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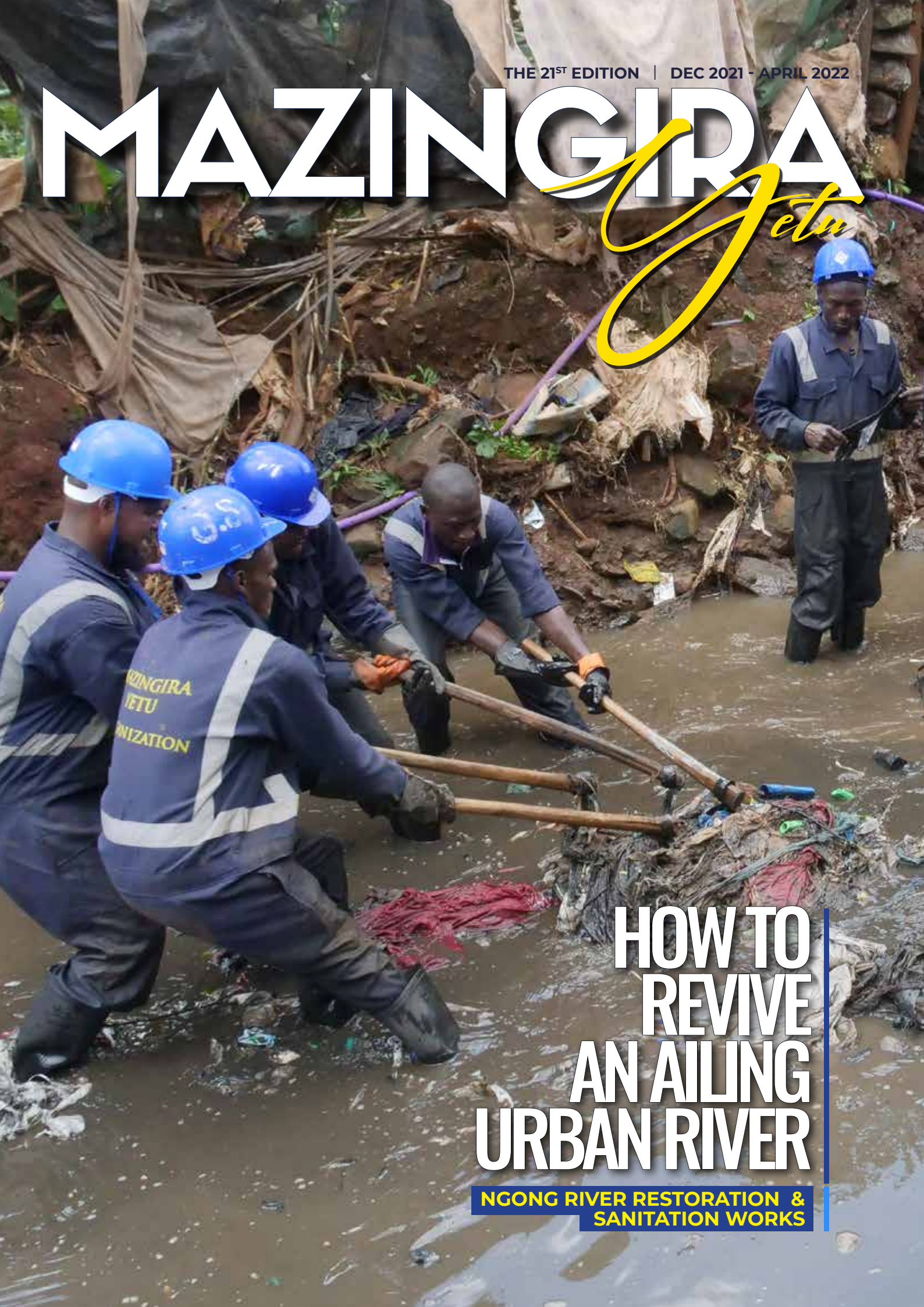
MAZINGIRA Yetu

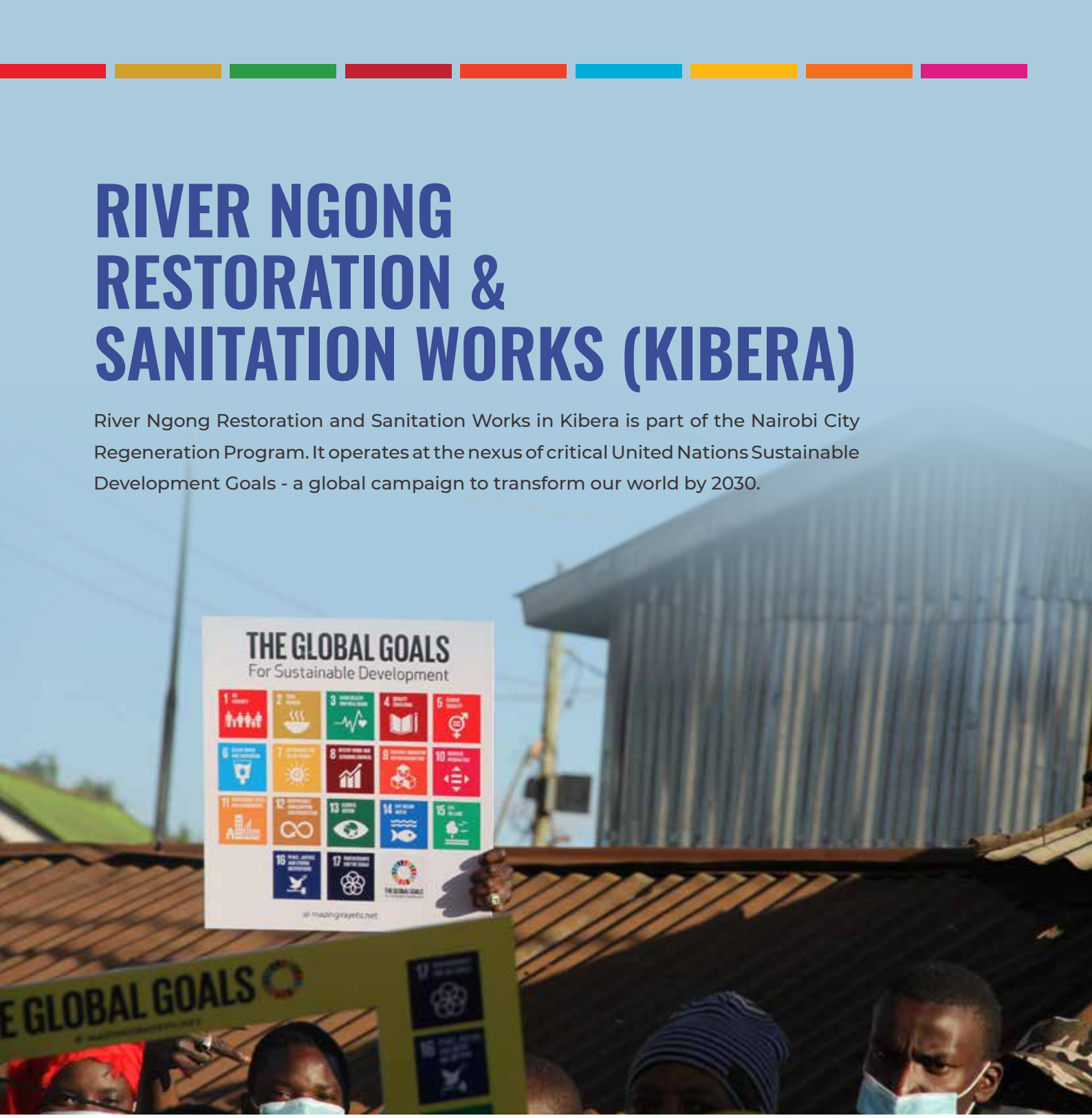


HOW TO REVIVE AN AILING URBAN RIVER

NGONG RIVER RESTORATION & SANITATION WORKS

RIVER NGONG RESTORATION & SANITATION WORKS (KIBERA)

River Ngong Restoration and Sanitation Works in Kibera is part of the Nairobi City Regeneration Program. It operates at the nexus of critical United Nations Sustainable Development Goals - a global campaign to transform our world by 2030.



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ATHI WATER WORKS

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EDITORS NOTE

In a range of contexts, different stakeholders have called for the reintegration of rivers into urban life with the ideal final state being a river with green waterfronts, accessible for recreation, full of biodiversity and with water of fine quality. This growing appreciation of the need to restore and sustainably manage urban riverscapes for environmental and societal benefits can be attributed to both the increasing awareness of the scope and scale of human-driven ecosystem changes and recognition of the values/services, that stem from them.

Informal settlements such as Kibra are characterized by an imbalance between population growth and infrastructural development with the latter usually lagging behind. The different elements of the urbanization process—demographic expansion, technical infrastructure and land use impinge on river use. Stripped of any ecological dynamic, urban rivers such as River Ngong often appear as mere conduits of flowing water and open sewer drains.

Through this edition, we aspire to elaborate on the drivers of successful river restoration and slum sanitation initiatives. From the perspective of environmental history, we stress on human/environmental changes and spatial processes, that is; the present-day condition of Ngong River as the consequence of long term changes involving economic, political, cultural and social influences. **Ngong River Restoration and Sanitation Works project was launched in October 2019 and involves removal of solid waste from river ngong and adjacent drainage channels, construction of 19 community toilet blocks, construction of 3 material recovery facilities/transfer stations, 4 foot bridges and sewerline rehabilitation. Over 200 youths are currently involved in the different activities.**

The ongoing works in Kibra provide a useful framing on how planning and design must respond to the needs and particularities of the place; underlining that design must always be adaptable.

In Kibra, for instance, the primary stressors are solid waste and waste water. The underlying factors to include lack of toilets with one unit serving more than 300 residents, lack of solid waste management infrastructure and broken sewerage system. Therefore, it is with urgency that we are addressing the acute sanitation deficits in Kibra, even though these may be transient arrangements and a provision of the requisite momentum towards slum upgrade.

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FORWARD NOTE

MR. JOSEPH WAIRAGU IRUNGU

MBS Former Principal Secretary
Ministry of Water, Sanitation and Irrigation

As we continue to progressively implement the Nairobi River Regeneration Program, we are glad to present the Ngong River Restoration Project in Kibera as a success story. The project has been implemented through a unique partnership between the Ministry of Water, Sanitation and Irrigation and Mazingira Yetu Organisation.

The head waters of Athi River in Nairobi City County are highly polluted and this impacts down stream communities negatively. The Government of Kenya has embarked on Nairobi City Regeneration Programme with a goal of improving the quality of water flowing into Thwake Dam.

The situation in Kibra is a clear illustration of how the disparity between rapid population growth and sanitation infrastructure development has led to continued pollution of our rivers. This is mainly through solid waste dumping and sewer/waste water leakage. The commitment by His Excellency President Uhuru Kenyatta through this program will not only curb pollution of the river but also improve the living standards of Kibra residents as they are now able to use 15 clean and safe community ablution blocks with direct connection to a sewer line. In addition, proper solid waste Material Recovery Facilities are under construction.

Key to this success is the inclusion the social and community participation through extensive community mobilization and training sessions on the management of infrastructure being put in place. We recognize that long term sustainable outcomes can only be achieved by having well informed communities as they interact directly and depend on river ngong.

We are eager to replicate this in all other informal settlements.

I have no doubt that when all these is done, then the Human Right on access to water and sanitation services and improved will be actualized.

"The commitment by His Excellency President Uhuru Kenyatta through this program will not only curb pollution of the river but also improve the living standards of Kibra residents"

Joseph Irungu

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Youths in Kibera engaged in solid waste evacuation from River Ngong

Project Overview

Urban rivers such as River Ngong accumulate several constraints to their natural dynamics over time, mainly due to uncontrolled solid waste/wastewater disposal and irregular occupation of river banks.

The ongoing Ngong River Restoration and Sanitation Project was initiated in October 2019 by His Excellency The President Uhuru Kenyatta as one of the flagship projects under Nairobi River Regeneration Program.

The target area is a 9 km stretch of Ngong-Mutoine river that flows through Kibra from Jamhuri park to Nairobi Dam. It entails mobilizing and utilizing the local community capacity to clean, manage and protect their environment.

The scope of work includes:

- Solid waste removal from the river and adjacent drainage channels
- Construction of 19 toilet facilities
- Construction of 3 Material Recovery Facilities and waste transfer stations
- Construction of 3 footbridges
- Sewer line rehabilitation
- Formation of a waste management enterprise

The project has directly provided employment to over 200 youths who are involved in the river cleanup and construction works.

Its implementation is through a multisector approach involving The Ministry of Water, Sanitation and Irrigation, Government agencies; Athi Water Works Development Agency, Nairobi Water and Nairobi Metropolitan Services, and Mazingira Yetu Organization.

Context

Kibera is the biggest informal settlement in Kenya and arguably in the Africa continent. Its population is estimated at 300,000. River Ngong is joined by several tributaries as it flows through this densely populated area.

Daily human activities and interactions between residents and the river determines its state. On a spatial scale, river Ngong/Motoine can be considered as the synthesis of the territory, that is, actions taking place in Kibra informal settlements. The position of the river reach within the river system means that its pollution is by direct deposition from Kibra other than transfer from other areas in the broad fluvial system. Apart from polluting the immediate river reaches, the waste is transferred and deposited in areas downstream primarily resulting to the siltation of Nairobi Dam.

Of importance is to understand the interconnectedness of different factors that have led to the current state of the river and the complexity brought about by interactions between social, economic and political setup of the areas of interests The structure and function of urban rivers are constantly similar but the extreme variation in social-economic factors result in important differences that should influence the restoration practices.

Huge discharge of household wastewater and human waste into Ngong river is mainly due to lack of lack of adequate sanitary facilities and sewerage infrastructure. Up to 100 households share 1 pit latrine which are generally in deplorable conditions and unsafe to use for women and children. Lack of adequate latrines forces residents to use alternative means of excreta disposal, such as polythene bags referred to as “flying toilets”.

Additionally, with the lack of an efficient solid waste management infrastructure and collection services, the over 300,000 residents of Kibera bury, burn or dump their waste in remaining open spaces, river and drainage channels within settlements. Collection services by the county government are highly irregular and concentrated in only a few areas near public utilities such as schools and hospitals.

The contents of untreated wastewater such as organic materials, nutrients and fecal matter directly affect the water quality in urban rivers. This in turn affects aquatic life and people who frequently come into contact with this wide variety of pollutants thus exacerbating health risks from water, sanitation, and hygiene-related diseases such as cholera.

Dispersed solid waste from the illegal open dumps often blocks the drains and sewers. Ultimately these blockages create flooding and unhygienic conditions. Uncollected solid wastes from few locations degrade the urban environment causing a severe aesthetic nuisance in terms of smell and manifestation, and discourages efforts to keep streets and open spaces clean.

1. An illegal dump site
2. A shallow pit latrine next to River Ngong
3. A broken sewer line flowing into River Ngong
4. An overflowing man-hole

Solutions

Human Centered Design Challenge

We believe that the pursuit of long-term sustainable outcomes for human societies requires insights from all stakeholders. This approach is not only inclusive but also sensitive to the very communities that interact directly and depend on the natural resources.

By overlaying the river system with the urban system and concentrating on the areas that both systems intersect, the participants were challenged to model the preferred final state of the river ecosystem and adjacent green spaces. Trainers informed this decision by communicating the costs and benefits of setting different restoration goals in terms of resource availability.

