



Sustainable Urban Development
Action Plan (SUDAP)
African development bank

Scaling up Essential Services
in African Cities

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FOREWORD

Africa is the fastest urbanizing region in the world, with the share of urban population projected to increase to about 50 per cent by 2030 and 60 per cent by 2050. While cities have often been described as engines of growth, urbanization in Africa is yet to deliver on economic advancements. In countries across the continent, poorly managed urban growth has resulted in the proliferation of slums, informal settlements, urban poverty and rising inequality. This has hindered the provision of essential services that are precursors to inclusive and sustainable development, and citizens' health and well-being.

This context demands a step away from the business-as-usual approach. African cities need investments in infrastructure services across the water, sanitation, waste management, energy, housing and transportation sectors to help them meet the growing needs of their populations, reduce inequalities, improve health outcomes and address the climate crisis.

It is crucial to develop new models of infrastructure financing and delivery to respond to fragmented infrastructure networks and hybrid urban service delivery patterns that characterize African cities. With the right infrastructure solutions implemented through appropriate service delivery models, African cities can reap the full benefits of the urbanization dividend to grow economically, drive social development and reduce poverty.

This report, *Scaling up Essential Services in African Cities* — published jointly by the African Development Bank (AfDB), Cities Alliance and UNOPS — demonstrates a way forward to ensure more effective delivery of basic services through infrastructure, especially for communities living in informal settlements and the urban poor. Africa's growing urban centres require innovative approaches and new business models for service provision to leapfrog to more sustainable development pathways.

The AfDB adopted the Sustainable Urban Development Action Plan (SUDAP) in 2021 to guide investments into African cities to improve citizens' quality of life. Developed by Cities Alliance, the SUDAP is supported by six papers, including this paper, written by UNOPS.

This report provides recommendations based on good practice examples and transformative approaches to infrastructure development in African cities that have contributed to positive outcomes. With a focus on water, sanitation, waste management, renewable energy and digital infrastructure, the report identifies various innovative solutions that could be scaled up and replicated elsewhere in the region, based on contextual relevance. It draws on a wide range of experiences and includes UNOPS and Cities Alliance work to support partners in developing sustainable, resilient, and inclusive infrastructure in African cities.

The report demonstrates the potential of investing in transformative strategies to support sustainable and inclusive growth in Africa. Key approaches include nature-based solutions, digital infrastructure, circular economy, decentralized infrastructure, labour-intensive services, and mainstreaming gender-responsiveness and social inclusion. It further establishes that implementing urban infrastructure in Africa requires coordination and partnerships between

different state and non-state actors, including national and local governments, the private sector, small and medium- scale enterprises in the informal sector, and community-based organizations.

African cities are potential places for locally-led innovation and imaginative experiments to achieve global agendas such as the Sustainable Development Goals and the objectives of the Paris agreement. The report adopts a future-oriented outlook by providing clear strategic direction and identifying targeted high impact areas for urban infrastructure investment. In doing so, it aims to enable African countries to better manage urbanization, transform existing negative path- dependencies, and thus realize the Africa Union’s Agenda 2063 vision. The time to act is now.

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EXECUTIVE SUMMARY

Urbanization has outpaced economic growth in Africa, resulting in the proliferation of informal settlements. Around 62 per cent of the urban population resides in areas without minimum standards of essential services - including power, water and sanitation - and experiences disproportionate vulnerability to environmental risks. The lack of administrative and fiscal decentralization, small tax revenue base and inadequate capacity limit the ability of local governments to raise funds and cater to the investment needs for urban infrastructure (\$12.5-35 billion per year for Africa).

The impact of infrastructure lasts for decades. As governments make investments to fill service delivery gaps and plan future development, it is critical to align investment decisions with sustainable and resilient infrastructure to avoid locking in expensive and unsustainable development patterns. This requires taking a step away from the business as usual approach and adopting innovative and transformative strategies across critical infrastructure functions to meet the needs of the growing population, spur sustainable development and achieve the objectives of the Agenda 2063, Sustainable Development Goals (SDGs) and the Paris Agreement.

