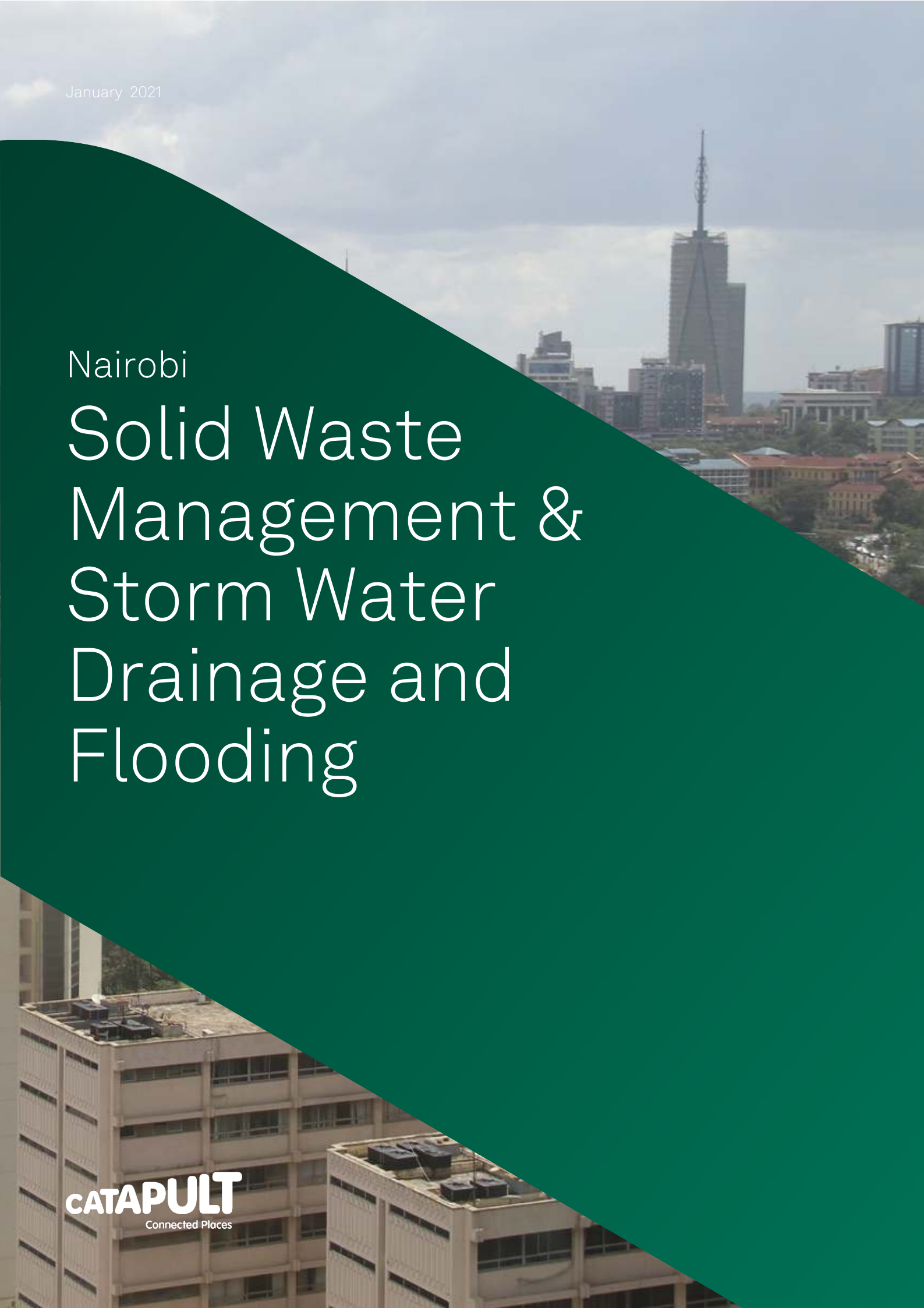
January 2021

Nairobi

# Solid Waste Management & Storm Water Drainage and Flooding



CATAPULT
Connected Places

# Executive summary

## Welcome to Connecting Places Catapult: Urban Links Africa (ULA) market analysis.

ULA is an ambitious programme, funded by the United Kingdom (UK) government through the Global Challenges Research Fund (GCRF) and delivered by Innovate UK and Connected Places Catapult. We work closely with six cities - Nairobi, Mombasa and Kisumu in Kenya; and Cape Town, Johannesburg and eThekwini (Durban) in South Africa - to tackle some of their key urban challenges and improve citizens' lives. ULA does this by facilitating a sustainable collaboration between the UK, South Africa, and Kenya, bringing together cities and tech ecosystems through equitable partnerships and industry investment. We share here foundational research and analysis which describes the urban challenges we are focusing on and their context in each country.

Through discussion with city stakeholders we have finalised three urban challenges (one for each ULA city) in South Africa, and four urban challenges across the three Kenyan cities. The key challenges in South Africa are:

- Cape Town: building resilience in informal settlements
- Durban: improving solid waste management and reducing pollution
- Johannesburg: solutions are being sought around sustainable mobility

The four key challenges selected to be addressed across the three Kenyan cities of Mombasa, Kisumu and Nairobi are:

- Solid waste management
- Flooding
- Wastewater management
- Traffic management and active mobility

In this section of the document, we will give an overview of Nairobi. We examine the innovation potential of Nairobi comparing it with its global peers, examining its innovation ecosystem and business attractiveness.

We then discuss initiatives that governments, private, local and international NGOs and other stakeholders have undertaken to address solid waste management. We examine recent and ongoing projects which attempt to tackle these problems in order to ensure that the collaborators we are supporting as part of ULA are able to learn from and build upon the efforts of others.

# Contents

# Nairobi Overview

Nairobi is Kenya's capital city as well as the country's political and economic centre. Having the biggest Airport in East and Central Africa and being a gateway to numerous safari destinations, Nairobi is also a centre for tourism It is popularly referred to as the "Green City in the Sun."

Since its designation as a city in 1954, Nairobi has had one of the highest growth rates of any city in Africa. Today it is a vital regional hub, home to an increasing number of major international organisations and companies as well as one of the world's most vibrant tech and start-up scenes. Signifying this progress is its cityscape, which is increasingly characterised by new skyscrapers, roads, malls and residential real estate projects.

However, the economic progress of Nairobi has come with some costs. The growth of its population and physical environment have outpaced administrative capacity.

Polluted flood waters, impassable roads and submerged informal settlements are common sights in Nairobi every time it rains heavily. Flooding in Nairobi causes threats to lives and property. As a result, this compounds many other urban challenges like mobility and access to basic services.

The city also now produces more solid waste than its collection and disposal systems can handle. Approximately a third of the city's waste is collected. The city's only official dumpsite Dandora is at overcapacity. The majority of waste is dumped in illegal dumpsites.

These two issues of polluted flood waters and poor solid waste collection intersect. Improperly disposed of waste is often collected by stormwater streams and washed onto water courses, road reserves and sewerage systems: exposing communities to hazardous materials, damaging the natural environment and preventing much of the city's existing infrastructure from functioning effectively.

The large scale of both these issues point both to the entrenched nature of the challenges, but also the potential impact which innovative solutions might have if deployed effectively.

This report will discuss the two interrelated challenges of solid waste management, and stormwater draining and flooding that plague Nairobi. The first section of the report looks at Nairobi's innovation potential, comparing and benchmarking the city against its global peers and examining its innovation ecosystem.

In the second section we examine the challenge of solid waste management and stormwater drainage and flooding. We discuss the city's attempts to address these issues and the problems they have encountered. We examine recent and ongoing projects which attempt to tackle these problems.

# Benchmarking Nairobi's Innovation Potential

East Africa's largest economic centre, Nairobi has in recent years diversified its economy and taken steps to position itself as Africa's pre-eminent financial services hub. Nairobi has over this period leveraged a strong cycle of national investment in physical and digital infrastructure to develop new enterprise advantages centred around finance, retail and engineering, and has become a major magnet for workers from throughout the nation and further afield.

Having overtaken Johannesburg and Cape Town for foreign direct investment in recent years, Nairobi has also become one of the world's most dynamic real estate markets and has established itself as a technology leader within the African continent. The attraction of global tech giants like Microsoft and International Business Machines Corporation (IBM)have contributed to kickstarting a now booming local innovation ecosystem, while careful planning and a growing culture of policy collaboration between the different counties within the metropolitan area have facilitated wider economic growth.

However, there are still significant gaps in basic service provision in Nairobi, and lower potential for economic agglomeration, relative to other similar cities around the world. This is mainly due to network infrastructure failing to keep up with rapidly growing demand and to less optimal use of land in central areas of the city. The benchmarking data also suggest that in the next cycle it will be important for Nairobi to develop economic policies that facilitate growth in the number of career-ready graduates and that help to close the skills gap by improving access to technical and higher education.

This section benchmarks Nairobi's performance relative to cities in the Global South, 7 leading cities in Sub-Saharan Africa and 7 "enterprisers"; business-friendly regions with populations between 6 and 12 million people.