We designed and held a series of training sessions applying the human centered design concept. The aim was to:

- Capture how groups of people interact with and rely on river ecosystems,
- Show changes to those ecosystems, either as the result of natural process or of human actions and how they influence individual and community well-being.
- Allow participants to identify problems and design solutions.

Youths in Kibera engaged in a Human Centred Design Challenge

Solid Waste Management – Taka ni Pato Enterprise

5,6,7. A marketing campaign by TAKA NI PATO social enterprise
8. Up-cycling of PETE bottles by youths in Kibera

The Ongoing Ngong River Restoration and Sanitation Works re-examined the entire waste stream and thus in the present situation, it was imperative to:

- Evolve model for decentralized and cost effective solid waste management with local community participation.
- Implement circular economy principles and practices such as value addition of recyclable materials for useful purposes
- Avoid accumulation of raw solid waste (uncollected) in the river and adjacent drainage channels through regular clean-up exercises.

The existing centralized system has a limited scope for community participation and livelihood generation. Decentralized system is more appropriate as it encourages civic responsibilities and provides effective solid waste management by engaging the local people in the waste management and helps in changing the mindset of people towards the waste management.

This circular economy approach entails decoupling economic activity where resources are kept in use for as long as possible while extracting maximum value from them while recovering and regenerating products and materials at the end of each service.

The system is based on door to door waste collection and sensitizing residents for segregation of waste. The system operates firstly because of the waste collector's (youth and women groups) 'entrepreneurship', and secondly as a result of social obligation developed through the collective effort to ensure that the waste collector gets regular payments. This provides better income and employment options to the youth groups. Collection, transfer, and storage schedules and points have been set up.

The high intensity of participation by residents and communities has been the defining characteristic of this pilot project and the key to the project's immediate success and long-term sustainability.

The enterprise has so far provided employment to over 70 youths and services 600 households. To encourage residents to recycle, the project is establishing 5 materials recovery facilities right at the community. These centers will be operated under Taka ni Pato enterprises.

Taka ni pato social enterprise team

Sanitation Infrastructure

The project has built 17 community ablution blocks (8 already in use). These facilities are of varying sizes and designs based on the size of land available. However, all comprise separate gents and ladies' units with toilets, bathrooms and washing area. Local registered youth/women groups are involved in the management of the ablution blocks ensuring that they are clean, safe and accessible to the general community.

Additionally, we embarked on rehabilitation of sewer lines and construction of a network of new sewer lines. This has drastically reduced the amount of waste water flowing into the river.

Communication and social mobilization

Creative approaches can engage and empower local communities, foster participation, and help to ensure relevance and impact. Community focused approaches enable the integration of a wealth of local knowledge and social capital. We engage the community in both novel and familiar ways and reinforce key messaging through creating memorable experiences and artefacts.

We engaged the locals through training sessions, use of music and community open days.

Outputs reflect ownership by participants and become more effective on-the-ground conduits for information sharing.

9. An ablution in Kianda (Kibra)
10. Nairobi water and Sewarage Company (NWSC) staff unblocking a manhole in Karanja (Kibra)
11. James Kagwe training the youths in Kibera on Circular economy
12 Youths showcasing their understanding of SDGS
13. Solid waste management awareness through performing arts in Karanja (Kibra)

FACTS SHEET

19 ablution blocks constructed – 8 in use
3 material recovery facilities to be constructed
4 KM Trunk sewer line to be constructed
3 Foot bridges under construction
1 borehole drilled and 2 boreholes to be drilled

Results


A clean flowing River Ngong in Raila village-Lan'gata

The project has empowered the people and mobilized many of them to focus their efforts towards preventing continued pollution of Ngong River

Garbage collection has significantly improved. Regular household level collection and transfer to segregation centers. Upcycling of plastics and glassware to different products and composting of organic waste into manure for urban farming occurs.

The water quality has drastically improved with reduced flow of sewer and human waste into the river. The project has brought different stakeholders together to clean up the river and empowered the community to take charge of maintaining the current state.


Unclogging of storm water drainage channel in Karanja (Kibra)

Lessons

One of the key lessons of the project is the importance of sustained awareness-raising and capacity-building activities to reinforce positive change. The infrastructure built within the community would have been wasted if people did not know how to use it and if they continued dumping waste in the river. Communication and social mobilization toward behavioral change were key. Community mobilization complemented the technical components of the project.

The ongoing Ngong River Restoration and Sanitation Works is a simple but quite effective slum sanitation upgrade intervention to reduce conflicts and incidence of violence induced by infrastructure insufficiency. It has strengthened resilience to risks such as flooding, conflict and security through trust building – both horizontally, between communities and vertically, between communities and governance providers.

Q&A

SICILY KARIUKI

EGH. FORMER CABINET SECRETARY FOR WATER, SANITATION AND IRRIGATION

> *"The ultimate goal is to be counted as having played a key role in steering the ministry to realize the country's universal objective in provision of Water, Sanitation and advance food security through Irrigation."*

Q.1: Phase 2 of Nairobi City Regeneration Program was launched in 2019. What has been the notable achievement in the water and sanitation sector?

The water and sanitation sector under Nairobi Regeneration Programme has to date utilized funds amounting to **Kshs. 1.9 billion** to implement the expansion of Dandora Estate Waste Water Treatment Plant, construction of over 35km sewer lines along CBD-Dagoretti-Karen, Eastlands, Imara Daima, Outering and Thika road, unblocking 10km sewers across the city, construction of seven (7) river and six (6) road sewer crossings and construction of ablution blocks in various informal settlements.

Q.2: What makes the Kibra project among the most successful ones notwithstanding it being implemented in an informal settlement?

The Kibera project is unique as it incorporates the infrastructural development aspect as well as the social and community engagement bit. The project, which is being implemented by Athi Water Works Development Agency has improved water and sanitation services to over 45,000 residents living in Kibera informal settlements.

The activities being implemented within Kibera informal settlements include extension and rehabilitation of 30km sewer lines, unblocking, desilting and rehabilitation of manholes, extension of 25km water pipelines, construction of 40 ablution blocks and the Ngong River/ Mutuini River Clean up.

These efforts have gone a long way to ensure that the once chocked and black river is now flowing. The youth have come together under the Mazingira Yetu Community Based Organization which was formed in 2012 with the aim of cleaning, restoring and improving sanitation in areas along River Ngong in Kibera.

As part of empowering the CBO, the ministry aided them by handing over 200 Personal Protective Equipment's (PPE's) comprising of reflectors, helmets, gumboots, and overalls together with other tools including rakes, pangas, and shovels

to Mazingira Yetu CBO.The initiative has created employment and capacity build over 200 youths in the ongoing restoration of Ngong River through removal of solid waste.

Q.3: What is the Ministry of Water, Sanitation and Irrigation doing following up a presidential directive to clean up Athi River in the Upstream to ensure the water in Thwake dam is fit for human consumption? The inter-agency

To address the Athi River upstream issue, first there was an Inter-Agency Technical Committee (IATC) on River Protection and Pollution Management that was officially constituted. The ministry chairs this Inter-Agency Committee whose membership includes Water Resources Authority (WRA), Athi Water Works Development Agency (AWWDA), Ministry of Environment and Forestry, National Environment Authority (NEMA), Nairobi Metropolitan Service (NMS), Nairobi Water & Sewerage Company limited and the Thwake Dam Implementation Team.

The Technical committee established was to address the prevailing poor state of the country's rivers especially those traversing urban centers with specificity to address the pollution on Nairobi River.

Each agency implements activities that are within its mandate. To achieve this the IATC identified the following for immediate action;

- Sewerage network and gaps which have now been mapped.
- Point sources of pollution which have been identified and Water Resources Authority spearheading correction measures.
- Encroached riparian areas pegged by Water Resources Authority.
- Blocked/ occupied sewerage way leaves mapped

Finally, there are also quite a number of ongoing interventions for additional sewer infrastructural investments.

Q.4: Is Kenya within the timeline of ensuring availability and sustainable and equitable supply of water and sanitation services for all by 2030?

Indeed, Kenya is on track towards achieving water and sanitation services universal coverage. There has been intensified legal and institutional reforms that followed enactment of Water Act 2016; subsequently development and implementation of prudent regulatory framework have guided the Water Sector towards improved performance. The ongoing construction of over 600 water and sewerage projects across the country have led to significant progress in achieving increased access to water and reasonable sanitation. This has resulted to increased water coverage from 53.3% in 2013 to 68% in 2020, while urban sewerage coverage increased from 21% to 28% in the same period. Most of the ongoing projects with high impact on accessibility will be completed by June, 2022, once completed it is projected that the national water coverage will reach 80% by end of 2022 and 100% by 2030. Urban sewerage is projected to increase to 40% in 2022 and 80% by the end of 2030.

Q.5: The pandemic placed added challenges on water services in developing countries such as Kenya and more severely in urban informal settlements. What has the Ministry done to ensure there is access to water and sanitation to the public?

The Ministry undertook the following key interventions to ensure access to water to the public and focusing on informal settlements and vulnerable populations;

Provided free water to informal settlements and vulnerable members of society and suspended water disconnection due to non-payment. Further the ministry through Athi Water Works Development Agency installed a total of **6,626** water supply tanks and **5,965** handwashing facilities at strategic locations in major cities and towns, especially targeting markets centers, police stations, hospitals and health centers, public places and informal settlements in order to support and escalate the fight against the spread of coronavirus. Additionally, in conjunction with NMS through our agency Athi Water, drilled and equipped **193** boreholes to enable **1,600,000 people** access free water in the informal settlements in Nairobi and environs.

Q.6: How can enterprises in the water, sanitation and hygiene value chain access the Kes 5 billion water, sanitation and hygiene financing program?

The Ksh 5 billion conditional liquidity grant is managed by Water Sector Trust Fund (WSTF), while Water Services Regulatory Board (WASREB) acts as the independent performance monitoring and verification agent. The Funds are disbursed on application to Water Utilities that is Water Service Providers (WSPs) which are severely impacted by the pandemic. The WSPs are required also to have been registered by Water Services Regulatory Board, clearly demonstrate good governance, competence and prudent utilization of public funds.

Q.7: Which roles do CBOs such as Mazingira Yetu have to play in solving Kenya's sanitation crisis?

Involvement of community-based organizations remains critical in the providing equitable access to water and sanitation for all. A participatory approach not only improves the success of the project but also makes projects more efficient and effective. Stakeholder participation and engagement provides valuable customized initiatives that would shift social norms and promote behavior change with long lasting impact on water and sanitation.

In addition, forging partnerships with Community Based Organizations such as Mazingira Yetu has transformed the society and provided the youth with meaningful socio-economic activities through capacity building, skills, and training to be self-reliant to manage their own resources.

Former Cabinet Secretary For Water, Sanitation and Irrigation Madam Cecily Kariuki with AWWDA C.E.O Eng Michael Thuita handing over P.P.ES and tools to Mazingira Yetu Organisation at the Ministry of Water, Sanitation and Irrigation HQ in Nairobi (Credit AWWDA)

> *Involvement of community-based organizations remains critical in the providing equitable access to water and sanitation for all.*

Q.8: What are the current Irrigation initiatives in the country that will ensure food security is achieved as one of the Big4 agenda by H.E President Uhuru Kenyatta is met?

From 2013 to date, irrigation development has realized **60.4%** increase of area under irrigation from **374,000** acres to the current **600,000** acres accounting to **31.5%** of the total potential of 1.9 million acres without storage. This has been achieved through implementation of programs/ projects, key among them are: Lower Kuja, Mwea, Lower Nzoia, Bura, Turkana Irrigation Development Programme in Naipa, in Lotikipi aquifer, Galana Kulalu Food Security Project.

In addition, the ministry has under the Micro-Irrigation for Schools programme, drilled a total of **78 boreholes** and installed **120 greenhouses** in schools across the country.

Former Cabinet Secretary for Water, Sanitation and Irrigation Madam Cecily Kariuki inspecting a sanitation project in Roysambu-Nairobi City County *(Credit AWWDA)*

Further, the ministry has developed a medium term plan to increase the area under irrigation from the current **600,000** to **815,000** acres. Among the ongoing projects to improve food security are; Thiba Dam, Rwabura Irrigation Development, Lower Nzoia Irrigation Project among other ongoing projects.

The ministry is also in the process of developing framework on Farmer Led Irrigation Development **(FLID)** approach to support small scale irrigation farmers through private sector involvement so as to accelerate expansion of area under irrigation.

Q.9: The youth fondly refer to you as "MAMA". Why is this so?

The youth refer to me as "Mama wa Ma-Youth" a name I am proud of.

I was given this name when I served as Cabinet Secretary, Ministry of Public Service, Youth and Gender Affairs. Under the socio-economic programs; National Youth Service (NYS), Youth Enterprises Development Fund and National Youth Council (NYC) the day to day interactions with the youth was very exciting, appreciating their creativity and innovativeness; hence my immense support to nurturing their talents.

Q.10: How would you want to be remembered during your tenure as the Cabinet Secretary for Water, Sanitation and Irrigation?

My guiding principle has always been to offer the best in whatever assignment is at hand. I would want to be remembered for putting proper mechanism to fast track and ensure majority of Water, Sanitation & Irrigation projects approx. 685 in number are completed by 2022.

This has not been a ride in the park though; I have had to challenge the status quo held by the team at the Ministry of Water, Sanitation and Irrigation; by continuously employing Rapid Results Initiative (RRI) as a management tool to complete many projects and at a faster rate.

Further I will want to be remembered as having actualized the Water Act 2016; by fast tracking development of legal and institutional framework among them; the Sessional Paper No. 1 of 2021 on National Water Policy, National water Resources Management Strategies (2020-2025), Irrigation Services Strategies and Regulations on Transfer of Assets among others.