City-led innovation in urban infrastructure development and service delivery is on the rise in African cities. Transformative strategies that offer potential include: nature-based solutions, digital infrastructure, circular economy, decentralized infrastructure, labour-intensive services, and gender-responsiveness and social inclusion. Nature-based solutions are key in providing protection from environmental risks and supporting climate mitigation and adaptation efforts. Digital infrastructure can improve efficiency, transparency and affordability of service delivery and bridge the digital divide to achieve prosperity. With circular economy principles, African cities have the opportunity to build next-generation sustainable economies and reshape material and resource use across water, sanitation and waste systems. Decentralization of services has the potential to meet service delivery needs in a cost-effective manner using local resources. Labour-intensive rather than capital- or technology-intensive approaches to the provision of sanitation, renewable energy and community access roads should be adopted to meet the goals of employment generation and green growth in African cities. Mainstreaming gender and inclusion-related considerations across the infrastructure life cycle in all sectors can reduce of violence against women and girls and enable equal access to critical services and socio-economic opportunities for all.

While the diversity of governance actors and agendas complicates the urban service delivery processes in African cities, it allows for the leveraging of a variety of skills and resources through the adoption of appropriate, including hybrid, service delivery models that bring different stakeholders together. Implementing different service delivery models can help reap the benefits offered by the aforementioned transformative strategies. Strong infrastructure governance mechanisms must be put in place to establish an enabling environment that allows different actors to work in tandem. Public-private partnerships (PPPs) in Africa remain a very small, untapped market, with the provision of urban services presenting an opportunity for private sector investment. Moreover, given

the contribution of the informal sector, governments need to engage with it for the service delivery process. Community-based groups and non-governmental organization (NGOs) also play a key role in filling the gap in infrastructure provision in particular areas.

The recommendations for prioritization of investments in African cities follow a three-pillar approach. Firstly, quick-win, wide-impact work on renewable energy and digital infrastructure underpins other critical leapfrog technologies and accelerates the achievement of the SDGs. Renewable energy is a strategic area of intervention and investment that offers opportunities for climate mitigation, health outcomes, private sector investment, decentralized systems and employment. Widespread adoption of technology, digitalization and broadband infrastructure can improve efficiency and effectiveness while promoting economic prosperity and job creation for urban youth. The growth of mobile money in Africa, for example, has demonstrated the potential of harnessing technology to overcome high upfront capital costs and enable low-income households to access water, sanitation and energy services.

Secondly, interconnected, system-based and critical intervention of water should acknowledge that urban water supply, drainage and flood defence require multi-level governance and coordination. Interventions should combine urban development with basin-level planning and coastal systems, adopting an integrated urban water resource management approach to contextualize water sources, water supply, waste water, storm water and rainwater. Delivery through the informal sector and private sector engagement has been successful in some cities, and this is an untapped opportunity to replicate and scale up.

Thirdly, the hygiene factor of sanitation and waste management is fundamental for basic human health. Sanitation services, including waste water management interventions, should incorporate decentralization and resource recovery to produce environmentally acceptable effluents and reduce the overall cost of sanitation systems. The greatest opportunity for the waste sector lies in the application of circular economy principles whereby municipal waste can be managed holistically to reduce the need for some waste infrastructure, especially landfills. The third pillar can transform informal settlements into neighbourhoods as the pathway for improved services.

Africa faces a critical turning point. The challenges to development are plentiful — including rising poverty, the pressures of rapid urbanization, and the climate crisis — but so are the opportunities. African cities have the opportunity to adopt low-emission, climate-resilient and equitable development pathways to respond to the climate crisis while simultaneously reducing poverty and inequality.

INTRODUCTION

For a city to establish good environmental health, support the well-being of its citizens, grow its economy and respond to climate-related risks, it needs to deliver a wide range of services. Infrastructure services can have multiple positive impacts and can influence the achievement of 92 per cent of the targets across all 17 SDGs.¹ Critical functions for urban infrastructure services include connecting (people, goods and services), protecting (people, ecosystems, assets and services from natural and man-made hazards), and providing (services that support the well-being and productivity of cities).²

In theory, the concentration of urban settlements should make it more economical and feasible to provide essential services. In practice, however, most African municipalities are unable to provide many essential services to their citizens due to poor governance, dysfunctional land administration systems, financial limitations and capacity constraints. Nevertheless, citizens can access provision via the informal economy, community managed infrastructure or the formal economy via public private partnerships. Different service delivery models are associated with various difficulties and opportunities. The informal economy, for example, enables access to services for a significant number of people, albeit often at low quality and high cost. To some extent, communities, through savings groups and international donor support, have demonstrated an ability to develop infrastructure that is then managed by the community and paid for through user fees.