Table 1: Nairobi's most similar cities across various themes [1]

| Theme | Global rank | Most similar cities |
|---|---|---|
| **Population** | Global top 30 (10.3m) | Bogotá, Colombia; Bangalore, India; Surabaya, Indonesia |
| **Economic size (GDP)** | 238th ($57bn) | Yangon, Myanmar; Casablanca, Morocco; George Town, Malaysia |
| **Innovation intensity*** | 80th/107 | Jakarta, Indonesia; Johannesburg, South Africa; Santiago, Chile |
| **Transport infrastructure performance** | 173rd/185 | Lagos, Nigeria ; Kolkata, India ; Manila, Philippines |

*No. of technology-enabled start-ups, scale-ups and established corporates per resident

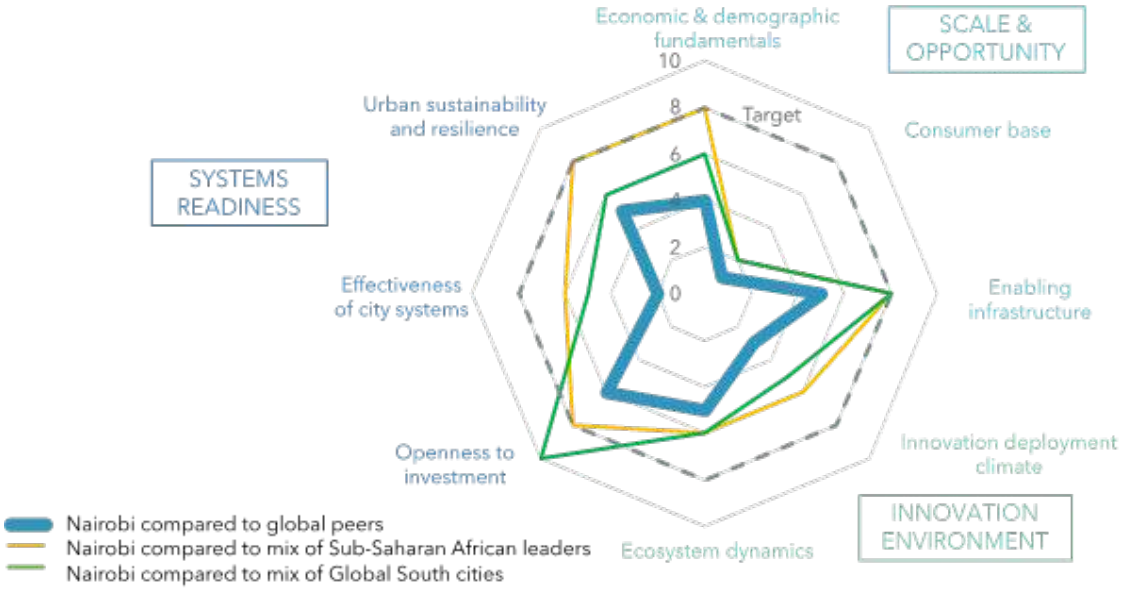
### Which cities is Nairobi most like?

Despite already having a metropolitan population of over 10 million people, Nairobi continues to stand out for its very high population growth rate, estimated at 79% over the next 15 years. In terms of its economic size, Nairobi shares similarities with other emerging Global South cities that are beginning to decisively specialise in business and finance, such as Yangon and George Town, as well as the growing North African financial hub of Casablanca. Relative to its population size, the breadth of Nairobi's innovation ecosystem is comparable to those of other 'Megahub' economies such as Jakarta and Johannesburg. Nairobi's transport system faces similar challenges in terms of how to improve its coverage and accessibility as other expanding cities experiencing high levels of population growth and sprawl, such as Lagos and Manila.

1 Population and Economic Size data: JLL Global 650 (2018), data from 2017.
Innovation Intensity: The Business of Cities analysis based on Crunchbase data, retrieved March 2019.
Transport Infrastructure Performance: IESE Cities in Motion Index 2019.

# Summary

Figure 1: Nairobi's relative performance across innovation-related areas




Based on 90 metrics and 540 data points. Peers and Sub-Saharan African leaders selected based on population size, productivity, global and regional status, and visibility in global benchmarks

Global peers (other large business friendly 'enterpriser' cities, with metropolitan population between 6 and 12 million): Bangalore, Bogota, Nanjing, Pune, Santiago, Surabaya, Taipei

Sub-Saharan African leaders: Abidjan, Accra, Cape Town, Dar es Salaam, Johannesburg, Lagos, Luanda

# Performance Review

Nairobi's economy has now been on a very strong upward trajectory for more than 5 years. Its strong demographics, investment in infrastructure and booming tech ecosystem has catapulted the city to be among the top 5 most dynamic cities among 130 cities in the world in terms of investment potential[i]. The city's economic growth is mainly driven by its strong population growth, which is forecast to be the 10th highest out of 71 cities in the Global South between 2020 and 2035[ii]. Moreover, as the 4th least expensive major city in terms of business and labour costs in the world, and with a comparatively low unemployment rate, Nairobi has seen a particularly strong growth in foreign direct investment since the early 2000s - the 4th highest out of 24 African cities[iii].

Nairobi's growth has also been strongly supported by national and local policies to protect business owners and facilitate access to credit and electricity. Nairobi performs better than the sub-Saharan African average for the ease of starting a business in terms of time, cost and number of procedures although it still ranks in the middle of the pack among Global South cities, behind top performers like Kigali or Santiago.

In addition to its impressive economic fundamentals, Nairobi also stands out in the African context for the coverage and quality of its enabling infrastructure systems. It ranks 1st out of 38 cities in the Global South for mobile penetration, 7th out of 29 cities for availability of Wi-Fi across the city and 1st among its Sub-Saharan African peer group for average fixed broadband speeds[iv]. These impressive results follow Kenya's heavy investment in communications and technology projects, including the widespread roll out of fibre-to-home service throughout the Nairobi metropolitan area.

However, Nairobi's high inequalities are limiting the breadth and depth of its consumer base. While Nairobi stands out as the 6th wealthiest city in Africa, it also has the lowest share of "middle-class" residents among 10 major sub-Saharan African cities[v]. It also ranks 35th out of 40 Global South cities, and 8th out of its global peers, for the share of households earning above US$20,000 and it ranks 40th out of 45 Global South Cities for purchasing power in terms of wages relative to the cost of goods and services. By 2025, it is estimated that less than half of the population will be earning less than US$20,000, down from 69% in 2015, pointing to the growth of the middle-income earners. One important strategic imperative for start-ups in the next cycle will be to work to understand the consumer spending patterns of emerging middle-class households.

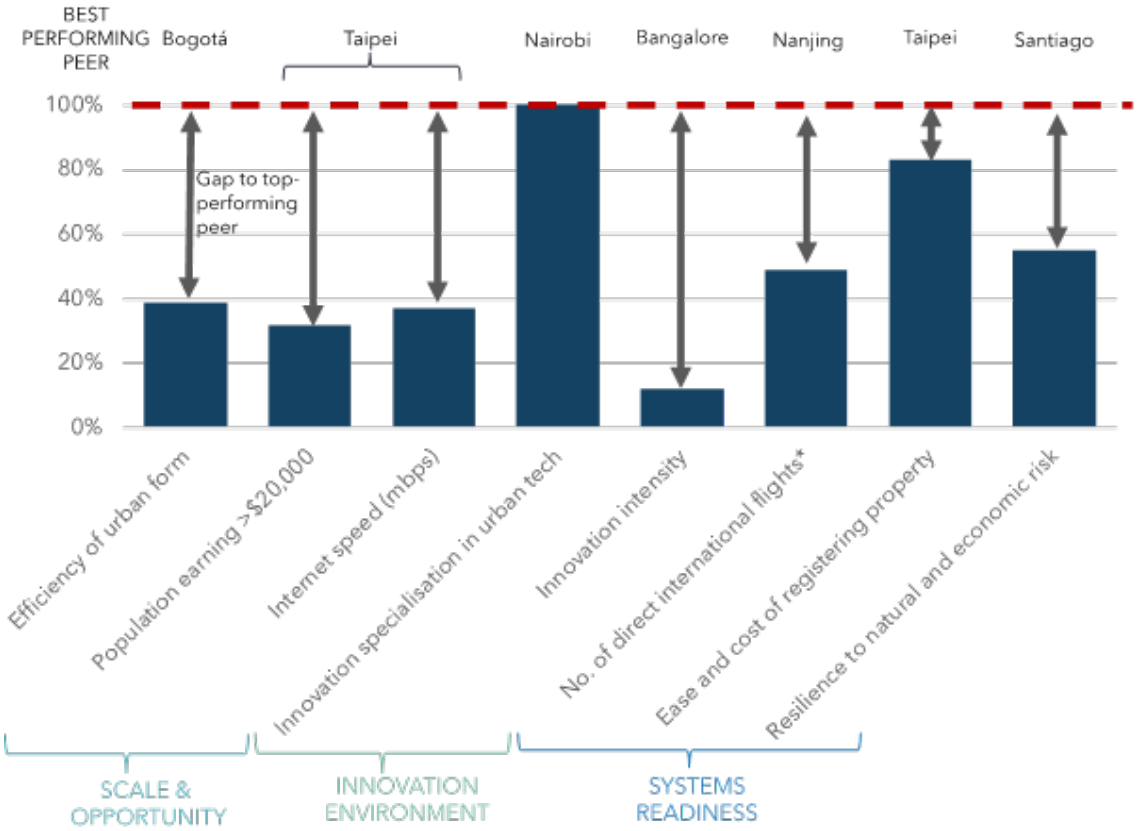
Nairobi's transport infrastructure also has room to improve, as there is evidence to suggest that in its current form it is a significant brake on households' ability to access to job opportunities. Despite relatively low levels of private car use, the city faces relatively high levels of congestion, due mainly to the high volume of matatus and boda-bodas traffic and the absence of a well-planned public transport system. Congestion costs Nairobi almost $1bn a year in lost productivity[vi]. While Nairobi ranks 4th among 11 Global South Cities for bike-friendliness, continued investment in cycling and pedestrian infrastructure will be important for reducing fatalities and for enhancing uptake. At present, the lack of affordable public transport options results in around 40% of the population walking or cycling to work, placing Nairobi 1st among its sub-Saharan peers for uptake of active transport, but far behind South American cities which have much higher levels of public transport use. The future Bus Rapid Transit should help to ease the commuting experience for residents.

In the next cycle it will also be important to ensure that city systems can keep up with the city's strong forecast population growth. With only 75% of its population currently having access to piped water, Nairobi falls behind many of its sub-Saharan African peers such as Dakar, Addis Ababa and Abidjan, all of which record more than 90%. Access to piped water is even lower in informal settlements, at only 36%.

# Innovation Ecosystem

Nairobi performs relatively well for the strength of its urban tech ecosystem but has room to improve for its access to market and infrastructure.

Figure 2: Nairobi's performance relative to best performing peer across key indicators




Used as proxy for openness to global markets in absence of other data

A booming start-up ecosystem has enabled Nairobi to establish itself as one of the leading innovation hubs in Africa and in the Global South. It currently ranks 61st globally among more than 100 cities for the number of start-ups and an impressive 8th out of 39 cities in the Global South. It is also in the top 20 cities in the Global South for the size, scale and growth prospects of its innovation ecosystem, mainly due to strong growth in the total number of companies and the number of globally recognised firms and a buoyant fintech industry. Yet, given its size, Nairobi still has room to improve in terms of the number of high-innovation companies per capita, as it currently ranks only 5th out of its global peers for this measure.