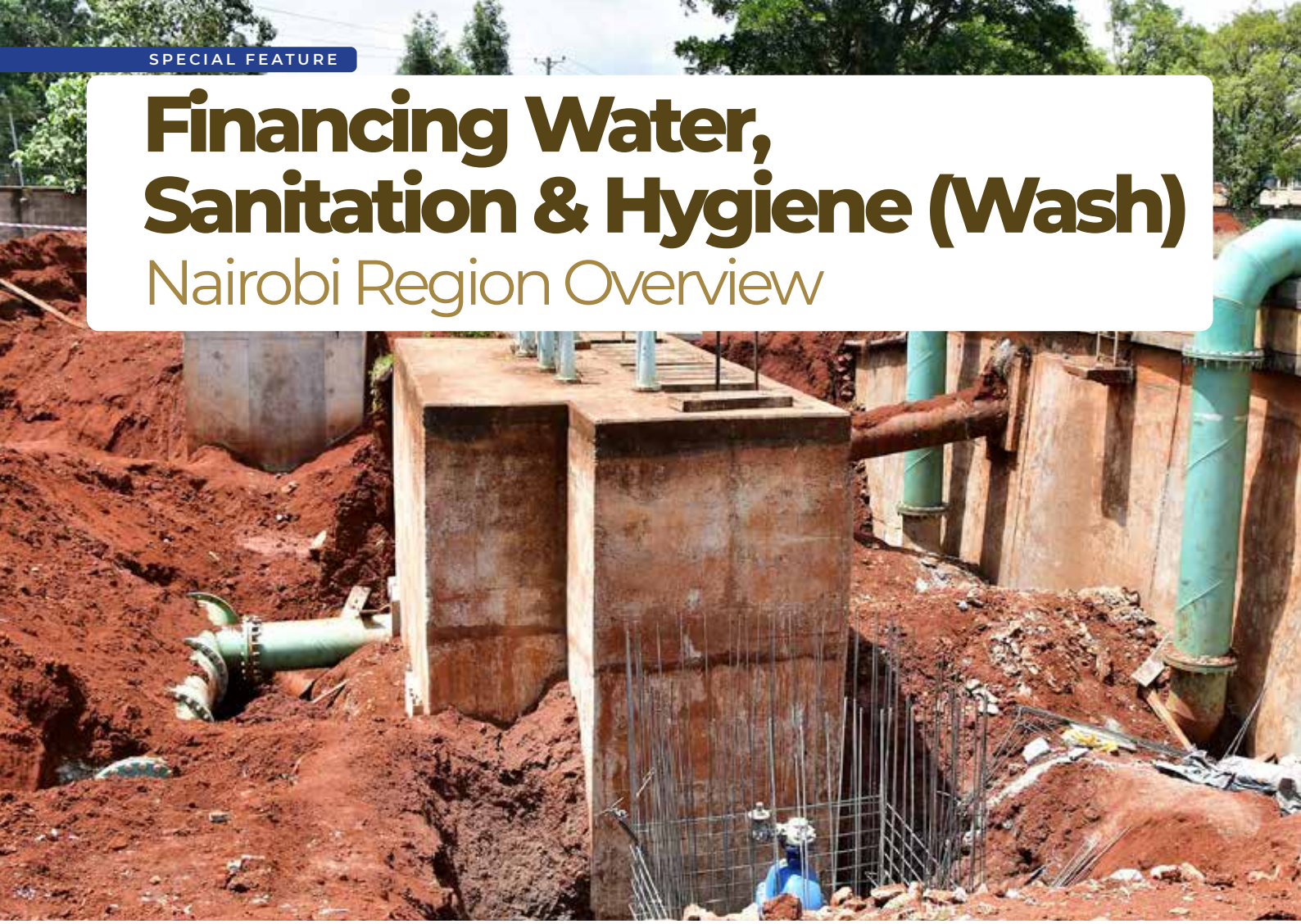

Former Cabinet Secretary for Water, Sanitation and Irrigation Madam Cecily Kariuki together Sam Dindi of Mazingira Yetu Organisation with AWWDA C.E.O Eng Michael Thuita in Kianda-Kibra (Credit AWWDA)

The ultimate goal is to be counted as having played a key role in steering the ministry to realize the country's universal objective in provision of Water, Sanitation and advance food security through Irrigation.

In conclusion, I would want to be remembered as instrumental for having played a critical role in realizing His Excellency the President Uhuru Kenyatta's legacy story.

Financing Water, Sanitation & Hygiene (Wash)

Nairobi Region Overview



Access to sufficient, affordable, clean drinking water and adequate sanitation is a fundamental human right.

Water is also very critical to our country's socio-economic prosperity. It is an important component of Kenya's social infrastructure playing a key role in agriculture, health, energy, manufacturing and general consumption. As our economy grows, there's an increasing demand for safe water and proper sanitation.

Human development and environmental health will be jeopardized if water resources are not managed responsibly. Therefore, the government has developed an institutional framework for water and sanitation governance that prioritizes the rights of all Kenyans to safe and affordable water while recognizing the need to protect and conserve our water reservoirs.

Internationally, the UN's Sustainable Development Goal 6 or SDG 6 provides for the right to clean water and sanitation for all. It is one of 17 Sustainable Development Goals established by the United Nations General Assembly in 2015, and it advocates for the availability and sustainable management of water and sanitation for everyone.

Locally every Kenyans right to clean water and sanitation is anchored in Chapter 4 of Our Constitution, specifically Article 43 on Economic and Social Rights which provides that; (1) Every person has the right– (a) to the highest attainable standard of health, which includes the right to health care services, including reproductive health care; (b) to accessible and adequate housing, and to **reasonable standards of sanitation;** (c) to be free from hunger, and to have adequate food of acceptable quality; (d) **to clean and safe water in adequate quantities;** (e) to social security; and (f) to education.

In an effort to achieve the targets of SDG 6 as ratified by the UN general assembly and mirrored in our constitution, the government through both state and non-state actors has for almost a decade

On going Improvement of Kabete Water Treatment works *(Credit Kibet Cheptumo/KNA)*

worked hard to expand both water and sanitation infrastructure within the country (last mile connectivity concept); and the role of water and sanitation management by the local communities.

Currently, government policy dictates that all government agencies and departments must subscribe to the one government approach strategy and embrace a multi- sectorial method of implementing national projects and programs. To this end and in compliance with executive Order No. 1 of 2019, Nairobi region has two key committees which remain keen on monitoring, verifying and evaluating the progress of all government projects within the region.

The first commission is the Nairobi Region Development Implementation Coordination Committee which is chaired by the Regional Commissioner Mr. William Kang'ethe Thuku with Mrs. Truphosa Awour a senior director from the President's Delivery Unit as its Secretary. The other committee is the Nairobi County Development Implementation Coordination Committee chaired by the County Commissioner Nairobi, Mrs. Flora Mworoa and Deputised by Mr. Larry Mulomi a director from the President's delivery Unit.

It is instructive to note that some of the mega projects being monitored by the committee involve the construction of multifaceted water distribution systems and relocation of water utilities. Majority of the water and Sanitation projects are being handled by Athi Water Works Development Authority, Nairobi City Water and Sewarage Company, NMS and other non-state actors like Mazingira Yetu Organization.

> *"Locally every Kenyans right to clean water and sanitation is anchored in Chapter 4 of Our Constitution."*

Flora Mworoa, Nairobi county commissioner and also chair of the Nairobi County Development Implementation Committee (Third left) and members of CDICC follow an explanation from Senior Eng. Eric Muriithi, the Mangat I.B Patel (MIBP) Ltd Consultant's Project Engineer (Credit Kibet Cheptumo/KNA)

Flora Mworoa, Nairobi county Commissioner and also Chair of the Nairobi County Development Implementation Coordination Committee (CDICC) (left) with Engineer Kiprono Rop, Head of the Expressway Relocation Works, follow an explanation from a water Engineer on Tuesday, May, 4, 2021(Credit Kibet Cheptumo/KNA)

In collaboration with these agencies the aforementioned committees have so far overseen the implementation of *inter alia* the following (**Major) Water and Sewerage Programmes**

a. The Northern Water Collector Tunnel (NCT) Phase 1 water project (WASSIP AF). Estimated to cost Kshs 6.8 B. The Project entails the construction of a 11.7Km long tunnel with 3.2m diameter across the Maraga , Irati and Gikigie rivers to Thika (NDakaini)dam in Murang'a County and it is meant to transfer 140,000m3/ day flood water to Nairobi from Maragua,Gikigie and Irati Rivers to Thika dam and to approximately 1.2 million people Nairobi City.

b. Kirogo water treatment plant (AFD) – which cost about Kshs 4.5 B. The project entails the Construction of Kigoro Water Treatment Plant (WTP) of capacity 140,000m3/d in Gatanga Murang'a. The Water treatment serves approximately 1.2. Million consumers in Nairobi City.

c. Ndakaini –Kigoro Gigiri transmission pipeline project (WASSIP AF/AFD) – at a cost of KShs. 6.8 B. This project entails the laying of 55km, 1.2m diameter steel water pipeline to convey water from Thika Dam to Kigoro WTP and onto Gigiri reservoirs in Nairobi. The project is meant to deliver additional 140,000m3/ day treated water supply to 1.2 million Nairobi City residents, Kiambu &Muranga Counties.

d. Kiambu-Embakasi JKIA Water Transmission Pipeline (KFW) – This project cost Kshs. 2.0 B. it involeved the laying of a 24km, 1.0 meter diameter water pipeline from Kiambu Town to Embakasi and JKIA airport and the construction of a 14,000m3 storage tank at Embakasi. The objective of the project was to deliver additional water supply of 100,000m3/d to 1.1 million beneficiaries in Eastern Nairobi, Kayole ,Dandora, Utawala ,Embakasi, Ruai and JKIA airport

e. Kabete-Karen water transmission pipeline project (KFW) – The project costs KShs. 1.2 B, involving the laying of a 13km, 0.8 meter diameter water pipeline from Kabete Water Works to Karen via Uthiru and the constructional of a 5,000m3 storage tank at Karen. The main purpose of the project is the delivery of additional water supply of 50,000m3/d to 580,000 beneficiaries in Western Nairobi, Karen, Dagoretti, Kawangare, Riruta, Uthiru, Kanagemi areas.

f. Extension of Water transmission pipelines projects (Kfw)- the project cost is Kshs. 431 Million. It involves extension works of water supply and sewerage improvements of 900,000 beneficiary households in Nairobi City's Eastern and Western informal settlements, mainly, Gitari Marigo ,Korogocho, Dandora, Ngando, Kawarangware and Kangemi.

g. The Nairobi Expressway Project – this project involves the relocation of Water and Sewer Pipelines along Nairobi Expressway at a cost of Kshs. 3.5 Billion. More specifically the project entails the relocations and extensions of 85km water pipelines (DN200 mm to DN1000mm) and 25km sewer pipelines (DN300mm to DN750mm) as well as associated tie in works for the proposed Nairobi Expressway Road Project.

h. Karimenu II Dam Water Supply Project (China Exim Bank and Gok) – The project entails the construction of a dam (40m high Dam of storage capacity 20Mm3, tapping water from the Kariemenu River0, Raw and Treated water pipelines 55 km long , water treatment plant of capacity 70,000m3/day and storage tank capacity 20,000m3 in Ruiru –Jacaranda. The project will supply 70,000m3/d to 850,000 beneficiaries in Ruiru ,Juja and parts of Nairobi.

i. Ruiru 2 Dam and water treatment Plant (French Govt &Gok) – Project cost is Kshs. 19B and entails the construction of Ruiru II Dam (55m high earth fill Dam of storage capacity 13Mm3), water treatment plant of capacity 40,000m3/day and storage tank capacity 38,000m3. Tapping the Bathi and Ruiru Rivers. This project will supply 40,00m3/day to 510,000 beneficiaries in Karuri, Kiambu ,Ruaka and parts of Nairobi.

j. Maragua IV Dam, Tapping the Maragua and Gikigie River- The project entails the Construction of a 100m high earth embankment dam, with a gross storage capacity of 600m3/ and a safe yield of 140,000 m3/day. The project cost is estimated at Kshs 35 BN and will supply 140,000m3/ day to benefit 830,000 people in Nairobi and additional 170,000 people in Murang'a

k. Nairobi Regeneration Project: Phase I – the project cost Kshs. 240M. it invileved the rehabilitation of broken Trunk sewers along the Nairobi, Mathare,Ngong , Gitathuru and Ruaraka River ; Rehabilitation of trunk Sewers at road and river crossing points; Construction of a new 2.7Km long DN 600 S&S precast concrete pipes to join the Muthaiga Trunk Sewer; Unblocking and Rehabilitation of Manholes at River Road Crossings.

Ongoing improvement of Kabete Water Treatment Works that include installation of new water pumps (Credit Kibet Cheptumo/KNA)

l. Nairobi Regeneration Project: Phase II - The project entailed the construction of CBD and Industrial Area and Sewers, Imara Daima Sewers, Kasarani Sewers, Dagoretti Sewers, Mathare Sewers, Kipande Road Sewers at a cost of Kshs. 800 Million

m. Nairobi Regeneration: Phase III – at a cost of Kshs. 800M. It entails the construction of CBD and Industrial Area and Sewers, Imara Daima Sewers , Kasarani Sewers , Mathare Sewers, Dagoretti Sewers, Mathare Sewers, Kipande Road Sewer

n. Nairobi Sewerage Improvement Project (NaRSIP)- Phase II. The project costs is Kshs. 8.22 Billion and entails the rehabilitation and duplication of Dandora Estate Sewerage Treatment Plant Inlet Works, Construction of Secondary reticulation sewers and last mile sewers connections , Water and Environmental safeguards ,Hygiene and sanitation promotion, communication and awareness. This project is meant to contribute to sustainable development through improved health and environmental management.

o. The specific objectives of the project include ;-

- To increase sewerage coverage in Nairobi City from the current 48% to 55%by 2021.
- Reducing pollution levels by collecting and treating 80,000m3/d of waste water.
- To enhance sustainability of sewerage operations through increased revenue collection.

Other examples of WASH projects which are at various stages of implementation within the country include but are not limited to;

Marsabit Water and Sewerage Project (KSH 1.9BN), Malaba Water Supply and Sewerage Project (KSh 1.065 BN), Naivasha Industrial Park Water Supply (KSh 0.995BN), Baringo Chemususu Dam Water Supply and Sanitation Project (KSh 2.98BN), Kerugoya - Kutus Sewerage Project (KSh 0.569 BN), Mathira Water Supply Project (KSh 0.438 BN), Meru Sewerage Project (KSh 0.994 BN) Construction of Pemba Dam Intake and Treatment Works (KSh 0.286 BN), Water Sector Development Lake Victoria South (KSh 0.455), Homa-bay Water Supply Improvement project - Homa Bay Cluster Water Supply and Sanitation Project (KSh 1.143 BN), Ugunja - Ukwala - Sega Water Supply and Sewerage Project (KSh1.214 BN), Olkalou Town Sewerage Project (KSh 0. 590 BN), Thwake Multipurpose Water Development Programme Phase 1 (KSh42.36 BN), Samburu West - Yamo dam and Water Supply (KSh 2.105 BN), Isiolo and Garissa Last Mile Water Connectivity (KSh 0.264 BN), Mandera Water and Sewerage Project (KSh 2.798 BN) Kiptogot - Kolongolo Water Supply Project (KSh 1.2 BN) Improvement of Drinking Water and Waste Water in Mombasa, Mwache Dam (KSh14.80 BN), Vihiga Cluster Project-Belgium funding (KSh 2.018 BN), Construction of Kendu Bay Water Supply and Sanitation Project (KSh0. 687BN), Construction of Bomet-Mulot Water Supply and Sanitation Project (KSh 2.032 BN), Kisumu water supply PROJECT (KSh7. 7 BN), Oyugis Water Supply and Sewerage Project (KSh0.716BN), Kisii Water Supply and Sanitation Project Bunyunyu Dam(KSh14.20 BN), Lake Nakuru Biodiversity Improvement Water Project (KSh6.521 BN), Flood Control Works Nyando, Narok, Budalangi, Migori & Homabay (KSh1.645 BN), Kericho- Homa bay Wastewater -Trilateral Program (KSh1.9 BN), Chuka Water Supply and Sewerage Project (KSh1.188 BN) Mwache Dam Project (KSh16.50 BN), Baringo North Kirandich Dam Project Phase II (KSh2.250 BN), Moi's Bridge-Matunda Water and Sewerage Project (KSh3.200 BN), Maralal Water and Sewerage Project (KSh2.569 BN), Sagana River Restoration Project (KSh1.194 BN), Lamu Groundwater Conservation (KSh 0.380BN), Construction and Rehabilitation of Water Resource Monitoring Station (KSh 1.300BN), Implementation of Sub Catchment Management Plans (KSh1.500BN), National Water Harvesting and ground water Exploitation (KSh11 BN), Kisii Water Supply and Sanitation Expansion Works-Expansion of Water Supply and Sanitation Systems for Kisii and Nyamira -Water Sector Development Program-C-Lot 1 (KSh2.289BN), Narok Water Supply Project (KSh1.5 BN), Iten Tambach Sabor Water Supply Project Phase II (KSh1 BN), Masinga - Kitui Water Supply Project (KSh2.200 BN), Embu Water Supply Project (KSh2.350 BN), Thika - Juja Sewerage Project (KSh3 BN), MWEA Irrigation Project-Component II: Irrigation facilities and drainage works (KSh3.534 BN), MWEA Irrigation Project-Component I: Thiba Dam (KSh8.221 BN), Kajiado Rural Water Supply Project (KSh1.200 BN), Lake Victoria Water and Sanitation Initiative -Phase II (KSh1.506 BN), Construction of Narok Sewerage and last mile connectivity for Narok (KSh1.714 BN).