Section 1 gives a broad overview of the challenges of delivering affordable, reliable and quality services to African citizens, especially those living in informal settlements. Section 2 presents urban infrastructure initiatives with different service delivery models that have improved access to services in African cities. This includes infrastructure that provides access to energy, clean water and sanitation, and waste services; infrastructure such as flood defences, sea walls, and natural and man-made drainage systems to protect against shocks, environmental risks and climate change impacts; and infrastructure such as access roads and digital services to connect people, goods and services.³ Section 3 includes a theory of change to leapfrog to more sustainable development with transformative strategies and approaches to scale up essential services. Finally, the recommendations include projects and programmes for integrated, cross-sectoral infrastructure planning and service delivery, as well as different infrastructure services.

¹ Thacker, Scott, et al., *Infrastructure: Underpinning Sustainable Development*, United Nations Office for Project Services, Copenhagen, 2018.

² Arup and the Rockefeller Foundation, 'City Resilience Index', 2018, <www.cityresilienceindex.org/#>, accessed 28 April 2022.

³ Transport in African cities is covered as a service in one of the other six papers.

SECTION 1

STATEMENT OF THE CHALLENGES

Unlike other developing regions in the world, urbanization has outpaced economic growth in Africa, resulting in the proliferation of informal settlements that lack basic services. Africa has the fastest urban growth rate in the world, and the urban population is expected to triple between 2014 and 2050.⁴ However, economic growth has not kept pace with rapid urbanization, and Africa's urban areas are relatively poorer with low levels of per capita GDP.⁵ This results in high levels of poverty and the proliferation of unplanned, informal settlements that are outside formal service-delivery territories. The number of people living in informal settlements in Africa has been growing steadily — from an estimated 128 million in 1995 to 255 million in 2018.⁶ Around 56.2 per cent of the urban population in sub-Saharan Africa resides in such areas without minimum standards of critical services —including power, water and sanitation — and is disproportionately vulnerable to environmental risks and hazards.⁷ Cities also face an escalating threat of youth unemployment as 10-12 million young Africans join the labour market each year.⁸

With 15 per cent of refugees in sub-Saharan Africa living in urban areas and a rapidly growing number of internally displaced persons (IDPs) in African cities, there are mounting challenges in accessing services when refugees and IDPs arrive in cities.⁹ Rates of urbanization are increasing among displaced populations on the continent despite a lack of formal assistance or protection. Refugees face many of the same challenges as the rest of the urban poor once they arrive in African cities. While cities can be safe spaces for many, they can also be quite dangerous for those who reside in neighborhoods where authorities are functionally absent and basic services (policing, running water, food security, sewerage, electricity, garbage collection, or walkable streets) are lacking. Given the overwhelming informality (and sometimes illegality) of urban refugee networks, the risks are significantly high for refugees and those who migrate into sub-Saharan Africa's cities. Many cities are willing to build communities

⁴ Heymans, Chris, et al., *Providing Water to Poor People in African Cities Effectively: Lessons from Utility Reforms*, World Bank, Washington, D.C., August 2016.

⁵ Lall, Somik V., J. V. Henderson and Anthony J. Venables, *Africa's Cities: Opening Doors to the World*, World Bank, Washington, D.C., February 2017.

⁶ UN-Habitat, 'Urban Population Living in Slums by Country or Area 1990-2018 (Thousands)', July 2021, <<https://data.unhabitat.org/pages/housing-slums-and-informal-settlements>>, accessed 28 April 2022.

⁷ United Nations Statistics Division, 'Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable', United Nations Department of Economic and Social Affairs, <<https://unstats.un.org/sdgs/report/2021/goal-11>>, accessed 28 April 2022.

⁸ African Development Bank Group, *Jobs for Youth in Africa: Improve the quality of life for the people of Africa*, AfDB Group, Busan, 2018.

⁹ Subulwa, Angela G., 'Urban Refugees', *The Wiley Blackwell Encyclopedia of Urban and Regional Studies*, edited by A. M. Orum, John Wiley & Sons, Ltd., 2019.

inclusive of displaced populations. However, lack of access to resources and inadequate national and international policy affect their ability to do so.