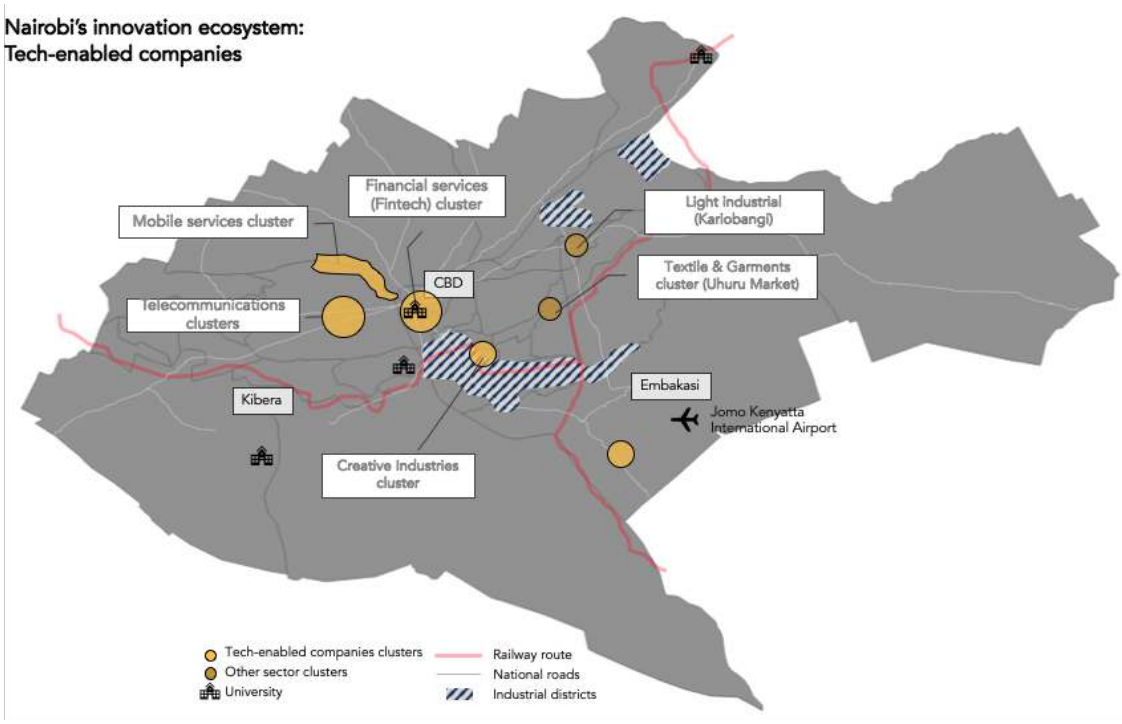
Nairobi also stands out for its access to funding. Nairobi ranks 7th globally for the growth in the amount of venture capital invested between 2010-12 and 2015-17 and it is in the top 10 out of 26 Global South cities both for the number of venture capital deals and the amount of capital invested between 2015 and 2017. Nairobi is also unique in its relatively high concentration of seed stage investments, for which the city ranks third only to Bangalore and Pune among its peers or on a par globally with more established ecosystems such as Buenos Aires and Bogotá.

Dubbed "Silicon Savannah", Nairobi's ICT cluster (telecommunications, internet-based services) underpins innovation in many other industries. For example, the city's financial services, and especially mobile payments, are growing significantly, gaining global visibility and attracting almost 20% of the investment capital flowing into the city.

While Nairobi has successfully exploited a niche in Fintech, it also boasts a high share of companies working in sectors explicitly allied to urban technology, such as transportation, renewable energies, mHealth and recycling. Nairobi currently ranks 1st among its global peers for this measure, with around 5% of firms specialising in these such sectors. Nairobi has seen significant growth particularly in the number of innovative solutions for mobility, including for example the creation of a Digital Matatus network map, a joint project between MIT, Columbia University and the University of Nairobi. Nairobi also has its own ride-hailing app, Little, backed by Kenya's largest communications firm, Safaricom.

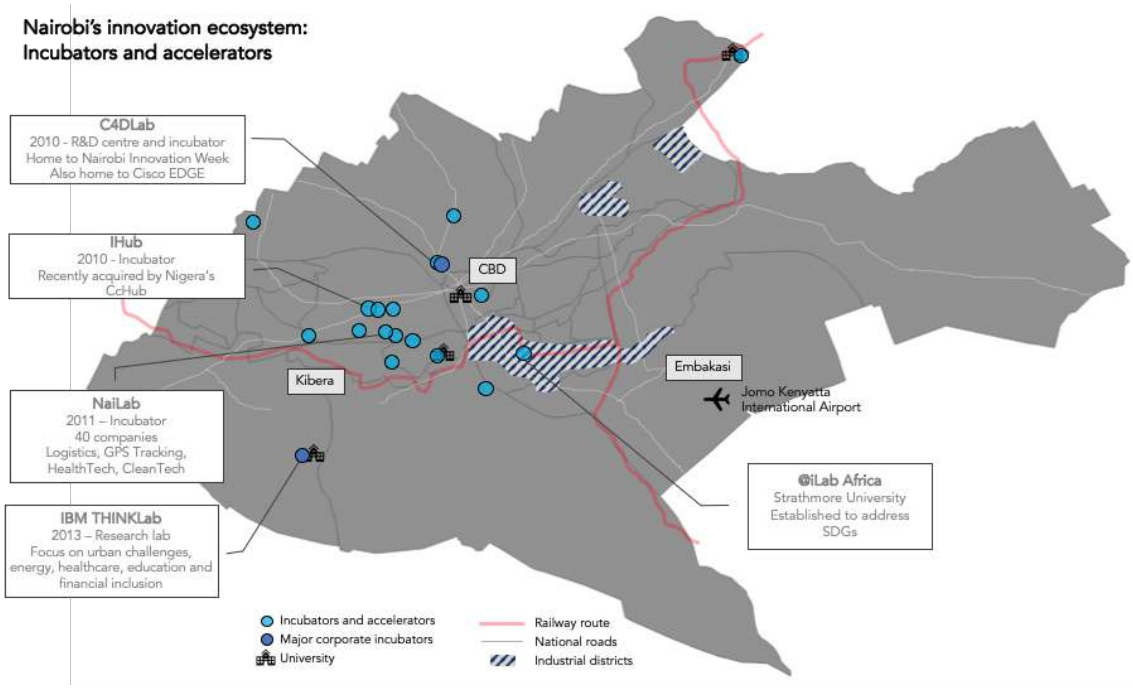
Nairobi's innovation economy is highly concentrated along two main road corridors, Waiyaki Way and Ngong Road, west of the central business district (CBD). 25% of tech-enabled companies are within 2km of Nairobi's CBD, and more than 65% at a 5-km radius. This can be explained by the fact that western Nairobi is also the most affluent, home to major corporate and institutional headquarters. It concentrates the highest value-added industries, with FinTech, mobile and consumer services clusters located in the CBD and along the Waiyaki Way. The Ngong Road is also a bustling innovation hotbed with a higher share of SMEs, home to many telecommunications companies but also enterprises in the energy and education sector. Nairobi's innovation economy is also characterised by clusters of informal entrepreneurs, in for example, light industries (metalwork), textile and furniture manufacturing. There is also a small logistics and transportation cluster close to the airport.

Map 1: Tech-enabled Companies in Nairobi



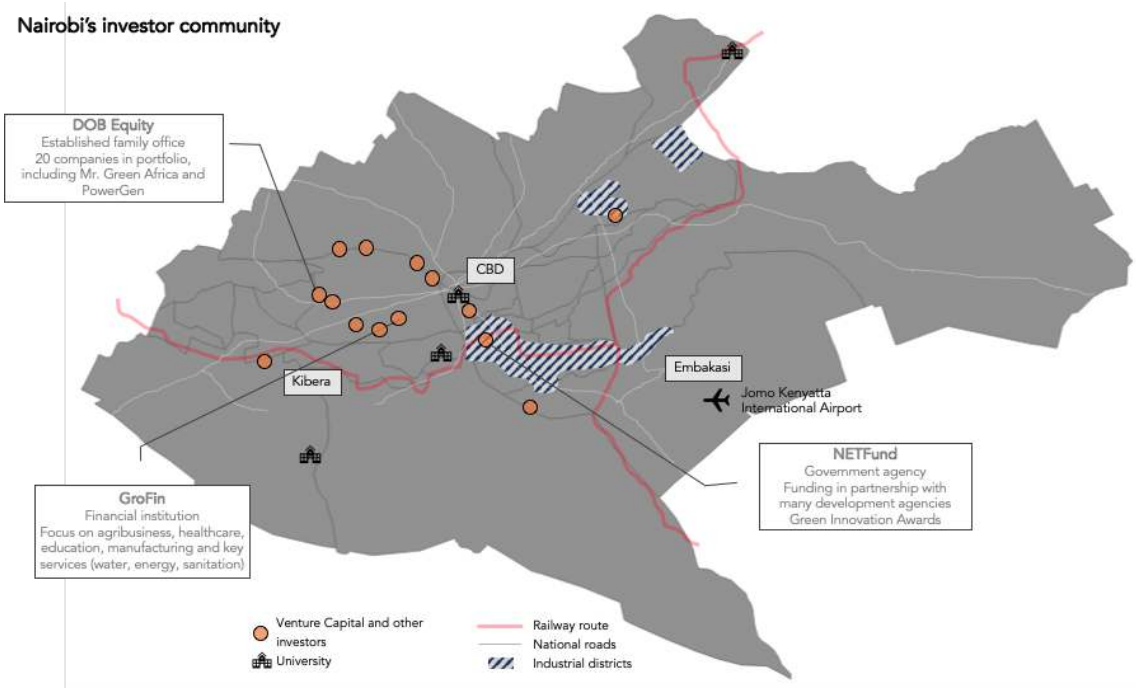
Unsurprisingly, incubators and accelerators (most of which have been founded in the last 10 years) in Nairobi are located mostly in the west of the city, although some are located in suburban university campuses. They aim to support entrepreneurs in a variety of sectors through training, mentoring and funding, create communities and accelerate commercialisation of products. Those organisations are well supported, through partnerships with major global companies such as Google, Intel, Samsung, etc, and demand has been such that several incubators such as Nairobi Garage and iHub have relocated to larger sites or opened second branches.

