor

Cities all over the world continue to bear the impacts of climate change particularly in the wake of increasing urban challenges and continued climate related risks and hazards occasioned by extreme weather events. Cities is where the future happens first and in line with the recent climate report, there is need to accelerate and coordinate intervention measures towards attaining the goals of the Paris Agreement and walk together on the ***Race to Zero.***

Nairobi city has taken lead in the region and developed its first long term Climate Action Plan for 2020-2050. With this plan, the city of Nairobi seeks to restore its famed glory of being the *'green city in the sun'* while building climate resilience and reducing greenhouse gas emissions in the high impact sectors as well as achieving the SDGs and other city climate change and developmental priorities.

My government has been working closely with C40 Cities Climate Leadership Group to develop a scientific evidence base on greenhouse gas emissions in the city which informed the transformative climate change interventions contained within the plan. These actions have been domesticated from the National Climate Change Action Plan (2018-2022) and takes into consideration key strategies from the city such as the County Integrated Development Plans, Medium Term Plans, Annual Development Plans, key policies and regulations in air quality, urban planning, mobility, energy security, water and waste management strategies.

It is an ambitious and robust climate action plan that compliments and aligns with the updated Nationally Determined Contributions (NDC) for Kenya to reduce GHG emissions by 32% by 2030. This solidly positions the city of Nairobi as the first county in Kenya to develop such a plan that aims to offer wider benefits to citizens, improve livelihoods and health, create green jobs, restore parks and open spaces, improve mobility options for residents, enhance air quality management, embrace clean energy options and next generation mobility targeting NMT facilities and electric mobility.

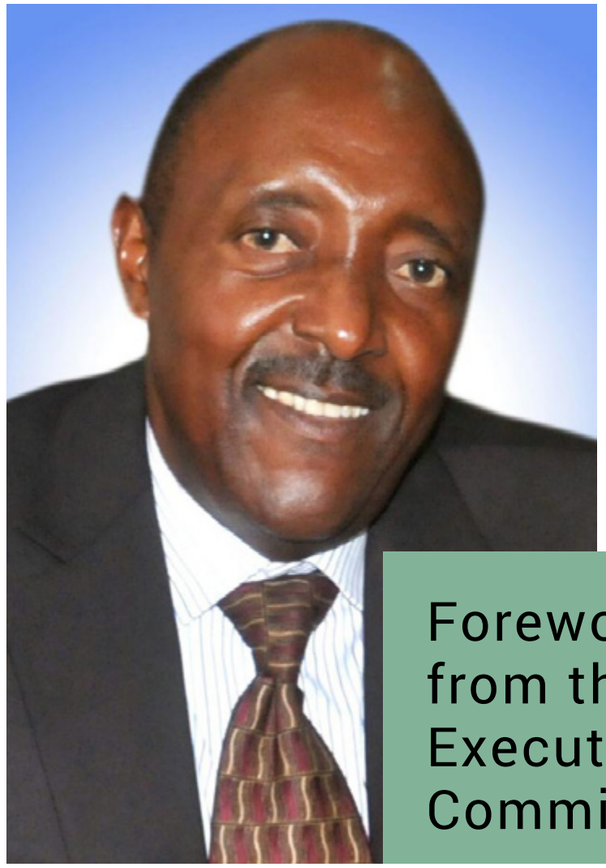
I would like to appreciate the consolidate efforts and support from the key city departments, line ministries and state agencies, international partners, private sector and community representatives who participated in bringing this document to life. Special gratitude to the County Executive Committee Member in charge of climate change Hon. Larry Wambua and his very able team for steering this process towards the delivery of such a transformative action plan.

The journey has just begun for the city of Nairobi to build resilience against frequent climate risks and hazards like urban flooding, heat stress, and extreme weather events that have high impact on urban infrastructure, food, health and water systems and calls for greater responsibility not only on the part of the county government but also from the great citizens and residents of Nairobi.

I call upon all partners to come on board and support in the implementation of this action plan through increased financing, enhanced collaboration and concerted engagement to ensure inclusivity and equity especially in line with the current challenges of the COVID-19 pandemic.

Together we can restore this great city to its former green glory and bask under the absolute promise of being the city of choice to invest, work and live in.

H.E HON. ANNE KANANU MWENDA
Governor, Nairobi County



Foreword Letter from the County Executive Committee Member

Nairobi City County Government embarked on an ambitious journey in 2015 to tackle its everyday climate challenges and develop long term actions aimed at ensuring sustainability, low carbon development, enhanced climate resilience and improved livelihoods for city residents.

The support of C40 Cities Climate Leadership Group in this process has been quite instrumental with the installation of a City Adviser working closely with the technical and political leadership of the city. This has culminated in the development of the city's first Climate Action Plan with transformative climate change interventions to meet global and national obligations of the city county government. This process is already bearing fruit with the establishment of the Climate Change Directorate in Nairobi that aligns with the provisions of the Climate Change Act of 2016. This process was also complimented with the designation of the County Executive Committee Member in charge of Environment and Natural Resources docket with the Climate Change Portfolio that will ensure the governance structure in the city is streamlined to facilitate mainstreaming, coordination, financing and implementation of climate change mitigation and adaptation actions.

This action plan embodies emerging and innovative approaches in the management of waste in the city with a shift from a linear to circular model to enhance the waste value chain and deliver quality services. It embraces mass mobility options and non-motorized forms of transport for walking and cycling, ensuring water security, promoting sustainable urban food systems and advancing clean energy options by focusing on renewables. This people-centric plan seeks to restore parks and open spaces and support the call towards a Green and Just Recovery by giving parks back to people, improve on general air quality and health of citizens and ensure economic prosperity while tackling the most challenging climate impacts in our city.

I remain positive and extremely excited about the opportunities that this action plan will bring forth and call upon support of all our partners to enhance coordination and implementation as we operationalize this new governance structure and keep at par with global cities while demonstrating astute leadership within the continent.

I am grateful for the strong leadership and commitment by Her Excellency the Governor of Nairobi, Anne Kananu in steering this process and ensuring the city remains connected with the mayoral leadership of other C40 Cities. Special gratitude to the city leadership and my technical officers for the splendid execution to deliver this action plan and to all partners for their dedication to drive the climate agenda in this city towards an innovative and sustainable future.

This is an action plan for posterity and I am both humbled and encouraged by the tremendous level of support that we have received and call upon our family of partners to continue to walk this journey with us and support in the implementation of these great interventions for a climate smart and resilient city of Nairobi.

HON. LARRY WAMBUA
County Executive Committee Member,
Environment, Natural Resources and Climate Change

Letter from the Executive Director, C40 Cities

C40's Deadline 2020 Programme supports the world's leading cities to meet the objectives of the Paris Agreement. C40 works with its member cities to help them develop Paris Agreement compatible climate action plans that if implemented with the speed required will help the world limit global temperature rise to 1.5°C above pre-industrial levels and prevent a climate crisis.

Nairobi is one of the 11 cities in Africa which are part of the Deadline 2020 Programme, the city's plan outlines ambitious and transformational actions to cut greenhouse gas emissions from the transport sector and transition the city towards clean mobility and non-motorized transport, enhance building energy efficiency, foster the use of sustainable and green energy, and promote waste and waste-water management, while building resilience of the city to the impacts of the climate crisis.

With a total of 36 climate mitigation and adaptation actions, and 15 ready-to-implement actions across the energy and buildings, waste and transport sectors, this robust plan delivers a holistic package of sectoral climate change mitigation and adaptation strategies, actions and pathways for building an inclusive, carbon neutral and resilient Nairobi. The city strives to transition to a green economy in the face of COVID-19 pandemic while delivering bespoke co-benefits in relation to job creation, cleaner air, healthier environment for a more liveable city. These actions will directly contribute to the implementation of the Kenyan National Determined Contribution (NDC).

The COVID-19 pandemic has exposed critical urban inequities and gender inequalities that exist when it comes to addressing the public health crisis in Africa. African cities are the most vulnerable to the climate crisis and the pandemic exacerbates the situation bringing to light the compounding impacts of climate change and COVID-19. Cities are

therefore on the frontlines of addressing both crises through creative solutions with the full recognition that actions in response to COVID can also transform cities to be greener and more climate-resilient to impacts of climate change.

The improvement of non-motorized transport facilities and development of mass transit options in Nairobi are aimed to reduce congestion, pollution, and greenhouse gas emissions. This demonstrates Nairobi's commitment to improving mobility and fostering inclusive urbanization through safer streets for pedestrians and cyclists and sustainable public transport.

I would like to recognize and appreciate the effort of the Nairobi City County Government (NCCG) leadership for the commitment to developing an ambitious, equitable, and inclusive plan of action. This serves as a guide to other cities within Kenya and Africa in general on how to effectively address the challenge of climate change focusing action on where greenhouse gas emissions are energy and buildings, transport and waste sectors.

C40 aims at pursuing continuous engagement with the city of Nairobi to actualize this plan of action and achieve bespoke ambitious climate targets set out in this transformational plan.

MARK WATTS
Executive Director
C40 Cities Climate Leadership Group

Mayors Letter of Commitment to D2020 Programme

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COUNTY EXECUTIVE COMMITTEE MEMBER
ENVIRONMENT, WATER, ENERGY AND NATURAL RESOURCES

CO(E&NR)/3/3/262

30th July, 2018

Mayor Hidalgo
Paris France

Dear Mayor Hidalgo,

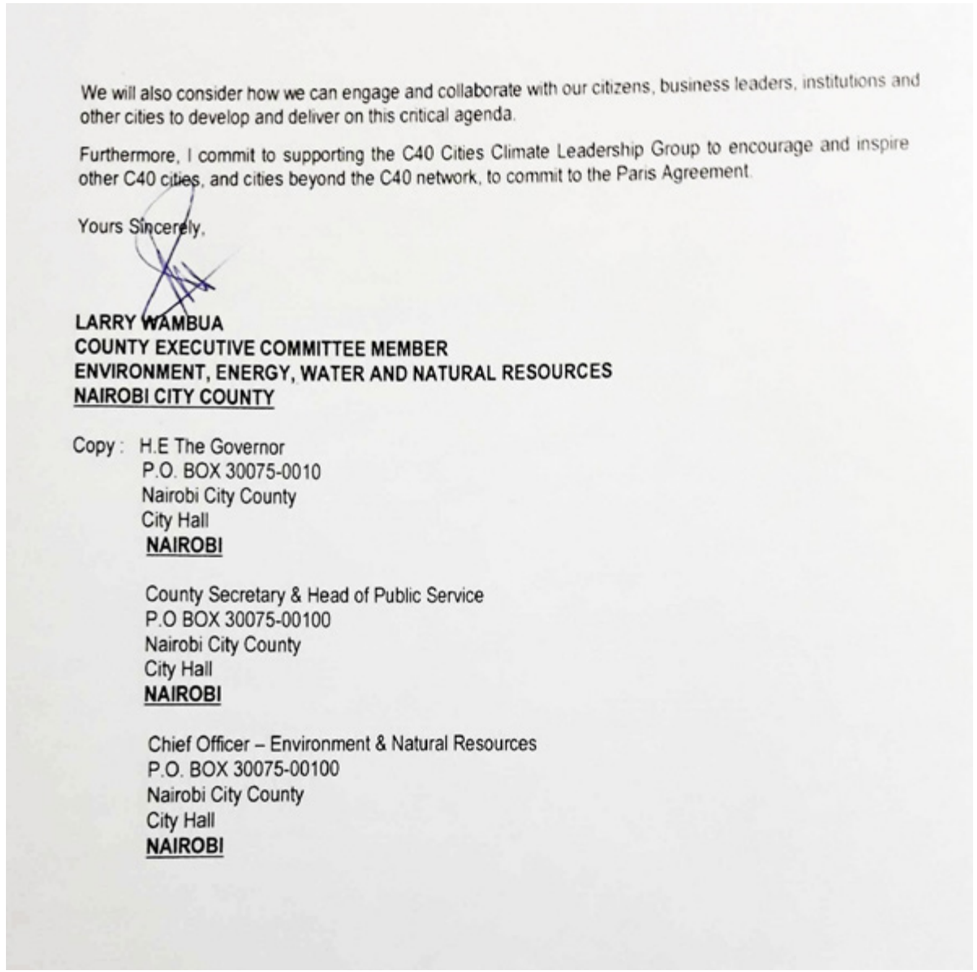
RE: LETTER OF COMMITMENT TO 'DEADLINE 2020' CLIMATE ACTION PLANNING TO SUPPORT THE IMPLEMENTATION OF THE PARIS AGREEMENT

In 2016, nations of the world ratified a historic global agreement on climate change, the Paris Agreement, committing to keep rises in global average temperatures within 2°C of pre-industrial levels, and to pursue efforts to limit temperature rises even further to only 1.5°C. The Agreement also commits to strengthening the ability of countries to deal with the unavoidable impacts of climate change through adaptation. All of this is set within the context of sustainable development and on the basis of inclusivity for all communities. According to research by C40 and partners, concrete action in the years to 2020 is necessary to achieve the ambition of the Paris Agreement and prevent catastrophic climate change. Deadline 2020: How Cities Will Get the Job Done provides a roadmap outlining the pace, scale and prioritization of action needed by C40 member cities, and identifies C40 cities' share of the remaining global carbon budgets to 2100 that would keep us on a climate safe path.

To support the implementation of the Paris Agreement, I commit Nairobi City County to develop and begin implementing a climate action plan (or series of plans) before the end of 2020 that will deliver action consistent with the ambitions of the Paris Agreement, and addresses both the need to reduce greenhouse gas (GHG) emissions and adapt to the impacts of climate change.

Specifically, I commit Nairobi City County to deliver a GHG emissions neutral and climate resilient city by 2050, with a public plan or series of plans to:

1. Develop a pathway to deliver a GHG emissions neutrality by 2050 at the latest, and set an interim target for 2030.
2. Demonstrate how the city will adapt and improve its resilience to climate hazards that may impact the city now, and in future climate change scenarios.
3. Outline the wider social, environmental and economic benefits derived from implementing the plan, and improve the distribution of these benefits throughout the city's population.
4. Outline how the city will approach implementation of the plan (or series of plans), using available powers, resources and partners.



We will also consider how we can engage and collaborate with our citizens, business leaders, institutions and other cities to develop and deliver on this critical agenda.

Furthermore, I commit to supporting the C40 Cities Climate Leadership Group to encourage and inspire other C40 cities, and cities beyond the C40 network, to commit to the Paris Agreement.

Yours Sincerely,

LARRY WAMBUA
COUNTY EXECUTIVE COMMITTEE MEMBER
ENVIRONMENT, ENERGY, WATER AND NATURAL RESOURCES
NAIROBI CITY COUNTY

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Acknowledgements

In the past few years, the negative effects of climate change and its impacts on lives, the environment, properties, economic growth and livelihoods, especially of the vulnerable and large informal sectors of the city, have made the City of Nairobi engage in the preparation of its first Climate Action Plan. It is impossible to name all people and institutions who took part in this process and contributed to the development of this document but Nairobi City County Government would like to acknowledge the hard work of all city stakeholders, as well as national and international experts who cooperated in this process.

Developing this Climate Action Plan would not have been possible without the political leadership and commitment of Nairobi City County Governor, Her Excellency Anne Kananu Mwenda and dedicated efforts of the county executive team led by the CECM in charge of Environment, Natural Resources and Climate Change affairs in the city Hon. Larry Wambua. Further, the continued support and engagement of the Director Environment and Natural Resources Mr. Isaac Muraya and the Chief Officer Mohammed Abdirahman and the NMS team have added great value in successfully steering this process. The Nairobi City County Government Environment and Natural Resources technical officers led by the CAP focal point Mr. Maurice Kavai as well as city departments of energy, transport, finance and the County Secretary's office has offered immense support and input in the development of the GHG inventory and this action plan. The Ministry of Environment and Forestry through the Climate Change Directorate as well as the key line sectoral Ministries of Transport and Energy as well as State Agencies like NEMA and KMD have also been instrumental throughout this journey. Other key institutions that have supported in this process include SNV Kenya, CCAK, GIZ, CDKN, SEI, KAM, UNDP contributed expertise to the climate evidence basis and provided support for actions prioritisation and detailing processes, for which we are grateful. The CBIT Project, Ahadi Kenya and the different service providers were helpful partners in our stakeholder engagements. Special appreciation to officials of the Ministry of Environment and Forestry's Climate Change Directorate in particular the late Mr.Stephen King'uyu whose input and support was key in the beginning of the development of the CAP. Gratitude to the Ministry of Energy through the national focal point Mr. Peter Maneno, State Department of Transport through the National focal point Ms. Esther Gachanja, GIZ-TraCs project, Niko Green, KCCWG, UN Environment for their active participation at various workshops. NCCG appreciates the support provided by the C40 internal review team for a comprehensive review of the draft document. KALRO, KFS, NTSA, FES Kenya, SDI, Naipolitans, Safer Nairobi Initiative also deserve a mention for contributing to the process.

We acknowledge the assistance provided by C40 Cities Climate Leadership Group throughout this journey, with specific reference to the C40 Africa Team especially, C40 City Advisor to Nairobi, Phillip Dinga, C40 Technical Advisor for East Africa, Elizabeth Mwangi, CAP Africa Manager, Paul Jorgenson, Regional Director and the Deputy, Hastings Chikoko and Gifti Nadi. Appreciation to the consultants that have supported this process from the very beginning, Ricardo Energy & Environment and Sustainable Energy Africa. The support was made possible by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) as well as the Cities Alliance. Special thanks to the numerous individuals from the city and national government, academia, private sector and community interest groups that contributed knowledge and insights through the workshops and consultations over the past years of the climate action planning process.

Acronyms

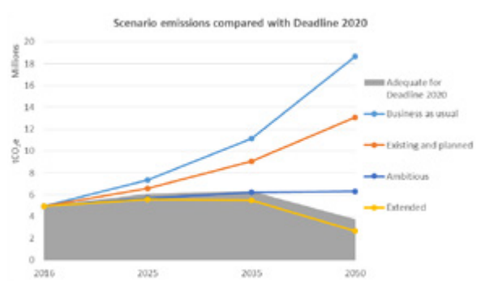
ADPs	Annual Development Plans
AQMP	Air Quality Management Plan
BAU	Business As Usual
CAP	Climate Action Plan
CBD	Central Business District
CCAK	Clean Cooking Association of Kenya
CDKN	Climate and Development Knowledge Network
CEAF	County Energy Access Fund
CECM	County Executive Committee Member
CIDP	County Integrated Development Plan
CRA	Climate Risk Assessment
CRMF	Climate Risk Management Framework
EPRA	Energy and Petroleum Regulatory Authority
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoK	Government of Kenya
ISWMP	Integrated Solid Waste Management Plan
JKIA	Jomo Kenyatta International Airport
KARA	Kenya Alliance of Resident Associations
KAM	Kenya Association of Manufacturers
KCAA	Kenya Civil Aviation Authority
KENGEN	Kenya Electricity Generating Company
KeNHA	Kenya National Highways Authority
KEPRO	Kenya Extended Producer Responsible Organisation
KEPSA	Kenya Private Sector Alliance
KFS	Kenya Forest Service
KNBS	Kenya National Bureau of Statistics
KURA	Kenya Urban Roads Authority
LPG	Liquefied petroleum gas
M&E	Monitoring and Evaluation
MEPS	Minimum Energy Performance Standards
MoEP	Ministry of Energy and Petroleum
MTPs	Medium Term Plans
NaMATA	Nairobi Metropolitan Area Transport Authority
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCFP	National Climate Change Framework Policy
NCCG	Nairobi City County Government
NCCRS	National Climate Change Response Strategy
NCFP	National Climate Finance Policy
NDC	Nationally Determined Contribution
NMT	Non-motorised Transport
NMS	Nairobi Metropolitan Services
NOx	Nitrogen oxide
NTSA	National Transport and Safety Authority
PETCO	Kenya PET Recycling Company Limited
Q&A	Question and answer
SDG	Sustainable Development Goal
TraCs	Advancing Transport Climate Strategies
UN	United Nations
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile Organic Compounds

Executive Summary

Nairobi city is the capital and largest city in Kenya and among the fastest-growing cities in East and Central Africa. It has complex temporal and spatial distributions of population, infrastructure, and socioeconomic activities. Rapid urbanization and unplanned settlement driven by rapid population growth and urban poverty lead the city to an urgency to act to mitigate and adapt to climate change.

Nairobi's most recent Greenhouse Gas Inventory is based on 2016 data and was developed in accordance with global best practice (GPC compliant). Results from the inventory showed that in 2016, total GHG emissions in the city of Nairobi amounted to 4.7 $MtCO_2e$ which is equivalent to 1.2 tCO_2e per person. The transport sector had the largest contribution. A comparison of national and city-level total GHG emissions shows that Nairobi currently accounts for approximately 5% of Kenya's total emissions. However, as the largest city in Kenya, Nairobi will likely contribute increasingly to national emissions.

Nairobi's 2016 inventory was modelled to project emissions to 2050, using 2025 and 2035 as interim years. By developing and comparing multiple emissions scenarios (Business-As-Usual - if no climate actions are implemented; Existing and Planned Scenario - using planned actions and global market trends; Ambitious Scenario - ambitious yet achievable actions if barriers are addressed; Extended Scenario - an even more ambitious scenario that would require major barriers to be removed, i.e. there is a risk it may not be achievable), Nairobi was able to determine the ideal set of actions required to become carbon neutral by 2050. The climate scenarios were compared with the emissions reduction that needs to be achieved to show adequate progress towards achieving an emissions reduction pathway in alignment with the Paris Agreement, which aims to keep global warming below 1.5°C. In the ambitious scenario, the GHG reduction targets are only achieved in 2025 and 2035. In 2050, climate actions implemented achieve a 66% reductions in emissions from the business-as-usual scenario, with emissions of around 6 million tonnes still remaining. In order to meet the carbon neutrality goal, much more ambitious actions would be required, including more stringent enforcement of current regulations. An Extended Scenario was developed, considering more aggressive actions but substantive barriers will need to be addressed by Nairobi City County Government in order to move from the Ambitious trajectory to the Extended one.



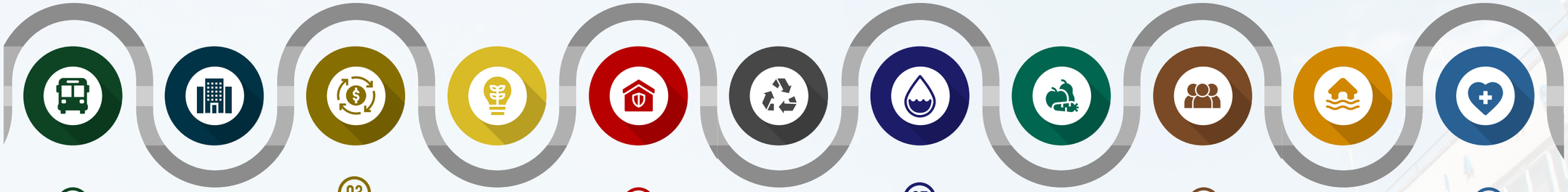
Through analysis of future projections and historical trends, three key climate hazards have been identified as prominent drivers within Nairobi: floods & storms, heat and drought. An assessment has identified impacts that may pose risks to social, natural and economic capital in Nairobi, producing a list of impacts for each climate hazard, which in turn were assessed, based on determined level of risk (likelihood and disruptiveness of event), on a low-medium-high scale.

Table 1: Prioritized inpacts per hazard theme

PRIORITISED IMPACTS PER HAZARD THEME AND CAPITAL AFFECTED		
Hazard theme	**Key impacts**	**Rank / prioritisation**
FLOODS & STORMS	Flooding leading to soil erosion from uncovered areas, siltation of rivers and damage to property due to clogged water ways which impacts communities living next to rivers	Very high
	Disruption of transport and communication lines as well as damage to property	Very high
	Vector and water borne diseases especially spikes in cases of malaria and cholera outbreaks from the contamination of domestic wastewater as well as water wash diseases from sanitation facilities which have low coverage	Very high
HEAT	Heat stress which caused various illnesses and heat stroke especially for the elderly and those with underlying conditions like hypertension	Very high
	Increase in vector and water borne diseases which high cases of mosquitoes breeding where malaria cases are frequent	Very high
	Food availability affected due to lack of essential minerals and balanced diet for populations particularly in informal settlements	Very high
DROUGHT	Prolonged periods of drought lead to food insecurity especially for the elderly and children under 5 years which can also affect their mental health	Very high
	Disease outbreaks like cholera, dysentery and kwashiorkor occasioned by unhealth diets which lack essential minerals	Very high
	Diminished urban water resources leading to water stress and scarcity	Very high

Recognising its current and future threat from climate change, Nairobi recognises the need for targeted action at the city scale, with proposed strategies aligned to specific urban contexts and which utilise institutional, financial and social capacity. Through this CAP, the city committed in playing its part to reduce the growth of future emissions, supporting the achievement of international and national climate change mitigation goals, and achieving the 17 United Nations Sustainable Development Goals (UN-SDGs). Working together with the national government, city stakeholders, and all citizens, the city aims to transition to a lower emissions and resilient future through the following goals and actions:

A GLIMPSE OF THE CLIMATE ACTIONS PLANNED IN THE CITY



01 LOW CARBON SOLUTIONS AND CLIMATE-PROOFING THE TRANSPORT INFRASTRUCTURE

Improvement of NMT facilities

Development and improvement of mass transit options and mode switching

02 URBAN DEVELOPMENT

Development of new master plan to decentralise services away from the CBD

03 TRANSITIONING TO A CIRCULAR ECONOMY

Implementation of a circular economy solid waste management approach

04 CLEAN AND SECURE ENERGY SECTOR

Increase adoption of renewable energy

Develop Minimum Energy Performance Standards (MEPs) for more appliances

05 CLIMATE-PROOFING HOUSING STOCK

Revision of building codes for Enhanced Energy Efficiency in buildings

06 WORKING TOWARDS A CLEAN AND ZERO WASTE CITY

Invest in Solid Waste Management this includes material recovery facility and transfer stations.

Wastewater management

Reduce the amount of solid waste in stormwater systems through city-wide solid waste collection initiatives

07 WATER RESOURCE MANAGEMENT

Adopt water conservation initiatives to cater for scarcity

08 RESILIENT FOOD SYSTEMS

Heighten innovation in food process and storage; adopt a Food Systems Strategy.

09 SAFEGUARDING VULNERABLE COMMUNITIES

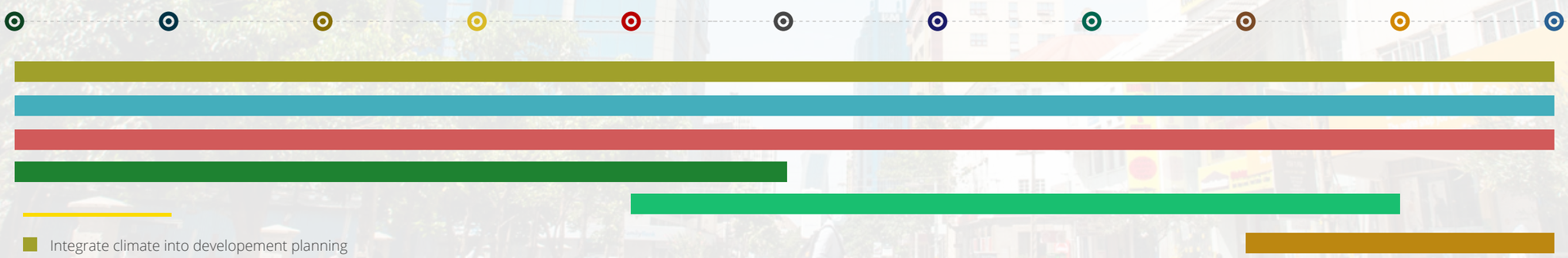
Increase access to climate related resilience and safety net programmes.