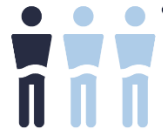
The lack of administrative and fiscal decentralization, small tax revenue base and inadequate capacity limit the ability of local governments to raise funds for urban infrastructure development. The investment needs for urban infrastructure in Africa are in the range of \$12.5-35 billion per year.¹⁰ This is far greater than what local African governments can provide, owing to insufficient transfer of national funds and fiscal decentralization. Further, the poverty of the people moving to cities results in a small tax revenue base and inadequate local revenue collection. The challenge is compounded by the fact that responsibility for key urban infrastructure services is often fragmented amongst large numbers of actors, including government and private sector, with overlapping or conflicting interests.

¹⁰ Godin, 2010, in Paulais, Thierry, *Financing Africa's Cities: The Imperative of Local Investment*, Africa Development Forum, World Bank, Washington, D.C., July 2012.

AFRICA HAS GROWING INFRASTRUCTURE NEEDS

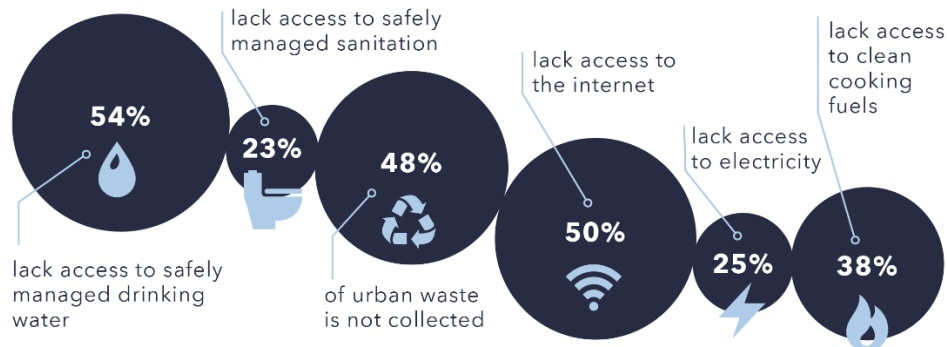


The number of informal settlers has doubled in the last 20 years

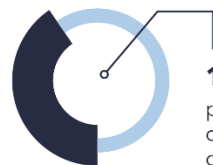


The urban population will triple between 2014 to 2050

MANY STILL LACK ACCESS TO ESSENTIAL SERVICES



THE LACK OF ESSENTIAL SERVICES CAN BE COSTLY



per year is lost in Africa due to premature deaths caused by air pollution

THERE IS A NEED TO INVEST IN AFRICAN ESSENTIAL SERVICES



USD 12.5 TO 35.0 B PER YEAR is needed to invest in urban infrastructure in Africa

INFOGRAPHIC DATA SOURCES:

1. Urban dwellers: United Nations Statistics Division
2. Informal settlers: UN-Habitat
3. Urban population: Heymans, Chris, et al., 'Providing Water to Poor People in African Cities Effectively: Lessons from Utility Reforms'
4. Water & sanitation: World Health Organization and the United Nations Children's Fund
5. Urban waste: United Nations Statistics Division
6. Internet: International Telecommunication Union
7. Electricity: International Energy Agency
8. Fuel: World Health Organization
9. GDP air pollution: African Development Bank
10. Investment: Godin, 2010, in Paulais, Thierry, 'Financing Africa's Cities: The Imperative of Local Investment'

Figure 1: Essential infrastructure service needs in Africa¹¹

World Health Organization and the United Nations Children's Fund, *Progress on household drinking water, sanitation and hygiene 2000–2020: Five years into the SDGs*, WHO and UNICEF, Geneva, 2021, pp. 30, 50.

While sustained access to electricity, piped water, waste disposal and sanitation has improved in historic city centres and formal areas in urban Africa over the years, peri-urban areas and informal settlements still have challenges to overcome. Access to services decreases rapidly as distance to the city centre increases, leaving peri-urban areas and informal settlements with limited access to basic services and in want of investments.¹² Urban form and expansion have a critical role to play in determining the coverage, cost and standard of service delivery. Infrastructure and basic services can be provided more efficiently and equitably where populations are large and densely packed because urban density has the potential to lower the unit costs of public service provision. Sprawling cities, including many African cities (such as Bamako and Conakry), currently have limited opportunities for densification and costlier delivery of urban services.