Map 2: Incubators and Accelerators in Nairobi




Nairobi's investor landscape has also been diversifying, with all types of investors, from venture capitalist (VC) companies to family offices and private equity companies deploying capital, albeit not always with a physical presence in the city. Nairobi stands out for its share of impact investors, focusing on supporting entrepreneurs in financial inclusion, energy, healthcare, education and cleantech. Investors are focused on early-stage companies, with less funding and support available for companies aiming to scale up.

Map 3: Investor Community in Nairobi



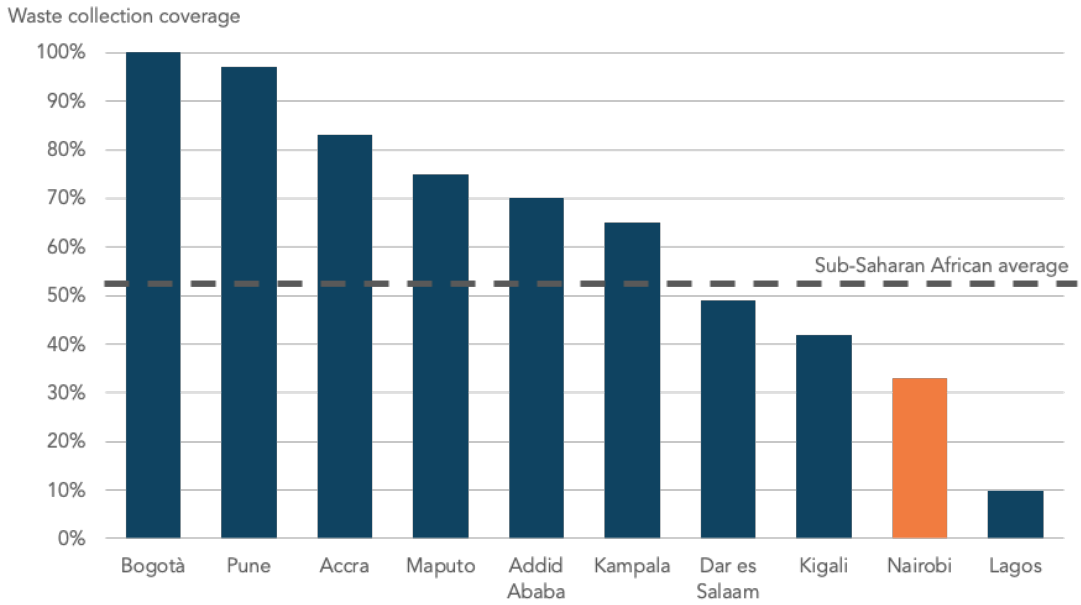
# Solid Waste Management in Nairobi

Nairobi faces challenges in relation to solid waste management. Increasing urbanization, rural-urban migration, rising standards of living and rapid development associated with population growth have resulted in increased solid waste generation. In short: the city produces more waste than its current systems can deal with. Aside from fundamental issues of capacity, the current systems of collection and disposal lead to negative social, economic, and environmental outcomes.

Nairobi produces approximately 2,475 tonnes of waste each day[vii]. While 95% of Nairobi's waste is potentially reusable, only 5% of waste is recycled. Moreover, only 33 per cent of waste produced is collected for disposal at Nairobi's only official dumpsite, Dandora[viii]. The rest is dumped illegally in dumpsites, is left next to houses, or burned.

Waste production and waste management in Nairobi is a severe challenge by international standards according to available data. When compared to cities of similar population size, Nairobi generates 50% more than Addis Ababa and 30% more than Dar es Salaam. The city generates more waste than its income levels would suggest, and its production per day per capita is expected to grow by nearly 70% by 2030[ix].

Figure 3: Waste collection rate in select Global South cities




Sources: World Bank (2018). What a Waste 2.0: A Global Snapshot on Solid Waste Management to 2050
Nairobi data: United Nations Development Programme (UNDP) (2015) A Circular Economy Solid Waste Management Approach for Urban Areas in Kenya

Dumping occurs for several reasons, not least because many collection and disposal systems are inefficient and operating under capacity. Many low and middle-income areas do not benefit from any

formal waste collection systems, whilst in high income areas, private waste collection companies paid for by residents are prevalent, but the current private sector model only collects waste for the purposes of disposal, either at Dandora or illegal dumpsites, and no waste gets recycled.

Generally, the Western areas of Nairobi (Hurlingham, Lavington, Westlands, Kileleshwa) are better served by private firms and the Nairobi City Council (NCC) than the Eastern areas (Kayole, Dandora, Umoja)[x].

Illegal dumping both by individuals and communities as well as formal and semi-formal collection services causes highly visible pollution as well as less immediately apparent impacts on health and wellbeing. The problem is especially acute in many low and middle-income areas where high population density and a lack of infrastructure and service provision exacerbate these problems. Over half of Nairobi's 3.5 million citizens live in low-income areas or slums[xi].

The African Population and Health Research Centre (APHRC) conducted a survey in 2016 into households solid waste disposal in Nairobi and Mombasa*. Among their key findings in Nairobi were:

- 76.2% of household receive any garbage collection services
- 56.8% of households do not take measures to reduce waste
- 65.6% of households disposes toxic substances (e.g. batteries, bulbs, etc) with other trash.

Source: An assessment of the evolution of Kenya's solid waste management policies and their implementation in Nairobi and Mombasa: analysis of policies and practices – Haregu, T.N et al. (2017)[2]

The qualitative component of the APHRC study revealed several issues which help explain failures of solid waste collection:

- weak institutional structures complicating coordination between country-level agencies,
- mixing of waste types that makes reuse/recycling difficult,
- barriers related to moving dumpsites elsewhere,
- weak enforcement of new regulatory frameworks
- inadequate staffing of implementing agencies
- rapid urbanization

The APHRC found that these challenges were intensified by the crime associated with solid waste management. Unlicensed garbage collection business in Nairobi is a multi-billion Shilling industry controlled by cartels that are more focused on profit and extortion, than on delivering services contracted by the municipality. Some cartels include even elected leaders in the county[xii].

2 key indicators of SWM practices were drawn from a population-based household sample survey conducted with 1,158 (93 per cent response rate) households in Nairobi

## Official Waste Management Services

Compared to other cities, the NCC under-spends on waste management; only $5 mn of its $300 mn budget. In contrast, cities in other developing countries spend 20 - 50 % of their budgets on waste management[xiii]. As United Nations (UN)- Habitat coordinator Andre Dzikus states:

> "Due to budgetary deficiencies, town authorities find it difficult to address solid waste management in a sustainable manner. In addition, insufficient public awareness and enforcement of legislation is also a hindrance."[xiv]

The NCC's service is provided either directly or with partners from government agencies and private sector organisations. There are over 150 private sector waste operators independently involved in various aspects of waste management[xv]. The majority of private companies are either small family ventures or a hybrid between a community based organisation and private firms. The private sector lacks laws and regulations. Beyond mandatory licenses and permits, (which have minimal qualification requirements[xvi]) there are few regulations guiding private sector involvement in waste management, leaving private enterprises in open competition with one another on a purely, "willing-buyer-willing-seller" basis[xvii]. Thus, despite the county government being considered the key actor in solid waste management, its overall reach is inadequate. Its control is further constrained of course by the cartels and their connections.

In addition to the dearth of waste collection services, Nairobi's waste management system lags behind in terms of recycling. With no adequate infrastructure, most of the recycling takes place informally at the Dandora dumpsite where more than 3,000 waste pickers recover different recyclable waste materials for middlemen to buy and process further. Only 5% of the waste generated ends up recycled, despite almost 75% of it being metal, paper and cardboard, glass and organic waste. Nairobi ranks 31st out of 52 cities in the Global South for the proportion of waste being recycled, behind cities like Bamako (21%), Bogotá (17%) and Dar es Salaam (13%)[xviii].

## Nairobi Official Dumpsite: Dandora

Source: https://www.aljazeera.com/indepth/inpictures/life-kenyan-rubbish-dump-illness-poverty-afflict-community-190129180436685.html

Dandora is a sprawling dumpsite of over 30 acres surrounded by the slums of Korogocho, Baba Ndogo, Mathare and Dandora. It is estimated that about 200 trucks offload waste at Dandora daily, despite the site being officially full since 1996[xix]. Dumping in Dandora is unrestricted and includes industrial, agricultural, domestic and medical waste. Overcapacity affects management of the site and waste has been contaminating the groundwater. The Nairobi river runs nearby and carries polluted water downstream where it is used for irrigation of food products and for drinking water. A 2007 study by United Nations Environment Programme (UNEP) examined 328 children living close to the dumpsite found that half had blood lead levels equal to or exceeding the poisoning threshold of 10 micrograms per deciliter of blood[xx]. Such exposure to high levels of lead is linked to damage to the nervous system and the brain.

Waste sorting and recycling of waste for recovery and reuse at Dandora is performed by informal groups or individuals who sort the waste into economic lots for sale to recyclers/reusers. The waste pickers sell the sorted lots to private companies; the council having little or no role in this process. The waste pickers recover more than 30 different types of materials, such as aluminium and copper.

Although Dandora is Nairobi's main dumpsite, there are an additional over 70 illegal dumping sites scattered throughout the city[xxi].

# Who Is Doing What?

Aligning with Kenya's Vision 2030, waste management has emerged as one of Nairobi's key priorities in its urban regeneration plan. The county has invested in better road infrastructure to the Dandora site, fleet acquisition to increase capacity and the registration of waste management companies. There are also two plans for waste-to-energy plants, one in the Dandora site and one located in Kibera, funded by the Sustainable Energy Fund for Africa (a multi-donor fund managed by the African Development Bank).

In 2015, Kenya passed the Solid Waste Management Act. The Act classified waste and created a collection scheme organised on a sub-country level, putting penalties in place for the mismanagement of solid waste collection and disposal. In addition, in 2016, environment officers were appointed to plan and supervise waste management operations. However, despite these early signs of a progressive and efficient waste management system, gains that were made were soon lost due to inefficient enforcement[xxii].

Recently the Nairobi City Council (NCC) have been looking at enforcing the Solid Waste Management Act of 2015. The county government is in the process of implementing the provisions of the Act, enforcing subsidiary legislation under the Environmental Management Coordination Act as well as developing an environment policy. According to the NCC, the county is intending to implement the Integrated Solid Waste Management Master Plan the county created with the Japanese development agency (JICA) in 2010. The plan comprises eight programmes including waste collection and transportation; 3Rs – reduce, reuse and recycle – as well as intermediate treatment; final disposal; organisational restructuring and human resources; legal and institutional reform; financial management; private sector involvement promotion; and community participation promotion[xxiii].