10 DISASTER MANAGEMENT

Introduction of stormwater infrastructure policies and regulations to maintain and operate drainage systems so that stormwater runs efficiently in the city.

11 IMPROVING HEALTH STANDARDS

Strengthen climate related disease mapping in vulnerable communities in hazard prone areas.



- Integrate climate into developement planning
- Enhance synergies between adaptation and mitigation action
- Achieve 23% reduction below BAU emission by 2025, 44% reduction by 2035 and 66% reduction by 2050
- Enhance resilience of public and private sector investment
- Enhance resilience of vulnerable population to climate impact through adaptation to disaster risk reduction strategies.
- Improve knowledge and learning for adaptation and future protection of the country

The implementation of Nairobi's CAP will be achieved by operationalising capacities, strengthening climate governance and partnerships and maintaining monitoring and evaluation practices that provide consistent feedback on implemented actions. The city is also committed to periodically review and update the climate action plan in order to explore opportunities to increase ambition in the future and strengthen the mainstreaming of climate change in the city processes particularly the County Integrated Development Plans (CIDPs) and Annual Development Plans (ADPs).

01

Climate action in Nairobi

1.1.
Overview of the Climate Action Plan

Introduction

A climate change action plan (CAP) is a strategic document that includes specific measures that demonstrates how a city will reduce GHG emissions and adapt to the impacts of climate change, contributing in this way to the goals of the Paris Agreement.

The Paris Agreement commits signatory countries to "holding the increase in the global average temperature to well below 2ºC above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5ºC above pre-industrial levels." In response to the Paris Agreement, C40 Cities launched "Deadline 2020 Programme – How cities will get the job done" and has developed the C40 Cities Climate Action Planning Framework, which sets out the essential components of a climate action plan to deliver low-carbon resilient development.

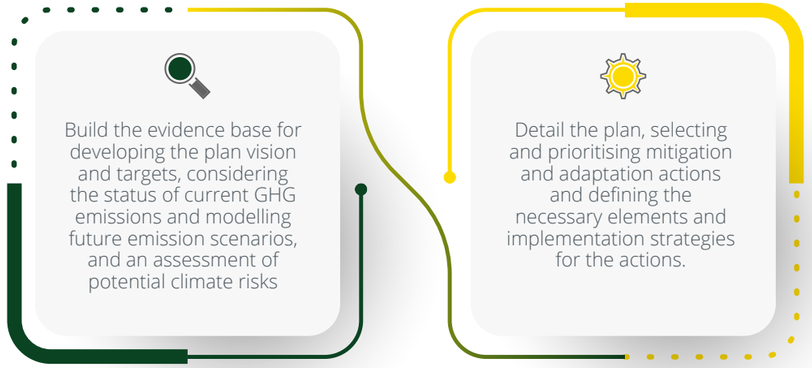
Under C40's Deadline 2020 programme, Nairobi City County Government has committed to develop and implement an ambitious Climate Action Plan (CAP) that aligns with the global goal of limiting the average temperature rise to 1.5°C. This document presents the Nairobi CAP, which is defined based on evidence, it is inclusive, and it aims to achieve its goals in a transformational way, centred on understanding the powers of the city and the wider context. In addition, it establishes a transparent process to monitor implementation, communicate progress and update climate action planning in line with governance and reporting systems.

"Nairobi is the capital and largest city of Kenya. The city and its surrounding area also form the Nairobi County. The name "Nairobi" comes from the Maasai phrase 'Enkare Nyrobi', which translates to "cool water". Nairobi is referred to as the green city in the sun. This climate action plan seeks to embrace this approach and restore the city back to its enviable name."

CAP Development Process

The CAP aims to mainstream the city's current plans and policies, thereby, each action has been developed by building on existing city policies, structures and initiatives. These actions are also domesticated based on the National Climate Change Action Plan 2018-2022 mitigation and adaptation interventions that have a city specific orientation for implementation. Stakeholder participation and engagement has been deployed throughout the development process as a key element of modern administration and decision making. In addition to bringing effectiveness and ownership to the process, stakeholder engagement and documentation of findings are key for future engagements, improving trust and enhancing transparency.

The climate action planning process in Nairobi had two main phases:



Box 1: Steps of CAP development process

Stakeholder participation and engagement has been deployed throughout the development process as a key element of modern administration and decision making. In addition to bringing effectiveness and ownership to the process, stakeholder engagement and documentation of findings are key for future engagements, improving trust and enhancing transparency. A summary of the climate action planning process in Nairobi is represented in Figure 2, highlighting the key steps on where city engagements happened.

Step 1:

The greenhouse gas inventory has been compiled by Nairobi City County Government sectors (led by the Environment sector), C40 Cities, Sustainable Energy Africa and Ricardo Energy and Environment (consultants),with support from Line Ministries, State Agencies, Development Partners, Civil, Business and Community Organizations, the media, academia and private sector stakeholders.[1]

Step 2:

Nairobi's 2016 inventory was modelled to project emissions to 2050, using 2025 and 2035 as interim years. Using Pathways modelling tool, different emissions scenarios were developed, using population growth, GDP and other parameters, and discussed with stakeholders during various in-city workshops.

Step 3:

The scenarios developed considered actions from national and city level with potential to mitigate the increase in Nairobi's future emissions. Due to the COVID-19 pandemic, at this time, virtual meetings were organised with key stakeholders to discuss and prioritise the long list of actions.

Step 4:

Through virtual workshops, follow-up meetings and also sharing templates with stakeholders for collection of information, the prioritised actions were detailed and included into the CAP with key information to support their implementation, as timeline, potential funding, lead agency etc.

Box 2: What should a CAP include?

[1]Greenhouse Gas (GHG) Emission Inventory of Kenya's Capital, Nairobi City (2016

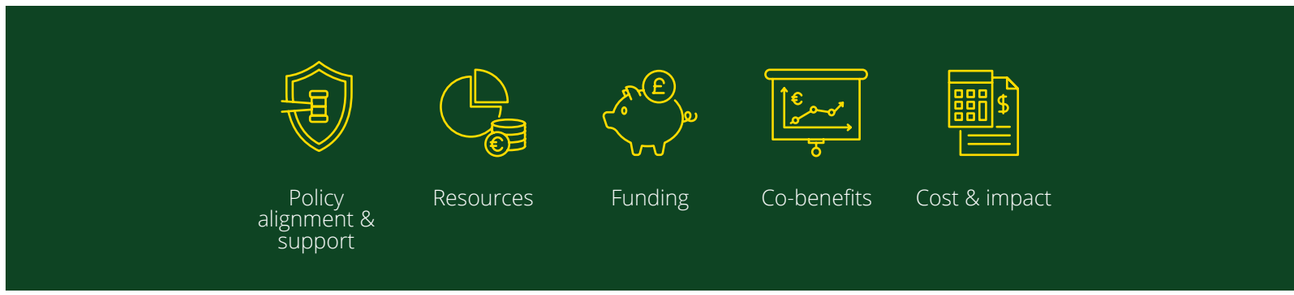
Nairobi's selected climate actions have been identified through consultation with key stakeholders facilitated by the CAP city team. The engagement acted as a catalyst for generating discussion and using the stakeholders' insights and knowledge about the city's existing actions and policies. An initial long list of actions was assessed and modelled into mitigation scenarios, that were discussed with stakeholders to develop the city's vision and identify additional potential mitigation actions the city should implement to reach a goal of net-zero emissions by 2050. Further discussions with stakeholders through online surveys and meetings helped defining the priority actions that the city intends to implement in the coming years. A web-based tool was configured and shared to stakeholders as a survey, where participants answered specific questions about each of the climate mitigation actions. The answers allowed to score the actions according to key criteria, such as alignment with policies and support, resources available for the action implementation and potential benefits. To present the survey results and engage more stakeholders, sectoral virtual meetings were organised. For each meeting, one short presentation was delivered to explain the principles and criteria to be taken into consideration when prioritising climate actions. Then, participants were asked to discuss and score the longlist of actions against key questions/criteria, with the aim of understanding the potential of each action and to identify a prioritised list of actions for inclusion in the CAP. The criteria were grouped under five main themes namely: Policy alignment & support; Resources; Funding; Co-benefits (Economic growth & development (including jobs); Public service delivery; Inclusivity & equity; COVID-19 response / recovery); and Cost and impact.

There was a separate, although similar, prioritisation process for adaptation actions, using a Rapid Climate Risk Assessment (CRA) as the foundation. Within the Rapid CRA, climate impacts were assessed based on their likelihood and level of disruptiveness, and subsequently given a rating of low-medium-high priority. Existing adaptation actions, outlined in the Kenya National Adaptation Plan (NAP, 2016) and the NCCAP's Adaptation Technical Analysis Report (ATAR), were identified based on their ability to address the prioritised impacts, and ultimately reduce vulnerability or increase resilience. Selecting actions that already exist within national strategies can help to increase the robustness of the proposed adaptation action plan, as the actions reflect the context in regard to existing mechanisms, decision-making structures and tools available within Kenya; ultimately streamlining the implementation process.

Box 3: The prioritization process

The prioritisation process for Nairobi's climate mitigation actions utilized an assessment and a scoring process, where stakeholders were asked to discuss and score the long list of actions against key questions/criteria, with the aim of understanding the potential of each action, and to identify a prioritized list of actions for inclusion in the CAP.

The criteria for prioritization is determined by the five themes highlighted below



The highest scoring actions formed Nairobi's short-list of priority actions which were further validated during a second round of meetings, when stakeholders were also asked to distinguish between 'flagship actions' and supporting actions, identify key implementation steps via 'roadmaps', and detail potential pilot projects.

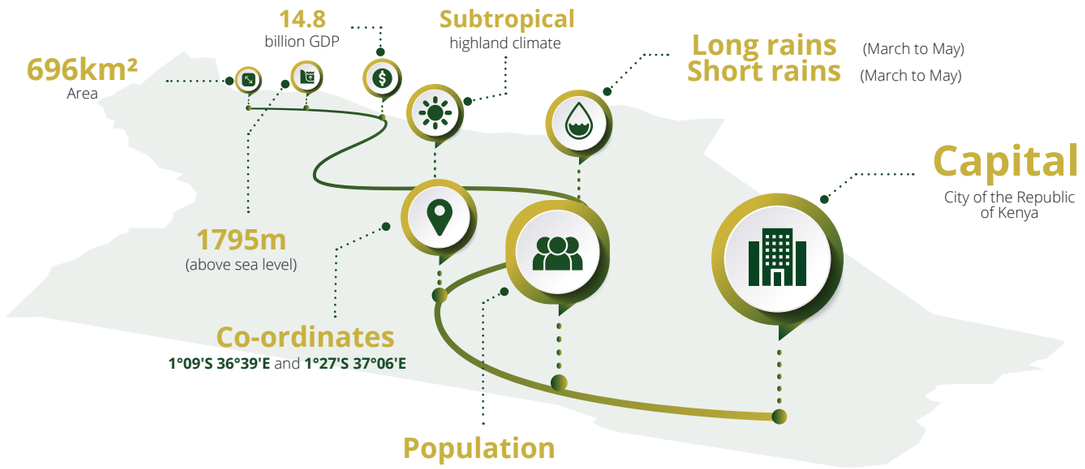
Climate impacts were assessed based on their likelihood and level of disruptiveness, and subsequently given a rating of low-medium-high priority. Existing actions taken from the National Climate Change Action Plan (NCCAP) and the existing long-list of priority local and national actions, were cross referenced with prioritised impacts, creating a list of contextual and targeted actions or initiatives aimed at reducing sensitivity, exposure and vulnerability, improving adaptive capacity, and increasing resilience. The Rapid CRA's framing of impacts around social, natural or economic capital allowed the action selection process to maintain a consideration of social, natural and economic resilience.

1.2. Why Nairobi is creating a climate action plan

Setting the scene

The area Nairobi currently occupies was essentially uninhabited swamp until a supply depot of the Uganda Railway was built by the British in 1899 linking Mombasa to Uganda. The location of the camp was chosen due to its central position between Mombasa and Kampala. It was also chosen because its network of rivers could supply the camp with water and its elevation would make it cool enough for residential purposes for not only the thousands of Indian laborers who came to Kenya seeking to be employed to work on the railway line, but also for the British settlers. With such an apt location, it had soon grown big enough to become the railway's headquarters.

The city was first incorporated in 1900 as the Township of Nairobi. The regulations governing it were published on the 16th April 1900 under the powers vested in Sir Arthur Hardinge, H.M. Commissioner at Zanzibar by Article 45 of the East Africa Order-in-Council. The regulations defined the township of Nairobi as "the area comprised within a radius of one-mile-and-a-half from the present office of H.M. Sub-Commissioner in Ukamba"[2] and authorized the Sub-Commissioner to nominate annually a number of the leading residents or merchants to act with him as a committee.[2]



[2]Nairobi.go.ke

Figure 1: Scope of the CAP

Socio-economic context and key future trends

Nairobi has been the capital city of the Republic of Kenya since the country gained independence in 1963. Its location on the banks of the Nairobi River has made it an important trading and commercial centre since the turn of the 19th century, due in part to its railway connections. Being the largest city in Kenya, in the past few decades Nairobi has undergone rapid and sustained expansion to become one of the fastest-growing cities in Africa. To this day, the railway and light industrial sectors are major employers in the city. Nairobi is the major commercial and industrial hub of not only the country but is also the regional and international headquarter for several commercial and public institutions that include multinational companies and United Nations agencies.[3]

Industries in Nairobi cover various sectors including chemicals and allied industries, food and beverages, pharmaceuticals and medical equipment, metals, textiles, building mining and construction, as well as agriculture and fresh produce. Most of the formal sector wage employment in Kenya is in the manufacturing industry, closely followed by trade and hospitality. Other industries that play a key role in wage employment creation cover the transport, communications, finance, real estate and business services.

The informal sector covers economic activities at a small scale that are mostly unregulated, simple in its technological use, semi- organized and employs few people per establishment. However, according to the Kenya National Population and Housing Census 2009, there were roughly four times as many people self-employed in the informal sector compared with those in formal wage employment.[4]

Despite the range of opportunities available, roughly 60% of the population lives in densely populated slums (although estimates vary, and the figure may be higher). Therefore, Nairobi is characterised by significant inequalities in terms of housing, employment, and access to services.

[3]Ndolo I. J, C. Oludhe, N. J. Muthama, J. K. Ng'ang'a and R. S. Odingo, 2018. Influence of Urbanisation on Minimum and Maximum Temperature characteristics over Nairobi City. J. clim. chang. sustain. Vol 1, issue 2, pp. 73-81. https://doi.org/10.20987/jccs.1.04.2018.

[4]County Government of Nairobi (2018) Draft County Integrated Development Plan

Informal Settlements

With rapid growth in population there has also been rapid growth in demand for land, resulting in expansion of informal settlements in Nairobi. Kibera and Mathare Valley slums, on the west and east of the city respectively, are the two largest informal settlements in the city[5] and the latter is the largest urban slum on the continent. These, and other settlements like Korogocho and Kawangware, are characterised by uncontrolled growth of poor housing.[6]

As stated previously, among the total population of more than 4.4 million people, it is estimated that around 60% of Nairobi residents live in slums. In addition to lack of ownership rights over the land, residents often have limited or no access to electricity, clean water, medical facilities, waste or wastewater collection. Furthermore, informal settlements are often located in Nairobi's most physically vulnerable areas – flood plains[7], steep slopes, river valleys or adjacent to sewers and dump sites. This situation exposes slum residents to floods, fires, landslides, and health risks from contaminants.

Climate and environmental context

Prior to urbanisation, much of the land area of Nairobi would have comprised grasslands and rainforests. In addition to urban parks, there remain two large rainforests within the municipal boundaries: The Ngong rainforest (c. 538 hectares) and Karura (c. 1,000 hectares). However, continued growth and urbanisation are placing ever increasing strain on the city, in terms of public services, food security, infrastructure and natural resources. This is leading to a decrease in green open spaces, and degradation in the quality of those spaces.

Climate change, combined with rapid urbanisation, is creating new and intensifying existing challenges for Nairobi's terrestrial and aquatic ecosystems and air quality. A UN report[8] on climate risks in Kenya emphasised that the country as a whole is highly susceptible to the impacts of earthquakes and extreme climate events such as floods, heat, droughts, landslides, and forest fires. In Nairobi, where a significant portion of the population is poor and/or living in informal settlements, these hazards are particularly acute.

X-factor:

The world's only wildlife capital. Only city in the world with a National Park.

[5]Nairobi, Kenya: https://www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/Nairobi.pdf

[6]Nairobi, Kenya: https://www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/Nairobi.pdf

[7]Moullier, Thomas; Hanzen, Antoine; Castell Ruano, Eduardo; Barker, Louisa Helen; Abrassart, Theresa Maria Josette. 2019. Managing Risks for a Safer Built Environment in Kenya: Building Regulatory Capacity Assessment (English). Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/982831550848603568/Managing-Risks-for-a-Safer-Built-Environment-in-Kenya-Building-Regulatory-Capacity-Assessment

[8]International Institute for Sustainable Development, 'Climate Risks, Vulnerability and Governance in Kenya: A review.' Available at: Climate Risks, Vulnerability and Governance in Kenya: A review (iisd.org)

Air quality

The main sources of air pollution in Nairobi city are motor vehicles, industries, the use of charcoal and wood and open burning of waste. These are sources of harmful gases such as nitrogen oxide (NOx), volatile organic compounds (VOCs) and particulate matter. Poor air quality has been identified as a contributing factor to the high rates of respiratory illnesses in Nairobi where, as of 2014, respiratory diseases were listed as the third highest cause of death.[9] Vulnerable and low-income populations are at particularly high risk from poor air quality, due to multiple factors such as proximity to industrial or polluted sites, combined with the lack of available health services.

There have been some local and national government efforts to improve air quality in the last decade, notably the national Air Quality Regulations introduced in 2014, and the Air Quality Policy and Action Plan (2019-2023) which was developed by the Nairobi City County Government in collaboration with UN Environment and the Stockholm Environment Institute. The city government is currently developing the Nairobi Air Quality Bill and Regulations set to be passed by the county assembly of Nairobi in the coming months. There have also been initiatives by other organisations such as the Kenya Air Quality Network which convenes stakeholders from different institutions to address air quality challenges in the city. However, implementation has been challenging, particularly due to the lack of monitoring sensors and subsequent unavailability of reliable data.[10]

Water resources

Water resources in Nairobi are compromised due to a combination of environmental and anthropogenic factors. The bulk water supply that Nairobi receives is unreliable, especially during seasons of drought. Although it is estimated that water connection is currently at about 80 percent in the city, only 40 percent of those with household connections receive water continuously. According to the World Bank, as of 2017 there was a freshwater supply of roughly 412 cubic meters per person per year, down from around 647 cubic meters per person per year in 2000. For comparison, based on the Fallenmark Water Stress Indicator, the threshold for a country experiencing 'water stress' is below 1,700 cubic meters per person per year, while the threshold for 'water scarcity' is 1,000 cubic meters per person per year.[11]

The main sources of water for the residents in Nairobi County are from Sasumua Dam in Nyandarua, Kikuyu Springs, Ruiru Dam, Thika Dam and Ngethu water works. It is estimated that there are around 50% losses from the distribution system due to the poor state of repair and illegal connections. Siltation is also a major problem, which is linked to deforestation in the catchment area upstream.[12]

Nairobi Dam was originally constructed to provide drinking water for city residents, but the Nairobi River has become highly polluted over the decades and is now deemed unsafe for human consumption. Among the many contributing factors, a major issue is that Kibera is located adjacent to the dam and the reservoir has been filled with sewage, garbage, and industrial waste products.

To try and mitigate the water supply issues, the Government has initiated various borehole drilling projects.[13] Going forward, a key challenge will be to increase access to clean water while ensuring sustainable abstraction takes place.

Wastewater Treatment

Nairobi's rivers receive untreated or improperly treated discharge from industrial areas and sewage treatment plants. Waste and sewage from informal settlements also find their way into the rivers where sanitation facilities are basic and there is no public solid waste collection. Nairobi currently has two main wastewater treatment plants, Dandora and Kariobangi. The treatment plants are estimated to serve about half of Nairobi's population but have experienced issues relating to poor maintenance and lack of capacity due to the population influx. This has resulted in discharge into rivers, frequent blockages, and other issues[14].

[9]Nairobi Statistical Abstract 2014, page 36

[10]ASAP_-_East_Africa_-_Air_Quality_Briefing_Note_-_Nairobi.pdf (publishing.service.gov.uk)

[11]Renewable internal freshwater resources per capita (cubic meters) - Kenya | Data (worldbank.org)

[12]Nairobi County Integrated Development Plan 2018, 37

[13]Water for all project: https://www.capitalfm.co.ke/news/2019/05/sonko-launches-water-for-all-initiative-in-nairobi-county/

[14]http://erepository.uonbi.ac.ke/bitstream/handle/11295/97457/Miruka

Solid Wate Management

According to the Integrated Solid Waste Management Plan for Nairobi 2010-2020, roughly 50% of the residential population has access to regular solid waste collection services. In the informal settlements, this rate is much lower. Solid waste is mostly collected by private contractors engaged by the NCCG, although there are some collections made by community-based organizations and the city fleet. A large proportion of waste is dumped in unregulated landfills rather than being recycled or sent to sanitary landfills, resulting in major pollution of the land and water systems.

Green spaces

Green spaces in Nairobi, both within the urban centre and the surrounding area, are under threat from urban expansion and environmental degradation. At present, around 5.3% of the built-up area in the city comprises public open spaces, which equates to a very small area per capita. According to a study by Kenya Forest Service (KFS, 2013) the national tree cover is about 7.2% while that of Nairobi City County is 7.6%; however, there is a national forest target of 10% of land area, and the major afforestation effort would have to be in community and private lands. There are numerous parks and forests close to the city that are home to many different species of wildlife and serve as recreational spaces as well. These are under threat due to the ever-growing demand for land for real estate development and road building. Relatedly, there has been a steady decline of land for agriculture in the city as conversion has increased towards residential buildings. This has meant that the city relies heavily on other counties for its supply of food produce.

There is a clear need for Nairobi to work towards improving the amount of urban land designated, used and experienced as public space. This is particularly important to future-proof the city from stress and such shocks climate and health disaster risks. Remediating the environmental damage while finding ways to expand the amount of high-quality green space is a key issue to the city.

TO TACKLE THESE ISSUES, NAIROBI'S CAP AIMS TO ENSURE IT ADDRESSES THE ENVIRONMENTAL DEGRADATION THROUGH A SERIES OF TRANSFORMATIONAL ACTIONS TO EQUIP THE CITY WITH A RESILIENT & SUSTAINABLE INFRASTRUCTURE REGULATORY FRAMEWORKS & COMMUNITIES

1.3. Nairobi's governance and powers to address climate change

The governance system in Nairobi came into being after the promulgation of the new constitution in the year 2010. The previous structure classified the country under 8 provinces and Nairobi was one of those administrative units under the leadership of a mayor. There was no Mayor of Nairobi from 1983 to 1992 because the City Council of Nairobi was replaced by the City Commission appointed by then President Daniel Toroitich Arap Moi. The City Council was restored after the multi-party elections of 1992. In the year 2013 the office of mayor ceased to exist since under the Constitution of Kenya, 2010 local governments were replaced by county governments.

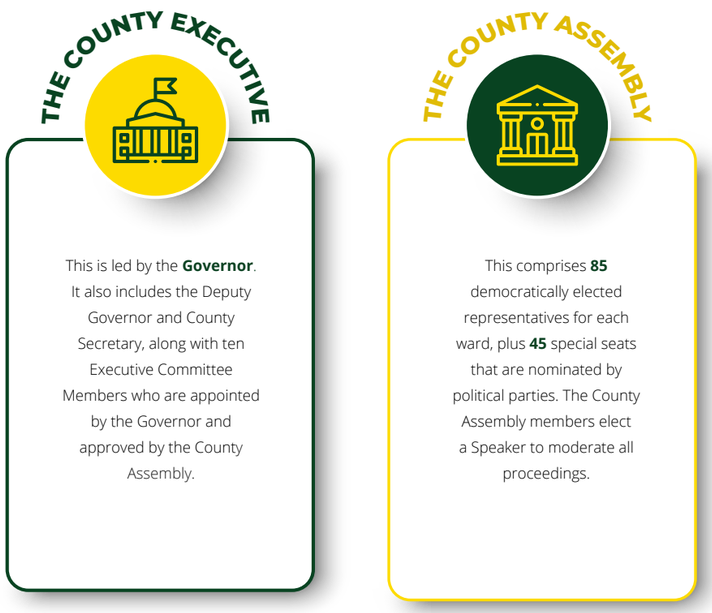
Post 2010, the structure changed to devolved governance units where Nairobi is recognized as both a city and county government under the leadership of a Governor. Nairobi has had 39 mayors till then. The Urban Areas and Cities Act (revised in 2012) and the Constitution of Kenya 2010 mandates the establishment of functions and institutions in the governance of the capital city. The City has had 3 Governors since 2010 with the current Governor being the first female to occupy the office, Her Excellency Anne Kananu Mwenda.

In March 2018, the President of the Republic of Kenya H.E Uhuru Kenyatta formed a new body the Nairobi Metropolitan Services (NMS) under the leadership of General Mohamed Badi as the Director General. The NMS was constituted to take over the functions of key county government functions after the handover of these functions by the former Governor Mike Sonko on February 25th 2018 as provided for in the Kenyan Constitution. Article 187 of the Constitution provides that a function or power of government at one level may be transferred to a higher level of government. The transferred functions include health, transport, planning and development and waste management. The NMS with support from the County Government of Nairobi has implemented impactful projects like expansion and development of NMT facilities, water provision, city planning and development, decongestion of the CBD, enhancing green spaces and parks and waste management.

City administrative structure

The Constitution of Kenya assigns 14 separate responsibilities to Counties, which include but are not limited to: health, transport, control of air and noise pollution, trade development and regulation, education, planning (including housing, electricity and gas), water and sanitation services, and refuse collection. Within this context, Counties are mandated to plan and implement their climate mitigation and adaptation actions and set up the necessary infrastructure to drive their agendas on climate change matters through policies, laws and strategies which are all developed in the city and are ratified by its law-making arm. In addition to these locally devolved powers, County Governments are responsible for implementing policies that are set at a primarily national level, including strategic education, health and infrastructure initiatives.

The Nairobi City County Government (NCCG) comprises two 'arms', as follows:



Box 4: County government of Nairobi

Box 5: Hierarchy & roles of the County Executive

Within the NCCG, the Environment and Natural Resources Department has primary responsibility for climate change-related programs. Recently through a memo that was approved by the NCCG Cabinet on 23rd February 2021, the CECM in charge of Environment and Natural Resources was designated as the minister in charge of climate change affairs in the city. The NCCG has begun engaging with the National Government through the Ministry of Environment and Forestry's Climate Change Directorate (CCD) towards operationalization of the Climate Change Unit (CCU) and will be working closely with the council of governors towards this establishment and capacity enhancement of city staff and leadership with support from the National Treasury. Recent developments indicate the city prefers to domicile the climate change docket under the proposed Climate Change and Energy Directorate with two deputy directors

each handling climate change and energy respectively. This is awaiting cabinet approval and includes the air quality unit and the development of a robust organogram at the time of preparing this CAP.