A significant proportion of the urban population in Africa lacks access to affordable, reliable and safe electricity. Around 25 per cent of households in African cities have no access to grid electricity, and while North Africa attained almost universal access to electricity in 2018, the rate of electrification in sub-Saharan Africa was only 45 per cent.¹³ Where electricity connection is available, it is often illegal, costly, unreliable or poor quality, thereby impacting safety, productivity and economic prosperity. The urban population in formal areas that have electricity connections frequently experiences outages and voltage fluctuations with costly and unreliable service. Meanwhile, a high proportion of residents in informal settlements either lack electricity connection or are connected illegally, and establishing a utility-customer relationship and billing channels can be difficult.¹⁴ In some instances, the state is usually unwilling or legally unable to provide infrastructure services.¹⁵ Further, only 38.2 per cent of urban dwellers in Africa

United Nations Statistics Division, 'Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable', United Nations Department of Economic and Social Affairs, <<https://unstats.un.org/sdgs/report/2019/goal-11>>, accessed 4 March 2022.

International Telecommunication Union, 'Measuring digital development: Facts and Figures 2021', ITU, 2021, <www.itu.int/itu-d/reports/statistics/facts-figures-2021>, accessed 4 March 2022.

International Energy Agency, *Africa Energy Outlook 2019*, IEA, Paris, November 2019.

World Health Organization, 'Proportion of population with primary reliance on clean fuels and technologies for cooking (%)'. <www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-phe-primary-reliance-on-clean-fuels-and-technologies-proportion>, accessed 4 March 2022.

African Development Bank, Organisation for Economic Co-operation and Development, and United Nations Development Programme, *African Economic Outlook 2016: Sustainable Cities and Structural Transformation*, OECD Publishing, Paris, 23 May 2016.

Godin, 2010, in Paulais, Thierry, *Financing Africa's Cities: The Imperative of Local Investment*, Africa Development Forum, World Bank, Washington, D.C., July 2012.

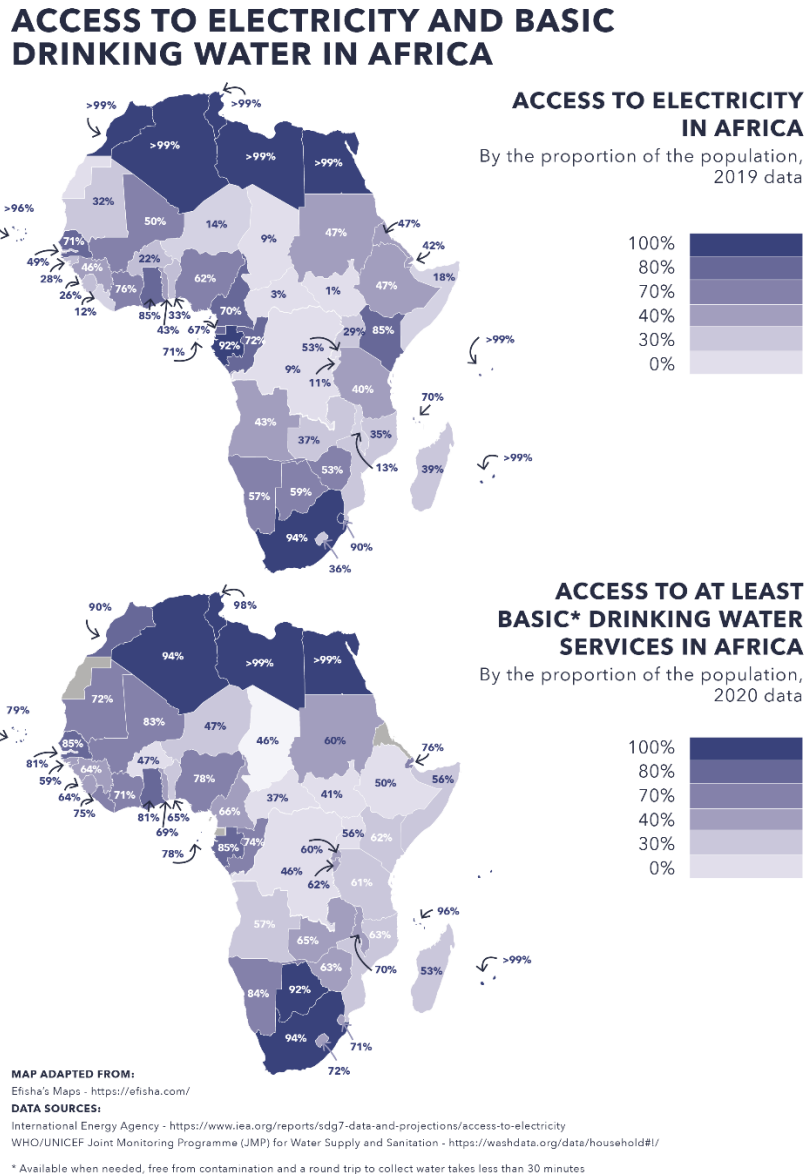
¹² Lall, Henderson and Venables, *Africa's Cities: Opening Doors to the World*, p. 54.