## Recent developments

Since its inception in March 2020 the newly formed Nairobi Metropolitan Services (NMS) has vowed to crack down on garbage cartels in the city. NMS Director-General Mohammed Badi recently declared that his administration identified 110 illegal dumping areas and currently 82 have been cleared of solid waste with enforcement for closure ongoing. At the same time, the NMS have claimed to map 122 illegal discharge points in line with the governments directive to ensure enforcement on effluent discharge from industries and restaurants into rivers[xxiv].

According to Badi, the new administration has put in place effective garbage collection and disposal methods where more than 70 percent of garbage backlog in Nairobi has been cleared. The backlog was caused by a recent "go slow" by garbage contractors over a back-payment dispute. To clear the backlog the Environment Department has engaged a new contractor to collect 2,200 tonnes every day covering all the city's 17 sub counties[xxv]. In addition, City Hall signed a deal with the National Youth Service (NYS) to collect garbage. The one-year contract with NYS enhances garbage collection from an initial 1,000 tonnes per day to an average of 2,500 tonnes per daily and a daily disposal target of 3,000 tonnes[xxvi].

## Support from foreign agencies

International development agencies from other governments, in particular Japan and Denmark, have been attempting to support Nairobi's progress in waste management.

## Japan

The Japan International Cooperation Agency (JICA), has supported on capacity development and technical assistance of solid waste management in Nairobi. As well as the 2010 Integrated Solid Waste Management Plan (mentioned above), JICA has been involved in projects including a proposed KSh 1.251billion ($11.5 million) investment in the Public-Private Partnership (PPP)-Project of Medical Waste and Hazardous Waste Appropriate Processing Plant. Through this project, Kenya's Ministry of Water, Environment and Natural planned to instal and operating an incinerator using Japanese advanced waste management technologies with the participation of a Japanese private company. Despite these plans, we have been unable to find evidence of the project going ahead, beyond a feasibility study phase[xxvii].

In a similar vein, JICA funded a pilot project titled "Clean, healthy, Wealthy Nairobi" in October 2014. The project was designed to change the current point collection system to a more efficient system involving waste segregation and a single company responsible for all waste in a given area[xxviii].Although a second phase was approved, the project ended in March 2016, possibly due to outstanding issues not solved by Nairobi County[xxix]. JICA has previously cited insufficient funds for the city's failure to implement clean-up plans and have also stressed the need for a legal framework for PPP investments[xxx].

## Denmark

Denmark's engagement with Kenya is primarily through a Strategic Sector Cooperation (SSC), an arrangement where Danish specialist agencies collaborate with recipient country counterparts in areas where Danish companies have a particular strength and are designed to open up new commercial opportunities as well as deliver on social objectives.

Environmental sector cooperation between Kenya and Denmark under an SSC arrangement has been ongoing since 2016 where the Danish Environmental Protection Agency held several meetings in Kenya for stakeholders at national and regional levels as well as private sector companies and organisations. The main objectives are to assist in accelerating Kenya's transition towards a circular economy, with a focus on resource efficient industrial production and the waste sector. Key activities of interest to the ULA programme include supporting the creation of a plastics recycling strategy. A useful 2018 report on this topic with a comprehensive list of companies involved in plastics recycling is available here. At the time of writing there were only 3 exporters of recycled plastic waste in Kenya and only 15% of plastic packaging waste was estimated to be recycled; this represents a large untapped opportunity if the right capabilities were in place to capitalise on it.

Another Danida-funded project of interest is the Green and Circular Economy for Kenyan Companies (GECKO) project[xxxi]. This project which started in 2018 and expected to complete this year. It examines the potential for Kenya to leapfrog to a circular economy, seeking to provide a methodology and a scientific knowledge base for developing circular eco-industrial parks in Kenya. Specifically, it is investigating the prospects of 'industrial symbiosis' i.e. when one companies' residue becomes another proximate companies' resource. It uses the Ruaraka industrial zone on the outskirts of Nairobi and 31 mixed manufacturing companies as a pilot case.

## e-Waste Management

Multinational IT companies have been supporting waste management projects. In 2013 Dell created an e-waste recycling programme with the E-Waste Solutions Alliance for Africa. The regional e-waste handling facility has 40 collection points run by local entrepreneurs that buy e-waste from collectors. Hewlett Packard (HP) has had an e-waste management project since 2010. HP have partnered with the East African Compliant Recycling company and the German Deutsche Investitions- und Entwicklungsgesellschaft and created a system for separating and dismantling e-waste including domestic devices. Reportedly this has resulted in East Africa's first large-scale recycling facility in Nairobi and Kenya's first-ever registered collection network for e-waste[xxxii].

# Local Initiatives

In the past decade, several locally executed projects have attempted to promote circular economy solutions in Nairobi. For example, TakaTaka Solutions, a social waste enterprise, started with a 2-year pilot project in Kangemi before establishing two recycling centres in the city with the support of the Swiss foundation myclimate, and funded by the Swiss federal government. Now financially sustainable, TakaTaka Solutions now serves 120,000 households, of which 60% are in low-income areas, collects over 50 tonnes of waste daily and recycles/composts 95% of this waste.

On the other side of the city, in Embakasi, Mr. Green Africa, supported by the London-based Global Innovation Fund, is using smart technology to streamline waste collection operations and empower informal waste pickers[xxxiii]. It sells fairly-sourced recycled materials to local and international markets and has created more than 100 direct jobs since its inception. Self-sufficient, Mr. Green Africa uses investment by Global innovation Fund and DOB Equity, the growth equity funder, to scale up and expand their model. It also partners with corporates, for example recently developing fully recycled plastic packaging in collaboration with Unilever. Informal recycling also happens in the slum next to Mr. Green Africa, on Enterprise Road.

Map 4 Gives an overview of the location of Nairobi's key players in solid waste management.

Map 4: Solid Waste Management Challenges in Nairobi

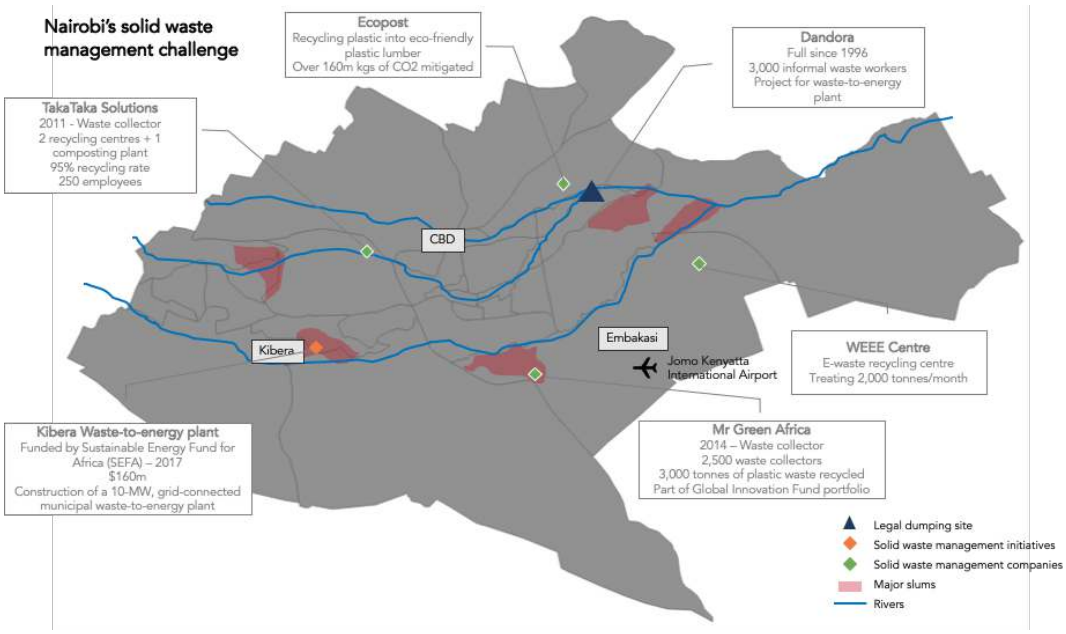



Table 2 (see below) gives an overview of waste management players and projects in Nairobi

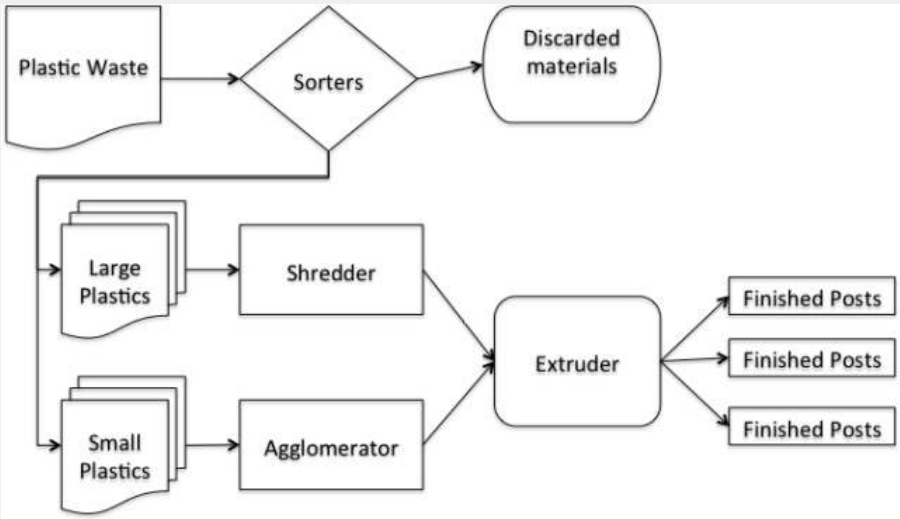
# Case study: Ecopost

Founded in 2009, Ecopost recycle waste plastic to manufacture eco-friendly plastic lumber posts that are used in numerous industries, such as fencing, road signage and outdoor furniture for example. The products produced resemble wooden two-by-fours that are omnipresent in construction material shops and hardware stores in the West. The difference being that Ecopost's product is made of recycled plastic rather than lumber. The company sell both circular and square versions of their products in various lengths.