While access to clean water and improved sanitation remains a global challenge the above projects illustrate the government's commitment to ensure investments are focused and directed towards WASH services. The completion and/or ongoing completion of similar projects across the country is additional testament of the Government's financial dedication to achieving universal access to clean drinking water and adequate sanitation. The objective remains that at least 80% of the Kenyan population will have ready access to clean and safe water in adequate quantities by December 2022.

It is not in dispute that the sanitation and hygiene situation in the country has improve tremendously over the last ten or so years. Nevertheless, a lot still needs to be done to improve access, equity and quality of WASH services. Perhaps an upward revision of the percentage of our annual national budget allocated to WASH programs, coupled with a fiscal chastisement to reduce protracted procurement as well as cash flow challenges on WASH activities would do the trick.

LARRY MULOMI
ADVOCATE, DEPUTY DIRECTOR
PRESIDENT'S DELIVERY UNIT

President Uhuru Kenyatta commissioning Muthua community water project on February 12, 2021 (Credit Maureen Kinyajui)

Athi Water Works Development Agency (AWWDA) at the forefront of Accelerating Access to Clean Water and Sanitation

By Eng. Michael Thuita
C.E.O Athi Water Works Development Agency

Boosting Nairobi's access to water

As population in Nairobi grows by the day, so has the demand for water and sanitation services in the city. Currently, Kenya's capital has a demand of 810 million litres per day, against 550 million litres of installed water production capacity. This leaves the city with a daily deficit of 260 million litres of water.

Boosting access to water and sanitation for residents of Nairobi and the surrounding counties is also one of the legacy projects and an enabler of President Uhuru Kenyatta's Big Four Agenda. Athi Water Works Development Agency (AWWDA) has in the last few years embarked on planning, development and maintenance of multiple dams and boreholes have been as well as improvement of existing water infrastructure.

Karimenu Dam II

Located 75 kilometres north of Nairobi, and constructed along Karimenu River, Karimenu II Dam is one of the major projects expected to boost this access. The project is at 72% completion entails construction of a 59m high dam, water treatment plant of capacity 70 Million litres per day, 67 km of raw and treated water transmission pipeline and two concrete water storage tanks in Ruiru and Juja each with a capacity of 23.5 Million litres and 3 million litres respectively.

Currently, the project has achieved seven key milestones including ground-breaking, tunnel breakthrough, completion of tunnel secondary lining, river diversion, substantial completion of dam foundation treatment works and commencement of pipelaying works. Upon completion, the dam is expected to add 70,000m^3 (70 million litres) to the current water supply, serving 850,000 consumers in Juja, Gatundu North and Ruiru townships.

Former Cabinet Secretary for Water, Sanitation and Irrigation Madam Cecily Kariuki with AAWDA C.E.O Eng Michael Thuita and Sam Dindi of Mazingira Yetu Organisation in Kianda-Kibera

Northern Collector Tunnel

This engineering masterpiece and one-of-a-kind project in the region, boost existing water supply to Nairobi by 140 million litres per day. The Northern Collector Tunnel is funded by the Government of Kenya and the World Bank, and consists of construction of the Northern Collector Tunnel, an 11.8km, 3.2m diameter raw water transfer tunnel along the Aberdare Conservation Area. The tunnel will divert raw flood water from Maragua, Gikigie and Irati rivers through weir control intakes and convey the raw water to Thika (Ndakaini) Dam Reservoir.

The project which is now approaching completion has so far created more than 2,500 jobs for the residents with 150 professionals hired to provide skills and knowledge transfer. Ten community water supply projects have been implemented to benefit the residents of Muranga with portable water supplying an additional 42 million litres per day to serve over 400,000 people in Muranga, Kigumo, Mathioya and Kiharu areas.

The project also consists of construction of the Kigoro Water Treatment Plant which is funded by the Government of Kenya and the French Development Agency to treat additional water flowing into Thika Dam as a result of the construction of the Northern Collector Tunnel.

The treatment plant is 100% complete and will treat an additional 140 million litres of water per day to Nairobi and will increase supply of water from 550,000m3/day to 690,000m3/day and serve over

1.2 million residents of Nairobi City and surrounding towns.

To convey the additional water to Nairobi, the project will also see the construction of 56km of water gravity pipelines from Thika Dam to Kigoro Water Treatment Plant and treated water from Kigoro water treatment plant to Gigiri reservoirs in Nairobi.

Water provision – COVID-19 Interventions

His Excellency the President of the Republic of Kenya Uhuru Kenyatta, E.G.H commissioned the water interventions to ensure access to free clean water for residents living in the Nairobi informal settlements. The Government set aside ksh 1.7 billion to implement independent community projects aimed at increasing water supply to the vulnerable communities especially during the COVID-19 pandemic.

The project which was implemented by Athi Water Works Development Agency in partnership with Nairobi Metropolitan Services, involved drilling of 193 boreholes and construction of elevated steel tanks. The project targeted high population areas in Nairobi, Kiambu, Muranga, Machakos and Kajiado Counties. 2.1 million residents across these counties can now access free water from the project which is supplying 41.3 million litres of water per day.

Correcting the sanitation gap

Currently, Nairobi City generates approximately 400,000 cubic metres per day (m3/d) while the capacity of treatment is 194,000 cubic metres per day (m3/day) leaving at least 206,000 cubic metres per day (m3/d). This has been occasioned by inadequate sewerage coverage currently at

48%, old- dilapidated sewer networks due to age, overflowing of sewers due to insufficient flow and treatment capacity and the lack of integrated planning in city development whereby developments are approved without adequate waste-water management infrastructure. The existing systems also face significant operational challenges which include:

- Solid waste being washed away into the sewer pipelines leading to blockages and subsequent spillage into the storm drains.
- The existing waste-water management facilities are overstretched due to lack of integrated city planning and development.
- Incidental breakages and deliberate vandalism of sewerage infrastructure.
- Encroachment of sewer lines wayleaves and river riparian land hindering sewerage network expansion.

Rehabilitating, expanding Nairobi's sanitation infrastructure

In the last few years, Athi Water Works Development Agency (AWWDA) has increased access to sanitation from 40 percent to 48 percent with plans to increase coverage to 60% by the year 2023. The interventions have included construction of trunk sewers and wastewater treatment plants. Further investments for the sewer reticulation networks will include:

Nairobi City Regeneration Program (NCRP)

In 2018, the National Government through the Ministry of Water, Sanitation and rolled out the Nairobi City Regeneration Programme (NCRP) at a cost of KSh1.6 billion.

The programme aims to increase access to sanitation facilities in the city, to improve the quality of water and to reclaim riparian ecosystems. Under the NCRP, new sanitation infrastructure has been laid and the existing sewer lines rehabilitated, redesigned and expanded in a multi-billion-shilling investment, with immediate successes.

The project has also seen the rehabilitation and expansion of broken trunk sewers along various Nairobi River crossings including Mathare and Ruaraka, Nairobi, Ngong and Kibarage. With the trunks now rehabilitated and expanded, and the sewage rerouted, the rivers are so clean that they have become a haven for swimmers and launderers.

Restoration of Ngong River

Through collaboration with Mazingira Yetu Community based Organisation, Athi Water Works Development Agency has undertaken the physical clean-up of Nairobi City Rivers to remove solid waste hence improving the quality of water and riparian ecosystem. The restoration is under the Nairobi City Regeneration Program (NCRP).

The Ministry further handed over 200 Personal Protective Equipment's (PPE's) comprising of reflectors, helmets, gumboots, and overalls together with rakes, pangas, and shovels to community-based organization. This will assist the organization in ensuring 8 km of rivers in Kibera informal Settlement are cleaned up and maintained.

As part of the city's regeneration programe, the activities being done within Kibera informal settlements include the extensions and rehabilitations of 15km sewer lines, unblocking, desilting and rehabilitation of manholes. Others include the extensions of 18km water lines, construction of 20 sanitation blocks and the Motoine River Clean up. Improving the water and sanitation services to over 45,000 residents living in Kibera informal settlements.

The project has provided employment of the youth with over 200 individuals being directly involved in the various activities around the area. In addition to this, by involving the youth, this has enabled them to play a positive role in society as part of the river reclamation agenda whereby they play a big part in conservation efforts.

Former Cabinet Secretary for Water, Sanitation and Irrigation Madam Cecily Kariuki with AAWDA C.E.O Eng Michael Thuita and officials from AWWDA inspecting Sewer works in Roysambu-Nairobi City County

Securing and Expansion of Wastewater Treatment Facilities

Aims at securing of encroached and grabbed land for water and sewerage installations including Dandora, Kariobangi, Karen and Kahawa WWTPs, Kabete water treatment plant and Loresho water reservoir. Among the milestones by the government in this project was to repossess over 4,350 acres of land that had been grabbed by private developers to expand the Dandora Estate Sewage Treatment Plant to increase the treatment capacity by additional 20,000 cubic metres per day (m3/day).

Nairobi Rivers Basin Rehabilitation and Restoration Program (Sewerage Improvement Project Phase II)

Which aims at laying of 400km secondary sewerage network within Nairobi, and rehabilitate the treatment systems for Dandora estate sewerage treatment plant to serve over 800,000 people, and increase sewerage coverage from 48% to 55% by 2023. Project areas include Karen, Westlands, Mountain View, Uthiru, Kileleshwa, Kilimani, Ngara, Eastleigh, Ruai, Huruma, Mathare, Kahawa West, Githurai, Kahawa Sukari, Mwiki, Clay Works and various informal settlements. The project is financed by the Government of Kenya and the African Development Bank, at a cost of Kshs. 8.0 Billion.

Nairobi Water and Sewerage Improvement Project

Aims at laying of 250km secondary sewerage network within Nairobi, to serve over 400,000 people, and increase sewerage coverage from 55% to 60% by 2023. The project areas include Dagoretti, Riruta, Kangemi, Upperhill, Baba dogo, Lucky Summer, Marurui, Kariobangi North and South, Marura, Maili Saba, Umoja Innercore, Embakasi, Plot 10, Zimmerman, Kasarani, Roysambu and various informal settlements. The project is financed by the Government of Kenya and the French Development Agency. The costs for sewerage interventions is Kshs. 3 Billion. Procurement for design and construction contractors is currently ongoing, and works are expected to commence in March 2022.

> *"The project has provided employment of the youth with over 200 individuals being directly involved in the various activities around the area. In addition to this, by involving the youth, this has enabled them to play a positive role in society as part of the river reclamation agenda whereby they play a big part in conservation efforts."*

Dr. Andrew Tuimur, CBS, Chief Administrative Secretary Ministry of Water, Sanitation and Irrigation with AWWDA C.E.O Eng Michael Thuita inspecting ablution block facilities in Kianda-Kibra

National And International Development Plans And Policies As Drivers To Successful Slum Sanitation Initiatives

An ablution block facility in Bombolulu-Kibra

MR. DAN T. MOGUSU
ACTING DIRECTOR NATIONAL WATER RESOURCES
MINISTRY OF WATER, SANITATION AND IRRIGATION

The Constitution of Kenya, 2010 gives every person the right to clean and safe water in adequate quantities [Article 43 (1)(d)]. This demand implies that the State should ensure affirmative action is implemented in the fulfilment of this important provision, especially considering minority and marginalized groups [Article 56 (e)]. The Fourth Schedule of the Constitution divides the various functions that are to be performed by the National and County Governments. In matters of water, the National Government handles water resources management while the County Governments are charged with water services provision. It is important to note that the National Water Master Plan 2030 (NWMP2030) gives the country's per capita renewable water resources ad 586 m^3 per person per year in 2010. This figure is likely to reduce to 393 m^3 per person per year by 2030. The national coverage for access to safe water is 55.9% as per the Annual Water Sector Review Report 2015 with urban coverage at 65.4% and rural coverage at 48.8%. This implies that about 18.5 million people out of the total population of 42 million people in Kenya do not have access to safe water.

The impacts on and costs to the economy-related ineffective and unsustainable management of the nation's water resources may not be clear to many but are extremely large and in the long run irredeemable. The impacts extend to key sectors of the economy — including health, agriculture and livestock, energy, manufacturing, and transport.

In a world where there is a rising concern for the environment and global warming, slum areas are becoming increasingly prevalent. The number of slum areas is on the rise all around the world in developing countries. These areas have been looked at as being detrimental to the environment due to poor sanitation. The same old methods of dealing with these issues have not been working, so more innovative approaches need to be taken for sustainable development. The people centred approach is one such approach. It usually focuses on the poor and disadvantaged and uses a community-driven development process to address their needs. The approach is gaining support from international development donors, governments and other stakeholders.

Aspirations for better living conditions in slums and low-income areas must be met within a framework that includes environmental improvements and economic growth. It has become clear that slums are not going away, so involving community members in the development process by equipping them with the necessary knowledge and skills to participate in decision-making provides them opportunities to address issues that impact them directly.

The Water Act 2016 (WA2016) envisaged the need for such an approach in the protection of our water resources by entrusting this important work to the Water Resources Authority. The work of protecting and conserving the various Basin Area in the Country is further given to the various Basin Management Committees (WA2016, Article 25, 27). However, this has not been fully implemented because of the lack of various instruments to bring it to force. Water Resources Users Association (WRUAs) can further be formed to ensure management at the Sub-Basin level. WA2016 Article 29 (2) further dictates that WRUAs should be a community-based association for collaborative management of water resources and resolution of conflicts concerning the use of water resources. The current push to complete the various regulations (Water Resources Regulations 2021, Water Services Regulations 2021 and Water Harvesting and Storage Regulations 2021) will ensure that WA2016 can be fully implemented.

It is clear that for any intervention to be successful, the participation of the community is extremely important. It is also important that the community should have the feeling of ownership of the various projects that are done for the intervention. This has been envisioned by the various laws and policies in the country that seek to ensure that management of the water resources is more and more devolved to the community level through the community-based WRUAs.

Kenya, being a member of the International Community of Nations, is part of various conventions and treaties that touch on water and sanitation. Key among these conventions is the Sustainable Development Goals (SDG). These are a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others and that development must balance social, economic and environmental sustainability. SDG 6 ***(Ensure access to water and sanitation for all)*** acts as a guide and drives the need to ensure that this important sector is well managed and geared towards achieving the best for everyone, especially the marginalized and minority groups.

"Aspirations for better living conditions in slums and low-income areas must be met within a framework that includes environmental improvements and economic growth."