Under the Kenyan Constitution, counties are expected to decentralise their functions and services where practicable. In Nairobi the governance structure is divided into a total of 17 sub-county units and 85 electoral wards. The wards are administrative units and are responsible for supporting, coordinating and managing administrative functions at the grassroot level, particularly community- and neighbourhood-based initiatives. They also play a role in shaping County-wide policies, plans and legislation, and therefore would potentially be involved in the rollout of climate change related projects through implementation at these local levels.

City powers and capacity

Understanding the city's power and capacity to implement climate actions is important for identifying where and how the city can implement actions, and other stakeholders that need to be engaged as delivery partners. The City Powers and Related Capacity Map shows where the strengths in Nairobi's current capacity lie.

In particular, these are in the enhancement of the resilience of drinking water and wastewater/sanitation systems, improving solid waste management and enabling next generation mobility. These are all areas that have a high-power score and a moderate or high capacity score. The other two highest scoring areas, next generation mobility and solid waste management, are mitigation focused in terms of decongesting the city transport sector and ensuring less waste ends up at the dumpsite. The city has higher power and capacity to manage waste, due to the fact that waste management functions have been devolved to counties. The area with lowest capacity and power is in decarbonising the electricity grid.

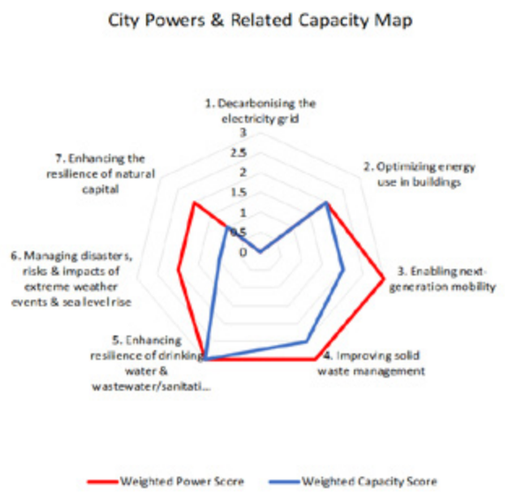


Figure 2: City Powers and Related Capacity Map

1.4. Previous climate change initiatives and policy landscape

National Context

At a national level, the Government of Kenya (GoK) has developed and implemented a number of policies and programmes that address climate, environmental, social and economic development goals and objectives. These are an important framework for Nairobi's climate response and have been considered in the development of this CAP.

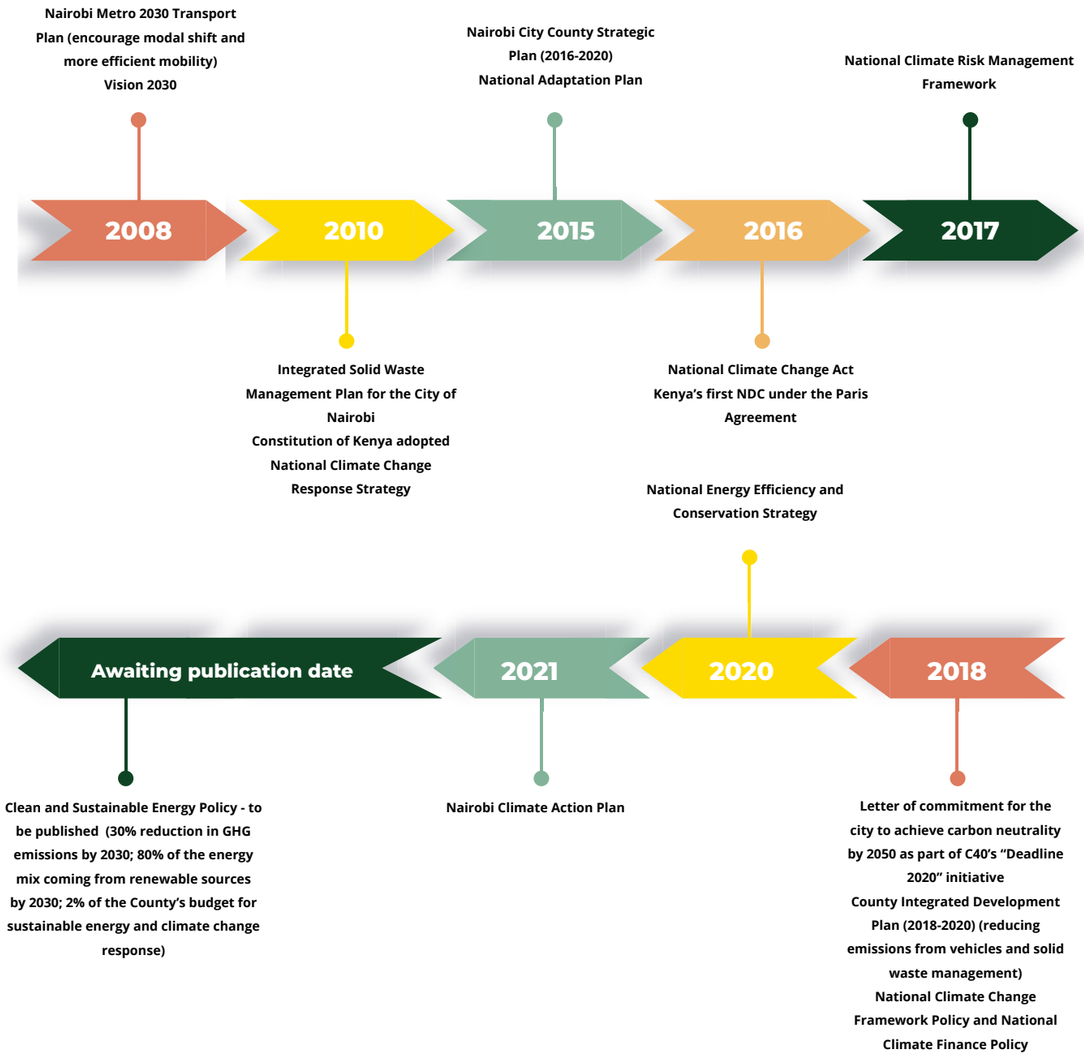
The Constitution, adopted in 2010, lays the groundwork for climate change action. It clarifies that sustainable development is a key principle of governance and guarantees the right to a clean and healthy environment under the Bill of Rights.

Vision 2030, created in 2008, is the long-term development strategy for Kenya. It is based on three 'pillars', covering economic, social and political growth; the environment is named as a key sector under the social pillar. Vision 2030 is implemented through 5-year Medium Term Plans (MTPs), which explicitly address climate change programmes and projects and their implementation.

The key piece of legislation that explicitly addresses climate change in Kenya is the 2016 Climate Change Act, which provides the legal framework for mainstreaming a climate change response across different Government functions and sectors. The Act establishes a National Climate Change Council, gives legal powers for the cabinet secretary of the Council to impose duties relating to climate change, prescribes a course for legal action to be take regarding climate change through the Environment and Land Court, and stipulates the creation of a Climate Change Fund. The Act also advocates for the establishment of climate change units at devolved levels of government. It stipulated that annual reporting must be carried out by institutions mandated to tackle climate change, both at national and city level.

The 2016 Climate Change Act also underpins the development of National Climate Change Action Plans (NCCAPs). The current NCCAP (2018-2022) sets out a vision for Kenya to deliver on its Nationally Determined Contribution (NDC) under the Paris Agreement, to achieve a 32% reduction in emissions by 2030 compared to a 'business as usual' (BAU) scenario. It includes a variety of sectoral emissions reduction targets that apply nationally, along with some that are specific to Nairobi, particularly around waste management and transport emissions.

Other notable pieces of legislation are the National Climate Change Response Strategy (NCCRS, 2010), the National Adaptation Plan (NAP, 2015), Kenya's NDC under the Paris Agreement (2016 and updated in 2020), the Climate Risk Management Framework (CRMF, 2017) and the National Climate Change Framework Policy (NCCFP), the Green Economy Strategy and Implementation Plan (GESIP) and National Climate Finance Policy (NCFP, 2018).



Box 6: The evolution of climate actions

Local context

On 30th July 2018, Mr. Larry Wambua, the County Executive Committee Member (CECM) for Environment, Energy, Water and Sanitation, signed a letter of commitment for the city to achieve carbon neutrality by 2050 as part of C40's "Deadline 2020" initiative. This represented a critical step towards developing and implementing transformational actions that will deliver an "emissions neutral and climate resilient City by 2050, consistent with the Paris Agreement".

Although Nairobi City County does not yet have approved plans that explicitly demonstrate the city's long-term vision and commitments to climate action, there are some existing, interrelated policies that cover most

of the critical elements of climate policy. These include the Nairobi Metro 2030 Transport Plan, the Integrated Solid Waste Management Plan (ISWMP) for the City of Nairobi, the County Integrated Development Plan (CIDP), the Nairobi City County Strategic Plan and the draft Clean and Sustainable Energy Policy. Each of these policies includes broad plans and targets that could help reduce emissions in their respective sectors, whether directly or indirectly.

The Metro Plan indirectly relates to climate change mitigation, as the aims of the plan are to encourage modal shift and more efficient mobility. Similarly, the Solid Waste Management Plan articulates general aims to reduce waste quantity and increase recycling as well as encouraging proper disposal of waste. Within the County Integrated Development Plan, explicit reference is made to reducing emissions from vehicles and solid waste management. Transport and waste are key sectors that are addressed in numerous of the internal policy documents and therefore seem like key focus areas for the city of Nairobi.

The National Energy Efficiency and Conservation Strategy (2020) calls for the improvement if fuel economy performance and reduction of CO_2 emissions that will also be implemented

in Nairobi through the Nairobi Metropolitan Area Transport Authority (NAMATA) and the Nairobi Metropolitan Services (NMS) through the County Government of Nairobi.

The draft Clean and Sustainable Energy Policy is expected to include an explicit target for reducing GHG emissions in line with the country's updated NDC). It is proposed that this will be achieved largely through measures aimed at the transport and waste sectors at the national level, including but not limited to the development of mass rapid transit systems and non-motorised forms of transport, more effective waste management and the utilisation of waste for clean energy production. The policy also includes targets relating to renewable energy, including a goal of 80% of the energy mix coming from renewable sources by 2030, a proposal to allocate 2% of the County's budget for sustainable energy and climate change response as well as establishing a County Energy Access Fund (CEAF). These measures would potentially be supported through the enactment of a Nairobi County Sustainable Energy Act.

Nairobi's CAP has strong alignment with national policies, since actions were identified via engagements, and national and local policy reviews. Most actions detailed in this document either comes from or are aligned with national actions. There are also additional areas where Nairobi is going further or has more detailed actions, which may present opportunities for the national government to enhance their mitigation analysis and targets. Furthermore, there are priority national actions that are targeted at Nairobi.

02

Building Evidence

2.1.
Identifying greenhouse gas emissions sources and reduction opportunities

The objective of this chapter is to provide an overview of the scenario development phase and the rapid climate risk assessment (CRA) that was undertaken as part of developing the Nairobi City County's Climate Action Plan. The chapter provides the analytical evidence base that supported the decisions on city-wide emission reduction target(s) and overall mitigation adaptation priority strategies and informed more detailed action and plan development.

Using data from Nairobi's 2016 Greenhouse Gas Inventory (GHG), this chapter outlines the status quo of emissions within Nairobi City County (the geographical boundary covered includes an area of 696 km² and is made up of 17 sub-county administrative units and 85 wards), and how these emissions are forecasted to grow to 2050, considering different scenarios. The scenarios were developed using the Pathways Model, which is a tool for city-scale emissions reduction planning and can help cities identify emission reduction target(s) and overall mitigation priority strategies. The scenario development phase was undertaken as part of developing the Nairobi City County's CAP, engaging stakeholders to understand how emissions will grow if no climate actions are implemented (Business-As-Usual) and to examine whether the City's planned actions will enable Nairobi to meet its emission reduction targets. The chapter also outlines additional actions that could be enforced.

Using the Rapid Climate Risk Assessment template, based on literature review and engagements with stakeholders, the city determined relevant climate hazards and analysed historical trends and future projections, identified and prioritised impacts, and assessed key risks, based on severity and probability of impacts.

GHG Emissions Inventory

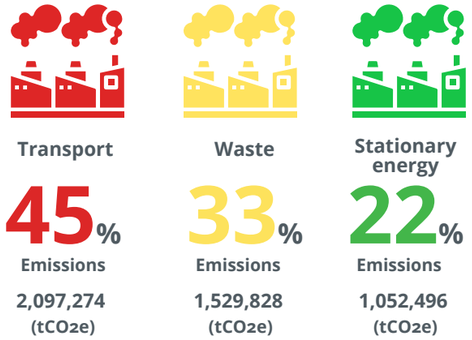
Nairobi's most recent Greenhouse Gas Inventory is based on 2016 data and was developed in accordance with global best practice (GPC compliant). It predominately includes GPC Basic sectors for transport, stationary energy and waste. The only Basic+ data source included was for Aviation.[15] Analysis of Industrial Processes and Product Use (IPPU) and Agriculture, Forestry and Land Use (AFOLU) were not included in the inventory.

Results from the inventory showed that in 2016, total GHG emissions in the city of Nairobi amounted to 4.7 $MtCO_2e$ which is equivalent to 1.2 tCO_2e per person. The transport sector had the largest contribution.

The inventory results showed that on-road vehicles were the single largest sources of emissions in Nairobi. Further analysis showed that whilst both public and private transport had significant contributions, private cars had higher emissions per person moved due to their lower occupancies.

Emissions from the aviation sector were determined by scaling down national aviation gasoline sales. However, the majority of these emissions were as a result of outside boundary travel (Scope 3) and were therefore not included in total transport related emissions. A small proportion for emissions related to small aeroplanes and helicopters that operate within the boundary was however included.

Wastewater and solid waste also contributed to Nairobi City's emissions. The latter was because of the decomposition of waste at both informal and formal dumpsites such as Dandora (which is unmanaged). Smaller amounts of waste emissions were as a result of composting and the incineration of waste.



[15]BASIC+ emissions sources, which includes outside-boundary (scope 3) travel in the aviation sub-sector were not included.

The residential and manufacturing/construction sub-sectors contributed about 0.5 $MtCO_2e$ respectively. The manufacturing sector mainly utilises electricity whilst the residential emissions are largely due to the burning of fuels such as kerosene (paraffin) and LPG, with fewer emissions as a result of electricity. Low electricity consumption in this sector is primarily because of the cost of electricity (in comparison to household levels of income) and lack of formal grid connections. To meet energy needs the residential sector also utilises wood and charcoal, however, these emissions were not counted within inventory emission totals because they were assumed to be biogenic emissions (linked to natural processes). However, the city is aware that the use of wood/biomass as a fuel leads to climate forcing, especially in the short-term. In addition to the fact that this biomass is mostly not sustainably harvested and regenerated, the use of these fuels is known to impact the city's air quality. For this reason, these sources were considered in emissions projections, as will be detailed in following sections.

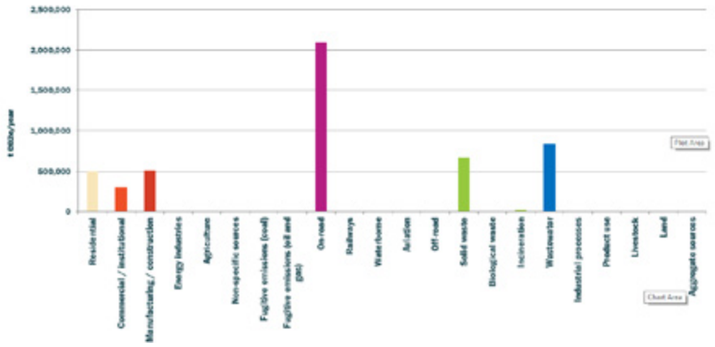


Figure 3: Base year 2016 GHG Emissions by sector

Nairobi City Emissions in the Kenyan Context

In 2015, Kenya's total greenhouse gas emissions were 93.7 $MtCO_2e$, which accounted for less than 0.1% of the global emissions recorded in the year[16] . These emissions are projected to increase to 143 $MtCO_2e$ by 2030. Whilst the Agriculture and LULUCF sectors have the largest contribution to Kenya's emissions, it is envisioned that by 2030 the energy sector will be the leading contributor to emissions due to increased consumption of fossil fuels in generating electricity, a growth in the transportation sector and larger heating demands in the domestic, commercial and industrial sectors. As the largest city in Kenya, Nairobi will likely contribute significantly to energy sector emissions. A comparison of national and city-level total GHG emissions shows that Nairobi currently accounts for approximately 5% of Kenya's total emissions. However, considering only the energy sector emissions, that Nairobi contributes for approximately 18% of Kenya's total energy related GHG emissions. This include emissions from both transport and stationary energy sector.

Analysis conducted using data from the National inventory[17] showed that similar to Nairobi's inventory, the transport sector plays a dominant role in Kenya's emissions, forming 53% of energy related emissions. The contribution of transport emissions is primarily due to Kenya's vehicle fleet which according to the National Transport and Safety Authority (NTSA) was approximately 2.8 million vehicles in 2015. With an average annual increase of 10%, Kenya is expected to have 5 million vehicles by 2030[18]. 46% of these are expected to be private vehicles, as shown by the rapid increase in the registration of saloon cars in Kenya[19]. This trend is consistent with a growing economy and rising economy levels and will probably be reflected in Nairobi's emissions in the future as well.

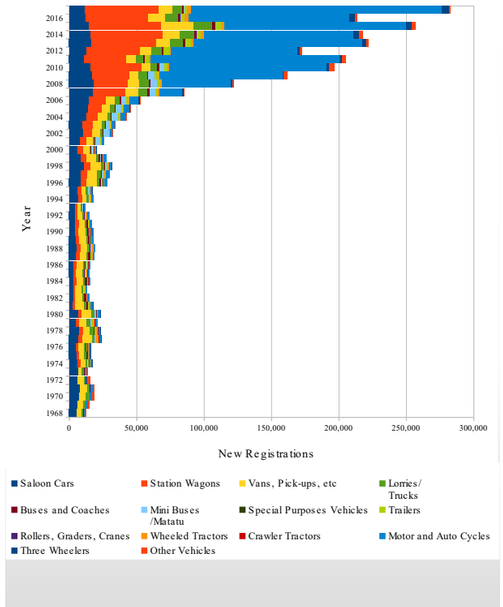


Figure 4: New vehicle registrations in Kenya, 1968 - 2017

Given the similarities in the emissions related challenges faced by national and local government (as highlighted by both inventories), it is essential that there is effective collaboration between the two entities. Central to this would be the sharing of information, as well as the alignment of policies and regulations which would encourage better enforcement. Key recommendations for ensuring efficient collaboration between national and local government have been highlighted in the Vertical Integration report[20]. As part of the County Government of Nairobi's commitment to tackling climate change, the city seeks to continue updating its GHG emissions inventory, the residual emissions analysis, and to producing such a report every two years.

Greenhouse gas emissions trajectories

The following section highlights the expected trajectory of Nairobi's emissions and how the enforcement of different actions and plans could potentially enable the city to become carbon neutral by 2050.

Nairobi's 2016 inventory was modelled to project emissions to 2050, using 2025 and 2035 as interim years. Note that Pathways baseline emissions do not align with the City's BASIC inventory total because the inventory did not include emissions from charcoal and wood, since they were considered as biogenic (part of a natural processes) emissions. However, due to the unsustainable use of these resources (use occurring faster than a forest can grow back), the city decided to include these biogenic emissions in the projections. As such, Pathways then allows for the full emissions impact analysis of a shift from biofuels, for example a switch from charcoal for cooking to a transition fuel such as LPG. The inclusion of these biogenic sources increased the stationary energy emissions by 270,504 tCO_2e.

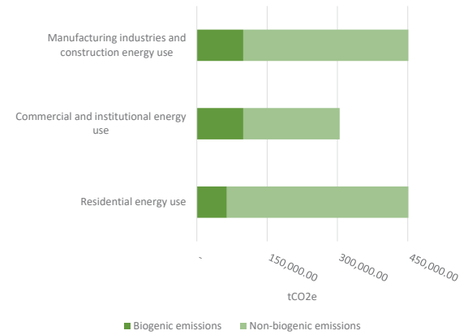


Figure 5: Biogenic and non-biogenic emissions

Projections were conducted using the Pathways Model, a tool for city-scale emissions reduction planning, which helped Nairobi identify emissions reduction targets, overall mitigation priority strategies and low carbon infrastructure actions[21]. The Tool also helped the city to envision the impacts of different proposed policies, projects and implementation assumptions. By developing and comparing multiple scenarios, Nairobi was able to determine the ideal set of actions required to become carbon neutral by 2050.

The three scenarios investigated were:

- Business-As-Usual (if no climate actions are implemented)
- Existing and Planned Scenario (using planned actions and global market trends)
- Ambitious Scenario (ambitious yet achievable actions)
- Extended Scenario (an even more ambitious scenario that would require major barriers to be removed, i.e. there is a risk it may not be achievable)

[16]REPUBLIC OF KENYA - MINISTRY OF ENVIRONMENT AND FORESTRY: Kenya's Updated Nationally Determined Contribution (NDC) (Draft for National Validation, 18November2020).

[17]Government of Kenya (2018). National Climate Change Action Plan (NCCAP) 2018-2022, Volume 3: Mitigation Technical Analysis Report. Ministry of Environment and Forestry. Nairobi.

[18]Government of Kenya (2018). National Climate Change Action Plan (NCCAP) 2018-2022, Volume 3: Mitigation Technical Analysis Report. Ministry of Environment and Forestry. Nairobi.

[19]Ogot et al, 2018, Characteristics of the in-service vehicle fleet in Kenya, University of Nairobi/GIZ.

[20]Nairobi vertical integration response strategy - Recommendations Report. 2020.

[21]CAP: Scenario Development Report – Nairobi. 2021.

Business-as-usual emissions trajectory

The Business-As-Usual (BAU) scenario forecasted emissions growth to 2050 using projected changes in population and economic growth (this was assumed to be the same as historical rates). This scenario looked at total emissions if no climate actions are taken.

Under BAU, Nairobi's emissions could potentially increase by 278%, between 2016 and 2050; with an average annual increase of 4%. Stationary emissions were expected to have the largest annual growth (5% per year), followed by the transport (3.8%) and waste (3.1%) sectors. To meet the Deadline 2020 commitment and become carbon neutral by 2050, Nairobi would need to engage in a reduction trajectory to achieve about 15% emissions reduction bellow BAU in 2025 and 45% below BAU in 2035. The late peak trajectory is consistent with cities that have low GDP and emissions when compared to other cities[22]. In order to achieve these targets, actors other than local government would need to take ambitious action against climate change.

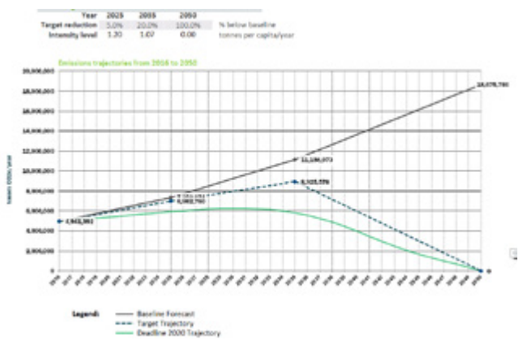


Figure 6: BAU emissions forecasts (total GHG emissions) and GHG emission reduction targets for Nairobi.

To explore the actions needed to reduce emissions in line with the Paris Agreement and meet the Deadline 2020, scenarios were generated to represent the impact of different options for mitigation actions implementation. These were informed by stakeholder consultation with City departments and local experts, as well as consulting national and local policies and plans. For the CAP, the two most important scenarios are:

Ambitious Action Scenario (unconditional):

This scenario represents ambitious yet achievable action. It is based on strategies and actions that the city is already planning to undertake but with more ambitious assumptions of the level of implementation or new strategies and actions that are deemed feasible. Ideally, ambitious actions should enable the city to achieve the Deadline 2020 commitment of a 30% emissions reduction below BAU by 2030, and significantly shift emissions towards the goal ofcarbon neutrality by 2050

Extended Action Scenario (conditional):

This scenario has been developed to show the impact on emissions if even further action is taken, and how the 'Deadline 2020' targets could be met or exceeded. This scenario assumes that the city has addressed the implementation barriers that prevent even more ambitious levels of action to be achieved in the Extended Action Scenario.

Emissions reductions in both scenarios are framed as a percentage reduction from BAU.

Climate action scenarios and residual emissions

Several climate actions were selected and incorporated in Nairobi's Ambitious Scenarios. Key focus was placed on strengthening the implementation of existing plans and actions through the development and enforcement of policies and regulations but also looked at reducing emissions in additional sectors, such as informal buildings, wastewater and industrial energy. A summary of the assumptions made for this scenario can be found in Annex 1.

Over the time period (2016 -2050), different actions have the highest impact on emissions reduction. In 2025, grid decarbonisation makes the largest impact, due to the planned increase in renewable energy on the grid which is expected by 2022. Between 2035 and 2050, transport sector related emission reductions result in the largest emissions reductions. This will be driven by a mode shift to Non-Motorized Transport (NMT) and improved public transport system (railway expansion project and BRT). Vehicles on the road will also be expected to adhere to more stringent efficiency measures. Electrical vehicle global market trends will also drive uptake in the city; however, this will be highly dependent on grid reliability and the city's ability to provide supporting infrastructure and policy.

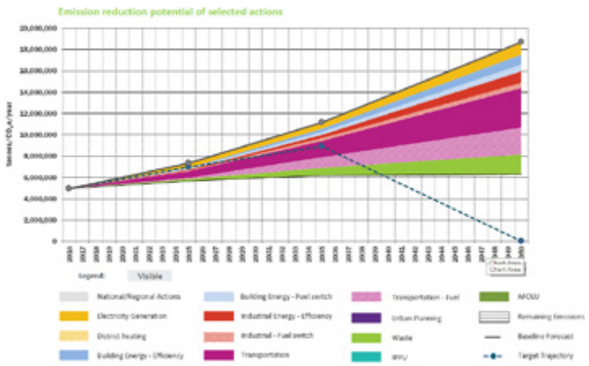


Figure 7: Emission reduction potential of selected actions

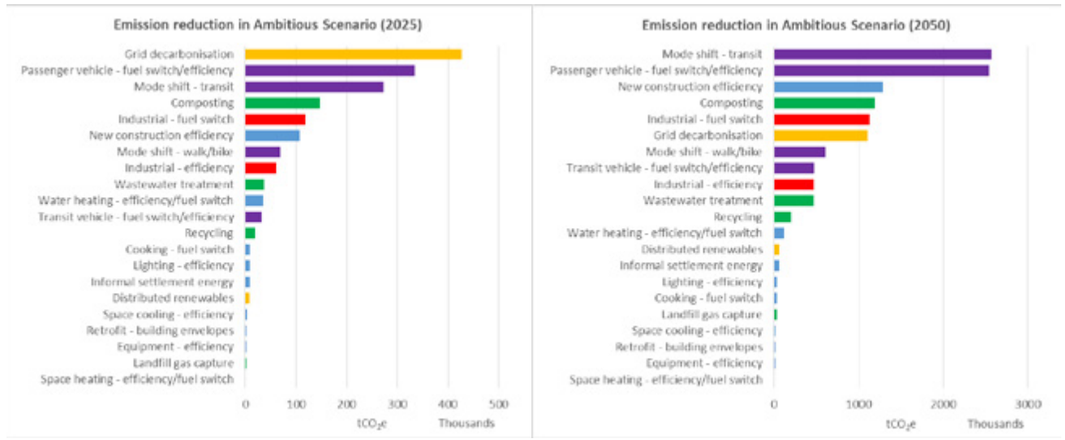


Figure 8 & 9: Long-term emissions reductions of ambitious action

Nairobi's climate scenarios were compared with the emissions reduction that needs to be achieved (represented by the grey area of the graph) to show adequate progress towards achieving an emissions reduction pathway in alignment with the Paris Agreement, which aims to keep global warming below 1.5°C. In the ambitious scenario, the GHG reduction targets are only achieved in 2025 and 2035. In 2050, climate actions are projected to achieve 66% emissions reduction below BAU, with around 6 million tonnes of residual emissions remaining. The remaining emissions would largely be from the wastewater sector, with 1.9 million tCO_2e being emitted per year, after implementing climate action. Energy consumption in industries and on-road transport are also important sources of remaining emissions, emitting 1.2 and 1.1 million tCO_2e per year respectively, according to the scenario.