Ecopost use a relatively low-tech and labour-intensive manufacturing process converting waste plastic to lumber posts with most of the labour being the collecting and sorting of the plastic waste. Plastic waste is obtained from various locations near waste dumps and collection yards in Nairobi. Ecopost employees drive trucks to these sites to collect the waste from part-time "collectors" (mostly woman and young people). The plastic is returned to the firm's factory where full-time employees prepare the material for processing by separating out the collected plastic into different categories of thickness and size (from light and thin grocery bags to thickly moulded plastics found in toys and furniture), and by removing any unwanted materials embedded in the trash, such as scraps of metal or rocks.

After preparation, workers place thicker, more rigid plastic into a machine that shreds the material into small 5mm-length pieces. Flimsy plastic such as supermarket shopping bags, are placed into an agglomerator, which forms the material into small round balls. EcoPost then mix the shredded and agglomerated plastics in a 60:40 ratio into a large moulding machine. After heating the mixture to about 250 degrees so that the plastic melted and moulded into the desired shape, the workers removed the finished posts and placed them in water to cool (figure 4).

Figure 4: Eco-post Manufacturing Process




Source: http://www.ecopost.co.ke/assets/pdf/case_study_stanford.pdf

The entire enterprise ensures minimum wastage. Discarded parts are recycled and put back into the heater which are used to mould posts. The water used for cooling is also recycled in the production process, making the process waste free.

The uniqueness of Ecopost's product has provided them with a distinctive selling point as the quality, endurance and the environmental values of the posts and building materials are appealing to a wide range of clients, from individuals, businesses, NGOs and local government.

The firm is working with national and international institutions including the Kenya Bureau of Standards and the International Labour Organization to develop standards as there are currently no industry standards for their product. In addition, Ecopost are looking for partners to expand their reach throughout Kenya and neighbouring East African countries.

Table 2: Key players and Developments in the Area

| Organisation | Overview | Website |
|---|---|---|
| International Organisations | | |
| Japan International Cooperation Agency | Capacity Development of Solid Waste Management of Nairobi City. The project aims to improve capacity for environmental management and solid waste management.<br><br>No measures have been implemented yet but have been included in Nairobi Solid Waste Management Master Plan to be executed starting mid-2020 and which is ongoing. | https://www.jica.go.jp/kenya/english/activities/activity01.html#a05 |
| Danish Environmental Protection Agency & Danish Embassy, Nairobi | Danish Environmental Protection Agency has ongoing projects to improve Kenya's development of the circular economy including solid waste management.<br><br>It has developed partnerships with Kenyan stakeholders and supported pilot projects like the GECKO Project (which remains live). | https://eng.mst.dk/sustainability/global-cooperation/kenya/ |
| African Development Bank | In late 2017, The Africa Development Bank's Sustainable Energy Fund for Africa approved a $995,000 grant to Asticom Kenya Ltd. for construction of a 10 to 40MW grid-connected waste-to-energy incineration plant at the Dandora. The incinerator would generate electricity by converting municipal solid waste from the Dandora landfill into biogas and ethanol.<br><br>The incinerator has however, had delays in construction, due to arising conflicts with wastepickers over safety issues. | https://ejatlas.org/conflict/proposed-incinerator-at-dandora-landfill-threatens-wastepicker-livelihood-in-nairobi-kenya |

| International IT companies | | |
|---|---|---|
| Dell | In partnership with the E-Waste Solutions Alliance for Africa, Dell opened the East African Compliant Recycling – one of the regions first large scale e-waste recycling facility and the creation of a new e-waste business to be supported by a regulatory model tailored for developing countries.<br><br>At the heart of the business model are shipping container-housed collection points located throughout Kenya. Each collection point functions as its own independent small business, purchasing e-waste from newly-trained individual collectors.<br><br>In addition to protecting the environment, the model has created jobs by converting existing informal-sector e-waste "pickers" into trained and legitimately compensated e-waste collectors. Dell have invested in education al training programmes to educate workers on safe collection and recycling of e-waste.<br><br>Dell have sponsored projects and created jobs for women from Nairobi's Mukuru informal settlements. Following the completion of a training course, women use funds made available through mobile technology to purchase and resell waste. | https://www.businesswire.com/news/home/20131204005097/en/Dell-Helps-Develop-New-E-Waste-Model-Developing<br><br>https://techmoran.com/2013/12/04/dell-unveils-a-recycling-hub-marketplace-in-africa-to-boost-the-lives-of-slum-women/ |
| Hewlett Packard | Similar to Dell model of recycling, Hewlett Packard has partnered with East African Compliant Recycling in an E-waste management project.<br><br>The micro-businesses that do the collecting receive equipment and training to ensure they meet global standards. | https://www.theguardian.com/sustainable-business/sustainability-case-studies-hewlett-packard-ewaste-recycling-africa |

| | | |
|---|---|---|
| IBM Research Africa | Formed a PPP with NCC to develop tracking devices that enable garbage collection vehicle management. Data such as speed, tonnage of garbage loaded on vehicles, and driver behaviour are gathered in real time. The system surveys events from multiple sensors embedded in workers' mobile phones and applies machine learning to the data. | https://techtrendske.co.ke/nairobi-to-be-relieved-of-garbage-menace-through-an-ibm-research-africa-app/ |
| Local Organisations | | |
| The Kenya Climate Innovation Center (KCIC) | The KCIC provides incubation, capacity building services and financing to Kenyan entrepreneurs and new ventures that are developing innovative solutions in energy, water and agribusiness to address climate change challenges. | http://www.kenyacic.org/ |
| Eco-post | A social enterprise, EcoPost uses 100% recycled plastics to manufacture into Eco-friendly plastic lumber profiles with application in numerous industries e.g.: fencing, road signage, outdoor furniture. | http://www.ecopost.co.ke/ |
| Gjenge Makers | A social enterprise that recycles plastic waste into alternative building materials. | https://gjenge.co.ke/ |
| Taka Taka Solutions | Waste collection service that collects waste from households, businesses and factories. Waste at their decentralized sorting sites is sorted into more than 40 fractions. Organic waste is composted. Other waste (paper, plastic, glass, metal) is either recycled in-house or through their partners. | https://takatakasolutions.com/ |

| | | |
|---|---|---|
| WEEE Centre | WEEE sources e-waste from the private and public sector and provides dismantling and automated processing services in Nairobi.<br><br>Initially a start-up supported by funding from Safaricom Foundation, Computer Aid international, Close the Gap and WorldLoop. | http://www.weeecentre.com/ |
| Mr. Green Africa | Supported by the Global Innovation Fund, Mr. Green Africa uses smart technology to streamline waste collection operations and empower informal waste pickers. | https://www.mrgreenafrica.com/ |

# Stormwater Drainage and Flooding in Nairobi

## Overview

Nairobi has a serious problem with storm water drainage and flooding. Polluted flood waters, impassable roads and submerged informal settlements have become common sights every time it rains heavily in Nairobi. In periods of high rainfall, water runs off roads and roofs onto carriageways, walkways and residential areas due to the inadequate capacity of storm water drains.

Growth of the built environment has not been matched by systems of drainage. The city authorities lack a detailed drainage master plan that is supported by comprehensive data of drainage demand and capacity, as well as effective infrastructure such as storm water channels and run off management mechanisms.

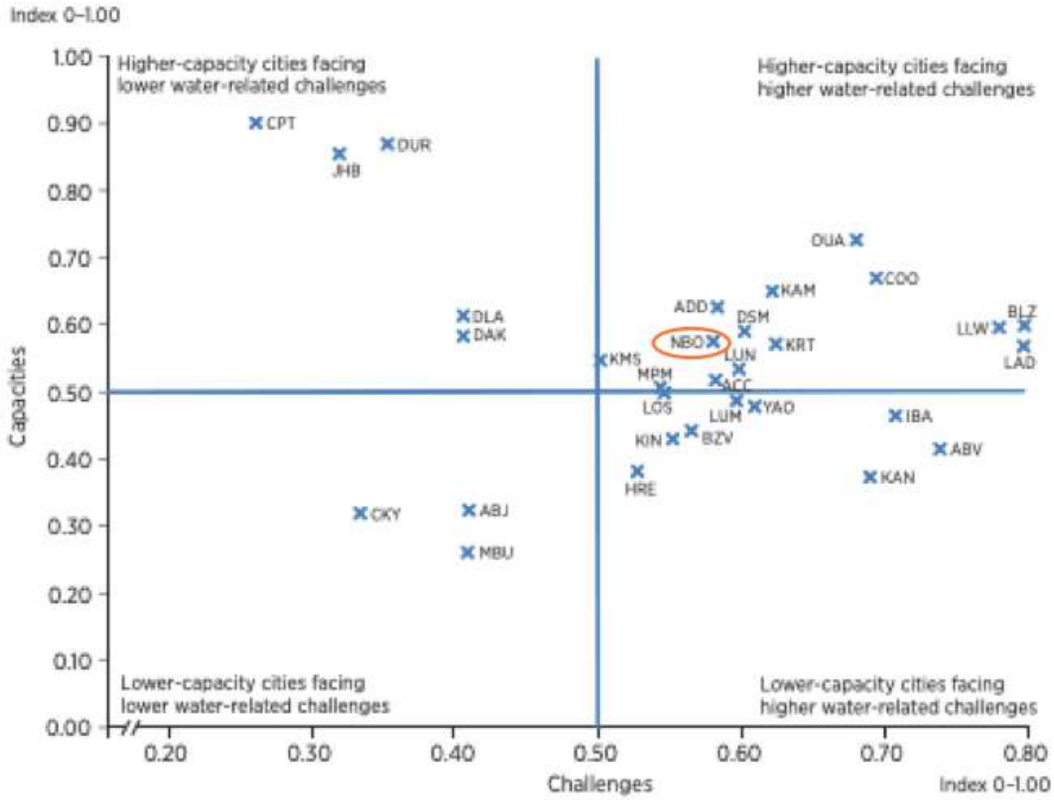
## Flooding

Located in a river basin, Nairobi is badly affected during the two rainy seasons. Waste accumulation during the year leads to blocked stormwater drainage systems across the city, houses in informal settlements located along the banks of the river are destroyed and essential infrastructure like roads and bridges become dangerous. The densest part of the city as well as many informal settlements are located in the areas most at risk of floods. As a result, every year, there are more than 15 incidents of flooding destroying people's livelihoods and leading to outbreaks of disease and displacement.