SDG 6, for ease of action, was further categorized into the following:

- **6.1** By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- **6.2** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

- **6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
- **6.4** By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
- **6.5** By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
- **6.6** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Over the years, many international development agencies (UNICEF, 2006; WHO & UN-Habitat 2008; Watkins et al., 2009) have tried several approaches to provide better living conditions for slum populations, but it seems like their efforts have not achieved the desired results. The reason for this is that these approaches often do not contain a community-driven development component; they are too focused on technical interventions (Aziz et al., 2010). It is therefore evident that a shift in focus, to promote the potential of slum populations is required. For this, local development efforts need to be supported by national and international development plans and policies. Governments have a key role to play, as they are the ones responsible for making necessary changes at the policy level. They can prioritize and enable access to infrastructure, basic services and economic opportunities within the urban environment (UN-Habitat et al., 2013).

Certain drivers that influence the policy-making process on water and sanitation for slums include Humanitarian impulse to improve access to services, Political imperatives to improve the lives of citizens, and Economic considerations. Barriers to these drivers can often include; infrastructural issues such as lack of sewers or water lines, social challenges such as residents not having the necessary infrastructure or knowledge to manage water or wastewater systems, and financial barriers such as high costs associated with infrastructure improvements.

Youths in Kibera attending a water and sanitation training in Lindi

For National/International policies and plans for improving slum conditions to be implemented successfully despite barriers, context must be considered greatly. Policy Planning needs to explore what is driving policy-makers at the local level, identify how policy-makers can access information on successful practices, and improve the quality of evaluations.

WATER AND SANITATION PROVISION IN KIBERA

ENG KAGIRI GICHEHA,
INFORMAL SETTLEMENTS REGION MANAGER,
NAIROBI CITY WATER AND SEWERAGE COMPANY

Kibera is one of the biggest informal settlements in the City County of Nairobi. It has a population of approximately 209,457 people as per the 2019 national census. The origin of Kibera dates back to the second world war after the British settled Nubian solders in the settlement. The settlement has since grown to its current size.

A Community water Kiosk (Credit NWSC)

Water provision

Water supply in Kibera is provided by Nairobi City Water and Sewerage Company (NCWSC) through piped mains supply and also from boreholes which were recently sunk by Nairobi Metropolitan Services (NMS) and Athi Water Works Development Agency (AWWDA) as a response to the COVID 19 pandemic. Water from the boreholes is dispensed through use of water kiosks which were developed together with the boreholes. Currently the water from the boreholes is being dispensed free to combat COVID 19 pandemic. The management of the water kiosks dispensing water from boreholes is done by water committees which were formed under the guidance of the Deputy County Commissioners and Chiefs.

Kibera being an unplanned informal settlement has challenges in water and sanitation provision. Plot based water and sewer connections are difficult to implement and hence NCWSC has come up with various models of service provision as listed below

1. Water kiosks: Where space allows, water kiosks have been constructed by both NCWSC, Athi Water Works Development Agency (AWWDA) and other development partners where the people fetch water using jerrycans. NCWSC has partnered with various Community Based Organizations (CBOs) to operate the water kiosks and hence regulate the cost of water.
2. Stand pipes: Individual water vendors have been connected and metered to sell water at their preferred locations usually next to their residences.

3. Prepaid water dispensers (PPD): NCWSC is installing PPD as an easier way to provide water and manage the same. The residents are issued with tokens which they use to draw water from the PPDs. NCWSC loads the tokens for the residents and 20 litres of water is pegged at 50 cents
4. Cluster meter chambers: In this model, NCWSC builds a lockable meter chamber where customers are connected to meters once they have made an application. The customer then extends the pipe to his preferred point of usage or sale
5. Water tankers: After the onset of the government through NMS purchased 24 number water tankers for water distribution in the informal settlements including Kibera. The water is distributed free of charge in the informal settlements.

Sanitation provision

Sanitation provision in Kibera is done using both water borne and onsite systems. The various systems for sanitation provision are as follows

1. Water borne sanitation: This is done in the areas which have sewer lines. Most of this is done by construction of ablution blocks which are connected to the sewer system. On plot toilets are rare as the settlements is unplanned hence the coverage of the sewerage system remains low.
2. Biodigesters: These are mainly ablution blocks which are not connected to the sewerage system. They utilize on site treatment by generating bio-gas and are then exhausted periodically when need arises. Most of the biodigester have been developed by NGO and are operated by CBOs.
3. Pit latrines: This mode of sanitation is still prevalent in Kibera due to the unplanned nature of the settlement and hence poor coverage of the sewerage reticulation. These are dug by individual structure owners and often pollute the environment due the owner's inability to exhaust or even being inaccessible to exhausters.

Way forward

The government through NMS is embarking of the upgrading of Kibera Informal Settlement. This will involve construction of roads, drainage systems, street lighting and the development of both water and sewerage reticulation infrastructure in the area. This will go a long way in improving access to both water and sanitation services in Kibera.

A water meter reader in Kibera (Credit NWSC)

TAKA NI PATO employees in a solid waste management sensitization exercise

Decentralized Solid Waste Management To Informal Settlements

BY MARIO KAINGA,
DIRECTOR FOR WATER, SANITATION AND ENERGY, NAIROBI METROPOLITAN SERVICE

Solid Waste Management is the greatest Environmental challenge facing all major towns in Kenya.

In Nairobi, traditional Linear model of Solid Waste Management that involve storage, collection, transportation and disposal has proved costly and unsustainable as well as greater contributor to Nairobi rivers pollution through release of leachate and illegal dumping of waste to avoid cost related to collection and transportation.

Current Status

Daily generation per person per day is estimated at 0.7kg while total generation for entire City is estimated at 3000 tonnes per day.

Amount of waste generated is dependent on life style, total population, Economic activities and status of the economy.

Management of Solid Waste in Informal Areas

The total population in informal settlement is estimated to range between 40%-60% whereas per capital generation is relatively low due to poverty levels and lifestyle in these areas is Spartan life with less consumerism as opposed to affluent areas.

However, due to poor access and collapsed service delivery, these areas experience rampant illegal dumping especially along the riparian areas and at the bank of rivers like Ngong river which traverse, Kibera slum and Mathare river which traverse mathare slum while Nairobi river traverse kawangware all the way to Korogocho slum. To be able to clean up the rivers, it is necessary to devolve or decentralize the service to village level or at least to ward level which hosts the adjacent slum to be served.

Nairobi City has a number of over 80 informal settlements and over 1000 villages. In order to ensure prudent waste management, it is necessary to map out the illegal dumping and identify feasible\ viable areas to establish material recovery facility sites

which are accessible and meets criteria for siting of such Environmental Management Installations, based on Public Health and Environment dictates.

Material Recovery Facilities and Circular Green Economy Initiative

Circular and green economy model advocates for recycling, re-use and reduction of waste to final disposal through promotion of industrial symbiosis is the only option that can guarantee sustainability of waste management. The construction of material recovery facilities and sustained serving through multi-actor approach can be a source of employment of youths during the full life-cycle of the facilities. This entails engagement of various experts, Stakeholders, Government Agencies and Community in an integrated manner.

Way Forward

The current waste management system is no longer tenable. Integrated waste management approach that move from linear to circular model is the best option to manage pollution of Environment, guarantee Public Health Safety, creation of jobs and promote economic interdependence through recycling of sorted waste under industrial symbiosis.

The Material Recovery Facility (MRF) is very critical interphase which will be semi-automated and greatly dependent on manual labourers. The project will prioritize manual operations as form of youth, women and people with disability empowerment centre.

Identification of appropriate sites will be subjected to public participation, critical stakeholders and leaders will be engaged.

We are looking forward to a more vibrant, sustainable and climate change, sensitive solution that is cost effective and all embracing leaving no one behind.

TAKA NI PATO employee engaged in a clean up exercise

Motoine River in Bombolulu (Kibera)

River Regeneration as an Urban Design Strategy

BY MARK OJAL,
GLOBAL PUBLIC SPACE PROGRAMME PLANNING,
FINANCE AND ECONOMY UN-HABITAT

Waterways, harbours and rivers have shaped the location and growth of cities and towns for centuries. Humans in all regions of the world settle along rivers and over time the relationships of towns and cities with rivers therein has evolved and changed variously. In contemporary cities, river systems provide an opportunity to rethink the relationship between people, the built and natural environments; to turnaround local economies; to create place-attachment; and to make healthy and inviting places to live, work, play and invest. Enhanced with a network of attractive cultural and recreational places, and a network of walking and cycling infrastructure connecting neighbourhoods and destinations, they offer an opportunity to enrich the quality of life of all people living and working in or visiting the city.

In South Korea, the regeneration of Cheonggyecheon river saw the demolition an elevated freeway, spuring socio-economic leading to economic growth and development in the city centre of Seoul. In Malaysia, the River of Life project is right on track to reconnect the city, the river and her people. Conceptualised as an economic transformation programme, the combines high-impact projects with low-cost, high-impact interventions to transform the city image and create livelihod opportunities. In Addis Ababa, 'Beautifying Sheger' project is an ambitious urban design endeavour to reclaim and transform 56 km of the Sheger river. The project is an entrypoint to the regeneration of Addis Ababa and make it green, clean and an inviting destination to live, work and invest. Urban river corridor regeneration projects, projects and initiatives in Nairobi are often

considered in isolation, delinked from the human settlements surrounding them and implemented as standalone environmental health endeavours. These projects demonstrate the potential of integral urban design approaches to transforming cities and rivers, and repositioning rivers not only as engines for urban regeneration but also for socio-economic transformation. This article argues that rivers in cities have much wider sphere of influence and that their regeneration should go well beyond the profile of the riparian reserve. It makes a case for river regeneration as an urban design strategy.

Through an integrated urban design-led river regeneration, Nairobi's rivers can provide opportunities to transform the city into a clean, green and livable city, a global environmental capital. The strategy can enable provide for the development of integrated, continuous and high quality network walking and cycling trails as alternative mobility corridors (NMT expressways), creation of parks, nature reserves and neighbourhood forests; redevelopment of inner city neighbourhoods in Eastlands into socially diverse mixed-use neighbourhoods; and transformation of informal settlements into places of opportunity and dignity. In a changing climate such as the one experienced in Nairobi with a mix of intermittent floods, droughts and water scarcity, imagining the city water from an urban planning and design perspective is a development imperative. An integrated urban design-led river regeneration provides an opportunity to build disaster risk into river corridor planning – managing flash floods through an integrated network of blue-green infrastructure including water water parks. Disused quarries along the city's rivers could be transformed into water parks which collect and recycle rain water.

Through an integrated urban design-led river regeneration, Nairobi's rivers can provide opportunities to transform the city into a clean, green and livable city, a global environmental capital.

An integrated Urban Design-led river regeneration is central to integrating the rivers into the urban fabric. One such project is the Nairobi River Life Project, a Nairobi River Regeneration Initiative led by the United Nations Human Settlements Programme (UN-Habitat) and a multi-agency team of the government. The main aim of the Nairobi River Life project is to embrace the river, reclaiming Nairobi River as a shared public good which supports better urban and environmental performance for better quality of life in the city. Below are three mutually-reinforcing principles for urban design strategy for river regeneration:

- **Connect:** Strengthen the connection between the city and the rivers. This calls for refocusing the city centre and neighbourhoods to face the river, and upgrading the streets connecting the river to the city by introducing public art, water and landscape features, and focusing on creating an enhanced experience along the streets and a 'sense of arrival' as one gets to the river.
- **Diverse**: Transform the riverfronts into places to see and be seen, providing oportunities for multiple things to see and do, and encouraging people to come to the edge of the river and engage with the river while also introducing a broad mix of land uses along the river frontages inclding spaces for events, recreation, commerce, employment, and art and culture. In addition, introduce a flexible social program with events and activities to activate the riverfront and associated spaces all year round. It also calls for creating multiple high quality desitnations along the river corridor.
- **Excellence:** Develop a framework for reconnecting the city to face the river, providing high quality design features including materials, furniture and other landscape elements, and good workmanship as well as developing an shared vision and an overarching spatial strategy to guide the development and provide a unified visual identity.

In conclusion, while river regeneration can be an important urban design to regenerate the city, it also requires an integrated urban design strategy to succesfully deliver on its ambitions.

An Alternative Future for the Nairobi Dam: Land Reclamation, River Restoration and the Nairobi Dam

DR. NATHAN. B. WANGUSI

Water hyacinth vegetation in Nairobi Dam

History of the Dam

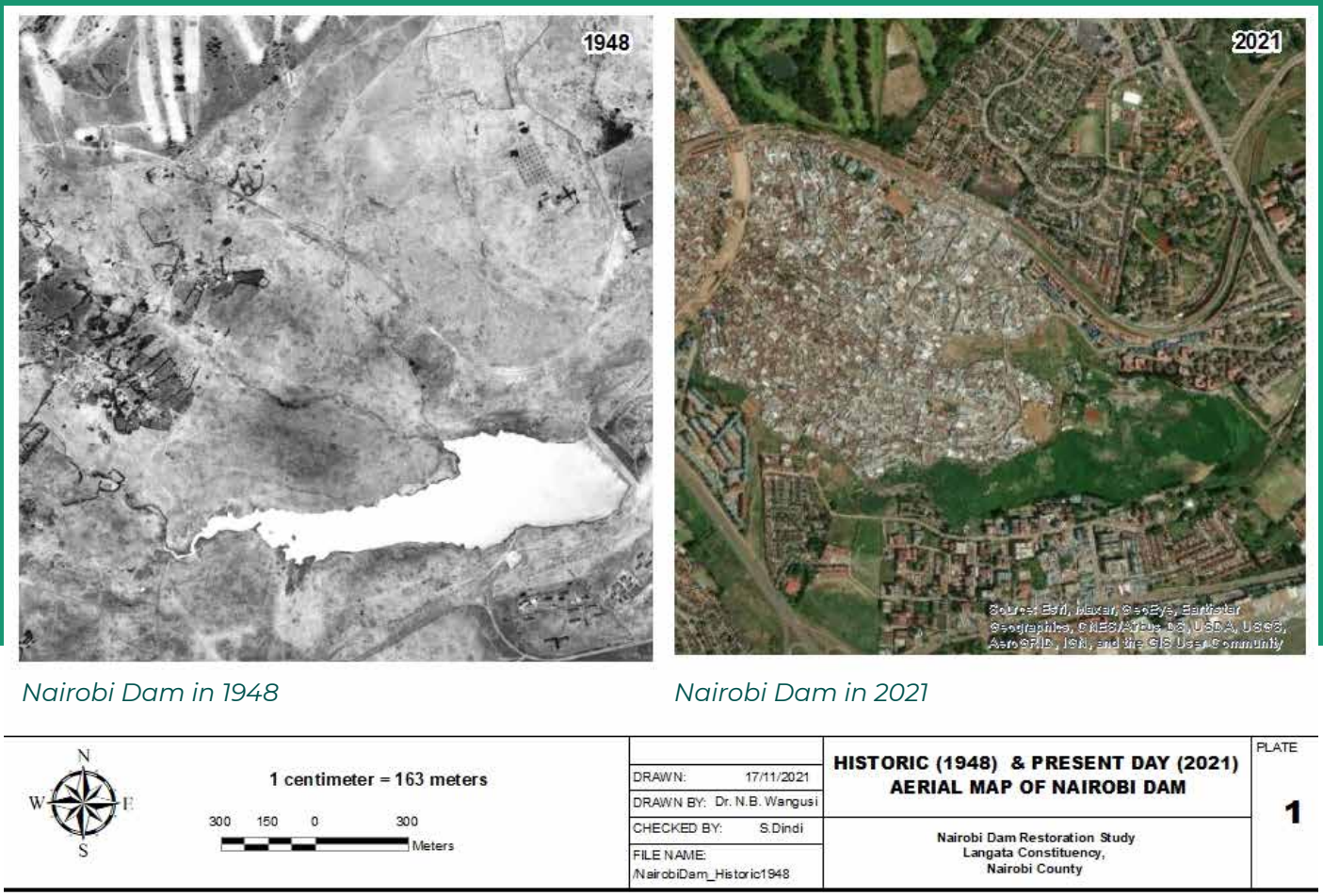
The Nairobi Dam is an earthen embankment dam built on the Motoine-Ngong Tributary of the Nairobi River completed the 1950's to provide water for the then growing city of Nairobi. It was designed by the Public Works Department of the colonial government in Kenya and built-in conjunction with the Uganda Railways and Harbors Service. The location of dam was in what was then a pristine area in the outskirts of the city nestled between the Nairobi National Park and at the edge of the Ngong Forest. Historically, the dam provided potable drinking water for the residents of Nairobi.