In order to meet these targets much more ambitious actions would be required, including more stringent enforcement of current regulations. An Extended Scenario to reach a Deadline 2020 trajectory were developed (yellow line in the graph), considering more aggressive EV uptake, in both private and freight vehicles; fuel switching to electricity, as well as more aggressive energy efficiency, in buildings and the industrial sector; expansion of anaerobic wastewater treatment, with biogas capture; and a 100% renewable grid, which excludes biomass.

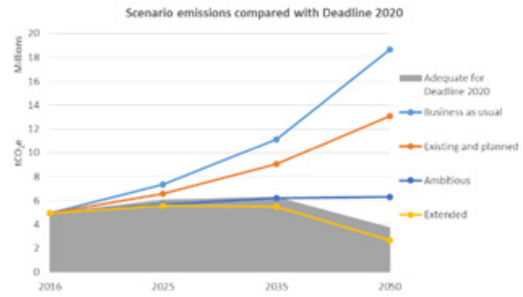


Figure 10: Scenario emissions compared with Deadline 2020

[22]GDP/capita less than $15,000 (Nairobi = $2,649) and emissions less than global average, 6 tCO2e (Nairobi = 1.2 tCO2e)

Below are extended scenario barriers with examples of how such barriers could impact the implementation of the actions.

Legal & Institutional

Examples

- Any further ambition, with regards to a shift in shares of the types of renewables, sits firmly in the sphere of national government authority.
- The City's influence will need to focus on lobbying national government and placing stricter controls on fuel use through local air quality regulations.
- The National Building Code only considers new buildings and regulations surrounding building envelope are not clear.
- Efficient appliance labelling regulations do exist, but they are set by national government, which enforcement is uncertain.

Financial & Economic

Examples

- Funding or financial incentives will be required to encourage retrofits in commercial buildings and housing.
- Complete uptake of efficient cooling across existing commercial buildings will be hampered by the cost and complexity of retrofitting large air-conditioning systems.
- The cost of electricity has been increasing over time, leading to a shift away from electricity, towards kerosene, for cooking.
- The aggressive expansion of centralized wastewater treatment systems, as well as investment into biogas capture represents a massive investment requirement.

Political & Social

Examples

- There has been little to no uptake of building efficiency retrofits, even within public sector buildings.
- Enforcement of retrofitting of buildings may be viewed as a burden to the local economy.
- Increasing the costs of alternative fuels (such as wood, kerosene and charcoal) may raise prices to intolerable levels for low-income households

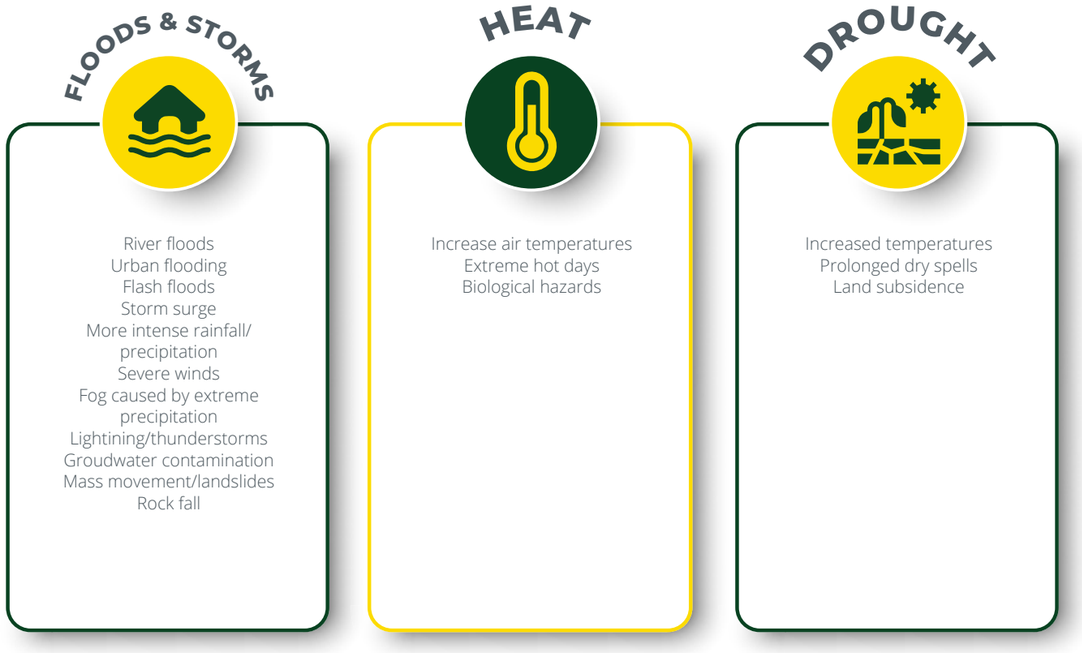
Practical & Technological

Examples

- -The national electricity grid is constrained, which will hamper the ability of fuel switching towards electricity.
- The market on solar products was not regulated, resulting in high equipment failure rate and households reverting to conventional means of lighting.
- There is uncertainty as to the types of fuels and processes that could replace conventional fuels / energy-use processes. Fuel switching and some efficiency measures may not be feasible or economical for all applications, especially if it requires replacement of still-functioning technology.
- Increase in shares of vehicles that are EV will need a far more concerted effort than envisioned in the extended scenario, in particular with regards to public charging infrastructure and grid stability.
- The technology around EV trucks is still quite new and uncertain.

Nairobi has little authority over most actions, in particular those areas outlined in the extended scenario (transport fuel shifting, grid decarbonisation, industrial fuel switching, wastewater infrastructure). The successful implementation of the actions modelled in the presented scenarios will, then, need the cooperation of a wide range of stakeholders, both government, private sector and the citizens of Nairobi. Nairobi is committed to engaging and establishing formal partnerships with multiple stakeholders at different levels and with national Government. The city is also committed to periodically review and update the climate action plan in order to pursue closing the ambition gap through policies and mitigation methods and technologies and the carbon neutrality in 2050. Analysing remaining emissions over time will allow the city to explore opportunities to increase ambition in the above areas.

2.2.
Assessing climate risks and prioritising assets, shocks, and stresses



Box 7: Three hazards consequent of climate change

Nairobi city is the largest city in Kenya and among the fastest-growing cities in East and Central Africa. It has complex temporal and spatial distributions of population, infrastructure, and socioeconomic activities. Rapid urbanization and reactive planning have increased pressure for infill high rise development in areas that were hitherto zoned and developed as the lower density[23]. In addition, part of Nairobi's urban footprint is unplanned settlement driven by rapid population growth and urban poverty leading to sprawling informal settlements. These are situated in the city's most fragile areas such as floodplains, steep slopes, river valleys, or adjacent to sewers or dump sites making inhabitants vulnerable to climate variability and change[24].

Through analysis of future projections and historical trends, three key climate hazards have been identified as prominent drivers within Nairobi: floods & storms, heat and drought. Although projections vary for future outcomes, globally there have been visible trends towards rising mean temperatures, increasing flood events due to increase in precipitation frequency and intensity and increasing drought or dry periods.

Table 2: Climate hazards according to historic trends

CLIMATE HAZARDS ACCORDING TO HISTORICAL TRENDS AND FUTURE PROJECTION			
Hazard theme	**Hazard**	**Historical trends**	**Future projections**
FLOODS & STORMS	Urban flooding Flash floods, rockfall, landslide	More frequent floods, more intense precipitation with higher impacts and coverage, rockfall and landslide occurrences on the increase,	Urban and flash floods projected to increase both in frequency and intensity
	River flood, storm surge, fog, ground water contamination,	More prevalent and with high impact	Heavier river flooding expected as precipitation averages increase
	Lightning, severe wind, extreme precipitation, More intense rainstorms	Rainstorms have been more intense over time	The average rainfall patterns are projected to continue increasing
HEAT	Biological hazards	Increase in vector and water borne diseases	Projected to increase due to the high temperatures
	Increasing air temperature	Higher air temperatures have been recorded	Average air temperatures will continue to rise
	Extreme hot days	Number of extreme hot days have been increasing	It is projected that the number of extreme hot days will go up
DROUGHT	Prolonged dry spell	Periods of dry spell have been longer	Projected to be more intense due to climate variability
	Increased temperature	Average max and min temperatures have been rising	Projected to rise
	Land subsidence	Land subsidence instances have increased in intensity and impact	Projected to increase due to encroachment and settlements near vulnerable spots especially the informal settlements

The Rapid CRA conducted for Nairobi is based on the Rapid CRA Module developed by SWECO and CAS as a tool to help cities assess their climate risks[25]. The module outlines an approach to determine what impacts from climate hazards will affect the city, how to determine the relevance of impacts based on level of risk, and how to lead workshops with city stakeholders to create impact diagrams. It also contains tools which aid the identification and prioritisation of hazards and impacts and contextualise impacts to key sectors and communities.

The assessment has identified impacts that may pose risks to social, natural and economic capital in Nairobi, producing a list of impacts for each climate hazard. The potential risks from these impacts were assessed, based on determined level of risk (likelihood and disruptiveness of event), on a low-medium-high scale. Three impacts per each hazard have been highlighted as having very high prioritisation.

[23]Sunday Julius Abuje, Bernard Moirongo Otoki, Bernard Mugwima Njuguna, Gerryshom Munala, The Vulnerability of Nairobi to the Effects of Climate Change Between 1984 and 2016, Landscape Architecture and Regional Planning. Vol. 5, No. 2, 2020, pp. 38-45. doi: 10.11648/j.larp.20200502.14.

[24]Walter Leal Filho, Abdul-Lateef Balogun, Olawale Emmanuel Olayide, Ulisses M. Azeiteiro, Desalegn Y. Ayal, Pastor David Chavez Muñoz, Gustavo J. Nagy, Paulette Bynoe, Otienoh Oguge, N. Yannick Toamukum, Mustafa Saroar, Chunluan Li, Assessing the impacts of climate change in cities and their adaptive capacity: Towards transformative approaches to climate change adaptation and poverty reduction in urban areas in a set of developing countries, Science of The Total Environment, Volume 692, 2019, Pages 1175-1190, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2019.07.227.

[25]Nairobi City Rapid Climate Risk Assessment (CRA). 2021.

Table 3: Sector based impacts of the hazard themes

LIST OF SECTOR-BASED IMPACTS			
Hazard theme	**Capital**	**Sector**	**Impacts**
FLOODS & STORMS	SOCIAL	Health	Water and vector borne diseases affecting particularly the vulnerable communities
		Water and energy	Contamination of water for domestic use leading to increased negative health impacts
		Housing and urban infrastructure	Settlements (mostly informal) are flooded in hotspot areas and increased damage to urban infrastructure placing the urban poor at the most risk including displacement of people/communities
		Education	Education disrupted due to flooded schools which reduces the number of days that learners attend school and can amplify the disease burden from water borne illnesses like cholera.
	NATURAL	Environment	Damage to trees and urban greenery, soil erosion on bare ecosystems as well as over-siltation in rivers which will enhance the impact of urban river flooding
		Transport and urban infrastructure	Destruction of transport infrastructure, disruption of transport modes and destruction of communication and power lines
		Agriculture	Damage to crops and reduced yields resulting from soil erosion and flooding episodes
		Water	Contamination of water systems which are used for domestic use leading to more health-related challenges from water borne diseases
	ECONOMIC	Transport	Damage to roads and housing infrastructure
		Agriculture	Reduced food production
		Housing	Damage to houses and related property
HEAT	SOCIAL	Health	Heat strokes especially for the elderly and vulnerable in the community
		Water and energy	Reduced availability of domestic water
		Housing	Urban heat island effect leading to illnesses for those with pre-existing conditions
	NATURAL	Environment	Drying up and loss of urban greenery, urban rivers and related ecosystems
		Water	Drying up of rivers and water scarcity in urban areas
		Air quality	Deterioration of air quality
		Agriculture	Drying up of crops
	ECONOMIC	ICT	Damage to communication lines
		Tourism	Reduced visitation from tourists and reduction of animal species
		Agriculture	Reduced GDP input that is the mainstay of Kenya's economy
		Transport	Damage to roads and other urban infrastructure
DROUGHT	SOCIAL	Health	Food availability is impacted putting vulnerable communities at high risk
		Water	Water availability is impacted for domestic and other uses
		Housing	More encroachment into vulnerable spots due to population increase
	NATURAL	Environment	Biodiversity loss
		Water	Diminishing water resources
		Air Quality	High humidity leads to spread of air borne diseases
	ECONOMIC	Tourism	Impacts wildlife and visitation from tourists
		Agriculture	Crop and animal produced grossly diminished

The risks prioritised have strong relation to Nairobi's wide variety of heterogeneous surfaces. The Central Business District (CBD) is characterized by paved roads, wide sidewalks, and high-rise buildings interspersed with low vegetation, while large neighbourhoods of informal settlements or 'slums' are characterized by dense metal housing, little vegetation, and limited access to public utilities and government services. The urbanization process happened with changes in construction materials and an introduction of impervious surfaces. Building materials, especially in the

Table 4: Prioritized inpacts per hazard theme

PRIORITISED IMPACTS PER HAZARD THEME AND CAPITAL AFFECTED		
Hazard theme	**Key impacts**	**Rank / prioritisation**
FLOODS & STORMS	Flooding leading to soil erosion from uncovered areas, siltation of rivers and damage to property due to clogged water ways which impacts communities living next to rivers	Very high
	Disruption of transport and communication lines as well as damage to property	Very high
	Vector and water borne diseases especially spikes in cases of malaria and cholera outbreaks from the contamination of domestic wastewater as well as water wash diseases from sanitation facilities which have low coverage	Very high
HEAT	Heat stress which caused various illnesses and heat stroke especially for the elderly and those with underlying conditions like hypertension	Very high
	Increase in vector and water borne diseases which high cases of mosquitoes breeding where malaria cases are frequent	Very high
	Food availability affected due to lack of essential minerals and balanced diet for populations particularly in informal settlements	Very high
DROUGHT	Prolonged periods of drought lead to food insecurity especially for the elderly and children under 5 years which can also affect their mental health	Very high
	Disease outbreaks like cholera, dysentery and kwashiorkor occasioned by unhealth diets which lack essential minerals	Very high
	Diminished urban water resources leading to water stress and scarcity	Very high

CBD, and the emerging districts of Upper Hill and Westlands have also changed from concrete and stone to glass facades that reflect most of the solar radiation to the atmosphere thereby increasing air temperatures. On the other hand, the informal settlements contain low, dense housing types built from galvanized iron sheets, wood and mud with inadequate access to basic services such as clean water. The population residing in these settlements are potentially highly vulnerable to heat exposure too due to lack of information on heat wave occurrence and risk, inadequate access to routine health services, limited access to potable water, limited household ventilation and lack of access to cooling centres.

The impervious surfaces reduce stormwater percolation, increasing runoff. These impervious surfaces have increased by 162% leading to a reduction in green open spaces[52]. This has resulted in about 43% chance of flooding every two years within the city[26]. Coupled with an overwhelmed drainage infrastructure, the city has been experiencing instances of flooding which worsen yearly. Despite the increased rainfall and flooding, rainwater harvesting, collection and retention in the city remains low even though the city is water scarce[27]. Shocks such as flooding due to heavy rains are likely to increase in frequency and magnitude impacting on livelihoods, economic activity, and individual well-being, particularly for the poorest and most vulnerable within the affected communities. For instance, annual average rainfall has increased by 50% between 1984 and 2016[52].

Studies have detected an increasing trend in temperature considering data from meteorological stations in the city of Nairobi, attributable to urbanization effect;[59; 28]. Decadal minimum temperatures in Nairobi have been increasing by 0.43ºC and maximum temperatures by 0.11ºC during the 47-year period (1961 to 2007)[37]. Previous Nairobi field studies have found evidence of warmer urban temperatures[29], particularly for minimum daily temperature, and satellite thermal imagery shows that land surface temperature is warmer in the city and in informal settlements than in some rural locations. An epidemiology study also found that heat is related to increased rates of mortality and morbidity in Nairobi's informal settlements[30]. This is a strong evidence of climate change warming at local scale and such findings demand serious considerations in planning of climate sensitive urban services for a rapidly expanding city of Nairobi.

Other potential climate change effects may affect urban agriculture leading to increase in costs of food commodities and food insecurity to urban poor comprising 45% of the city's population[53]. High pollution levels experienced in the city, due to vehicular[31] and industrial emissions, cause chronic diseases as a consequence of degraded air quality; this will be exacerbated by climate change through impacts from heat and drought hazards.

[26]Muli, N. M. (2011, November 7). Kenyatta University Institutional Repository. Retrieved January 10, 2018, from Kenyatta University: http://ir-library.ku.ac.ke/handle/123456789/1597?show=full.

[27]Ledant, M. (2013). Water in Nairobi: Unveiling inequalities and its causes. Dynamiques urbaines (263), 335-348. doi: https://doi.org/10.4000/com.6951.

[28]Ndolo I. J, C. Oludhe, N. J. Muthama, J. K. Ng'ang'a and R. S. Odingo, 2018. Influence of Urbanisation on Minimum and Maximum Temperature characteristics over Nairobi City. J. clim. chang. sustain. Vol 1, issue 2, pp. 73-81. https://doi.org/10.20987/jccs.1.04.2018.

[29]Scott AA, Misiani H, Okoth J, Jordan A, Gohlke J, Ouma G, et al. (2017) Temperature and heat in informal settlements in Nairobi. PLoS ONE 12(11): e0187300. https://doi.org/10.1371/journal.pone.0187300.

[30]Egondi T, Kyobutungi C, Kovats S, Muindi K, Ettarh R, Rocklo¨v J. Time-series analysis of weather and mortality patterns in Nairobi's informal settlements. Glob Health Action. 2012; 5(19065):23–32. https://doi.org/10.3402/gha.v5i0.19065 PMID: 23195509.

[31]Kinney, P.L., Gichuru, M.G., Volavka-Close, N., Ngo, N., Ndiba, P.K., Law, A., ... Sclar, E., 2011. Traffic impacts on PM2. 5 air quality in Nairobi, Kenya. Environ. Sci. Pol. 14 (4), 369–378.

03

Nairobi's Climate Vision

3.1. Climate change mitigation goals

Due to its geography and demographic characteristics, Nairobi is highly vulnerable to climate change. While much of the world relies on projections and forecasting to understand their future climate impacts, Nairobi has already experienced significant change as a result of increasing temperature, precipitation and increasing extreme weather events. Flooding, drought and extreme temperature have all led to loss of GDP, loss of biodiversity, resource depletion, displacement and loss of life.

There must be concerted effort to adapt to and withstand climate impact. This is reflected in Nairobi's consistent prioritisation of climate action in development planning and strategies, and Kenya's progressive status within international climate negotiations. By identifying and implementing appropriate actions, climate change impacts can be mitigated, and the city's adaptive capacity and resilience can be improved. The CAP therefore represents a public commitment from Nairobi in playing its part to reduce the growth of future emissions, supporting the achievement of international and national climate change mitigation goals, and achieving the 17 United Nations Sustainable Development Goals (UN-SDGs).

> **"To provide affordable, accessible and sustainable quality service, enhancing community participation and creating a secure climate for political, social and economic development'**
>
> *(Nairobi City Integrated Development Plan - 2018-2022)*

Following the ratification of the Paris Agreement in 2016, Kenya submitted its first Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) on December of the same year, committing to reduce emissions by 30% by 2030 relative to the business as usual (BAU) scenario. On December 2020, the country updated its NDC, committing to abate emissions by 32% by 2030 relative to the BAU scenario of 143 Mt CO_2e, and in line with its sustainable development agenda and national circumstances[32].

According to C40's 'Deadline 2020' analysis, ambitious targets in the climate action plan align with emissions declining rapidly or peaking in the shorter term (e.g. 2030) and achieving emissions neutrality in the longer term (by 2050).

Targets were identified in the Ambitious Scenario being consistent with the goals of the Paris Agreement and Deadline 2020[33]. The unconditional target for 2050 does not meet the city's deadline 2020 commitment of achieving carbon neytrality, however, with significant support to overcome the identified barriers to implementing Extended Actions, Nairobi could potentially go further. For this reason, the city commits to further 'conditional' targets to achieve a 24% reduction below BAU emissions by 2025, 51% reduction by 2035, and will strive to achieve carbon neutrality by 2050[34].

UNCONDITIONAL TARGETS

23% Emissions reduction below its BAU scenario of 7.4Mt CO2e, by 2025

44% Emissions reduction, below its BAU scenario of 11.2Mt CO2e, by 2035

66% Emissions reduction, below its BAU scenario of 18.7Mt CO2e, by 2050

Box 8: Emission reduction by percentage

Unconditional targets: targets to be achieved without any explicit external support.
Conditional targets: targets to be achieved upon finance support, technology transfer and capacity building.

CONDITIONAL TARGETS

24% Emissions reduction, below its BAU scenario of 7.4Mt CO_2e, by 2025

51% Emissions reduction, below its BAU scenario of 11.2Mt CO_2e, by 2035

Carbon Neutrality By 2050

[32]https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Kenya%20First/Kenya%27s%20First%20%20NDC%20(updated%20version).pdf
[33]The Deadline 2020 target for 2025 is a 15% reduction from the BAU, and 2035 a 45% reduction from the BAU scenario.
[34]See Section 3.2.2 for more details on the climate scenarios modelling that underpinned the targets setting.

3.2.
Climate resilience and adaptation goals

Kenya's NAP outlines a vision of 'climate resilience by 2030'. The nation is acutely aware of its current and future threat from climate change and has committed to a comprehensive evidence-based action plan that emphasises the importance of building resilience and increasing adaptive capacity. Nairobi's County Integrated Development Plan (CIDP) sets out a similar vision for their long-term development strategy, emphasising security and sustainability across all urban services and communities.

The city's contribution to national GDP (22%), population growth and development necessitates targeted action at the city scale, with proposed strategies aligned to specific urban contexts and which utilise institutional, financial and social capacity. The vision will be achieved by operationalising these capacities, analysing hazards, risks and impacts through the Climate Risk Assessment (CRA) and maintaining monitoring and evaluation practices that provide consistent feedback on implemented actions.

Aligned with the national vision of 'climate resilience by 2030', Nairobi City county commits to the following goals:

01	02	03	04	05
Integrate climate into development planning	Enhance resilience of public and private sector investment	Enhance synergies between adaptation and mitigation action	Enhance resilience of vulnerable populations to climate impacts through adaptation and disaster risk reduction strategies	Improve knowledge and learning for adaptation and the future protection of the county

Box 9: Goals aligned with climate vision 2030

3.3. Wider benefits

Nairobi is aware that effective mitigation and adaptation actions require careful consideration of cross-cutting issues and should aim to encourage synergies to maximise efficiencies and minimise investment risk. In the same way, the city is committed to ensuring that the CAP not only addresses climate change but can also support achievements of broader sustainable development goals.

Although Kenya's economy is the largest and most developed in eastern and central Africa and the new country economic update shows that the proportion of Kenyans living on less than the international poverty line (US$1.90 per day in 2011 PPP) has declined from 43.6% in 2005/06 to 35.6% in 2015/16, poverty rates in Kenya remain relatively high compared to other lower middle-income countries[35]. The impacts of the COVID-19 pandemic and associated economic downturn have highlighted stark social inequalities globally, as they disproportionately impact lower income and vulnerable groups. This is particularly relevant for Nairobi, where the poverty rate is currently over 45%[36].

The city therefore faces a major challenge, and opportunity, of achieving a sustainable economic recovery while at the same time avoiding any negative environmental impacts, including increased GHG emissions.

- Integrated development planning
- Impacts on local communities; Community safety
- Economic benefits
- Gender, youth, disadvantaged groups
- Access to safe drinking water
- Air pollution (indoor and outdoor) and heath impacts
- Improved standards of living and comfort
- Access to affordable and efficient transportation options
- New opportunities, e.g. women's education
- Employment opportunities
- Access to spaces and services
- New businesses

Box 10: Climate resilience objectives

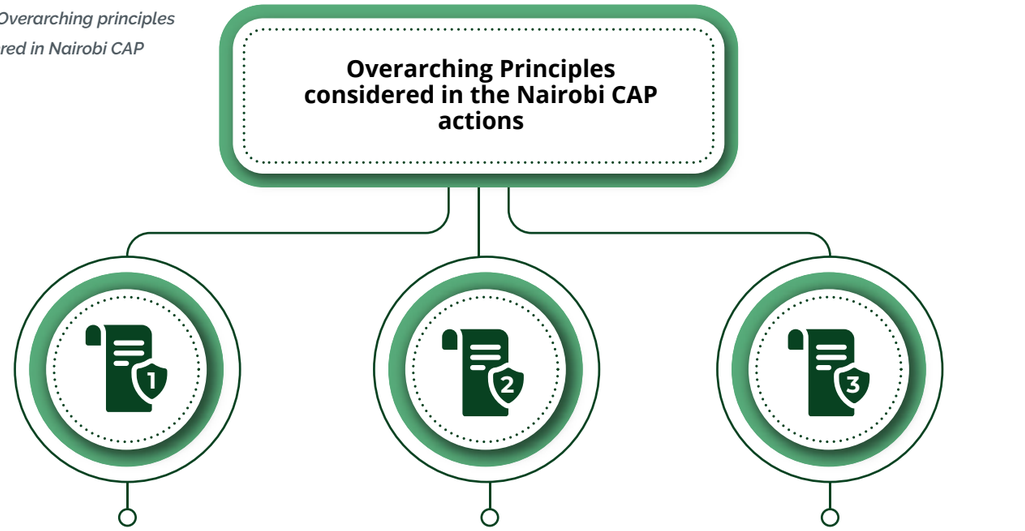
[35]https://www.worldbank.org/en/country/kenya/publication/kenya-economic-update-poverty-incidence-in-kenya-declined-significantly-but-unlikely-to-be-eradicated-by-2030

[36]Walter Leal Filho, Abdul-Lateef Balogun, Olawale Emmanuel Olayide, Ulisses M. Azeiteiro, Desalegn Y. Ayal, Pastor David Chavez Muñoz, Gustavo J. Nagy, Paulette Bynoe, Otienoh Oguge, N. Yannick Toamukum, Mustafa Saroar, Chunluan Li, Assessing the impacts of climate change in cities and their adaptive capacity: Towards transformative approaches to climate change adaptation and poverty reduction in urban areas in a set of developing countries, Science of The Total Environment, Volume 692, 2019, Pages 1175-1190, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2019.07.227.