Like many other cities in the Global South, Nairobi faces significant water-related challenges but given its specific location, a higher proportion of its infrastructure is at direct risk. The city has more than half its schools located in flood risk zones, as well as 105km of major roads, the 2$^{nd}$ highest number out of 12 sub-Saharan African cities, just behind Addis Ababa (127.8km). In the past 30 years, Nairobi has also seen the extent of its urban built-up areas located in flood risk zones multiplied by 3, the 4$^{th}$ highest growth rate among 11 African cities[xxxiv].

Nairobi also ranks 12$^{th}$ out of 30 sub-Saharan African cities for its capacity to handle water challenges, behind its South African and East African peers (see Figure 1).

Figure 1: Urban Water Management Challenges vs Institutional and Economic Capacities[xxxv]




Note: The figure presents an index that categorizes cities in two dimensions: water-related challenges and institutional and economic capacities. Water indicators were selected for the following variables: urbanization challenges, solid waste management, water supply services, sanitation services, flood hazards, and water resources availability. Institutional and economic capacities indicators include country policies and institutions, economic strength, water-related institutions, and water utility governance.

Flooding is highly damaging to the functioning of the city and has a range of impacts on other aspects of urban life. The indiscriminate disposal of solid waste (examined above), for example, including excavated soils, construction debris and garbage, compounds the issue. Waste finds its way onto water courses, road reserves and sewerage systems. This restricts the effective functioning of the current system by causing blockages to the grills installed across drains and also worsens the impact of flooding, by exposing citizens to unsafe and sometimes hazardous materials.

# Planning and Infrastructure

The physical urban planning of Nairobi dates back to the period under colonial rule when designs were made[xxxvi]. Since independence, the city has expanded with the construction of formal physical developments such as concrete pavements and large-scale buildings which were not matched by development of an adequate drainage structure.

In addition, as Nairobi has grown, rural migrants have settled into informal and low-income settlements. Drainage in these settlements is worse than other parts of the city due to haphazard development and construction without consideration of natural water flows, riparian reserves and wetland management. While the standard of water and sanitation infrastructure is particularly poor in economically deprived areas such as the Eastlands estates of Umoja, Makongeni and Donholm, wealthier areas such as Karen and Langata are also poorly served[xxxvii].

As Nairobi County's Executive for Water and Environment Vesca Kango explains: "There is a need to invest in a storm water master plan for the entire city which is lacking...A big investment is required to separate the storm water drainage and the sewer lines to stop the overflow especially in the CBD "[xxxviii].

# Health hazards caused by the intersection of solid waste and wastewater management

The intersection of flooding and solid waste causes health problems. Solid waste including excavated soils, construction debris and garbage finds its way onto water courses, road reserves and sewerage systems. Inadequate water supply and the absence of infrastructure for excreta disposal and wastewater management are linked directly to the high incidences of diarrhea, skin diseases, typhoid fever and malaria (Table 2).

Table 2: Infant and under five mortality rates and diarrhoea prevalence in Kenya

| Location | Infant mortality rate (per 1,000 live births) | Under-five mortality rate (per 1,000 live births) | Prevalence of bloody diarrhoea in children under age 3 in two weeks prior to interview (%) |
|---|---|---|---|
| Kenya (rural and urban) | 74 | 112 | 3.0 |
| Rural | 76 | 113 | 3.1 |
| Nairobi | 39 | 62 | 3.4 |
| Other urban | 57 | 84 | 1.7 |
| Nairobi, informal settlements | 91 | 151 | 11.3 |
| Kibera | 106 | 187 | 9.8 |
| Embakasi | 164 | 254 | 9.1 |

Source: Urban Drainage and Sanitation. A Case Study of Nairobi-Kenya – Isaak A. Alukwe (2016)

# Institutional challenges

The institutions responsible for Nairobi's water supply and sanitation have been beset with a history of problems. Nairobi's previous water utility: The Water and Sewer Department, lacked finance, had staff retention problems (due to low wages), was uncompetitive and subject to political interference. A series of reforms in 2002 resulted in the transformation of the city water and sewer department into a legally and financially autonomous utility called the Nairobi City Water & Sewerage Company (NCSWC) in 2003.

The reform was designed to allow utilities to offer higher salaries, insulate from political interference, improve the financial viability of utilities, and improve the quality of service. NCSWC however has had problems. A report into corrupt practices (cases of bribery for illegal connections, tampering with meter readings and diversion of water from domestic users to industries) led to the sacking of the entire board of the NCWSC for malpractices, by the Nairobi City Council in 2009. However, according to a report by NTV (Kenya TV channel) "some of the failures blamed in the board can be traced to members of the council[xxxix].

In 2016 the government passed The Water Act. The reform saw regional water boards, like NCWSC, formed into devolved Water Works Development Agencies. These Agencies are tasked with overseeing the development, maintenance and management of National Public Waterworks. NCWSC falls under the jurisdiction of Athi Water Development Agencies.

# Who is Doing What in the Area?

In their strategy document, NCWSC state their commitment to Kenya's Vision 2030 - the State's development programme from 2008 - 2030. IVision2030 commits to increasing government spending on the expansion and modernization of water infrastructure. Specific programmes include:

- Urban Water Supply Sub-programme which involves the clustering of water supplies in the counties to improve supply sustainability. Key towns targeted are Nairobi, Mombasa, Kisumu and Nakuru.
- Rural Water Supply Sub-programme aiming at constructing and rehabilitating 150 rural water schemes annually. With implementation of clustering, some of the rural areas within the environs of Nairobi City County may be served by NCWSC.
- Operationalization of Water Research Resource Centre (WARREC) to capture emerging issues, trends and technologies in the broad water sector. During the 2014/15 - 2018/19 plan period, NCWSC has collaborated with WARREC in undertaking relevant sector research to exploit market opportunities in terms of best practices and technologies.
- A programme focused on the provision of water to poor un-served areas including informal settlements that will, among other things, explore opportunities of subsidies through Water Service Providers (WSPs) to meet the basic water services supply in the informal settlements. NCWSC planned to devote its own resources and mobilize others from other stakeholders with a view of improving water and sewerage services in vulnerable areas.

(Source: Nairobi City Water and Sewerage Company Limited – Strategic Plan 2014/15 – 2018/19)

To meet these objectives NCWSC has enlisted the aid of international donors to deliver specific projects. For example, the Nairobi Sanitation OBA Project which was completed in 2018 was funded by the World Bank and DfID. The objective of the project was to increase sanitation and water services to informal settlements through the provision of reliable, affordable and sustainable basic sanitation and water services to the poor. The World Bank provided an initial grant of $4.33million and an additional $2.6million to the Kenyan Government for NCWSC to implement the project[xl]. A 2019 internal World Bank review of the project rated it as "moderately satisfactory[xli]. According to the World Bank 84,940 people in Nairobi's informal settlements were provided with access to improved water sources, and 137,243 people were connected to the sewerage network[xlii].

The World Bank is also active in funding other stormwater, drainage and sewerage projects in Nairobi and Kenya in general. A currently active project is the 2030 Water Resource Group (2030 WRG). 2030 WRG is a $444 million global project to help countries achieve water security by facilitating collective action between government, the private sector, and civil society.

In 2019, the 2030 WRG formed a partnership with the Government of the Nairobi Council and Nakuru Water and Sanitation Services Company Ltd to develop a Trade Effluent Management System (TEMS). The development of the TEMS would enable utilities to levy a surcharge on companies that release hazardous effluent that is based on the specific volume and load of pollution rather than the current flat rate.

Plans are under way to develop and pilot a TEMS mechanism, including guidelines for imposing sanitation service levies, trade effluent surcharges, and other related matters. Currently industries in Nairobi discharge about 400,000 $m^3$ of wastewater per day, of which only 192,000 $m^3$ of waste is treated by two wastewater treatment plants. The rest flows into streams that join the Nairobi River[xliii].

The objective is to support the growing business case for a circular water economy. The project has been designed for implementation at catchment level. Financing and preparation of a pilot is currently ongoing[xliv].

As part of the $330 mn Nairobi Metropolitan Services Improvement Project (NaMSIP), funded by the World Bank and Kenya National government, the city is also rehabilitating, reconstructing and unblocking sub-surface drains in the CBD, Dagoretti, Lang'ata and Embakesi. 3 other locations in the wider metropolitan area, Thika's CBD, Ongata Ragai and Makovo/Athi River will also benefit from the project.

## The African Development Bank

The African Development Bank(AFD) has funded numerous projects led by Kenyan and Nairobi governmental departments to tackle Nairobi's sewerage and sanitation problems. These have included the Nairobi River Basin Rehabilitation & Restoration (Phase I &Phase II) and the Kenya Towns Sustainable Water Supply and Sanitation Programme.

Phase 1 of the Nairobi River Basin Rehabilitation & Restoration dealt with sewerage. The goal of the Project was to improve the access, quality, availability, capacity and sustainability of wastewater services in Nairobi through the rehabilitation and extension of sewerage services and wastewater treatment facilities. Phase 1 on the project cost $40m and lasted from 2011 - 2016.