Nairobi Dam in 1963

40. Present day Nairobi Dam

Encroachment of the Catchment Area

The land around the dam was named *Kibra* which means "Forest" in the native Nubian language. The Nubians were brought as settlers by the British from the Sudan to serve as mercenary soldiers in the colonial army at the turn of the century. Since then, the descendants of these settlers still live in Kibra and have leased and sold this land to other migrant communities coming into Nairobi in search of jobs.



Nairobi Dam in 1948 *Nairobi Dam in 2021*

Figure 2. *Nairobi Dam in 1948*

Over time the impoundment area around the dam has been encroached by informal settlements, apartment blocks and commercial enterprises like carwashes, hotels and *jua kali* stalls. These establishments drain raw sewage and dump garbage that has led to sedimentation of the dam causing pollution and infestation by invasive plant species. This coupled with neglect, failure to dredge and repair the dam has rendered it unusable, toxic and degraded. There are several commercial boreholes in the adjoining estates where water trucks from around the city collect water for domestic supply.

> *"The land around the dam was named Kibra which means "swamp" in the native Nubian language."*

Impaired Water Quality in the Dam

Water quality studies of the surface and ground water in and around the dam respectively have found levels of chemical and biological toxins to be extremely high in comparison to the National Environmental Management Agency (NEMA) water quality standards. The ecological state of the dam was completely altered over this period from a natural wetland pre-construction of the dam to a healthy artificial wetland ecosystem to its current degraded state.

Table 1. *Water Quality Indicators in the Nairobi Dam at the Inlet and Outlets as compared to NEMA Environmental Effluent Standards*

Water Quality Parameter	Reported Range	NEMA Effluent Standard
Dissolved oxygen (DO)	2.8 - 3.5 mg/l	>5 mg/l
Chemical oxygen demand (COD)	128 – 352 mg/l	50 mg/l
Biological oxygen demand (BOD)	93 - 260 mg/l	30 mg/l
Fecal Coliform Count	94 - 299 counts/ ml	30 counts/ml
Nitrates	6.6 - 7 NO_3/l	10 mg NO_3/l
Total suspended solids (TSS)	50 - 200 mg/l	30 mg/l
Ph	7.15 - 7.5	6.5 – 8.5
Color	1400 - 5600 Hazen	15
Conductivity	491 - 1642 µS	250 µS

The deluge of a mixture of human waste, garbage, soil and decomposed biomass from invasive aquatic overgrowth has created peat islands in some areas which have been converted into floating gardens where urban farmers grow a variety of crops such as sugarcane, *sukuma wiki*, *nduma*, potatoes and even *marijuana*. There is also fish farming of primarily *tilapia* which thrives in such environments. These foods which are laden with pollutants such as heavy metals, fecal bacteria and industrial contaminants account for a significant portion of the food consumed within Kibra with some of it being "exported" to other slums, adjoining estates and to city markets where it finds its way into our urban food chain.

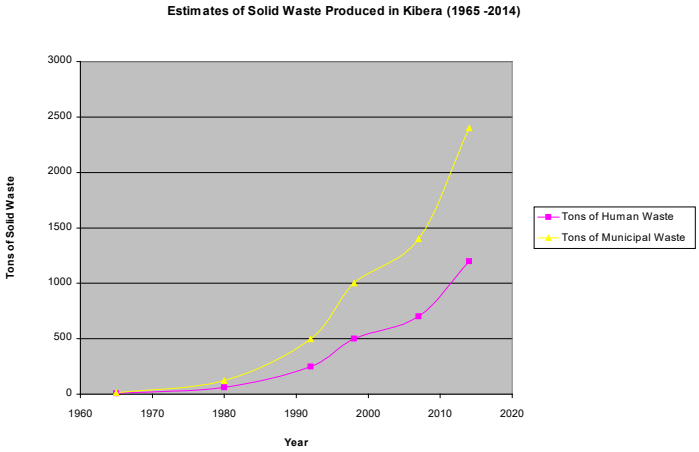
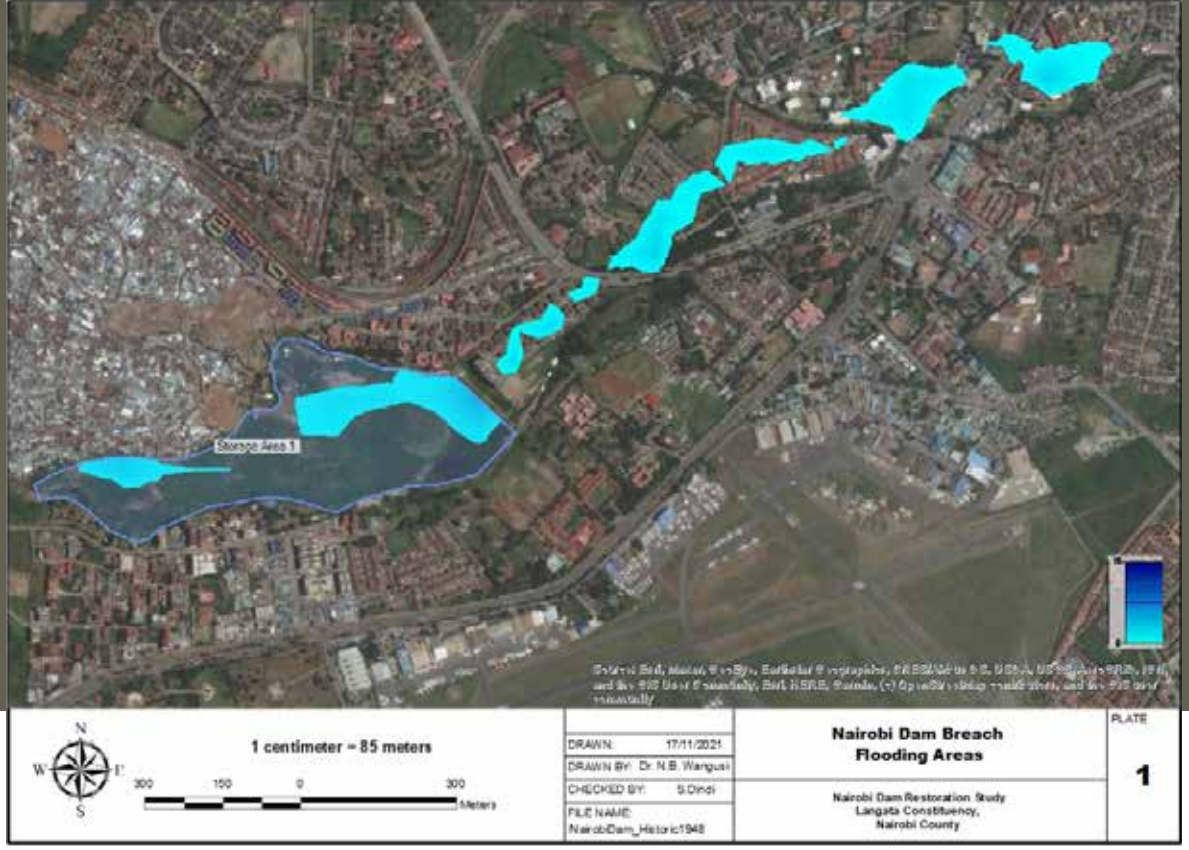


Figure 3. *Estimated Solid Waste Generated from Kibra (Tons per Day)*

Risk for Dam Collapse

In addition to the outlined public health risks , Seefar Apartments constructed by Erdemann Properties sits atop the embankment of dam. During the construction of these apartments, the embankment walls of the dam reportedly showed signs of structural weakness and in fact collapsed. It is therefore conceivable that the dam will one day breach causing destruction at a scale reminiscent of the Solai Dam tragedy that killed 48, injured hundreds, displaced thousands and destroyed property worth millions of shillings.

A recent dam breach analyses evaluating the collapse of the dam from hydraulic, seepage and structural failures established that in the event of collapse, there would be an uncontrolled release of stored water downstream inundating Highrise Apartments, Raila Odinga Way, Akila 1 Estate, Strathmore University and Nairobi West Shopping Center causing flood damage that would inevitably result in loss of life and destruction of property.



Inundation Map for Nairobi Dam break

Mitigation through Land Reclamation, River Restoration and Kibra Dam construction

The Nairobi Dam's stagnation has altered the envisioned hydrological benefits causing floods upstream that not only pose a threat to human life but damage infrastructure and property. The surrounding land is waterlogged and flood prone which has been more severe in the recent past. The embankment wall of the dam is unstable which is a structural hazard to the hundreds of buildings in the vicinity both because of the risks of collapse. The cost to continuous dredging to remove sedimentation and accumulated biomass has proved to be unsustainable. Restoring the water supply function of the dam would require relocating of the populations in the catchment of the dam and demolish existing structures which would be expensive and whose social and political consequences far outweigh the benefits of rehabilitation.

Alternative future for the Nairobi Dam

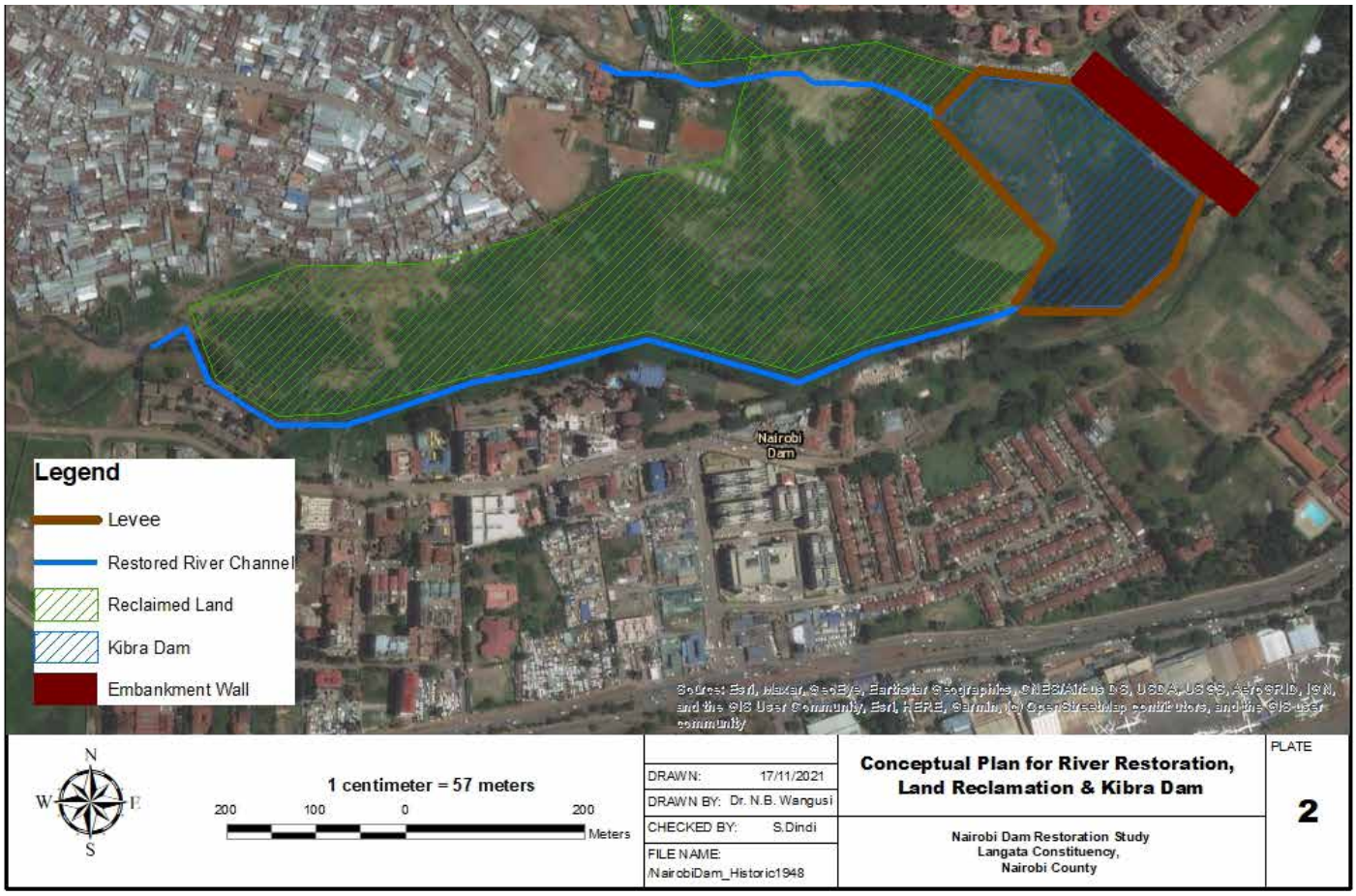
A simpler, significantly cheaper, cost effective and productive alternative future that would entail restoration of the Motoine-Ngong Tributary of the Nairobi River which was dammed 50 years ago to create the Nairobi Dam. This alternative would not only provide an additional water supply source for Nairobi but create a riparian area along the original water channel and mitigate all the challenges outlined above. It would recycle human and accumulated hyacinth feedstock for electricity

and biogas. It would open up 86 acres of high value urban public land which can be reclaimed as an extension of Uhuru Gardens and Ngong Forest in 3 phases.

a. Phase One would entail eliminating the effluent and pollution load into the dam by constructing an integrated waste collection system and energy cogeneration facility. Wastewater main trunks and communal sanitation facilities would be constructed. The sewage and hyacinth waste will be harnessed as feed stock for cogeneration of electrical energy. A comprehensive solid waste management program would be implemented and a recycling facility set up to deal with the municipal waste.

b. Phase Two would involve build a smaller secured dam Kibra Dam and levees at the western most and deepest tip of the existing Nairobi Dam to supply water to Kibra and the surrounding estates. Finally, source protection along the Nairobi River channel both upstream and downstream would be done to protect water quality.

c. Phase Three would entail restoration of the river channel and backfilling to reclaim land from the dam. Once backfilled and graded, this area would be reclaimed into a park and wooded area as an extension of Uhuru Gardens and Ngong Forest Complex.



River Restoration, Land Reclamation and the Kibra Dam

During the building and site selection for the dam, these challenges and changes were hardly envisioned. It would have been assumed that since this was publicly land it would remain unsettled and provide a buffer that would protect the dam and riparian areas from intrusion. Simply stated, the Nairobi Dam has outlived its purpose due to changes in the economic and resource landscape. It should not be rehabilitated but removed entirely.