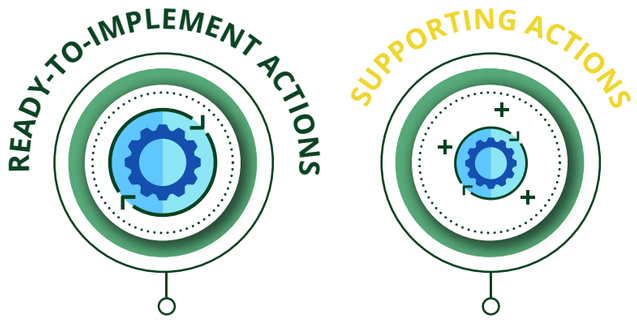
04

Climate Action Plan for Nairobi

Box 11: Overarching principles considered in Nairobi CAP actions



The plan was structured in 'ready-to-implement' actions and supporting actions, grouped in thematic areas identified to support Nairobi in achieving the city's climate goals. The actions included in each area are not exhaustive but incorporate the highest priority actions for both mitigation and adaptation. Each theme area aims to cover adaptation and mitigation in an integrate way thus, creating a cohesive climate action plan



Box 12: Ready-to-implement and support actions

For each ready-to-implement action, a road-map has been developed and refined to demonstrate the various mechanisms and elements required to implement them effectively, including:

Box 13: Ready-to-implement action roadmap

4.1. Low Carbon Solutions and Climate-Proofing the Transport Infrastructure

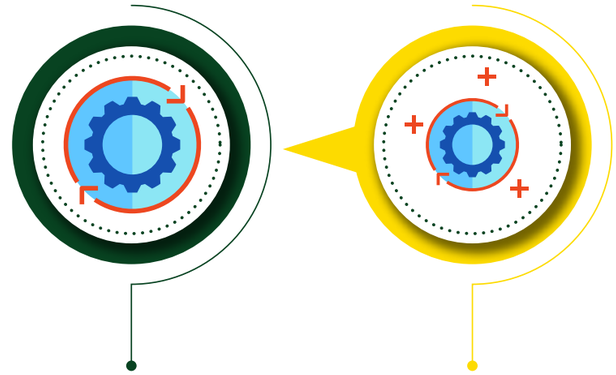
Being the Capital City of Kenya, Nairobi is a major air transport hub for Eastern Africa. Currently, Nairobi is served by two airports namely: Jomo Kenyatta International Airport (JKIA), which handles medium and large aircrafts operating on international and national routes and the Wilson Airport on Langata Road, which essentially handles small aircrafts operating on the national and regional routes.

Nairobi city's road network is currently inadequate as envisaged in Kenya's economic blueprint vision 2030. The road network as it stands cannot cover current and future demands especially with the challenge of heavy traffic congestion on most city roads during peak traffic hours in the morning and evening. A key driver is the increasing use of private cars (63% of all cars on the road in Nairobi are privately owned).[37] This results in significant levels of traffic congestion which lead to gridlock roads where vehicles emit large volumes of health inflecting pollutants. To address these issues, the BRT and LRT in Nairobi are key actions and have already been implemented. The BRT is projected to be complete by February 2022. The BRT will also include a park and ride system as well as other facilities and infrastructure. Electrification and rail are now key priorities in the NCCAP. The County has a railway network of 75Km and a total of 15 functional railway stations which are: Embakasi, Makadara, and Nairobi main terminal, Dandora, Githurai, Kahawa, Kibera, Dagoretti, JKIA and Syokimau. The establishment of Makadara and Imara Daima railway stations and expansion of Nairobi platform will help to improve public transportation in Nairobi for socioeconomic development.

The Government of Kenya had implemented major policy and institutional reforms and established the Kenya National Highways Authority (KenHA), the Kenya Urban Road Authority (KURA), and the Kenya Rural Road Authority (KeRRA). The Kenya Vision 2030 strives for an interconnected network of roads, railways, ports, airports and water and the Integrated National Transport Policy (2012) recognises the importance of non-motorised transport (NMT) in addressing the rapid expansion of private vehicles and the negative effects to urban living and health. The policy also recognises that transport policies have largely supported motorized transport at the expense of non-motorised transport which has led to the marginalization of NMT users in the urban areas more particularly in poorer communities. The Traffic Act provides a framework to enforce traffic laws, including those relevant to NMT users. However, infrastructure for pedestrians and cyclists is generally lacking in Nairobi, and when provided are poorly designed and maintained, often taken over by street traders and parked vehicles. Nairobi has experienced rapid urban sprawl. Trips to school and work account for over 85% of all walking trips in Nairobi, yet walking pathways are often of poor quality. There is a significant demand for improved non-motorised transport links and urban greening.

[37]https://www.kara.or.ke/Nairobi%20City%20County%20Non%20Motorized%20Transport%20Policy.pdf

Low Carbon Solutions and Climate-Proofing the Transport Infrastructure



Ready to implement actions	Supporting actions
• Improvement of NMT facilities • Development and improvement of mass transit options and mode switching	• Adoption of improved vehicular efficiency standards for road transport • Adoption of fuel-efficient aircraft and development of sustainable aviation fuel • Modal shift for road to railway for freight transport • Fuel switch; road and rail transport • Construction of storm drains in the city to reduce the impacts of floods • Climate proofing roads

ACTION 1: Improvement of non-motorised transport (NMT) facilities.

Nairobi non-motorized transport policy was developed in 2015 and is a joint initiative of the UN Environment Share the Road Programme and the Nairobi City County. The policy aims to develop and maintain a transport system that fully integrates NMT as part of the Nairobi transport system. This action is an extension of the work that has already been implemented by the NMT policy. This action will act as a catalyst to increase mobility and accessibility, increase transport safety, and improve amenities for NMT. Excepted outcomes through improving NMT facilities may include, an increase in the modal share of cyclists and public transport as a result of a decrease in car-oriented travel, reduce NMT users' accidents and minimise on-street parking in the CBD, this can provide open spaces for urban greening. Most significantly this action will create an inter-connected network of footpaths, dedicated bike lanes, safe crossways and green areas protected against the encroachment of NMT modes and other street users.

Box 14: Action 1 ready implement road-map

Climate impact

217,669 tCO2e reduction per year by 2035
604,590 tCO2e reduction per year by 2050
4.9% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Kenya Urban Roads Authority (KURA)
Nairobi City County Government (NCCG)

Collaborative agencies:

- Nairobi Metropolitan Services (NMS)
- Kenya National Highways Authority (KeNHA)
- Supporting agency: State Department of Transport

Timeline

2-5 Years

Resourcing plan

City (Public sector funding i.e. taxation) and National Government, NGOs & Donors (international development banks).

The Integrated Transport Policy includes NMT facilities and private investors will be involved in initiatives as Bicycle park and Kipande Plaza.

There are available human resources to implement the action but there are also some challenges, such as:

- Safety is an issue
- Finance
- Law awareness increase
- Bike share

More research – an informed implementation – identify gaps etc

- Technology does not exist like GIS
- Need to purchase land for NMT facilities

Level of city control

Predominantly a city level action (County enforcement of transport and pedestrial use), with National support law enforcement and road safety.

Alignment with policies & plans

Development Control Guideline to get additional spaces for NMT

Land-use Policy

NMT Policy (2015)

Nairobi Streets and Roads Design Manual (NSRDM)

Nairobi County Highway Code (NCHC)

Integrated National Transport Policy (2012)

The Traffic Act

Kenya Vision 2030

County Integrated Development Plan (CIDP)

Air Quality Management Plan (AQMP)

Medium term 3 plan

KPIs

Increased NMT space coverage,

Increased services along NMT facilities,

Safe NMT crossings (street signals, footbridges, underpasses, marked crossings),

Improved NMT user satisfaction

Co-benefits

Community benefit (e.g improved NMT, reduced fatalities and injuries among pedestrians, safer connections and employment opportunities in the construction phase.)

Environnent (e.g. air quality improvements – reduction in pollutant concentrations)

Mobility & accessibility (e.g. reduction in journey times, improved connectivity and reduction in congestion by encouraging shift from the private car to public transit)

Health benefits (happy, healthier urban/city communities/residents)

Sub-actions

1.1. Baseline survey of city residents – the city takes lead to collaborate with KNBS
1.2. Mapping to identify which areas NMT facilities can be positioned
1.3. Resource mobilization
1.4. Collaboration with other sub-sectors
1.5. Private sector engagement

ACTION 2: Development and improvement of mass transit options and mode switching; improvement of public transport.

Nairobi's growing demand for public transport networks can be seen in the scale of congestion within the city. This action is aligned with the city's plans and policies and will be designed to benefit local communities by addressing traffic congestion within the city. The BRT plan is one of the flagship projects in Nairobi City. This action aims to deliver a programme of improved measures. Measures include dedicated BRT lanes, replacement of matatus (minibuses) and ordinary bus services to feeder transport services to avoid traffic volume in the CBD, a bus notification system integrated with other transport system and a revision of the bus lines and timelines. All of the above measures aim to enhance the current BRT to provide a seamless, inter-connected and efficient BRT network. Thus, increase the attractiveness of public transport and disincentive private vehicles on the road.

To supplement the BRT project this action also addresses the rehabilitation of the railway system to expand capacity of the four commuter rails that radiate from Nairobi Central Business District. The project also includes upgrades to existing stations, rolling stock, signalling systems and around 100km of track, as well as the construction of new stations in Buru Buru, Pipeline, Umoja, Githurai and Donholm. Upgrades will be conducted to improve safety, reliability and comfort, and increase capacity from five million passengers annually to 15 million following the completion of Phase 1, and to 60 million following the completion of the entire project.

Another focus area of this action includes the electrification of the SGR line to Mombasa as well as the extension of SGR to Naivasha. Private sector participation in the operation, financing and management of transport systems in essential in providing a well funding network.

Box 15: Action 2 ready implement road-map

KPIs

Reduction of travel time and transport costs

Ownership of private vehicles on road

Improved modal share – indicators to be developed to assess if people left their cars

No. of fare sales

Increased commuter railway lines

Co-benefits

Reduction of travel time and transport costs

Ownership of private vehicles on road

Improved modal share – indicators to be developed to assess if people left their cars

No. of fare sales

Increased commuter railway lines

Sub-actions

2.1. Preliminary work – check out best practices

2.2. EoI (Expression of Interest) call is open for electric buses and trials

2.3. Ongoing survey on NMT and existing public transport - mass transit options - by UN-Habitat (to be published in about 1 month), including studies related to COVID-19

- Some baseline data can be provided by UN-Habitat
- KNBS can provide secondary data

2.4. Structuring of bus terminals to prevent congestion – Green Park Terminus Project under NMS (to be 5) to prevent PSVs from entering the city

2.5. Mass sensitization on importance of using these transit options to both investors and the public to look at this as an opportunity

2.6. Further capacity building on the knowledge

Climate impact

879,422 tCO2e reduction per year by 2035

2,575,296 tCO2e reduction per year by 2050

20.8% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Nairobi Metropolitan Transport Authority (NAMATA)

Collaborative agencies:

- Kenya Urban Roads Authority (KURA)
- Kenya Railways Corporation (KRC)
- Nairobi City County Government (NCCG)
- Nairobi Metropolitan Services (NMS)

Timeline

2-5 Years

Resourcing plan

City and National Government, NGOs & PPP.

NAMATA has some partners and donors committed to fund the BRT. Some options include:

- Development partners
- World Bank
- Investment banks
- AfDB
- GCF has different financing mechanisms - loans, grants, equity through accredited institutions e.g. NEMA, KCB etc.
- Technical assistance and transfer of knowledge will be necessary for institutions like NAMATA.

Level of city control

Predominantly a city level action with National support for implementing rail measures.

Alignment with policies & plans

NMT Policy (2015)

Integrated National Transport Policy (2012)

The Traffic Act

Kenya Vision 2030

Nairobi Integrated Urban Development Master Plan (NIUPLAN)

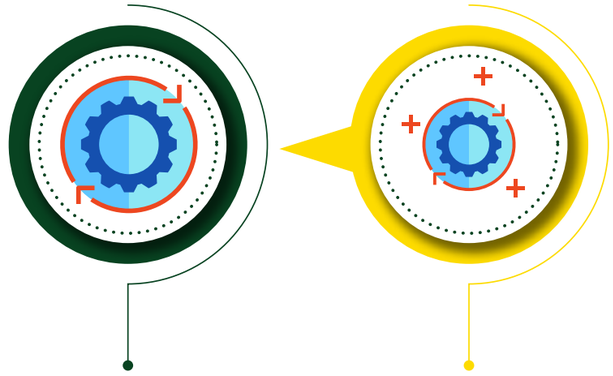
Table 5: Supporting actions for action 1&2

	Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
1.	**Construction of storm drains in the city to reduce the impacts of floods.**	(1) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts. (2) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response.	Number of degraded storm water drains rehabilitated	Strengthened management of urban flooding in major urban centres	Council of Governors State Department for Housing and Urban Development	Decreased sensitivity of urban infrastructure to extreme precipitation events through improved capacity of stormwater drainage to handle extreme volumes or overflow from river flooding; Decreases risk of flash flooding, pollution and disease outbreak from pollution.
2.	**Climate proofing of roads**	(1) Establish efficient, safe, world-class transportation systems and logistics services that can withstand projected impacts of climate change	Kilometres of roads climate proofed.	Strengthened climate-proofing of transport and other infrastructure	Council of Governors Ministry of Transport, Infrastructure, Housing and Urban Development Kenya National Highways Authority Kenya Urban Roads Authority Kenya Rural Roads Authority	Improves road quality which mitigates damage from extreme events, leading to disruption of emergency services, mobility, livelihoods and economic activity; Increases capacity to manage disaster risk and improve response mechanisms.
3.	**Adoption of improved vehicular efficiency standards for road transport**	(1) NMT Policy (2015) (2) Integrated National Transport Policy (2012) (3) The Traffic Act (4) Kenya Vision 2030 (5) Nairobi Integrated Urban Development Master Plan (NIUPLAN)	tCO_2e reduction per year	1.3 $MtCO_2e$ reduction per year by 2035 2,5 $MtCO_2e$ reduction per year by 2050 20.5% of the city's unconditional reduction target in 2050		Environment (e.g. air quality improvements – reduction in pollutant concentrations)
4.	**Adoption of fuel-efficient aircraft and development of sustainable aviation fuel**	(1) Integrated National Transport Policy (2012) (2) Kenya Vision 2030	tCO_2e reduction per year	Emission reductions (not estimated).		Environment (e.g. air quality improvements – reduction in pollutant concentrations)
5.	**Modal shift from road to railway for freight transport**	(1) NMT Policy (2015) (2) Integrated National Transport Policy (2012) (3) Kenya Vision 2030	tCO_2e reduction per year	Emission reductions (not estimated).		Environment (e.g. air quality improvements – reduction in pollutant concentrations)
6.	**Fuel switch; road and rail transport**	(1) NMT Policy (2015) (2) Integrated National Transport Policy (2012) (3) The Traffic Act (4) Kenya Vision 2030	tCO_2e reduction per year	Emission reductions (not estimated).		Environment (e.g. air quality improvements – reduction in pollutant concentrations)

4.2. Urban Development

The current city structure is homocentric, making all trips terminate in central business district. This leads to traffic congestion and concentration of economic activities in the urban core and leading to decay of the urban core. There have been efforts by the NMS in collaboration with NCCG to shift public vehicles from the CBD through development of smart bus termini such as the Green Park terminus and the Desai/ Parkroad project. The project is operational and seeks to divert all public vehicles from target routes from entering the CBD thus reducing congestion. Physical planning at city level aims to embrace the Nairobi Integrated Urban Development Plan (NIUPLAN) with a goal of guiding investments and planning in the city.

Urban Development



Ready to Implement Actions

- **Development of new master plan to decentralise services away from the CBD**

Supporting Actions

- Enhance the resilience and adaptive capacities of urban infrastructure, ensuring the retro-fitting of existing key infrastructure based on the order of priority with preference for those existing infrastructure facilities of post-disaster significance.
- Climate-proofing communication and power lines to reduce the impact of strong winds during the rainy season that cause power outages, destruction of property like billboards, cause harm through propulsion of dangerous elements like rocks and disrupt traffic
- Landscaping and planting of grass at open spaces to reduce erosion and beautify the city
- Protection of public open spaces, greenbelts, forest reserves, water bodies, wetlands, water catchment areas and other ecologically sensitive areas from physical development and urban encroachment.

ACTION 3: Development of new master plan to decentralise services away from the CBD

The main challenge for Nairobi is the mismatch between the rate of urban growth and the demand for transport services. Therefore, this action aims to ensure that urban development is intertwined with future development plans. Through the development of a city master plan it aims to meet the unprecedented demand for transport services in a sustainable manner. The objective of Nairobi's masterplan is to advocate for a city which is green, efficient and inclusive. A key focus area with the masterplan will include decentralising transport services away from the CBD. To achieve this, spatial and urban designs will be revised to include loop lines for the LRT and BRT to circuit around the CBD to improve traffic flows. Moreover, the masterplan will place an emphasis on modal integration, multi-functional station, sub-centres and the inclusion of the NMT facilities (see Action 1 above).

Box 16: Action 3 ready implement road-map

Climate impact

1.1 MtCO2e reduction per year by 2035
3.2 MtCO2e reduction per year by 2050
25% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Kenya Urban Roads Authority (KURA)
Nairobi City County Government (NCCG)
Nairobi County Ministries
Nairobi Metropolitan Services (NMS)
Nairobi Metropolitan Transport Authority
Ministry of Planning

Timeline

2-5 Years

Resourcing plan

City (Public sector funding i.e. taxation) and National Government
PPPs
Donor funding
City Master Plan Development should be included in the city budget
Human and technical resources from city Urban Planning Department already committed to the development of the city new Master Plan

Level of city control

Predominantly a city level action with National support law enforcement and road safety.

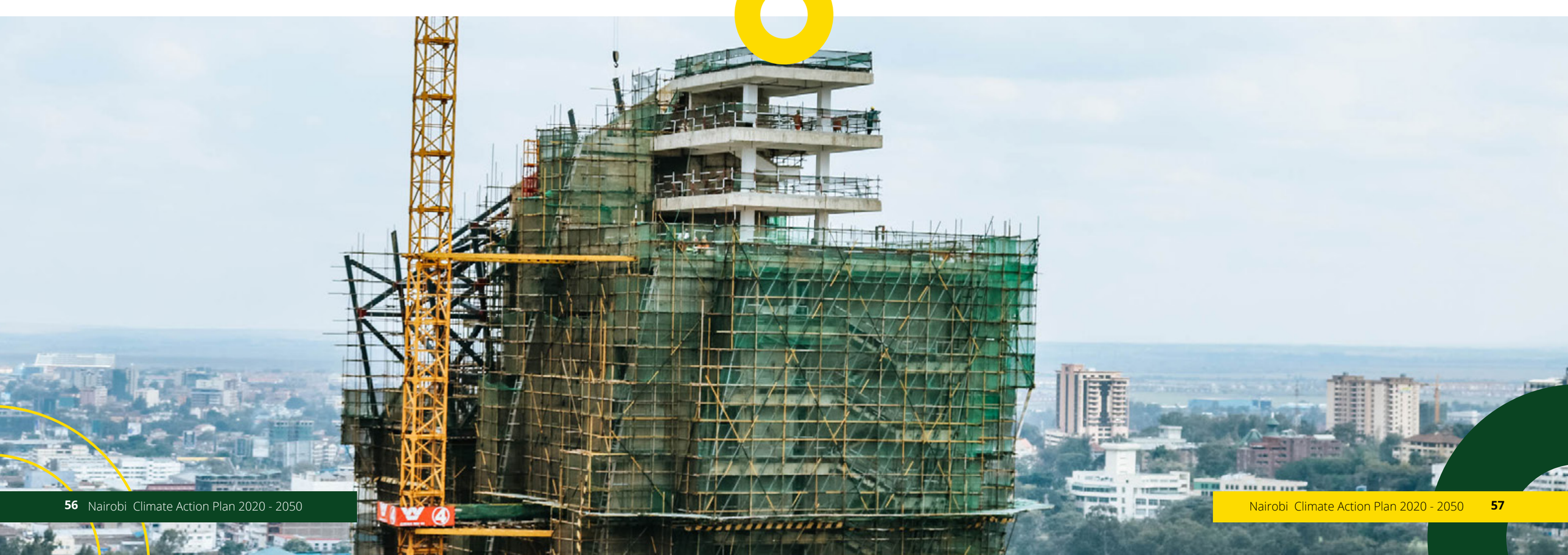
Alignment with policies & plans

NMT Policy (2015)
Nairobi Streets and Roads Design Manual (NSRDM)
Integrated National Transport Policy (2012)
Urban Development Master Plan (NIUPLAN)
Kenya Vision 2030

KPIs	Co-benefits	Sub-actions
Increased NMT space coverage, Increased services along NMT facilities, Safe NMT crossings (street signals, footbridges, underpasses, marked crossings), Revised bus / rail lines shift from a radial to orbital transportation system No. of sub-centres/station No. of loop lines built to deviate traffic from the CBD	Community benefit (e.g. reduced fatalities and injuries among pedestrians, safer connections and employment opportunities in the construction phase.) Environnent (e.g. air quality improvements – reduction in pollutant concentrations) Mobility & accessibility (e.g. reduction in journey times, improved connectivity and reduction in congestion by decentralising transport services in the CBD)	3.1. Conduct and enhance participatory planning approaches 3.2. Build the capacity of city planners on climate change issues 3.3. Develop feasibility studies and roadmaps for the improvement of transport routes and urban design 3.4.Plan and build control regulations and standards for urban design

Table 7: Supporting actions for action 3

Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
7. Enhance the resilience and adaptive capacities of urban infrastructure, ensuring the retrofitting of existing key infrastructure **8. Climate-proofing communication and power lines**	(1) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts. (2) Establish efficient, safe, world-class transportation systems and logistics services that can withstand projected impacts of climate change	Number of districts or neighbourhoods with strengthened capacity plan, contract and supervise the implementation of climate-proof infrastructure	Strengthened climate-proofing of transport and other infrastructure	Council of Governors Ministry of Transport, Infrastructure, Housing and Urban Development Kenya National Highways Authority Kenya Urban Roads Authority Kenya Rural Roads Authority	Strengthens resilience of public infrastructure to mitigate disruption from extreme events, particularly flooding and extreme heat, which will ensure that Nairobi's economy can continue to operate in the face of climate impacts; Strengthens urban capacity for economic and social growth through enhanced public infrastructure, which will promote economic activity, increasing economic prosperity and resilience; Potential to reduce encapsulated carbon from urban infrastructure by increasing the use of sustainable materials and processes.
9. Landscaping and planting of grass at open spaces to reduce erosion and beautify the city **10. Protection of public open spaces, greenbelts, forest reserves, water bodies, wetlands, water catchment areas and other ecologically sensitive areas from physical development and urban encroachment**	(1) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts. (2) Enhance the resilience of water sector by ensuring adequate access to, and efficient use of, water for agriculture, manufacturing, domestic, wildlife and other purposes.	Number and types of engagements and decisions leading to the rehabilitation of 'natural infrastructure'; Number of degraded rangeland units restored.	Strengthened management of urban flooding Improve rangeland health and condition	State Department for Housing and Urban Development Water Resources Authority National Water Storage Authority Ministry of Water and Sanitation Council of Governors	Contributes to urban cooling by providing shade to mitigate against impacts from extreme urban heat; Increases natural sequestering of carbon in urban areas; Improves air quality in urban spaces, reducing impact on health; Improves natural drainage, creating co-benefits for soil quality, soil stability, nutrient content and water table height; Promotes ecosystem health and the strength of ecosystem services which promotes growth of community livelihoods; Improves water security and therefore food security through sustained agricultural activity. *Maladaptation: Increase of green spaces in urban areas may increase demand on water during dry seasons – efficient and careful management of green spaces must be considered to preserve water resources.*



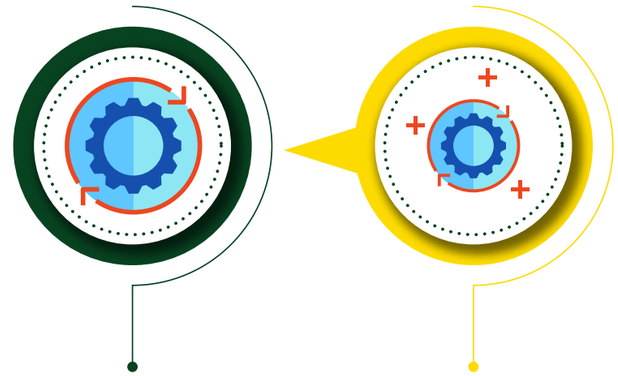
4.3. Transitioning to a Circular Economy

Nairobi County generates over 2,400 tons of waste per day projected to be 3,200 tons per day by year 2022. While 95% of Nairobi's waste is potentially reusable, only 5 per cent is actually recycled and composted. Moreover, only 33 per cent of waste produced is collected for disposal at Nairobi's only official dumpsite.[38]

To tackle the dysfunctional waste management system, a major mitigation action nationally on waste prevention and reduction is the implementation of circular economy principles in Nairobi as outlined in Kenya's NAMA. This is a key action requiring collaborative delivery and vertical integration between Nairobi's city government and the Ministry of Environment.

By adopting a circular economy within the waste sector can reduce the disposal costs and generate additional revenues from the sale of recyclable materials and compost.

Transitioning to a Circular Economy



Ready to implement actions	Supporting actions
• **Implementation of a circular economy solid waste management approach**	• Improved industrial practices through the scale up of industrial symbiosis

[38]Japan International Corporation Agency (JICA) (2010). Preparatory Survey for Integrated Solid Waste Management in Nairobi City in the Republic of Kenya. Available from http://open_jicareport.jica.go.jp/pdf/12005443.pdf

ACTION 4: Implementation of a circular economy solid waste management approach

Waste is a resource and has considerable economic value. Organic waste, which constitutes 69% of Nairobi's waste, can be converted into compost. Recyclable waste such as paper, plastic, glass and metal (16% of waste) is used by industries for manufacturing new products (JICA, 2010). Thus, an untapped market for waste-to value products, exist in Nairobi. Consequently, only 10% of potentially recyclable materials are currently recovered for recycling.[39] In order to adopt a more circular approach in Nairobi waste sorting centres and recycling points will be established to increase the quality of sorting and recovered material. This will be endorsed within the plastic action plan which aims to manage plastic waste within the city.

It is key to collaborate with the private sector to ensure their participation in the recycling and reuse of waste.