According to the AFD, the project was a success, making progress rehabilitating and expanding the sewerage services management of Nairobi. Outcomes included:

- The Dandora Treatment Plant was complete and has an additional treatment capacity of 40,000$m^3$/ day
- Rehabilitation of the Kariobangi Treatment Plant progressed (55% complete) with a restored operational capacity of 32,000$m^3$/day
- Construction of an additional 63.3 Km Trunk Sewers and 43 Km reticulation lines
- 25,000 trees planted along riparian zones
- 67% completion of the construction of ablution blocks in informal settlements
- Training of the Athi Water Service Board (AWSB) and Nairobi Water Sewerage Company(NWSC) staff on management of sewerage systems

Following the successful completion of Phase 1 a $70 millon Phase 2 of the project was approved. The project aims to increase sewer connection coverage by laying primary and secondary sewer lines covering areas of Zimmerman, Githutai 44, Kahawa West, Kasarani and Mwiki which are not connected to the main trunks. Specific objectives include:

- To increase sewerage in Nairobi City from the current 48% to 60% by 2021
- Reducing pollution levels of Nairobi River by collecting and treating 80,000m3/d of waste water
- Enhance sustainability of sewerage operations through increased revenue collection[xlv]

The $3 million Kenya Towns Sustainable Water Supply and Sanitation Programme (2016-2021) funded by the African Development Fund, Middle Income Countries Fund and the Government of Kenya aims to contribute to the development of water supply infrastructure in 19 towns, and sanitation infrastructure in 17 towns. The programme comprises:

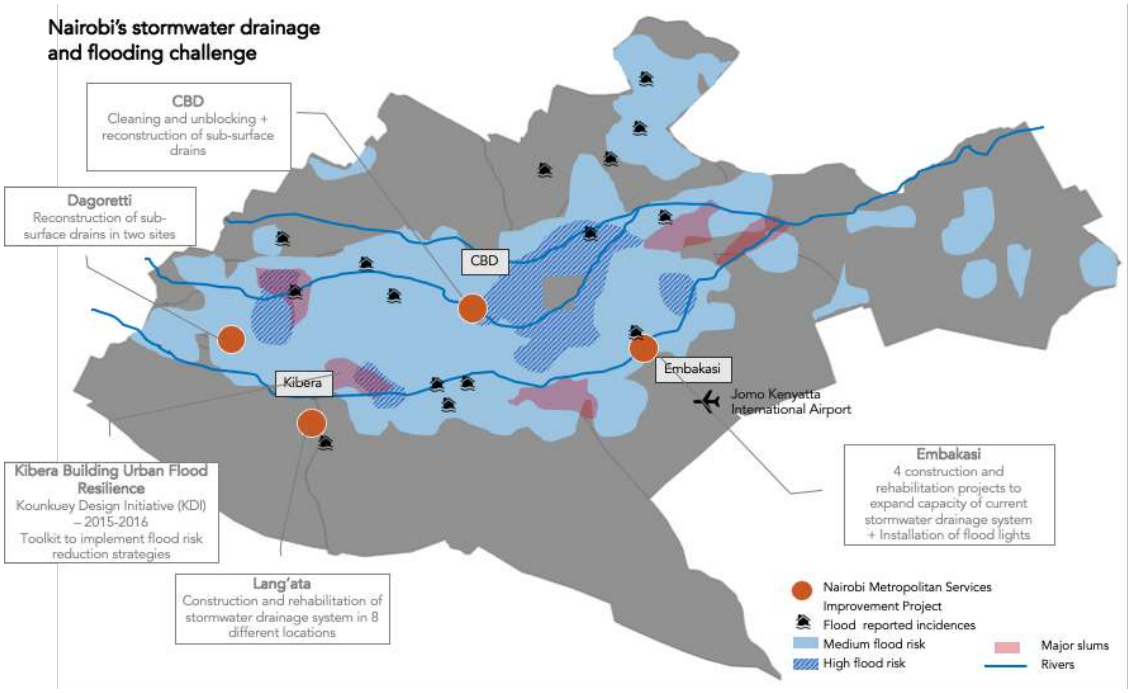
- The construction and repair of water supply and sanitation equipment (including the network extension to the informal neighbourhoods) to improve the quality of water supply and sanitation services
- The improvement of water supply service providers and the sector's regulatory authority's capacities in order to increase the concerned services' efficiency, and create new employment opportunities for women and young people[xlvi]

Figure 3 shows the map of the sub projected areas.

Figure 3: Rural Water Supply and Sanitation Projects in Nairobi and Surrounding Areas


Source: Project Kenya Towns Sustainable Water Supply and Sanitation Programme – African Development Bank Group. May 2016

Map 4: Stormwater and Drainage and Flooding Challenges in Nairobi



# Case study: The Trilogy Emergency Relief Application

The Trilogy Emergency Relief Application (TERA) is an SMS platform that allows users to send geographically targeted messaging allowing communities to better prepare for potential flooding situations. The mobile phone application was developed as a partnership with The International Federation of Red Cross and Red Crescent Societies (IFRC) and Trilogy International Partners, a wireless telecommunications company.

Kenya is a technology-savvy country with over 80 percent mobile ownership, and the population has embraced SMS as a communication tool[xlvii] TERA allows SMS text messaging designed for two way communication between disaster affected people and aid agencies, allowing responders to get in touch if they need assistance.

Outgoing messages are used for a number of reasons:

- To give early warnings of floods, hurricanes and other natural disasters
- To provide targeted information on where to find medical help, clean water, food, shelter
- To notify victims about vaccination programmes or changes in the aid services being offered
- To give detailed advice on a range of issues such as hygiene, avoiding fraud, caring for affected people
- To get feedback on the beneficiaries needs and experience of relief services

The IFRC is currently rolling out a programme to install TERA in to 40 countries that are thought to be most vulnerable to disasters and is seeking mobile network operators that are prepared to install TERA into their networks and provide SMS messaging services in times of disaster.

Table 3: Key players and Developments in the Area

| Organisation | Overview | Website |
|---|---|---|
| International Organisations | | |
| World Bank | Funded various water, sanitation and drainage projects through various channels: International Development Association, investments in the Nairobi City Water and Sewerage Company, Athi Water Services Board and Kenya Informal Settlements Improvement Project. | https://www.worldbank.org/en/news/feature/2020/02/19/providing-sustainable-sanitation-and-water-services-to-low-income-communities-in-nairobi |
| | Kenya Urban Water and Sanitation Output Based Aid (OBA) Fund for Low-income Areas.<br><br>The objective of the Kenya Urban Water and Sanitation OBA Fund for Low-income Areas is to increase the number of people in low income areas with access to improved water supply and sanitation services. This objective will be realized by incentivizing urban Water and Sanitation Programmes to invest in water supply and sanitation improvement subprojects to benefit households in low income areas by applying one-off OBA subsidies to make water and sanitation access affordable.<br><br>Date: 2014 -2020<br>Cost:$18.14 million<br>Status: Ongoing | https://projects.worldbank.org/en/projects-operations/project-detail/P132979<br><br>https://www.2030wrg.org/kenya/ |
| | Partnership with the Government of the Nairobi Council in the management of its industrial wastewater: Through the 2030 Water Resource Group<br><br>Nairobi Sanitation Project<br><br>Date: 2017 – 2018<br>Cost $7.2million<br>Status: closed/ Moderately successful | https://projects.worldbank.org/en/projects-operations/project-detail/P131512 |
| African Development Bank | Funding the Kenya Ministry of Water Development in the | https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and- |

| | | |
|---|---|---|
| | Nairobi River Basin Rehabilitation & Restoration Phase I<br><br>Development Objective of the Project was to improve the access, quality, availability, capacity and sustainability of wastewater services in Nairobi through the rehabilitation and extension of sewerage services and wastewater treatment facilities<br><br>Date: 2011 – 2016<br>Cost $40million<br>Status: Closed | Operations/Kenya-Nairobi_Rivers_Basin_Rehabilitation_and_Restoration_Program_Sewerage_Improvement_Project.pdf |
| | Funded the Nairobi City Water and Sewerage Company in the Nairobi River Basin Rehabilitation & Restoration Phase II. Project to Develop wastewater facilities with the aim to increase sewerage coverage from 48% to 60% by 2021 and reduce pollution levels.<br><br>Date: 2018 – 2021<br>Cost $70 million<br>Status: Approved | https://www.afdb.org/en/documents/document/kenya-nairobi-rivers-basin-rehabilitation-and-restoration-program-sewerage-improvement-project-phase-ii-esia-summary-100633 |
| | Funded the Ministry of Water and Irrigation in its Kenya Towns Sustainable Water Supply and Sanitation Programme<br><br>Date: 2016 – 2021<br>Cost $3 million<br>Status: Ongoing | https://projectsportal.afdb.org/dataportal/VProject/show/P-KE-E00-011 |

| | | |
|---|---|---|
| Global Resilience Partnership | Partnership of public and private organisations that aim to help vulnerable people in Africa and South and South East Asia. Founding sponsors include Rockefeller Foundation, USAID, and Sida, they now include a range of partners including DfID, Farm Africa, Kenya Red Cross Society, Wetlands International, KPMG, Exeter University, AXA, Zurich Insurance Group and others as partners.<br><br>In Nairobi they have worked with communities to promote and participate in regular clean-ups, freeing the drains of garbage and other blockages, which prevent flooding from heavy rains. | https://www.globalresiliencepartnership.org/news/2016/10/07/how-kenyan-communities-embrace-flood-resilience-strategies/ |
| SMEC Holdings Ltd | SMEC Holdings Limited is an Australian based-firm and partner of Surbana Group of companies that have presence in Asia, Africa, Australasia, UK, Middle East and the Americas. The company specialise in urban development, infrastructure and management services. They have had presence in Kenya since 1976.<br><br>SMEC's first project in Kenya was the Magarini Land Settlement Project, which involved the investigation and development of surface and underground water supplies, establishment of settlers' plots and development of agricultural potential. Since then, SMEC has completed numerous projects in Kenya including: an institutional restructuring project for Nairobi's water and sewerage service providers.<br><br>SEMC Athi Water Service Board (AWSB) to complete a feasibility study, preliminary design and economic analysis of a new Energy Generating Facility at the Dandora Sewage Treatment Plant. | https://www.smec.com/en_ke<br><br>https://www.smec.com/what-we-do/projects/Dandora-Sewage-Treatment-Plant |

| Local Organisations | | |
|---|---|---|
| Nairobi City Water and Sewerage Company | Nairobi Water Company was launched on 25th August 2005 as a private company for supplying drinking water and provision of sewerage services to the city of Nairobi. | https://www.environmental-expert.com/services/wastewater-treatment-231559 |

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i JLL (2020) City Momentum Index

ii UN Habitat, World Urbanization Prospects 2018

iii fDi Global Cities of the Future 2018/19, accessible at: https://www.fdiintelligence.com/article/73580 ; https://www.afdb.org/en/documents/document/the-state-of-african-cities-2018-106759 (p26)

iv UN Habitat Global Urban Indicators Database (2010) ; wifimap.io

v https://weetracker.com/2019/09/21/kenya-highest-number-of-billionaires/ ; https://www.ipsos.com/sites/default/files/ct/publication/documents/2018-02/20180214_ipsos_africanlions_web.pdf

vi https://www.bloomberg.com/news/articles/2019-09-24/traffic-jams-in-kenya-s-capital-bleed-1-billion-from-economy

vii https://qz.com/africa/1237034/how-nairobi-kenya-fixes-its-waste-management-problem/

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