Ondiri wetland

Conservation efforts upstream

- Ondiri Swamp (water tower) is a unique Palustrine wetland located in close proximity to Kikuyu town, Kiambu County.
- It covers 34.5 ha with a perimeter of 3.5 km and a depth range of 2 to 3 meters.
- It forms the headwaters of Nairobi River where it is fed by Nyongara River.
- It recharges the Kikuyu springs through a subterranean passage.
- The swamp is a source to 40 other springs, which provides water to the local community.
- The swamp supports biodiversity ranging from aquatic and semi aquatic Plants, birds, mammals, amphibians, reptiles and insects.
- Sixty-eight (68) plant species (aquatic and semi-aquatic) have been recorded in the swamp.
- Over 74 resident and migratory bird species utilize the swamp as their habitat including the Endangered Grey crowned crane.
- It has a potential for being classified as an Important Bird Area (IBA).
- Ondiri swamp provides critical ecosystem services from provision, regulatory and supporting culture

Tree planting at Ondiri Wetland by CAS Mohammed Elmi to mark World Wetlands Day 2022 (CREDIT NEMA)

Commissioning of Ondiri Swamp Eco-Toilet by CAS Mohammed Elmi

Governer James Nyoro of Kiambu County inspecting the Ondiri Wetland map with Friends of Ondiri Members

World Wetlands day commemoration in Ondiri Wetland-kikuyu

Ondiri Wetland Information Centre

Friends of Ondiri Coordinator, Mr. David Wakogy briefing guests on the history of Ondiri Wetland (Credit NEMA)

Activities: Bird watching, Picnic, Nature walks

Contact details:

Email: friendsofondiriwetland@gmail.com

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THE LITTER YOU THROW IN NAIROBI IS AFFECTING OUR OCEAN AND DOWNSTREAM COMMUNITIES' LIVELIHOODS

Introduction

Marine litter is a menace globally recognized and is present in all marine habitats, from the beaches to the most remote points in the oceans. The United Nations Environment Programme defines marine litter as any persistent, manufactured, or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment. It originates from either sea or land mainly where human activities are involved. Land-based sources account for 80% and include waste released from dumpsites near the coast or river banks, littering of beaches, ship-breaking yards, tourism, recreational activities, and storm-related events, i.e. flash floods whereas the major sea-based sources include: abandoned, lost, or discarded fishing gear from fishing activities, shipping activities and illegal sea-based dumping.

Plastic waste along the Indian Ocean shore

It is clear that without immediate and drastic actions and with the continuous growth of the middle-class community, significant quantities of waste will continue to impact the ocean. Organisms can be impacted by plastics through entanglement discouraging efficient movement of an organism, ingestion leading to potential weight loss and many at times mortalities, suffocation leading to mortality, bioaccumulation of pollutants, modification of benthic communities, introduction of non-native marine species into new habitats and change in physical conditions of the seafloor. In addition to impacting aquatic ecosystems, plastic pollution also affects societies and economies through increased costs on shipping, maritime and navigation, fishing, aquaculture, tourism and recreation. Humans are affected both health wise as plastic litter acts as breeding grounds for mosquitoes and flies that spread diseases like diarrheal diseases, Malaria, Dengue Fever, Elephantiasis and Chikungunya. Domestic animals alike are not spared by the adverse effects of plastics, animals die when they swallow plastic wastes alongside their feed. Plastics disposed of on land notoriously line the soil surface preventing soil aeration and killing important microorganisms in the soil. Kenya relies heavily on open dumping and burning to manage solid wastes and plastics collected which gradually break down and release harmful chemical additives and gases that contribute to global warming.

"It is clear that without immediate and drastic actions and with the continuous growth of the middle-class community, significant quantities of waste will continue to impact the ocean."

Poorly managed plastic waste makes its way from the source to the marine environment through several pathways including gutters, storm drains, sewage lines where they clog pipes and result in the stagnation of urban runoff and sewer bursts that are a common occurrence in most major towns of Kenya with the largest input being from rivers. Rivers traverse long distances across areas of different social, economic and cultural realities connecting landmasses to the oceans thus requiring more localized solutions to truly stem the tide of marine litter.

Status

Studies have reported that 90% of river-borne plastic waste that flushes into the oceans is conveyed by just a handful of large, continental rivers, including River Athi-Galana-Sabaki. Athi-Galana-Sabaki River is the second largest coastal river along the Kenyan coast with a lot of activities upstream and in the wider catchment area encompassing Nairobi city among other major towns that discharge their waste into the river before ending up in the Indian Ocean.

Our research findings in 2020 along Sabaki River estimated that the Athi-Galana-Sabaki River contributes to marine litter by discharging into the Indian Ocean between 6,622,560 and 614,952,000 litter items per year for low and high flow respectively. This litter originates from diverse areas including Nairobi. The study further revealed that Sabaki estuarine is unique marine litter sinks as plastic packaging containers dating back to 1998 were found during the study. Most of the litter collected was also typically of small packaging quantities e.g., 15 g, 30g of valon oil and colgate tabs cut in the middle to allow for full utilization of the content. Such litter is characteristic of litter from low-income settlements particularly Kibera slums in Nairobi thus attesting to the poor waste infrastructure upstream and range transportation of litter by Sabaki River. Most branded litter- food products were items not sold in the downstream kiosks suggesting upstream origin. The estuary thus plays an important role in temporarily providing a sink for the litter which is slowly remobilized and released to the ocean ensuring a slow but sure dose of contamination. Indeed the waste-shed areas of Sabaki River including Nairobi are contributors to the 49,321,854,000 litter items in the Kenyan

Some of the household products recovered from the Sabaki river floodplain

An old margarine packaging recovered preserved in the sands of the Sabaki floodplain

territorial and Exclusive Economic Zones.

A tracking survey carried out in the low regions of Athi-Galana-Sabaki also indicated that the rivers meandering nature and the vegetation along the river act as mini-sinks sieving litter thus reducing quantities entering the ocean during low flow but this litter is remobilized and fully delivered to the ocean during high flow.

Interventions and recommendations

Existing interventions

Kenya has over the years remained steadfast in turning the tide of the scourge of pollution of water resources by plastic and solid waste in general. To this end, Kenya has committed her actions in policy formulation and enactment of legislation. The National Environment Policy adopted in 2013 laid a solid framework for sustainable solid waste management and conservation of marine and freshwater systems among others. Kenya has enacted the Environmental Management and Coordination Act (Rev. 2015) and sectorial laws and regulations relating to water resources, fisheries, wildlife and marine waters prohibiting pollution of freshwater and marine environments in both open and protected areas. In more deliberate attempts, the government banned plastic carrier bags of thickness of less than 30 microns in 2008, secondary packaging plastic carrier bags and flat bags in 2017, and single-use plastics in protected areas in 2020.

Despite being widely successful, the 2017 ban continues to face several implementation challenges such as weak enforcement, lack of affordable alternatives, and illegal importation of banned plastic bags among others. Nevertheless, research has shown a decline in polythene bags encountered along the beaches. This shows that the polythene bags ban intervention has had a direct impact in reducing the amount of marine litter reaching the oceans. The Kenyan government is currently exploring a more inclusive and long-term approach through the development of Extended Producer Responsibility (EPR) regulations that will compel producers to take aftermarket responsibility for their products. Recently, Kenya has also drafted the National Marine Litter Management Action Plan to provide a sound and overarching approach to reduce pollution from point and nonpoint sources.

The Government of Kenya through the Nairobi Regeneration Program has also constructed over 35 km of sewers, unblocked 10 Km of sewers, constructed over seven river crossings across urban rivers and constructed 15 ablution blocks in the residential areas close to rivers all with the effort to reduce river pollution from the source.

Residents sifting through plastic waste

Suggested interventions/ Recommendations

Despite the commendable endeavors from the various sectors of the government, there is a need for:

a. Coordinated and collaborative actions across watersheds to minimize solid waste leakage into water bodies. Indeed, county governments must embrace the pivotal role they play in physical planning, and by extension, solid waste management planning.

b. Intensive public awareness and public responsibility including public education, removal of solid waste from waterways through targeted cleanup programs

c. Conclusive implementation of policies and enforcement of legislation and regulations for the effective and meaningful reduction of pollution.

d. Incentivizing recycling through rationalization of inter-county access for trans-shipment of waste resource for recycling, promoting the use of products made out of recycled material, compelling manufacturers to package products in reusable and recyclable material.

e. Full support and implementation of EPR schemes.

KENYA MARINE AND FISHERIES RESEARCH INSTITUTE

Okuku Eric, Kenneth Otieno, Maurine Kombo, Mary Mbuche, Purity Chepkemboi

EFFECTING BEHAVIOUR CHANGE AND SUSTAINABILITY OF ECOLOGICAL RESTORATION PROJECTS

BY CHRISTOPHER AMUTABI

The sustainability of ecological systems in many parts of the world remains to be an issue of great concern. Many of the current global, regional and local human suffering can be attributed to the consequences of water and food insecurity, climate change, and other forms of environmental degradation. These challenges have in the recent past been escalated by the Covid-19 pandemic. Ecosystem services have immeasurable benefits to humans and as such, protection and management of these resources sustainably is essential to restore the huge benefits that they provide. Environmental degradation does not only lead to the loss of local and global services, resources for human lives but also destabilizes the relationship between humans and nature.

Community sensitization exercise

Some of the human activities that contribute to environmental degradation include deforestation, water contamination, pollution, and climate change. Conversely, negative environmental impacts can be reduced through reforestation, water conservation, climate change mitigation among others. As such, activities that are associated with either positive or negative environmental impacts are determined by human behaviors. Behaviour change, therefore, is a critical consideration in efforts to restore ecological systems.

Restoration of ecosystems requires concerted effort and well-thought changes. My long-time (up to 20 years) in community-based conservation efforts within and around Kakamega Tropical Rainforest in Western Kenya has made me understand that socio-economic factors are critical for any successful ecological restoration projects. Many valuable natural ecosystems are situated in areas with a high human population, extreme poverty, and high levels of unemployment. A 240 square kilometer Kakamega forest located in the middle of one of the densely populated rural areas in Kenya (> 600 people per square kilometer), and the ailing Ngong river in one of the informal urban settlements in Kenya's largest city, Nairobi, are examples of such ecosystems. According to Mulligan, J. (2016) in his paper titled "*Community-responsive adaptation to flooding in Kibera, Kenya*", at least 30,000 Kibera slum residents live within 30 m of the main watercourse of the Ngong River. The congested settlements and low income among the slum dwellers along riverine ecosystems compound the challenges that people experience including sanitation challenges and lack of proper waste disposal infrastructure, which leads to the disposal of solid and human waste from the settlements into the Ngong River.

Ecological restoration should aim to enhance the relationship between people and the environment. The way people perceive the initiatives and respond towards the ecosystem restoration efforts will determine the success of the effort. Positively engaging the community (ensuring that they realize the social, economic, and environmental benefits) will create a positive behavioral change and propel the restoration agenda to success. The positive behavioral change is also enhanced when the local people have a sense of ownership and belonging to the natural resource. Through this, environmental stewardship gets rooted in people's vision and culture and it is embraced even by future generations.


Christopher Amutabi

Efforts to rehabilitate the Ngong river are in line with Sustainable Development Goal 6 (Clean Water and Sanitation) which calls for protection and restoration of water-related ecosystems to ensure safe and affordable drinking water for all by 2030. Mazingira yetu initiative has demonstrated beyond doubt that working together with the community on restoration activities is rewarding and that the activities can start small and self-organized but expand to partnerships with big agencies. Such initiatives demonstrate ways that can be used to bring positive behavior change among community members in implementing restoration projects. However, these efforts require a boost from the government and other multi-lateral agencies who can offer technical expertise, financial support to make these options more effective and viable.

Companies and businesses can promote ecological restoration by embracing business models and operations that address drivers of degradation. Some of the ways include promoting products and services that enhance conservation, creating job

> *Ecological restoration should aim to enhance the relationship between people and the environment. The way people perceive the initiatives and respond towards the ecosystem restoration efforts will determine the success of the effort.*

Kakamega Forest

opportunities for the local people, and improving their livelihood. In addition, businesses can invest in natural infrastructure, restoration of degraded land, and advocate for sound land-use criteria in their supply chain. For example, Eco2librium (www.eco2librium.net), a conservation-based social enterprise has demonstrated that businesses can use the power of business to solve social and environmental problems by engaging in business ventures that conserve and/or restore natural forests, creates jobs, and improve people's livelihoods. Through working with the local community-based groups, Eco2 has installed at least 70,000 energy-efficient stoves in Western Kenya, an intervention that has created over 500 jobs for underserved people from rural communities (primarily youth and women). This has reduced forest wood use equivalent to 250 acres per year, hence mitigating climate change by reducing $C0_2$ emissions. Such tangible and quantifiable benefits to the communities do not only create a paradigm shift in the people's perception of ecological resources but also bring about a positive behavioral change.

In conclusion, behavior change, which is largely connected to emotions, wellbeing, and socio-economic status of people, has a huge determination on the success of any ecological restoration project. The decision by people to support the ecological initiatives also partly depends on individuals' ecological knowledge and value. Expansion of awareness of the importance of healthy ecosystems throughout educational systems as well as the community at large has far-reaching impacts and enhances positive behavior change which is a key ingredient to a successful ecological restoration and by these, people have a shared vision of restoration that is rooted in their culture. Ecological consciousness by companies, businesses, and other for-profit and non-profit entities will ensure that ecological restoration is integrated into their business models. The government's support to individuals, communities, businesses, and all agencies participating in the restoration initiatives is of paramount importance.

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CLAYPITS

BY LAND USE CONSULTANTS

Glasgow Inner City Nature Reserve

The Glasgow Canal was built in the latter part of the 18th century. It is a branch of the Forth & Clyde Canal which provided a key trade route through central Scotland between the east and west coast. Although the canal was originally well used the development of railways in the 19th century and road infrastructure in the 20th century led to its decline. It eventually closed in 1963 and subsequently fell into a state of disrepair. As part of the millennium celebrations in 2000 UK National Lottery funding was used to reopen the canal with a focus on providing a recreational and leisure resource. The reopening of the canal was also intended to help regenerate adjacent communities many of which are disconnected or disadvantaged and record some of the worst health statistics in Scotland.

The Claypits project originated in 2015 from a shared visioning and community engagement process that was focused on the Glasgow Canal. Led by a team from LUC on behalf of Scottish Canals, this involved an intensive 4 day 'What Floats Your Boat?' charrette community and stakeholder engagement process. The charrette comprised a series of site walkovers, presentations, iterative groups workshops and an art outreach project. The charrette process, together with feedback obtained at subsequent follow up events, informed the establishment of a Vision and cohesive development framework for the canal corridor. A key outcome of the process was the desire to create an accessible, meaningful, and multifunctional linear greenspace along the canal that would better connect adjacent communities and offer the opportunity for improved health and wellbeing.

LUC subsequently developed a Green Infrastructure masterplan for a 17ha brownfield area that straddled the canal and was colloquially known as the 'Claypits' due its former use associated with extracting clay to line the canal. The area was designated within the Glasgow City Development Plan as 'Vacant and Derelict Land'. Site ownership was split between Scottish Canals and Glasgow City Council and

Pupils engaged in a park design

both parties supported the development of the masterplan based on the strength of support demonstrated from the charrette process.

The underlying design principles of the Claypits Green Infrastructure Masterplan were to:

- Improve pedestrian and cycling connectivity between various adjacent communities and their respective facilities including overcoming the barrier and constraints presented by the canal and associated topography;
- Improve the health and wellbeing of local communities through encouraging active travel, activity and facilitating access to a significant new greenspace;
- Enhance existing self-established habitats and improve biodiversity;
- Facilitate future sustainable development via the integration of SUDS and service infrastructure;
- Celebrate the unique heritage and culture of the canal and its surroundings.