Box 17: Action 4 ready implement road-map

Climate impact

77,340 tCO2e reduction per year by 2035
194,920 tCO2e reduction per year by 2050
1.6% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Nairobi City County (NCC)
Nairobi County Ministries
National Environment Management Authority (NEMA)
Collaborative agencies:

- Kenya Private Sector Alliance (KEPSA)
- Kenya Producer Responsibility Organisation (KEPRO)
- Kenya Association Of Manufacturers (KAM)
- Kenya Alliance of Resident Associations (KARA)
- Kenya PET Recycling Company Limited (PETCO)

Timeline

2-5 Years

Resourcing plan

City, National Government and Donors.
Financing locally through Climate Action Program:

- PPP model
- County Climate Change Fund (regulation to be developed)
- National Climate Change Fund

Other financing options:

- Green Cities Initiative by FAO (for food systems and

Human resources can be increased through collaboration with stakeholders.
The city has technical resources but will need to assess the necessity of more capacity building.

Level of city control

The city is responsible for providing waste management services to all residents. Will also need to engage with the private sector.

Alignment with policies & plans

Environmental Management and Coordination Act (EMCA)
National Climate Change Action Plan (NCCAP)
Kenya Vision 2030
The Integrated Solid Waste Management (ISWM) Plan for Nairobi
The Nairobi City County Solid Waste Management Act(2015)

KPIs

No. of recycling points and sorting facilities
Waste production (tonnes/year)
Recycling rates (tonnes per type/ year)
Amount of waste dumped and burned (tonnes/year)

Co-benefits

Reduced pollution (e.g. leachate from open dumps, and air pollutants from uncontrolled burning)
Increased public health (e.g. less waste dumped in communities with associated health issues – vermin, disease, contamination)
Job creation and economy (e.g. from new employment opportunities around collection and management, added revenue from sales of recycled material)
Cost reduction on management of waste
Increased stakeholder collaboration

Sub-actions

4.1. Establishment of transfer points across the city for waste segregation and sorting. Enforce existing by-laws for waste collection and sorting.
4.2. Launch a campaign at the household level on the perception of waste as a resource and encourage recycling and reuse.
4.3. Establish circular economy community projects to encourage reuse and communicate the benefits (e.g. revenue)
4.4. Establish annual survey of waste flow value chain

[39]NAMA Waste Kenya Report

Table 8: Supporting actions for action 4

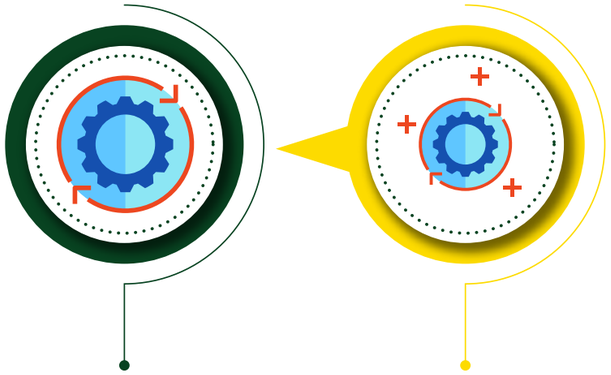
Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
11. Solid Waste Management within the Industry sector	(1) Environmental Management and Coordination Act (EMCA) (2) National Climate Change Action Plan (NCCAP) (3) Kenya Vision 2030 (4) The Integrated Solid Waste Management (ISWM) Plan for Nairobi (4) The Nairobi City County Solid Waste Management Bill (2015)	No. of recycling points and sorting facilities Waste production (tonnes/year) Recycling rates (tonnes per type/year) Amount of waste dumped and burned (tonnes/year) Uptake of advanced technology	Emissions reductions (estimates included in priority action)	Nairobi City County (NCC) Nairobi County Ministries The National Environment Management Authority (NEMA)	Reduced pollution (e.g. leachate from open dumps, and air pollutants from uncontrolled burning) Increased public health (e.g. less waste dumped in communities with associated health issues – vermin, disease, contamination) Job creation and economy (e.g. from new employment opportunities around collection and management, added revenue from sales of recycled material)

4.4.

Clean and Secure Energy Sector

Nairobi city sources its electricity from the Kenya Power and Lighting Company (KPLC) which predominantly sources its energy from geothermal and hydropower sources. The Kenyan electricity grid is increasingly relying on renewable energy, more than 90%. The leading electric power generation company in Kenya is KenGen. The sector is overseen by the Ministry of Energy and Petroleum (MoEP), the lead government ministry in charge of energy-related matters, and the Energy and Petroleum Regulatory Authority (EPRA), the sector regulator. The main sources of energy in Nairobi County are electricity, solar, LPG, biogas paraffin, charcoal and firewood. Lack of access to clean sources of energy is a major impediment to development through health-related complications such as increased respiratory infections and air pollution.

Clean and Secure Energy Sector



Ready to implement actions	Supporting actions
• **Increase adoption of renewable energy** • **Develop Minimum Energy Performance Standards (MEPs) for more appliances**	• Diversify energy sources and the energy mix to reduce reliance on climate sensitive energy sources

ACTION 5: Increase adoption of renewable energy

According to Kenya's National Climate Change Action Plan (NCCAP - 2018-2022), the country intends to develop 2,405 MW of renewable energy and retire 300 MW of thermal plants by 2022. Through the NCCAP and the national Energy Act, the country is also promoting the development of rooftop PV. Although the current electricity grid is relatively low carbon, Nairobi is aware that it is necessary to continue to upscale renewable power to meet the future demand that will arise as more of the population is connected and living standards rise. This action ensures that future demand can continue to be met by renewables and to reduce the reliance on current sources of renewable energy (i.e. geothermal & hydropower). By diversifying the current energy mix to include other renewable sources of energy (e.g. solar) this can help avoid adverse effects of water scarcity within the country and among all user types (e.g. industry, commercial, farming and residential). Thus, building a resilient energy supply.

Box 18: Action 5 ready implement road-map

Climate impact

589,876 tCO2e reduction per year by 2035

1,103,994 tCO2e reduction per year by 2050

8.9% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

- Nairobi City County (NCC)
- Ministry of Energy and Petroleum (MoEP)
- Energy and Petroleum Regulatory Authority (EPRA)
- Water Resource Management Authority
- Kenya Electricity Transmission Co.
- Rural Electrification and Renewable Energy Corporation (RERC)

Timeline

2-5 Years

but work will need to be ongoing to provide long-term benefits

Resourcing plan

Public Private Partnerships with support from Nairobi City County

Level of city control

City Government have the capacity to allocate funding to projects related to public sector buildings, and to coordinate with PPPs with support from National Government. However, in general, they are likely to play more of a role in awareness raising and indirect influence.

Alignment with policies & plans

National Climate Change Action Plan (NCCAP)

Enactment of the Energy Act No. 1 of 2019

Kenya Vision 2030

Kenya National Energy Policy (2014)

The Nairobi County Integrated Development Plan (2018-2022)

KPIs

Amount of renewable power generated annually (MWh)

Proportion of electricity demand in Nairobi that is met through renewables

No. of renewable installations

Co-benefits

Community benefits (e.g. expanding access to electricity while guarding against price hikes in fossil fuels, increased comfort)

Environmental (e.g. improved air quality from reduced use of diesel, kerosene and other fuels; use of energy efficient technologies resulting in lower energy demands than would otherwise occur)

Sub-actions

5.1. Identify buildings or zones that are suitable for local renewable energy systems and where the NCC has greater ability to influence uptake (e.g. civic centres, hospitals, schools, development sites, etc.) and undertake detailed feasibility studies to determine appropriate technologies

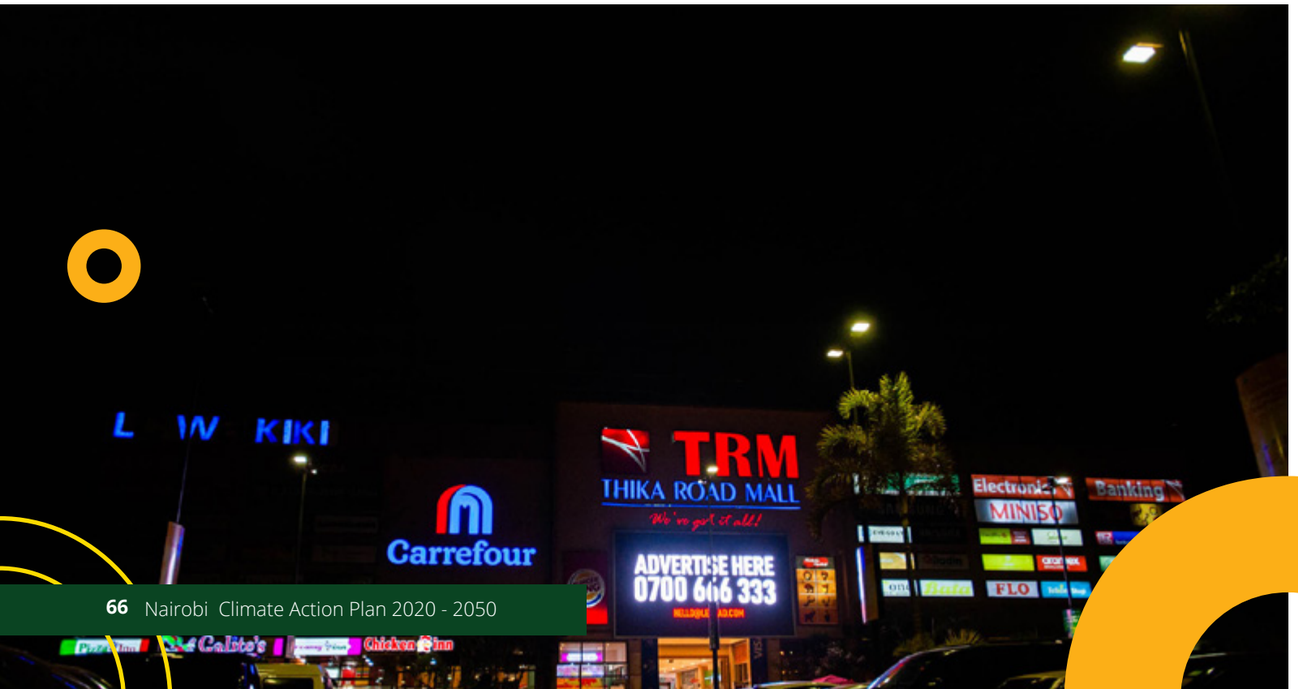
5.2. Identify specific funding sources for viable projects

5.3. Consider undertaking an awareness campaign targeted at property owners to encourage uptake of building-integrated renewables e.g. PV or solar hot water systems

5.4. Work with local businesses to identify any efficiencies that can be achieved (such as waste heat reclamation on industrial sites) and facilitate their implementation

5.5. Coordinate with the electricity distribution company to assist with strategic planning for renewables, where appropriate

5.6. Review the building permitting process to ensure that it encourages the use of on-site renewable heat or power generation where appropriate (see Action 7)



ACTION 6: Develop Minimum Energy Performance Standards (MEPs) for more appliances

Box 19: Action 6 ready implement road-map

Climate impact

2,776 tCO2e reduction per year by 2035

4,885 tCO2e reduction per year by 2050

<1% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Nairobi City County (NCC)

Kenya Bureau of Standards (KEBS)

Ministry of Energy and Petroleum (MoEP)

Energy and Petroleum Regulatory Authority (EPRA)

Timeline

<2 Years

Resourcing plan

City Government

Level of city control

City Government have the capacity to allocate some funding to this project but their involvement is likely to primarily involve working with the KEBS and MoEP to ensure that standards are implemented appropriately This is because the MoEP is currently carrying out a review of MEPs which will be captured in the Nation

Alignment with policies & plans

National Climate Change Action Plan (NCCAP)

Enactment of the Energy Act No. 1 of 2019

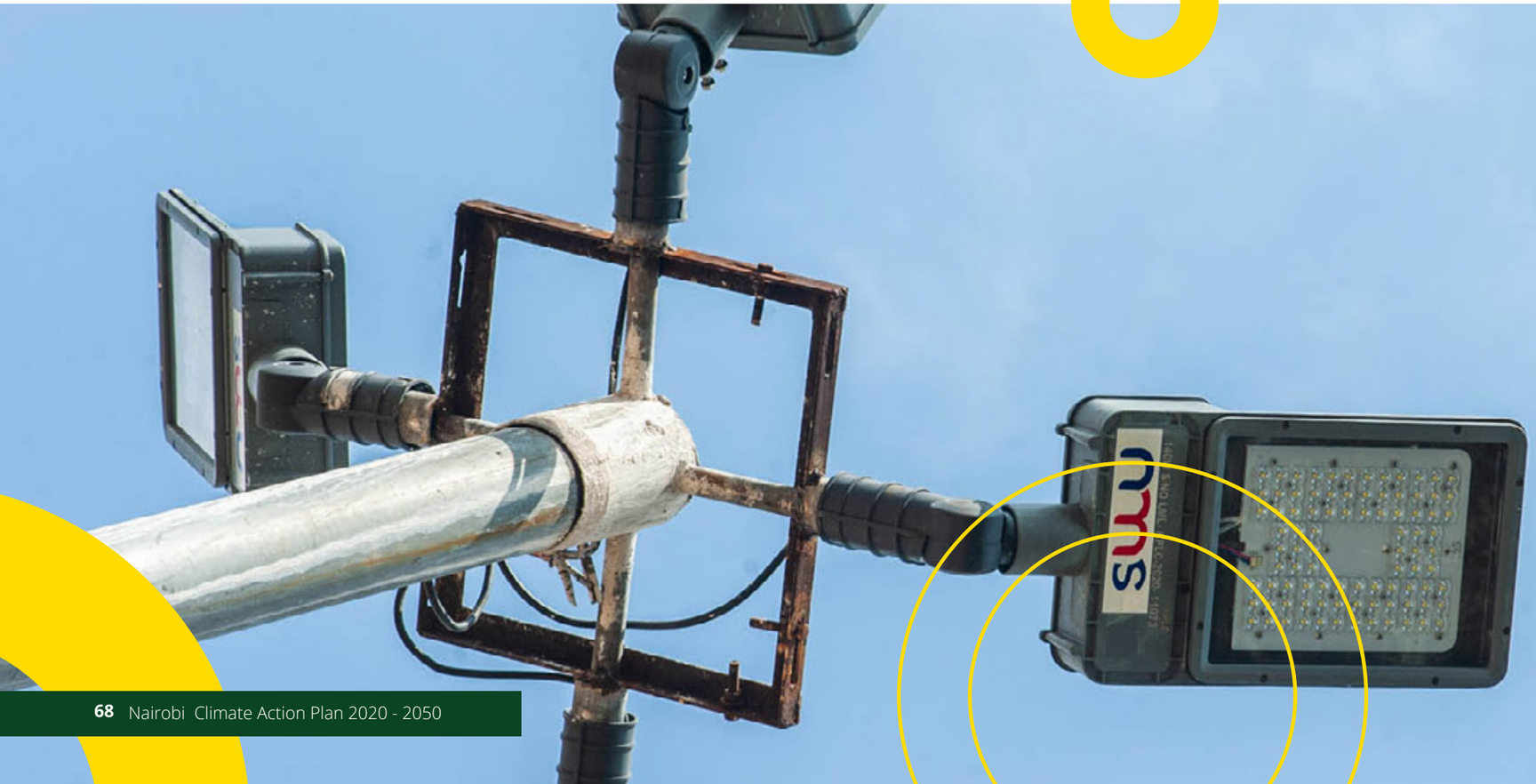
Kenya Vision 2030

The Nairobi County Integrated Development Plan (2018-2022)

KPIs	Co-benefits	Sub-actions
N/A	Community benefits (e.g. expanding access to electricity while guarding against price hikes in fossil fuels, increased comfort) Environmental (e.g. use of energy efficient technologies resulting in lower energy demands than would otherwise occur)	6.1. Keep informed of developments during the MoEP review of MEPs to understand how these will impact Nairobi individuals and organisations 6.2. Undertake a review of common appliances that contribute towards pollution in Nairobi to identify whether there are existing MEPs in place and whether these need to be strengthened or modified (e.g. by working with academics, trade bodies or local businesses). Note that cooking appliances are covered separately in Action 17).

Table 9: Supporting actions for action 5&6

Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
12. Diversify energy sources and the energy mix to reduce reliance on climate sensitive energy sources	(1) Ensure an electric supply mix based mainly on renewable energy, and is resilient to climate change, and promote energy efficiency	Share of climate-resilient renewable energy in energy mix	Energy provision diversified across sources and technologies	Council of Governors Ministry of Energy	Contributes to mitigation through promotion of renewable energy; Considers the intermittence of renewable energy, increasing energy security through diversification of sources; Reduces strain on ecosystems through reliance on hydro-power; Improves ecosystem health, ecosystem service strength, livelihoods and community capacity to increase resilience; Increases energy security by increasing the percentage of energy produced within Kenya's borders.



4.5.

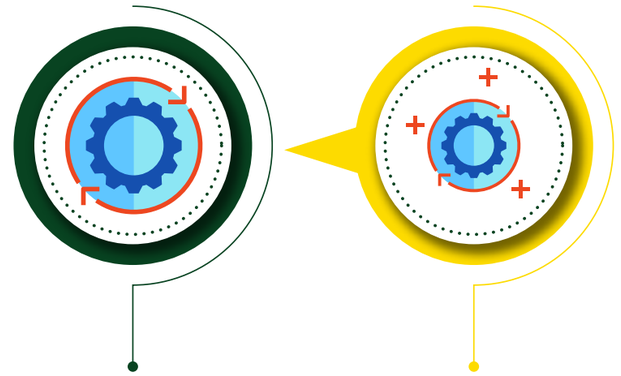
Climate-Proofing Housing Stock

Nairobi is the largest and populous city in the country and is forecasted to reach close to eight and a half million people by 2035. This puts an enormous strain on the current housing stock and more importantly on the current and predicted energy demand derived from the residential sector. In Nairobi's latest city inventory the residential buildings accounted for roughly half of the GHG emissions from stationary energy use.

The main source of emissions from the energy sector in Nairobi is cooking, especially in the informal settlements. LPG, paraffin and biomass are the most commonly used energy sources in the city for cooking options although there is a challenge in reconciling the number of people using kerosene, LPG, biomass and other energy sources in the city. Similar to Nairobi, the Kenyan residential sector predominantly relies on wood and charcoal to meet its heating and cooking needs. This reliance has resulted in land degradation and deforestation. In an effort to curb this, national government has introduced a logging ban which has resulted in charcoal prices increasing by more than 100%. To further promote clean cooking government has also discounted LPG stoves to promote their use. A levy on kerosene has also been introduced which has resulted in prices increasing by more than 40% since its introduction in 2018.

Despite these efforts, the COVID-19 pandemic has impacted consumer habits in many ways, including consumer choices relating to cooking fuels. Evidence points to the increased use of kerosene, especially in informal settlements, as a cheaper alternative to LPG – albeit one with higher GHG emissions. Clean cookstoves/LPG remains a priority action for Nairobi and the role of urban areas to build a local manufacturing industry, depots, generate biogas, in order to implement this is highlighted in the MTAR.

Climate-Proofing Housing Stock



Ready to implement actions	Supporting actions
• **Revision of building codes for Enhanced Energy Efficiency in buildings**	• Promote adoption of clean cooking technologies • Enhance water harvesting technologies in residential housing and public buildings

ACTION 7: Revision of building codes for Enhanced Energy Efficiency in buildings

This action aims to update current building codes within Nairobi to improve energy efficiency standards within buildings. This action acts to address the rapidly growing demand of energy from the residential sector. In order to tackle this escalation in demand, the building codes will mandate that all new buildings will be expected to go beyond the current building regulations and standards to encompass energy efficiency within the building design. This may include higher performance building fabric/materials, and services such as lighting, appliances and solar hot water heating. Moreover, this action aims to introduce energy certificates for all buildings so dwellers are aware of their current building's performance and how to increase its rating.

Box 20: Action 7 ready implement road-map

Climate impact

412,306 tCO2e reduction per year by 2035

1,284,628 tCO2e reduction per year by 2050

10.4% of the city's unconditional reduction target in 205

Lead agency & collaborative agecies

Nairobi City County (NCC)

Ministry of Planning and Development

Ministry of Energy (MoE)

State Department of Housing

Kenya Building Research Centre

Other industry groups such as the National Construction Authority, Architectural Certification Board, Architectural Society of Kenya, Green Building Society, etc.

Timeline

<2 Years

Resourcing plan

City, National Government and donors.

Level of city control

City Government have the capacity to allocate funding to this project in collaboration with the National Government. The National Government are pivotal in developing and enforcing national level policies.

Alignment with policies & plans

National Climate Change Action Plan (NCCAP)

Enactment of the Energy Act No. 1 of 2019

Kenya Vision 2030

The Nairobi County Integrated Development Plan (2018-2022)

Ongoing work to develop green building standards with UNDP

KPIs

Energy rating of new buildings

Energy intensity of the residential sector (e.g. median energy use per m2 floor area in new build dwellings)

Proportion of buildings that have an energy performance certificate issued

No. of energy audits carried out

No. of employment opportunities created in the sector

Co-benefits

Community health (e.g. improved living standards with benefits for women, reduced energy consumption resulting in reduced energy bills = more disposable income)

Environmental (e.g. reduced demand on energy; improved air quality in low-income areas)

Sub-actions

7.1. Keep informed of ongoing work that is being undertaken to develop green bulding standards with UNDP and adjust the following sub-actions where appropriate

7.2. Identify opportunities and challenges that would impact what performance standards can be reasonably achieved by undertaking re-search and surveys of buildings, building owners and construction compa-nies

7.3. Design and undertake stakeholder engagement and awareness raising amongst building developers, construction companies, building own-ers/managers and with the public

7.4. Development of a framework for energy efficiency permitting and stand-ards, consultation and pilots

7.5. Start to implement new building standards while undertaking monitoring and evaluation of compliance

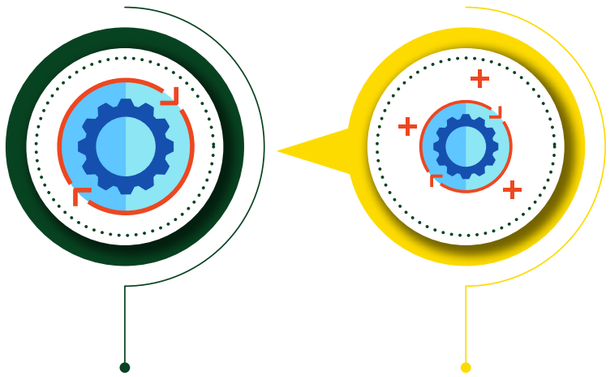
Table 10: Supporting actions for action 7

	Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
13.	**Promote adoption of clean cooking technologies**	(1) National Climate Change Action Plan (NCCAP) (2) Enactment of the Energy Act No. 1 of 2019 (3) Kenya Vision 2030 (4) The Nairobi County Integrated Development Plan (2018-2022)	Changes in charcoal production (kg) Uptake of efficient cookstoves (no. and proportion of cookstoves) Reduction of carbon emissions (tCO_2e) Improvements to air quality in the home and no. of mortalities linked to poor air quality Rate of rural electrification (% of households) Reduction of deforestation rates (per hectare)	Emissions reduction	Nairobi City County Government (NCCG)	Community health (e.g. improved indoor air quality, with particular benefits for women) Environmental (e.g. reduced deforestation for charcoal production; improved air quality in low-income areas)
14.	**Enhance water harvesting technologies in residential housing and public buildings**	(1) Enhance the resilience of water sector by ensuring adequate access to, and efficient use of, water for agriculture, manufacturing, domestic, wildlife and other purposes	Types of water harvesting and storage equipment	Increase water harvesting and water resource use efficiency	Water Resources Authority National Water Storage Authority Ministry of Water and Sanitation Council of Governors	Increases water security of communities by building alternative sources of water resources; Promotes conservation of ground or tapped water resources which builds ecosystem health, including soil health / stability, water quality and strengthens ecosystem services; Increases resilience of communities that rely on ground water resources, promoting community health.

4.6. Working Towards a Clean and Zero Waste City

Waste management is a significant challenge in Nairobi, as explained in Section 2.1.2. Roughly half of the residential population does not have access to regular waste collection services, and a significant portion of waste is either uncollected or dumped in unregulated landfills. This creates significant health hazards and environmental pollution.

Working Towards a Clean and Zero Waste City



Ready to implement actions

- **Invest in Solid Waste Management this includes material recovery facility and transfer stations.**
- **Wastewater management**
- **Reduce the amount of solid waste in storm-water systems through city-wide solid waste collection initiatives**

Supporting actions

- Construct climate proofed sanitary landfill in the city
- Decongesting/clearing drains during City Cleaning Initiatives
- Rehabilitate all degraded storm water drains in Nairobi and other urban centres by June 2023 in cross-collaboration with WRA, to control risk from urban flooding
- By laws to prohibit the development of new open drains in urban areas

ACTION 8: Invest in Solid Waste Management, including material recovery facilities and transfer stations.

This aim will be achieved through purchasing new equipment and machines and undertaking periodical maintenance of the new equipment and machines. Where relevant the city will also seek to embrace new technologies and innovations that will assist in this goal. The proposed improvements to solid waste management practices are in line with current plans and policies in the city, however specific policies related to dumpsite improvements may be necessary. This action will have benefits for local communities, including improved air quality, through the reduction of open fires, and reduced contamination of water bodies.

Box 21: Action 8 ready implement road-map

KPIs

National Climate Change Action Plan (NCCAP)

Kenya Vision 2030

The Nairobi County Integrated Development Plan (2018-2022)

No. of transfer stations

No. sorting centres

% of material recovered

Sales of recycled material VS production of virgin material

Volume of waste generated by waste stream (m^3)

Co-benefits

Reduced pollution (e.g. leachate from open dumps, and air pollutants from uncontrolled burning)

Increased public health (e.g. less waste dumped in communities with associated health issues – vermin, disease, contamination)

Job creation and economy (e.g. from new employment opportunities around collection and management)

Reversing and reducing the impact of climate change

Sub-actions

8.1. Establishment of transfer points across the city for waste segregation and sorting

8.2. Enforce existing by-laws for waste collection

8.3. Identify and establish new landfill site locations for the city and begin planning and procurement

8.4. Launch a campaign at the household level on the perception of waste as a resource and encourage recycling and reuse

8.5. Establish repair and upgrade waste collection facilities

8.6. Establish treatment centres for recycled waste

8.7. Install landfill methane gas capture technology

ACTION 9: Wastewater management

Installation of new wastewater treatment systems and enhancing methane recovery from existing and new wastewater treatment systems will increase public health and sanitation within the city.

Box 22: Action 9 ready implement road-map

Climate impact

146,185 tCO2e reduction per year by 2035

466,078 tCO2e reduction per year by 2050

3.8% of the city's unconditional reduction target in 2050

Lead agency & collaborative agecies

Nairobi City County (NCC)

PPPs, municipalities

Timeline

2-5 Years

Resourcing plan

City, National Government and donors.

Level of city control

City scale primarily but may require some support from national institutions.

Alignment with policies & plans

National Climate Change Action Plan (NCCAP)

Kenya Vision 2030

The Nairobi County Integrated Development Plan (2018-2022)

KPIs

Volume of wastewater treated (m^3/year)

No. of households connected to sewage network (households/ year or % of households)

No. of misconnected sewers fixed (no. repairs/year)

Proportion of sewage collected via formal wastewater network (%)

Quantity of gas collected and utilized (m^3/year)

Co-benefits

Increased public health (e.g. less waste dumped in communities with associated health issues – vermin, disease, contamination)

Job creation and economy (e.g. from new employment opportunities around collection and management)

Sub-actions

9.1. Revise existing wastewater treatment related regulations and enforce new policy regulations by 2030

9.2. Undertake capacity building programmes to address a technical skill and resourcing gap within the waste management organisations/departments.

9.3. Construct one additional new wastewater treatment facility by 2030 and two by 2030

9.4. Undertake compliance monitoring to new regulations

ACTION 10: Reduce the amount of solid waste in stormwater systems through city-wide solid waste collection initiatives.

Box 23: Action 10 ready implement road-map

Climate impact

Urban waste management infrastructure climate-proofed

Lead agency & collaborative agecies

NCCG
Council of Governors
State Department for Housing and Urban Development

Timeline

2-5 Years

Resourcing plan

City, National Government and donors.

Level of city control

City scale primarily but may require some support from national institutions.

Alignment with policies & plans

National Adaptation Plan (NAP)
National Climate Change Action Plan (NCCAP)
Kenya Vision 2030
The Nairobi County Integrated Development Plan (2018-2022)

KPIs

Number of waste recovery and disposal laws and regulations in which climate change adaptation has been mainstreamed

Number of waste dumpsites transformed into climate-proof landfills.

Co-benefits

Reduces sensitivity of urban areas to flash flooding by removing obstructions from drainage systems, improving drainage flow and increase capacity to manage extreme precipitation events

Reduces risk of pollution and reduces incidences of water or vector borne diseases, mitigating impacts to community health and shocks to health care systems from disease outbreak.

Sub-actions

10.1. Develop and implement public awareness and social mobilisation mechanisms
10.2. Enhance capacity to enforce and monitor the appropriate solid waste disposal
10.3. Enhance participatory planning and decision with communities
10.4. Mainstream disaster risk reduction measures in waste sector planning and service delivery, particularly for vulnerable areas

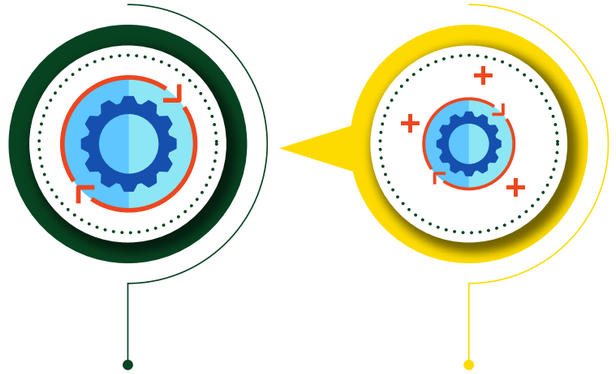
Table 11: Supporting actions for actions 8,9&10

Supporting Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
15. Construct climate proofed sanitary landfill in the city	(1) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts.	Number of waste dumpsites transformed into climate-proofed landfills	Urban waste management infrastructure climate-proofed	Council of Governors State Department for Housing and Urban Development	Decreases risk of pollution and disease outbreak; Improves health of communities; Promotes livelihoods or sectoral productivity within waste management sectors; Improves ecosystem health, biodiversity and strength of natural resources by reducing incidences of pollution; Reduces solid waste in drainage systems, reducing sensitivity to extreme precipitation events.
16. Decongesting/clearing drains during City Cleaning Initiatives. **17. Rehabilitate all degraded stormwater drains in Nairobi and other urban centres by June 2023 in cross-collaboration with WRA, in order to control risk from urban flooding**	(1) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts. (2) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response.	Number of degraded storm water drains rehabilitated	Strengthened management of urban flooding in major urban centres Decreased sensitivity of urban infrastructure to extreme precipitation through improved capacity of stormwater drainage to handle extreme volumes or overflow from river flooding	Council of Governors State Department for Housing and Urban Development	Decreases sensitivity of drainage systems to extreme precipitation events; Decreases risk of flash flooding, pollution and disease outbreak from pollution.
18. By-laws to prohibit the development of new open drains in urban areas	(1) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response.	Number of law enforcement events relating to urban planning and storm water management in urban areas.	Increase water harvesting and resource use efficiency	Ministry of Water and Sanitation Water Resources Authority Council of Governors National Water Storage Authority	Builds institutional capacity to manage and prevent over exploitation of ground water resources which conserves natural water sources and maintains soil health and stability – which is key for urban development; Reduces pollution of water and soil by ensuring waste water and waste products are transported to waste infrastructure facilities.

4.7. Water Resource Management

As described in Section 2.1.2, there are significant challenges with water resources in Nairobi, due to a combination of local and regional factors. On a national level, Kenya is classified as a country that experiences water scarcity. Locally, water supplies are restricted due to issues such as environmental pollution and lack of adequate infrastructure.

Water Resource Management



Ready to implement actions	Supporting actions
• **Adopt water conservation initiatives to cater for scarcity**	• Upgrading of existing water infrastructure, water treatment facilities and water networks • Wetland restoration in Nairobi river to increase greenfield spaces that can act as an alternative drainage ways for stormwater • Promote equitable distribution and access to water for vulnerable communities in climate-risk prone areas • Develop and strengthen policies and procedures to conserve water

ACTION 11: Adopt water conservation initiatives to cater for scarcity.

Water conservation has been prioritised for Nairobi because reducing demand for resources is a key prerequisite for successfully addressing shortages and other issues. In Nairobi, there are many examples of new boreholes being drilled in order to address water supply problems, which has resulted in unsustainable levels of abstraction and threatens the environmental health of the aquifer and water system as a whole. This action aims to develop a range of water conservation initiatives, which could range from the more strategic level to local, on-the-ground projects such as rainwater collection and storage.

Box 24: Action 11 ready implement road-map

Climate impact

Improved water security
Planning for water security strengthened
Enhanced resilience of wildlife and biodiversity

Lead agency & collaborative agecies

Nairobi City County (NCC)
Nairobi City Water and Sewerage Company (NCWSC)
Water Services Regulatory Board (WASREB)
Water Resources Management Authority (WARMA)
Ministry of Water, Sanitation & Irrigation
Athi Water Works Development Authority

Timeline

2-5 Years

Resourcing plan

Resourcing will depend on the types of initiatives but may include:

- City (public sector funding i.e. taxation) and National Government
- PPPs
- Donor funding
- NGOs
- Community groups

Level of city control

The city has the capacity to implement this action depending on the nature of the water conservation initiatives that are selected, with support from National government or other partners (e.g. NGOs, community groups, businesses)

Alignment with policies & plans

National Water Master Plan 2030 (published 2013)
Vision 2030
Water Sector Strategic Plan

KPIs

% of water demand met
Number of buildings or facilities installed with water saving devices

Co-benefits

Improves community health (lower risk of dehydration, better sanitation and washing facilities), reduces risk of impacts from drought, potentially contributes to small-scale urban agriculture, reduces need to obtain water from other sources such as boreholes, reduces energy demand for water treatment facilities, potentially decreases runoffs from roofs and other surfaces (i.e. in the case of rainwater collection)

Sub-actions

11.1. Maintain awareness of existing policy direction and initiatives to ascertain whether there are any ready-to-go projects that require NCC support and could be rolled out quickly
11.2. Identify vulnerable communities, sectors or areas that would benefit from additional water conservation initiatives
11.3. Work with stakeholders (e.g. water/utility providers) and engage with public to understand the types of technologies and programmes that would be suitable
11.4. Identify collaboration partners and sources of funding e.g. community groups, NGOs, other government authorities
11.5. Mobilise resources to implement projects
11.6. Ensure ongoing monitoring, evaluation and engagement with participating individuals or organisations to assess outcomes

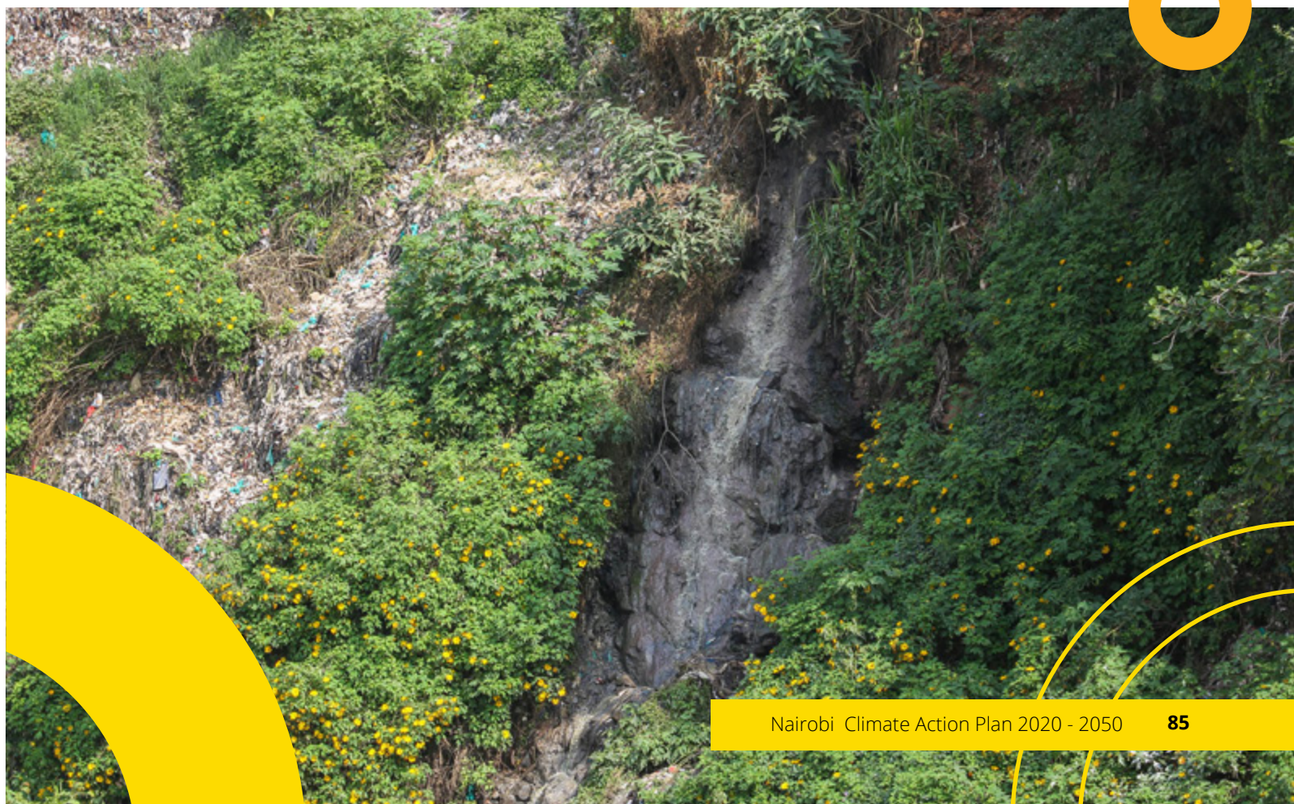


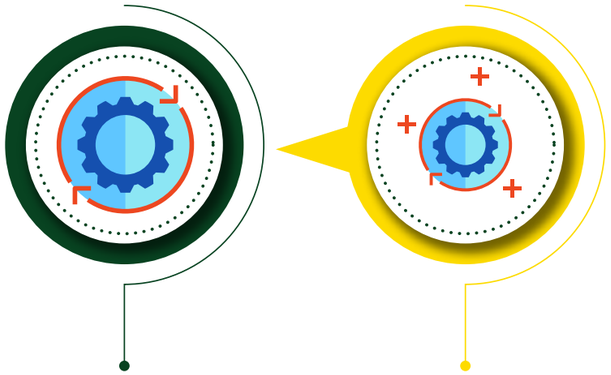
Table 12: Supporting actions for action;; 11

Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
19. Upgrading of existing water infrastructure, water treatment facilities and water networks	(1) Enhance the resilience of water sector by ensuring adequate access to, and efficient use of, water for agriculture, manufacturing, domestic, wildlife and other purposes	Number of climate-proofed water infrastructures	Improved annual per capita water availability through the development of climate-proofed water infrastructure	Water Resources Authority National Water Storage Authority Ministry of Water and Sanitation Council of Governors	Increases the capacity of water infrastructure to store, treat and transport water; Improves the resilience of water infrastructure which are vulnerable to climate impacts; Improves water security through efficient management of water resources.
20. Wetland restoration in Nairobi river to increase greenfield spaces that can act as an alternative drainage way for stormwater	(1) Increase Kenya's forest cover to 10% of the country's total land cover. (2) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response.	Numbers of hectares restored on degraded landscapes	Land and forest cover increased Reduced flood disaster risks An integrated watershed management approach embraced in various catchments	Ministry of Environment and Forest Kenya Forest Service Council of Governors Water Resources Authority	Increase natural resilience and ecosystem health; improved ecosystem services, benefiting community livelihoods and community resilience.
21. Promote equitable distribution and access to water for vulnerable communities in climate-risk prone areas	(1) Enhance the resilience of water sector by ensuring adequate access to, and efficient use of, water for agriculture, manufacturing, domestic, wildlife and other purposes	Number of people or entities accessing good quality water for domestic use.	Improved annual per capita water availability through the development of climate-proofed water infrastructure Increased per capita water storage	Water Resources Authority National Water Storage Authority Ministry of Water and Sanitation Council of Governors	Improves community health by improving access to clean, potable water; Decreases risk of disease, malnutrition and famine, especially in informal settlements.
22. Develop and strengthen policies and procedures to conserve water	(1) Enhance the resilience of water sector by ensuring adequate access to, and efficient use of, water for agriculture, manufacturing, domestic, wildlife and other purposes (2) Enhance the resilience of tourism and wildlife value chains	Conserve at least 20% of in-land water, especially for areas of particular importance to ecosystem services; Number of ecosystem-based adaptation and integrated sub-catchment management plans; Number of other sub-catchment management plans implemented; Percentage reduction in water-wastage and non-revenue water	Improved water security Planning for water security strengthened Enhanced resilience of wildlife and biodiversity	Water Resources Authority National Water Storage Authority Ministry of Water and Sanitation Ministry of Tourism and Wildlife Kenya Wildlife Service Council of Governors	Improved water security will ensure the health of urban communities, while promoting ecosystem health, therefore the strength of ecosystem services; Improved ecosystem health will improve biodiversity health and sustain the tourism industry that operates out of Nairobi; Increased preparedness for extreme heat or drought events by increasing the security of water resources.

4.8. Resilient Food Systems

Rapid urban expansion has placed strain on Nairobi's food security, while also reducing the land area available for agriculture, and degrading the environmental quality of remaining green spaces. The CRA for Nairobi (see Section 3.3.2) highlighted that climate change could lead to damage to crops, reduced food production, and scarcity of water resources and ultimately threaten the food supply. This can be addressed, in part, by improving resilience of the food system overall.

Resilient Food Systems



Ready to implement actions

- **Heighten innovation in food process and storage; adopt a Food Systems Strategy.**

Supporting actions

- Support the capacity building of county officials and local communities to improve agro-food systems in the city.
- Intensify urban agriculture especially amongst the vulnerable communities to increase food production.

ACTION 12: Heighten innovation in food process and storage; adopt a Food Systems Strategy.

A large proportion of Nairobi's waste is organic and biodegradable. There is significant wastage in the wholesale and retail food systems. Aside from the various implications in terms of finite resources (food, land for production, and water for irrigation), this exacerbates the already-serious issues related to waste management in Nairobi. Therefore, Nairobi has recently been in the process of developing a holistic Food Systems Strategy that can help to address these multiple issues. This action is aimed at ensuring the strategy is adopted, and specifically targets improvements in food processing and storage.

Box 25: Action 12 ready implement road-map

KPIs

Amount of food waste produced (tonnes per annum)

% of waste sent to landfill that is organic / biodegradable

% of organic / biodegradable waste that is composted

Co-benefits

Reduction in food waste which has positive repercussions for waste collection services and public health along with GHGs from landfill

Potential reduction in costs to individuals and organisations due to greater efficiencies in the food system and supply chain

Improved public health from better

Sub-actions

12.1. Completion of Draft Nairobi Food Systems Strategy,

12.2. Consultation with local and regional stakeholders to raise awareness of its implications

12.3. Engagement with businesses, academics, other regional authorities, etc. to identify gaps in food systems data and improve state of knowledge

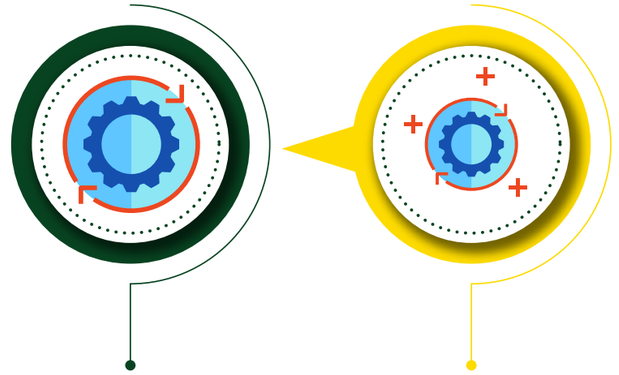
Table 13: Supporting actions for action 12

Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
23. Support the capacity building of county officials and local communities to improve agro-food systems in the city. **24. Intensify urban agriculture especially amongst the vulnerable communities to increase food production.**	(1) Increase food, nutrition and income security through enhanced productivity and resilience of value chains in the agriculture sector	Number of districts or neighbourhoods supported by capacity building officials in improving technical capacity for agro-food systems.	Improved food security within urban areas Enhanced capacity of communities to prepare for respond to climate risks in agro-food sector	Council of Governors Ministry of Agriculture, Livestock and Fisheries	Potential to improve ecosystem health and biodiversity through better managed natural resources and contribution to nutrient content within soil and water resources; Improved health within urban areas, especially within poor communities who may be at risk of malnutrition and starvation during extreme events; Increase in green spaces or sustainable land use within urban areas may also contribute to improved air quality. *Maladaptation: Increase of green spaces in urban areas may increase demand on water during dry seasons – efficient and careful management of green spaces must be considered to preserve water resources.*

4.9. Safeguarding Vulnerable Communities

As discussed in Sections 2 and 3, the worst effects of climate change will disproportionately affect the most vulnerable communities in Nairobi. The likely repercussions would include food and water scarcity, higher rates of health issues arising from climate change and environmental pollution, and damage to property due to floods, landslides or fires.

Safeguarding Vulnerable Communities



Ready to implement actions	Supporting actions
• **Increase access to climate related resilience and safety net programmes.**	• Promote climate resilient livelihoods and strengthen value chains for emerging climate resilient livelihoods. • Development of Flood Management Plans & Guidelines with city residents (especially those in informal settlements, i.e., the Mathare slums) by increasing continuous data collection and flood-hazard mapping. • Develop affordable housing for vulnerable communities living in climate-sensitive areas that prone to floods, for example, the Slum Upgrading Programme.

ACTION 13: Increase access to climate related resilience and safety net programmes.

Box 26: Action 13 ready implement road-map

Climate impact

Improved food security within urban areas

Enhanced capacity of communities to prepare for respond to climate risks in agro-food sector

Reduced post-harvest losses

Lead agency & collaborative agecies

Nairobi City County, Agriculture and Forestry Department

National Ministry of Agriculture

Timeline

2-5 Years

Resourcing plan

Resources are available due to ongoing work to develop a Draft Nairobi City Food Systems Strategy which is being carried out by NCC.

Level of city control

It is within NCC's remit to develop a Nairobi-focused Food Systems Strategy. This action also links with Action 4; as part of which, the city is legally responsible for providing waste management services to all residents and will also need to engage with the private sector.

Alignment with policies & plans

Draft Nairobi Food Systems Strategy (in development)

Urban Agriculture Promotion and Regulation Act

Ongoing work by NCC in collaboration with the UN Food and Agriculture Organisation (NADHALI project)

National strategies and policies e.g. Food security and nutrition strategy; rural development strategy; agriculture, livestock and fisheries strategy

KPIs

Amount of food waste produced (tonnes per annum)

% of waste sent to landfill that is organic / biodegradable

% of organic / biodegradable waste that is composted

Co-benefits

Reduction in food waste which has positive repercussions for waste collection services and public health along with GHGs from landfill

Potential reduction in costs to individuals and organisations due to greater efficiencies in the food system and supply chain

Improved public health from better

Sub-actions

14.1. Create social protection and insurance mechanisms against main climate hazards.

14.2. Create affordable and accessible credit mechanisms for vulnerable groups.

14.3. Improve and create awareness for climate opportunities

14.4. Promote and support climate resilient sustainable livelihoods

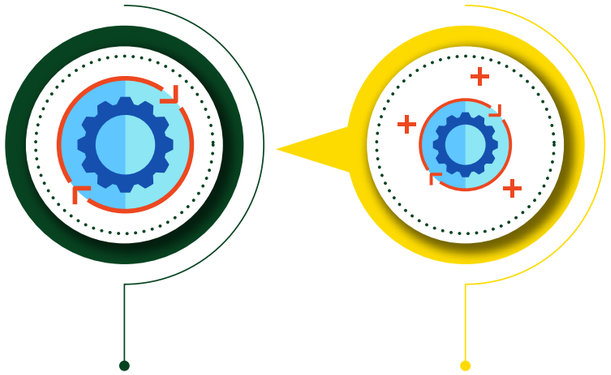
Table 14: Supporting actions for action 13

	Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
25.	**Promote climate resilient livelihoods and strengthen value chains for emerging climate resilient livelihoods.**	(1) Increase food, nutrition and income security through enhanced productivity and resilience of value chains in the agriculture sector	Number of pastoral individuals accessing better and more rewarding markets for their products; Number of pastoral product value chains developed and linked to markets.	Improved access to markets, market linkages and market opportunities	Council of Governors Ministry of Agriculture, Livestock and Fisheries	Increases social and economic capital of communities, which increases their resilience in the face of climate change and extreme events; Improved community capital will also improve health, reduce stress on public infrastructure and promote GDP growth.
26.	**Development of Flood Management Plans & Guidelines with city residents (especially those in informal settlements, i.e., the Mathare slums) by increasing continuous data collection and flood-hazard mapping.**	(1) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response	Management plans and guidelines that help affected communities; A GIS-based tool in place for real-time mapping and monitoring of flood hazards.	Reduced flood disaster risks Strengthened ability of affected communities to better cope with flood-risk	Council of Governors State Department for Housing and Urban Development	Builds information and knowledge to be able to make evidence-based decisions for flood management policy; Improves community engagement with flood management policies which increases the robustness of solutions.
27.	**Develop affordable housing for vulnerable communities living in climate-sensitive areas that prone to floods, for example, the Slum Upgrading Programme.**	(1) Empower children (girls and boys), women, youths (girls and boys), orphans (girls and boys), people with disabilities (women and men), the marginalized, minorities and people displaced as a result of climate change to reduce their vulnerability to climate change issues (2) Improve the resilience and adaptive capacities of urban areas, by enforcing standards for housing in anticipation of climate change impacts.	Number of vulnerable people accessing affordable housing; Area of informal settlements upgraded; Number of people living in climate-sensitive areas (for example, flood zones).	Strengthened adaptive capacity of vulnerable groups Increased empowerment of vulnerable groups	Council of Governors Department of Gender, Youths and Other Vulnerable Groups State Department for Housing and Urban Development	Strengthened safety net programmes will reduce poverty rates, resulting in: - Reduced stress on public infrastructure - Improved community health - Improved social and economic capital - Decelerated growth of informal settlements

4.10. Disaster Management

The impacts of climate change can exacerbate both natural and man-made disasters, such as floods, landslides, heatwaves, droughts, fires, disease transmission, water and food scarcity, and others. Therefore, it will be crucial to strengthen the existing level of hazard and risk awareness in Nairobi while also developing new disaster response mechanisms, such as early warning systems. These will need to be supported by appropriate policies, regulations, governance structures, and infrastructure to ensure their success.

Disaster Management



Ready to implement actions

- **Introduction of stormwater infrastructure policies and regulations to maintain and operate drainage systems so that stormwater runs efficiently in the city.**

Supporting actions

- Update hazard maps (floods, extreme rainfall, extreme temperatures) to inform decision-making.
- Strengthen institutional mechanisms for pro-active community-based flood Early Warning Systems in flood prone areas.
- Increase flood and landslide management, support climate-proofing of city Flood/Landslide Control Infrastructure to enhance their resilience.
- Provide reliable early warning information to stakeholders (urban dwellers etc).
- Implement flood control programme in the city to map flood prone areas and assess the costs and effects of relocation on communities located in floodplains.
- Establish relocation mechanisms for vulnerable communities in flood prone areas.

ACTION 14: Introduction of stormwater infrastructure policies and regulations to maintain and operate drainage systems so that stormwater runs efficiently in the city.

Box 27: Action 14 ready implement road-map

Climate impact

Strengthened management of urban flooding in major urban centers

Decreased sensitivity of urban infrastructure to extreme precipitation through improved capacity of stormwater drainage to handle extreme volumes or overflow from river flooding

Lead agency & collaborative agecies

State Department for Housing and Urban Development

Council of Governors

Timeline

>5 Years

Resourcing plan

City, National Government and donors.

Level of city control

City Government has the capacity to allocate funding to this program in collaboration with the National Government. The National Government are pivotal in developing and enforcing national level policies.

Alignment with policies & plans

National Adaptation Plan (NAP)

National Climate Change Action Plan (NCCAP)

Kenya Vision 2030

The Nairobi County Integrated Development Plan (2018-2022)

KPIs	Co-benefits	Sub-actions
Number of degraded stormwater drains rehabilitated	Reduces sensitivity of urban spaces to extreme precipitation events, leading to flash flooding. Reduces risk of disease outbreak from reduced incidences of flash flooding. Increases institutional capacity to manage flood risk.	15.1. Develop risk and vulnerability assessments of new and existing infrastructure 15.2. Conduct capacity building on infrastructure climate proofing 15.3. Develop and enforce standards for building infrastructure in anticipation of climate change impacts. 15.4. Improve institutional resilience mechanisms as preparedness and response. 15.5. Mainstream disaster risk reduction measures in drainage system planning and operation

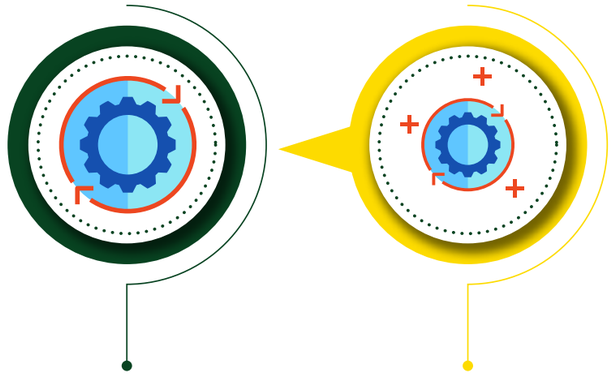
Table 15: Supporting actions for action 14

Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
34. Update hazard maps (floods, extreme rainfall, extreme temperatures) to inform decision-making.	(1) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response. (2) To reduce the vulnerability of communities to drought-related disasters, through such improved institutional resilience mechanisms as preparedness and response	Management plans and guidelines that help affected communities; A GIS-based tool in place for real-time mapping and monitoring of flood and drought hazards.	Reduced flood disaster risks Strengthened ability of affected communities to better cope with flood-risk Drought risk preparedness and response strengthened	Council of Governors Water Resources Authority National Drought Management Authority	Builds information and knowledge to be able to make evidence-based decisions for hazard management policies.
35. Strengthen institutional mechanisms for proactive community-based flood Early Warning Systems in flood prone areas. **36. Provide reliable early warning information to stakeholders (urban dwellers etc).**	(1) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response. (2) To reduce the vulnerability of communities to drought-related disasters, through such improved institutional resilience mechanisms as preparedness as response.	Number of policy instruments mainstreamed in climate risk management; Management plans and guidelines that help affected communities; Number of participatory scenario planning events held with communities; Number of institutional mechanisms in flood prone areas strengthened to undertake proactive community-based flood early warning.	Reduced flood disaster risks Strengthened ability of affected communities to better cope with flood-risk Climate early warning systems Access to improved climate information	Council of Governors State Department for Housing and Urban Development	Strengthens institutional capital to make informed decisions regarding flood management systems; Improves community engagement in development of flood management systems which increases robustness of mechanisms; Precents loss of life or livelihood through early warning.
37. Increase flood and landslide management, support climate-proofing of city Flood/Landslide Control Infrastructure to enhance their resilience. **38. Implement flood control programme in the city to map flood prone areas and assess the costs and effects of relocation on communities located in floodplains.** **39. Establish relocation mechanisms for vulnerable communities in flood prone areas.**	(1) To reduce the vulnerability of communities to flood-related disasters, through such improved institutional resilience mechanisms as preparedness and response.	Rehabilitated city Flood/Landslide Control Infrastructure Number of watersheds where landslide management is being supported through enhanced structural/mechanical designs	Reduced flood disaster risk	Water Resources Authority Council of Governors	Reduces risk of flooding or landslides in areas with vulnerable and exposed communities; Increases knowledge of economic and social vulnerabilities to flood risk which supports evidence-based decision making.