Necessary consents were obtained for the proposals including Planning Permission from Glasgow City Council and Scheduled Monument Consent from Historic Environmental Scotland. Although some priority projects and 'quick wins' were implemented during 2017 to demonstrate commitment and momentum construction for the main masterplan components commenced in 2019 once funding had been secured from various partners including Sustrans and Nature Scot's Green Infrastructure Programme. Construction continued for 2 years (through the Covid pandemic) and the site was formally opened to the public in July 2021.

LUC's masterplan proposals sought to harness the significant potential and unique character of the existing Claypits site to provide an attractive, accessible and multi-functional greenspace.

Individual masterplan components include:

- Over 1.5km of new pedestrian and cycle path infrastructure;
- Several bridges and boardwalks, including a significant new retractable bridge across the canal
- Extensive tree planting;
- Significant SUDS infrastructure integrated with Glasgow's Smart Canal scheme;
- Play and other features to encourage activity;
- Furniture, signage and wayfinding;
- Residential moorings on the canal.

From the original Charrette engagement process a volunteer community group was established to represent community interests during the design process and also to take on the longer-term management of the project once construction is complete, with some assistance from Scottish Canals.

One of the most positive outcomes of the project is that the site, once underutilised, overgrown and designated as Vacant and Derelict Land, has now been redesignated as a Local Nature Reserve, the only inner-city nature reserve in Glasgow. Since it opened in July 2021 it has proved to be immensely popular with the local community and attracts visitors from all over the city. It offers a unique environment for local residents to explore and spend time especially those who are disadvantaged and rarely get a chance to leave the city. The Claypits now encourage health and wellbeing through facilitating and encouraging walking, cycling, play and activity as well as providing a providing a 'natural' greenspace aiding mental health.

Glasgow Inner City Nature Reserve

The Napa River Restoration: A Case Study in Successful Riparian Restoration

BY BREANN M. RICHEY, PHD STUDENT

One of the largest problems facing modern rivers is the loss of riparian plants. These plants have unique and powerful root systems that help to hold dirt in place and dissipate the energy from the water that would otherwise result in erosion. They also serve as important members of the ecosystem through commensal relationships within communities and the housing and feeding local fauna. Invasive species are especially dangerous because they co-evolved with natural enemies (like herbivores and seed predators for plants) which are not present to control population size when these species are introduced to new habitats. As a result of the complex relationships between native and invasive species, one of the most serious threats to riparian plants is habitat colonization by invasive species. Invasive species are an increasing threat to biodiversity across the world as globalization "shrinks" the planet and allows plants and animals to colonize new locations and niches more easily. In riparian areas, these invasions can have particularly powerful trickle-down effects on river ecosystems.

NAPA River Restoration (licensed under CC BY-SA 3.0 by unknown author)

The Napa River is an excellent case study in riparian restoration. The Napa River is a 55 mile (89 km) long river that runs through the wine growing region of northern California. Increased water use, agriculture, tourism, and urban development have contributed to decreased health of the river and surrounding environment. In response to this, community members and state officials have created several projects to increase the river's health. These projects include widening the river, restoring 135 acres of vineyards to riparian habitat, and removing invasive plants and replacing them with native species.

In order to protect and improve this ecosystem, volunteers and land owners began by removing invasive plant species. Community protection of native species not only protects native flora and fauna, but also has the potential to save hundreds to billions of dollars in eradication and preservation programs over the long term (it is estimated that the United States spends $120 billion annually to protect native species from invasions). Many of the plants that were removed from the Napa River region were ornamental or edible imports which had escaped from gardens and replicated in the

open niche space along the Napa River. The removal of these invasive plants opened up opportunities for natural recruitment, addition to populations through migration or planting. Other spaces opened up by removal of invasive species were left open to create irrigation avenues. Riparian trees hold the Napa's banks in place and support commensal flora and fauna. These trees also offer shade to the river which cools the water and allows for a higher oxygen concentration since colder water is able to hold more oxygen. This in turn supports plants and animals living in the river.

NAPA River Restoration (Public domain)

Record-breaking rain storms in late October and early November of 2021 put the restoration project's work to the test. The rain caused flooding in nearby counties resulting in power outages, school closures, and numerous road closures. While heavy rain storms in the past resulted in disastrous flooding particularly in this riparian region there has been no damaging flooding reported in river-adjacent areas during this year's record floods. This

NAPA River Restoration (Credit Creative commons Attribution share Alike 3.0 Unported, 2.5 Generic and 1.0 Generic license by unknown author (pseudonym Sanfranman59).

suggests that the project's bank restabilization and return of native vegetation efforts are functioning as intended by protecting the flow, riverbed, and bank stability of the Napa River.

So far, the Napa River Restoration project has been incredibly successful, not only in flood prevention, but also in protection of local plant and animal populations. The river is home to 4 species of salmon and the steelhead trout, which are recreationally and economically valuable. These fish had experienced population decline due to decreased water flow prior to the start of the project. Since the implementation of the project there has been an increase in the salmon population, which contributes not only to the health of this river, but also to its tributaries and even extends to the San Francisco bay. Similarly, the California golden beaver, which had been locally extirpated, is now present again in the Napa River ecosystem.

Much of what has made the Napa River Restoration project successful is the willingness of landowners to give up short term profits in order to experience long term gains. When ecosystems are protected, restored, and conserved, entire community health has the potential to increase. In the Napa River riparian zone improved soil health has resulted in better tasting wines, which has resulted in long-term benefits for vineyard owners who were willing to put in the hard work and sacrifice required to protect this ecosystem. This community-level effort in concert with additional state and national funding resulted in a project that will yield long-term benefits for the region. That said, it is community engagement and a focus on protecting native flora and fauna that has made the project not only feasible, but successful. By continuing to focus on preserving native species and removing invasives that inhibit their growth, the Napa River Restoration Project will yield community-level benefits for years to come.

Alma
Associação de Limpeza e Meio Ambiente

ALMA is an association dedicated to waste collection services. We are based in Tofo, Mozambique. Tofo is a beach town, one of the biggest tourism hotspots in Mozambique and Key Biodiversity area. We pay special attention to prevention of leakage of waste to the ocean by running regular waste collection and beach clean ups.

Currently we are working on creating a circular economy model for our operations, where a significant part of the waste would become locally transformed and upcycled.

Our main mission is to protect marine life from plastic pollution, at the same time economically empowering the community.

Greenway Africa

GreenWay Africa (Pty) Ltd ("GreenWay") is a diverse group with core services offered through our advisory services and related technology solutions. GreenWay was incorporated in 2019 and is headquartered in Johannesburg, South Africa. It operates across South Africa with the plan to expand to other African regions by 2025.
The company operate through seven core advisory services:

Waste management

We follow ecosystem frameworks of circular design and implementation in diverting waste from landfills by closing loops in operations, recovering product packaging from source in both the informal and formal markets, and streamlining the entire value chain to be close-looped from cradle-to-cradle.

Water resources Management

Using data driven solutions to assist water-dependent clients with the reduction of their water footprint and water usage efficiency while providing holistic approaches that benefit the community and the environment.

Clean Energy

We provide data, insights, participation and resources to transition energy demands towards clean and renewable energy that will support operations, the community and the environment.

Climate change

Collaboration with different stakeholders to assess, develop, and implement climate change mitigation and adaptation initiatives and ensure that climate change is prioritised in strategy through programmes that yield short- and long-term protection of the environment.

Sustainable Agriculture

Using data-driven solution to provide climate-smart agricultural and food production processes. We design and advise on sustainable agricultural systems for small-scale and commercial farmers to optimize their operations and supply chains.

Electromobility

We advise on the development of low-cost and scalable transportation solutions that utilize electric vehicles, as well as e-bikes or pedelecs, electric motorbikes, and e-buses.
Technology solution: GreenGrid Technologies - a flexible hybrid virtual and physical workspace that provides easy, fast and secure ways to recover and add value waste at source.

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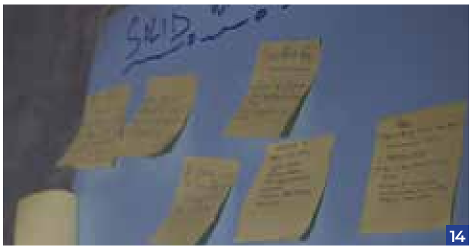

14. Youths in Kibera engaged in a Human Centred Design Challenge
15. Youths in Kibera engaged in a Solid Waste evacuation exercise
16. Nairobi Water and Sewarage Company employees in a sewer line dislting exercise in Karanja-Kibra
17. Tree planting in Karanja-Kibra
18. Kibra DCC Mr. Gideon Ombongi tree planting exercise in Al-aqsa Mosque –Karanja (Kibra)
19. Youths in Kibra displaying up-cycled products made from used plastic waste

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20. *TAKA NI PATO employees in a marketing drive of the services offered by their social enterprise in Karanja-Kibra*
21. *James Kagwe conducting a training on circular economy in Lindi (Kibra)*
22. *Youths in Kibra attending a water and sanitation workshop*
23. *Paul Nduati training youths in Kibra on Solid waste segregation*
24. *Cabinet Secretaries from Right Betty Maina, Najib Balala and James Macharia in Kianda (Kibra)*
25. *Cabinet Secretaries Eugene Wamalwa with James Macharia in Kianda Kibra*
26. *Cabinet Secretaries from right James Macharia, Betty Maina, Eugene Wamalwa and Najib Balala in Old Kibera Primary school.*
27. *Kibera community toilet facilities in Kianda (kibra)*
28. *River Ngong in Riala village (Lang'ta)*


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The residents of Kibra Sub-County and myself do sincerely thank H.E. Uhuru Kenyatta, C.G.H. President of the Republic of Kenya and Commander in Chief of the Defence Forces, the Cabinet and the Nairobi Metropolitan Services and the Mazingira Yetu Organization for sinking sixteen (16) boreholes to supply water to the people to avert and check the spread of Corona Virus disease. And for constructing nineteen (19) toilets to improve the sanitary conditions of the residents.

It has helped to do away with the flying toilets, which were synonymous with life in the Kibera slums and to prevent the outbreak and spread of diseases.

Last but not the least, in the same vein, the rehabilitation of three kilometers of the sewer line has too led to the improvement of the sanitary services. And the construction of two (2) foot bridges has easened the living conditions of the residents and protected them from flash floods.

Gideon M. Ombonya

DEPUTY COUNTY COMMISSIONER
KIBRA SUB-COUNTY

ASIA. S. RAMADHAN-SENIOR ASSISTANT CHIEF KIBERA LOCATION

"The borehole in Lindi has made access to clean free water to lindi residents possible in a long time. The free clean water has seen the residents save money that would have been used to purchase water whose source is unknown. The borehole also came in at a time when hand washing and hygiene is needed in order to prevent the spread and infection of COVID-19. The borehole has also helped reduce cases of insecurity such as mugging since the residents no longer have to wake up very early to go in search of water. Lastly access to water has made school children in Lindi have enough time to study since they no longer have to go very far in search of drinking water".

RAMADHAN SAID

"Having our own wheel carts has helped us cut costs incurred on hiring wheel carts during our weekly garbage collection exercise from households and businesses. The money saved is now to cater for the welfare of members. The safety gear and branding has earned us respect from the society as waste pickers and in turn it has helped us secure more clients and made marketing of our enterprise easier''

JOSEPH OGINGA

"The repair and rehabilitation of manholes and sewer lines has stopped direct pollution of River Ngong and it has stopped people misusing the facilities like constructing houses on top of man-holes because they now understand their importance and routine maintaince has made them realize the facilities are not for decoration''

SELESTINE ADHIAMBO

''The training we had was an eye opener since we learnt on why we need to separate solid waste after collection into different categories. We also learnt on how we could make baskets from PETE bottles and the need to have good customer relation with our clients for our enterprise to succeed.

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Music in Conservation

Eurofishion Award winner 2020, IPAC/IGAD Climate Action Awards Recipient 2021

LAWRENCE OCHIENG

Music is one of the most powerful media to communicate environmental messages to billions of people worldwide – irrespective of race, religion, income or age.

With over 10 songs composed and 3 major awards won, our project harnesses the potential of music to empower and sensitize individuals and communities on the need to conserve our environment. Through the program, we have mentored 13 youthful musicians from Kenya, Uganda and Rwanda on environment themed song writing, recording and marketing.

'*Kifaru Twakupenda*' (We love our Rhino) received an award from the Game Rangers Association in Africa (GRAA) for the best youth initiative in raising awareness of the plight facing Rhinos in Africa Range states and *Mazingira Yetu* (Our environment song) emerged the best in the Eurofishion song contest by the World Fish Migration Organisation.

Eurofishion song contest award handing over to mazingira yetu by Cabinet Secretary Sicily Kariuki at the Ministry's Nairobi Offices.

MUSIC IN CONSERVATION FACT FILE

1. The program has worked with 12 artists from Kenya, Uganda and Rwanda
2. Produced an environment themed song album containing 12 songs
3. Won 3 global awards- Rhino conservation award 2013, Eurofishion award 2020, IPAC/ IGAD CLIMATE ACTION AWARDS RECEIPT 2021

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use
cycle
cover
STOP
PLASTIC
POLLUTION
@ MAZINGIRAYETU.NET

Mazingira Yetu Organization

Our Vision
An informed society on issues to environmental conservation
Our Mission
To embrace innovation in environment education/training and a human centered approach in ecosystem restoration.

Mazingira yetu organization runs 4 programs:

1 Environment Education & Communication

Mazingira Yetu Magazine
Mazingira Yetu App
Mazingira Yetu Podcast
Music in Conservation Program
School Education Program

2 Ecosystem Restoration

Urban Rivers Restoration Program

3 Community Mobilisation and Training

Human Centre Design Challenge

4 Taka ni Pato Social Enterprise

Solid waste management and upcycling of recyclables like plastic waste.

Thank you

For supporting Feed A Child Program in Gatwekera, Kibra. Through your support, we've provided atleast one meal per day for approx. 500 children over the COVID -19 period.

VISROM
COMPANY LIMITED

VISROM
COMPANY LIMITED

We are one of the top construction companies in Kenya, established in April 2011 to deliver construction, building, and civil engineering and real estate contracts. The firm has leveraged its management's extensive experience to develop a unique set of competitive advantages that allow it to successfully operate in the construction industry within the country and its boarders. Visrom has managed to execute projects fully in in-house efficiencies and synergy with developers and the general contracting fraternity hence achieving successful projects over the years for both private and public sector.

OUR SERVICES

- Water construction and sewerage works
- Building construction
- Civil engineering
- Ground engeineering
- Structural steel works
- Road, bridge construction & maintenance
- Construction designs
- Excavation and machine hire
- Professional land-scaping
- Electricals and ict works
- General supplies

ACHIEVEMENTS









Rehabilitation of Kibera sewer line and construction of residential toilets

Construction of Gatundu water and sanitation project

Proposed Estate roads improvements, public pathway and parking lots in Ol Kalou Town

- We offer full end to end services on site.
- As a company we create sustainable solutions and aspires to be a leader in quality construction, work safety and business ethics.
- We have combined expertise, speed and quality controls thus able to meet deadlines without compromising on quality.
- We approach every project with very careful consideration so as to maintain integrity and that of the surrounding natural environment.

CONTACT US

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