4.11.
Improving Health Standards

Climate change and environmental degradation can have wide-ranging health impacts on the wider society and economy. For Nairobi specifically, the CRA (see Section 3.3.2) indicates that issues could include, but are not limited to: floods and storms resulting in higher transmittance rates of waterborne diseases; greater incidence of heat stroke and related illnesses due to higher temperatures; and strain on the water and food supply. Efforts to improve public health services and standards can help to mitigate some of these risks

Improving health standards



Ready to implement actions	Supporting actions
• **Strengthen climate related disease mapping in vulnerable communities in hazard prone areas**	• Increasing sanitation facilities. • Enhance city sanitation awareness creation and campaigns to reduce cholera and similar diseases in the city. • Establish climate change informed Health Information Systems including indigenous knowledge on health risk management.

ACTION 15: Strengthen climate related disease mapping in vulnerable communities in hazard prone areas.

Box 28: Action 15 ready implement road-map

Climate impact

Improved surveillance, response and monitoring of climate-related diseases

Lead agency & collaborative agecies

Council of Governors
Ministry of Health

Timeline

2-5 Years

Resourcing plan

International funding in combination with Nairobi's City Funding

Level of city control

The city has the capacity to implement this action although it may lean on expertise within the Ministry of Health.

Alignment with policies & plans

National Adaptation Plan (NAP)
National Climate Change Action Plan (NCCAP)

KPIs

Number and types of measurements built into the design of surveillance and monitoring programme of climate-related diseases

Co-benefits

Increases institutional capacity to make evidence-based decisions; Increased capacity to identify and control outbreaks.

Reduces risk to community health – largely those within informal settlements who have limited access to vital resources.

Reduces shock to health care systems due to outbreaks.

Reduces shock or stress on economic activity from outbreak control.

Sub-actions

13.1. Undertake a climate vulnerability and risk assessment of the impacts of climate change and variability on targeted population's health

13.2. Increase public awareness and social mobilization on climate change impacts on health

13.3. Enhance capacity of health professionals, focusing on climate change impacts

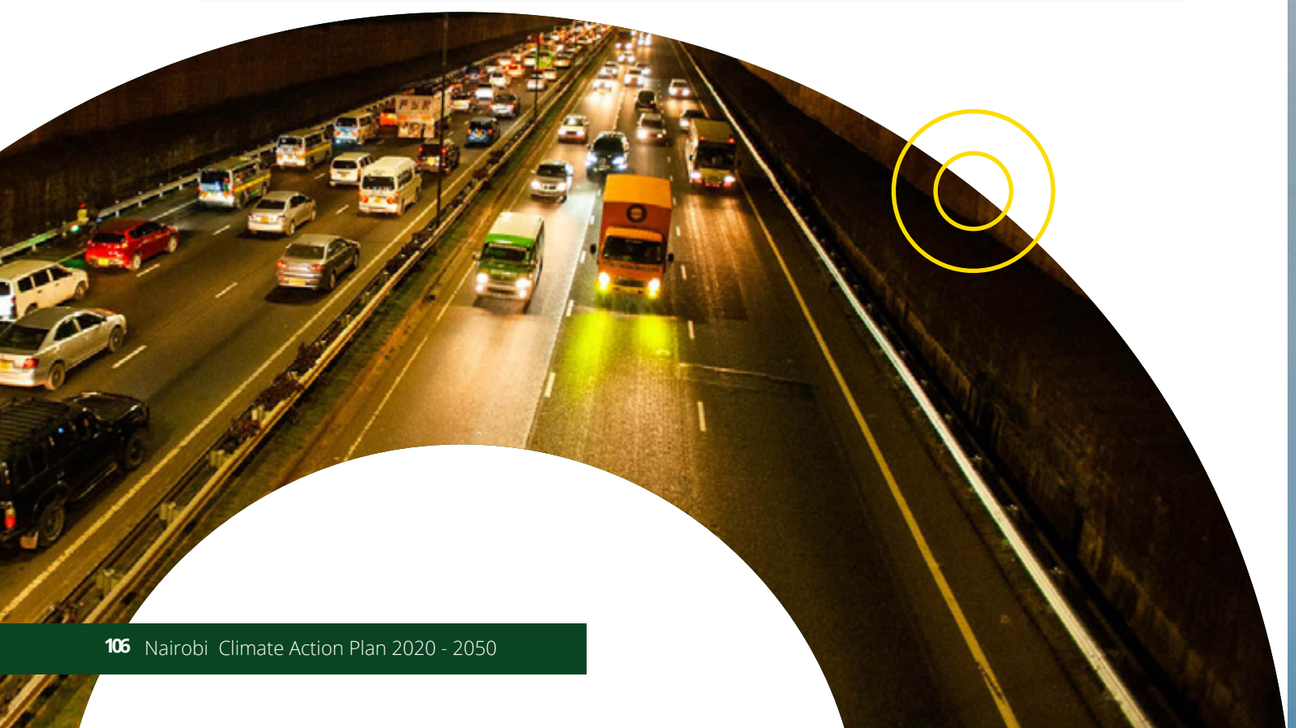
13.4. Design appropriate measures for surveillance and monitoring of climate change related diseases

Table 16: Supporting actions for action 15

Actions	Alignment with national strategic objectives	KPIs	Expected outcome	Key responsible agency	Co-benefits
Increasing sanitation facilities.	(1) Mainstream climate change adaptation into the health sector	Number of sanitation facilities development	Reduced incidences of climate-related diseases Strengthen adaptive capacities of vulnerable groups	Council of Governors Ministry of Health	
Enhance city sanitation awareness creation and campaigns to reduce cholera and similar diseases in the city.	(1) Mainstream climate change adaptation into the health sector	Number of districts or neighbourhoods with strengthened delivery of sanitation campaigns	Reduced incidences of climate-related diseases Strengthen adaptive capacities of vulnerable groups	Council of Governors Ministry of Health	
Establish climate change informed Health Information Systems including indigenous knowledge on health risk management.	(1) Mainstream climate change adaptation into the health sector	Number and nature of engagements and decisions leading to the development of the climate change information system strategy	Reduced incidences of climate-related diseases Strengthen adaptive capacities of vulnerable groups	Council of Governors Ministry of Health	Integrating climate risk into health information systems will build Nairobi's capacity to understand, manage and prevent climate impacts to health.

Table 17: Summary of ready to implement actions

SUMMARY OF READY-TO-IMPLEMENT ACTIONS					
		<2 YEARS	2-5 YEARS	BEYOND 5 YEARS	ONGOING
Action 1	Improvement of NMT facilities	X	X	X	X
Action 2	Development and improvement of mass transit options and mode switching	X	X	X	X
Action 3	Development of new master plan to decentralise services away from the CBD		X		
Action 4	Implementation of a circular economy solid waste management approach	X	X		X
Action 5	Increase adoption of renewable energy	X	X		X
Action 6	Develop Minimum Energy Performance Standards (MEPs) for more appliances	X			
Action 7	Promote adoption of clean cooking technologies	X	X		X
Action 8	Invest in Solid Waste Management this includes material recovery facility and transfer stations.		X		
Action 9	Wastewater management	X	X		X
Action 10	Reduce the amount of solid waste in stormwater systems through city-wide solid waste collection initiatives		X		X
Action 11	Adopt water conservation initiatives to cater for scarcity	X			X
Action 12	Heighten innovation in food process and storage; adopt a Food Systems Strategy.		X		X
Action 13	Increase access to climate related resilience and safety net programmes.		X	X	X
Action 14	Introduction of stormwater infrastructure policies and regulations to maintain and operate drainage systems so that stormwater runs efficiently in the city.			X	
Action 15	Strengthen climate related disease mapping in vulnerable communities in hazard prone areas.		X		



05

Ensuring, Measuring and Delivering Impact

5.1.
Implementation strategy

Addressing barriers

Several actions are out of Nairobi's control, being under the authority of the national government, which brings some uncertainty to implementation. Financing poses a critical challenge since some actions will require high investments. Some of the CAP actions may also present additional costs or may be viewed as a burden to the local economy, which is something that needs to be considered carefully. Changes in technology will also be a challenge due to costs, regulations and technical capacity.

To overcome these barriers, Nairobi prioritized actions which implementation is mostly under its control. For the ones not entirely under its control, the city is aligning implementation with national strategies and policies to taket advantage of the synergies. Several actions are already aligned to other city's sectoral plans, in some cases with defined timelines and secured resources. The creation of the City Climate Change Fund, a process supported by the National Treasury and stipulated in the 2016 Climate Change Act, will also support the CAP implementation.

The following section brings more details on how Nairobi is envisioning to address institutional/governance and financial challenges to implement its CAP.

Climate governance, human resources and finance

Nairobi City County's capacity to implement climate actions is dependent on the structure, functions and powers of the different city county departments and other agencies. The City County plays a key role in controlling or influencing assets or services.

When the Constitution of Kenya was promulgated in 2010 under Vision 2030, one of the key changes to the governance landscape for climate change was the introduction of formalised devolution. A new structure of governance, the "developmental devolved government" delineated two levels of government: the National Government and then 47 county governments that are "distinct and inter-dependent and shall conduct their mutual relations on the basis of consultation and cooperation." The idea behind this new structure was that the national government was to focus on making policy and then the county governments could focus on implementing it. This means there are clear structures in place to facilitate and promote the implementation of actions by the counties.

One such example is the County Integrated Development Plans (CIDPs). The CIDPs outline the county's strategic intentions for the upcoming 5-year planning period and this timeline is directly aligned with those of the NCCAP. The current planning period is 2018-2022 and Nairobi's CIDP states that the sub-county work plans should contribute to the achievement of the objectives of the national planning frameworks[40]. These planning frameworks include the third Medium Term Plan (MTPIII) which states it will continue to provide an opportunity to mainstream climate actions into development planning, decision making and implementation in all sectors of the economy at national and county levels to ensure sustainable development, as required by the 2016 Climate Change Act[41], which is implemented through the NCCAP. The development of these documents presents a clear opportunity to align the implementation of Nairobi's CAP.

The Climate Change Act also requires all counties to appoint a minister in charge of climate change, which represents a significant advancement of climate governance in the city. Nairobi is currently working towards operationalizing its Climate Change Unit which was established following cabinet approval in February 2021. The designation of the County Executive Committee Member (CECM) or Minister at city level who holds the Climate Change portfolio has already been done. The city is in the process of development of the climate change policy, bill and regulations which have already been passed in the supplementary budget and covers capacity enhancement on climate change, air quality management and noise pollution for city staff. Further, the city is working towards enhancing its governance structure to have a stand-alone directorate on Climate Change and Energy, with deputy directors for climate change and energy, that also incorporates an air quality team to tackle air quality management at city level.

There are about 5 counties that have developed a Climate Change Fund policy, and the city is already working towards developing regulations to access climate change funds at county level which includes opening a special purpose account to receive climate change funds. This process is being supported by The National Treasury, offering an opportunity to leverage on the work done in counties that are more advanced in this process. There is also a national process to actualize the climate change fund as stipulated in the 2016 Climate Change Act and captured in the National Climate Change Action Plan 2018-2022 that can offer additional support towards the implementation of Nairobi's CAP. Developing County Climate Change Funds is well stipulated in the 2016 Climate Change Act.

Chapter 4 describes Nairobi's climate actions, detailing the identified lead agency and collaborating agencies and stakeholders for each action, as well as the financing options available. Addressing climate change in Nairobi will need financial support from the international community, such as the Global Environment Facility (GEF), banks and bilateral funds, alongside domestic funding from the county government of Nairobi, the national government budget, the private sector and other related international and regional organizations.

[40]Nairobi City County. 2018. County Integrated Development Plan (CIDP) 2018-2022. Section 5.4.1 Monitoring Implementation of the CIDP.

[41]Government of Kenya. 2018. Third Medium Term Plan 2018-2022. Section 7.2 Climate Change

5.2. Monitoring, evaluation, reporting and revision

Monitoring implementation

The 2016 Climate Change Act and Nairobi City County's Integrated Development Plan (CIDP) articulate M&E processes, structures and systems that can be utilised to monitor progress on climate change. Effective operationalisation of these at the county level can significantly enhance the tracking of actions under the CAP.

At present the institutional structures articulated include the establishment of county Sectoral Project Planning & Monitoring Units (SSPMUs) which should include appointing M&E officers in each sector to coordinate monitoring, evaluation and reporting. Reporting obligations include the development and submission of monthly summary monitoring reports which should be then aggregated into quarterly and annual monitoring reports, as stipulated by Nairobi's CIDP. These reports should then be submitted to the Department of Economic Planning, as stipulated in Nairobi's ADP 2021/2022. These annual publications will help report on the performance of county development planning as stipulated under the Performance Management Plan of the County Government's Act.

As the County Climate Change Unit (CCU) has been established and the CECM responsible for coordinating climate change affairs has been appointed; monitoring, evaluation and reporting processes, structures and systems under the development planning system will be aligned with any that are climate change specific under the CCU to avoid overlap and duplication of work and to maximise synergies to ensure resources are utilised most efficiently.

Evaluation of impact

Nairobi will consider opportunities to build on the existing national MRV framework to support the CAP M&E system. This will need to be supplemented with city-specific data to provide a more detailed understanding of the impacts associated with the CAP actions. To design an effective system for evaluating the impacts of actions, it will be important to identify the purpose and scope of the evaluation i.e. which interventions or policies are being assessed, over which timeframe and what geographic area. This will influence the approach to the monitoring system and will ensure the outputs are robust and reliable.

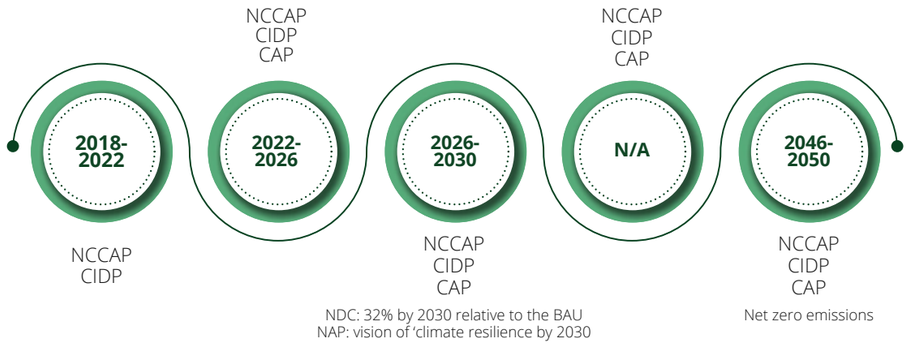
During the initial phases of implementation, the city will focus on priority actions to ensure that these actions are regularly monitored through use of indicators. Suggested indicators for each action are outlined in Chapter 4. Once the city has confirmed the set of indicators for its actions, a data collection plan will be developed. This will provide an overview for each indicator of what is being measured, the baseline, the targets, data sources and will align with existing systems for data collection. It will also specify the key parties for collecting data, how often and who will be responsible for reporting the data. Nairobi City County aims to share this data via a public reporting platform to ensure the city's accountability and to engage with members of the public in a transparent manner as shown below:

Box 29: Evaluation of Impact process

Review and revision of the plan

This Climate Action Plan is a living document. It sets out the priority actions for the next 5 years as well as longer term goals. Nairobi is committed to ensuring that the CAP stays current, identifies and prioritises the necessary new and emerging actions for the next delivery period, and can respond to new local and international technologies, opportunities and developments as well as challenges and pressures. When the CAP process started, for example, there was no COVID-19. This is now a reality that the world is living with, and its impacts are expected to remain for a long time.

Nairobi commits to review and update the CAP each 5 years, in alignment with the CIDPs, which in turn is aligned with the NCCAP timeline. This commitment will ensure that the CAP will capture the county's strategic intentions updates and assess its contribution to the achievement of the objectives of the national planning frameworks, at the same time that pursues closing the ambition gap to be net zero emissions in 2050.



Box 30: Ambition gap to achieve net zero emissions in 2050

The review and update of the evidence base that supports this plan will take place as following:

- City's GHG emissions inventory: updated every 2 years with a more comprehensive review and update every 5 years.
- The city undertook a Rapid CRA study because this component was not funded under the CAP programme. The city will work to develop a comprehensive CCRA report with more detailed information post-CAP. The city will aim to update this CCRA every 5 years, with a re-assessment every 10 years.

The city will work to build capacity to undertake monitoring and evaluation of the CAP actions' implementation and review and revise the GHG Inventory, the CCRA and non-GHG impacts of priority climate actions in the CAP.

06

Moving forward

Establish reporting lines to engage, cooperate and share information and analysis on the GHG inventory, review of emissions forecast and implementation of the CAP will be a key initial step. Ensuring the CAP also supports and aligns with national data and analysis will make plans and policies more robust.

The city is aware of the importance in engaging technical teams in the city around key issues such as GHG and activity data, assumptions, projections, modelling and analysis of sectors and actions and making such data available. In the same way, it is importante to enhance city staff capacity to assess the successful implementation of the actions.

Financial and technical resources are needed to implement this CAP. Nairobi is planning to develop the County Climate Change Fund Regulations in the near future and operationalise the Climate Change Unit to lead implementation of the CAP. This CAP also provides the city with a good reference and basis for attracting external resources, since it is evidence of the city's readiness and commitment to address climate change.

The CAP will be updated to accommodate changes and emerging issues on a minimum of a 5-yearly basis, with the first update due in 2030.

County Communication Platform and Strategy (CGA Part IX) obligates the county government to integrate communication in all its development activities.The county government is required to establish an effective communication and sensitisation framework using various media forms, targeted at widest selection of stakeholders in the county. As for the implementation process, the communication framework for the CAP will be aligned to Nairobi's development planning system to maximise synergies and ensure resources are utilised most efficiently. The Information Communication Technology & e-Government sector, responsible for dissemination of public information and public participation, among other things, will support in this activity. The city's Communciation Department will also support the communication and publication of the CAP and its subsequent implementation activities higlihting key achievements after the CAP launch.

Box 31: Nairobi CAP strategies moving forward

The city will aim to address the all legal, institutional, financial, economic, political, social and technological barriers to achieve the Extended Action Scenario and steer the city towards carbon neutrality in 2050.

Once the CAP implementation kicks off, the city will aim to supplement all supporting climate actions to the flagship actions and designate city lead agencies to take charge of all the sub-actions in the CAP.

Annexes

Annex 1. List of reports developed during the CAP development process that served as the basis for the plan preparation.

Greenhouse Gas (GHG) Emission Inventory of Kenya's Capital, Nairobi City (2016).

CAP: Scenario Development Report – Nairobi. 2021.

Nairobi City Rapid Climate Risk Assessment (CRA). 2021.

Nairobi vertical integration response strategy - Recommendations Report. 2020.

Sector	Actions/ Plans	Assumptions
Electricity	Kenya's NCCAP (2018 -2022) intends to develop 2,405 MW of new renewables and retire 300MW of thermal plants by 2022.	With the recent completion and launch of the 310 MW Lake Turkana Wind Power project, Kenya is well on its way to 100% renewable grid electricity by 2020 much sooner than envisaged in the NCCAP.
	National Energy Act Feed-In Tariff	The feed-in tariff is implemented/ operationalised, stimulating more investment in distributed renewables. Increased awareness and political buy-in drive greater uptake of embedded generation on buildings, to 40% of residential buildings and 70% of commercial buildings by 2050.
Buildings/facilities	The National Building Regulations, Kenya Green Building Strategic Plan, Appliances Energy Performance & Labelling Regulations, Solar Water Heating regulations	All lighting and equipment is efficient in new buildings by 2050, with high uptake (70-80%) in existing buildings, as a result of full enforcement of Appliance Labelling Regulations by 2035 (includes minimum energy performance standards for motors, air conditioners, refrigerators and lighting, but could expand to more appliances) and increased regulation via green building guidelines (based on Green Building Strategy). High uptake (70-100%) of efficient cooling systems in residential sector due to full enforcement of Appliance Labelling Regulations by 2035 (includes minimum energy performance standards for air conditioners), and in commercial sector (50-70%) due to faster system turn-over (system lifespan is shorter due to high use), high savings potential, and enforcement of National Building Regulations (new buildings or alterations / extensions should make provision for adequate natural lighting, natural cooling and natural ventilation). High uptake (70-90%) of efficient building envelope in new buildings due to enforcement of green building guidelines (based on the Green Building Strategy), enforcement of the National Building Regulations (new buildings or alterations / extensions should make provision for adequate natural lighting, natural cooling and natural ventilation), implementation / enforcement of the NCCAP (aims at promoting sustainable construction in sourcing for materials and employing technology to utilize climate responsive material), and adoption of green rating tools. Uptake will be higher in the commercial sector than in the residential sector due to market incentive (higher gains possible). Increase in building envelope retrofits in existing buildings driven by National government's interest in developing Green Buildings (as indicated by Green Mark rating tool development). Slow uptake (10-15%) due to cost / difficulty in retrofitting.

		High uptake (70-80%) of solar water heating and heat pumps (where roof space unavailable) in new buildings, as result of enforcement of Solar Water Heating regulations and National Building Regulations, with existing buildings lagging (25%). Continued increases in cost of charcoal (as result of expanded programme of logging bans) will also see greater uptake of LPG boilers and heat pumps in place of charcoal. Almost all water fixtures are retrofitting to low-flow options, due to low cost, ease of retrofit and promoting of water efficiency, as per NCCAP (promotes water efficiency - monitor, reduce, re-use, recycle and modelling) and Nairobi City Water and Sewerage Company Strategic Plan (aims to reduce water wastage and non-revenue water from the current 43% to 20% through).
	Fuel incentives and disincentives	Increase in the use of LPG for cooking rather than kerosene or charcoal, due to formal programme expanding logging bans (increases charcoal prices), Increasing the kerosene levy (discourages use by increasing prices), and discounting of LPG cook stoves (encourages use). A strong pricing signal will cause a rapid shift to LPG, following past trends within the City. By 2050, any new building built, is fitted with an LPG stove.
Informal Buildings	KENSUP Programme	Large rollout of the KENSUP programme to all city slums will be a key lever to higher use of electricity for lighting through solar lamps. .
	Fuel incentives and disincentives	Formal programme / strategy discourages charcoal use (through logging bans) and kerosene use (through increasing kerosene levy), which pushes up prices, while encouraging LPG use through discounts for LPG cook stoves. Increased uptake of improved cook stoves as a result of scaled-up local production
Industrial Energy	Energy Act NCCAP	Increased efficiency could be achieved through the development of policy or regulations that encourage strict enforcement of the Act (actions to improve efficiencies of charcoal kilns and to formalise the sector) and NCCAP (promotion of efficient kiln technologies) towards industrial energy efficiency. A continued fuel shift away from charcoal due to increasing price. As the price of renewables decreases (and grid becomes increasingly renewable), electricity costs decrease, encouraging a shift from other fuels towards electricity.

		Since residual fuel oil burning is linked with air pollution, a well-implemented Air Quality Plan will drive a phase-out of this fuel in favour of cleaner-burning fuels, such as diesel or LPG, or alternative energy sources, such as electricity.
Transport	Nairobi's Non-motorized Transport Policy	Mode shift to NMT due to implementation and enforcement of Nairobi Country NMT policy and scaling up of NMT initiatives. Shift to cycling will be higher than to walking, since cycling is being pushed harder than walking in the NMT policies / strategies.
	Railway Expansion Project	Mode shift to public transport (from private vehicles) due to completion of railway expansion project (covering all critical transport nodes) and better governance around /
	Bus Rapid Transport Project	Mode shift due expansion of the BRT project, along with additional infrastructure such as park & ride.
	Transport Bill	Regulatory & legal framework is reformed to encourage public & mass transit, as per Bill, allowing for upscaling of related transport projects.
	Euro 4 and 6 Standards	Vehicle efficiency improved by enforcement of Euro 4 and 6 standards. EVs are already quite efficient, therefore gains are smaller.
	Electric Vehicle Market Trends	Global market will drive uptake of EV cars, with grid stability/reliability as the main uptake barrier. Kenya's 100% green energy mix might be a good stimulus for investors. Legislation disallows import of vehicles older than 8 years, therefore assumed that EV uptake will mirror international markets, which are tending heavily towards EVs. City will need to be proactive in order to respond to these market forces. Kenya Light Commercial Vehicle EV mitigation scenario targets can be reached and possibly exceeded if charging infrastructure encouraged through policies. Electric or low carbon medium-duty trucks are still under development across the world, but once EV technology is available & ready, a substantial switch may be fostered due to potential fleet cost savings (less electrical energy is required than diesel/petrol energy to travel the same distance, and EVs have lower maintenance costs), in line with the switch to EV envisioned in light-duty trucks. Motorcycles are a growing employment sector, increasingly used by companies for deliveries. Addressing policy-related barriers and infrastructure will therefore be a key enabler for the high uptake of electric motorbikes.

		Local EV motorcycle manufacture is already planned. Given the high turnover due to vehicle lifespan, and difficulties in meeting ever-tightening EURO standards, this is one market segment where a high shift by 2050 is the likeliest. Uptake still slower in initial years, but accelerates rapidly.
Waste	Nairobi City County Government Sustainable solid waste management policy Plastics Action Plan 2019. Republic of Kenya Waste Management Bill 2019 Solid Waste NAMA National and City Waste Management Strategies	Paper and plastic waste are recycled following the implementation and enforcement of Policy and Plan More waste will also be diverted to managed landfill sites (through either creation of managed landfill sites or rehabilitation of the Dandora dumpsite) Diverting organic waste from open dump sites to composting through enforcement and implementation of current policies and plans. Landfill gas capture more viable due to waste diversion from open dumps to managed landfill sites (through either creation of managed landfill sites or rehabilitation of the Dandora site).
Wastewater	WASREB and NCWSC Strategic Plans	Increase in share of wastewater treated by anaerobic systems due to expansion of the wastewater infrastructure. Strategic planning around improvement of wastewater treatment, will see a reduction in latrines towards septic systems and some biogas capture from anaerobic wastewater treatment.

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