¹³ International Energy Agency, *Africa Energy Outlook 2019*, IEA, Paris, November 2019.

¹⁴ Odarno, Lily, 'Closing Sub-Saharan Africa's Electricity Access Gap: Why Cities Must Be Part of the Solution', World Resources Institute, 14 August 2019, <www.wri.org/insights/closing-sub-saharan-africas-electricity-access-gap-why-cities-must-be-part-solution>, accessed 4 March 2022.

¹⁵ Attia, Benjamin, and Rebekah Shirley, 'Living Under the Grid: 110 Million of Africa's Unconnected Customers Represent a Massive Opportunity', Greentech Media, 8 December 2017, <www.greentechmedia.com/articles/read/living-under-the-grid-110-million-of-africas-unconnected-customers-represen>, accessed 4 March 2022.

have access to clean cooking fuels, resulting in negative health impacts.¹⁶ Africa is the only region where the aggregate proportion of the population without access to electricity is estimated to increase after the COVID-19 pandemic.¹⁷



¹⁶ World Health Organization, 'Proportion of population with primary reliance on clean fuels and technologies for cooking (%)'. <www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-phe-primary-reliance-on-clean-fuels-and-technologies-proportion>, accessed 4 March 2022.

¹⁷ International Energy Agency, 'SDG7: Data and Projections, Access to electricity', IEA, Paris, 2022, <www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>, accessed 4 March 2022.

Figure 2: Access to electricity and basic drinking water in Africa

Low-income households and informal settlements often lack water piped to their premises, and women and girls disproportionately bear the burden of inadequate water supply. In sub-Saharan Africa, only 54 per cent of urban residents had access to safely managed drinking water in 2020.¹⁸ Further, as women and girls are responsible for water collection in over 70 per cent of sub-Saharan households without access to water on premises, they are disproportionately affected by the shortages.¹⁹ The time they spend collecting water increases their time poverty. Moreover, rapid urbanization exacerbates existing inequalities in access to urban water between poor and rich households in many African cities.

Access to safely managed sanitation for sub-Saharan Africa's urban population is at 23 per cent,²⁰ and this deficit perpetuates poverty and social marginalization. Kibera, an informal settlement in Kenya with one toilet for every 2,500 residents, exemplifies the sanitation crisis across the region. The shortfall of sanitation costs the country an estimated \$324 million a year in lost work hours due to sickness.²¹ In Khayelitsha, an informal settlement in South Africa, an average of 635 sexual assaults on women travelling to and from temporary toilets were reported every year between 2002 and 2013. Aside from causing emotional and physical trauma, this also results in an estimated assault-related social cost of \$34 million.²²

¹⁸ World Health Organization and the United Nations Children's Fund, *Progress on household drinking water, sanitation and hygiene 2000–2020: Five years into the SDGs*, WHO and UNICEF, Geneva, 2021, pp. 30, 50.

¹⁹ United Nations Entity for Gender Equality and the Empowerment of Women, 'Turning Promises Into Action: Gender Equality in the 2030 Agenda for Sustainable Development', Sub-Saharan Africa fact sheet, UN Women, 2018, p. 4.

²⁰ WHO and UNICEF, *Progress on household drinking water, sanitation and hygiene 2000–2020*, p. 50.

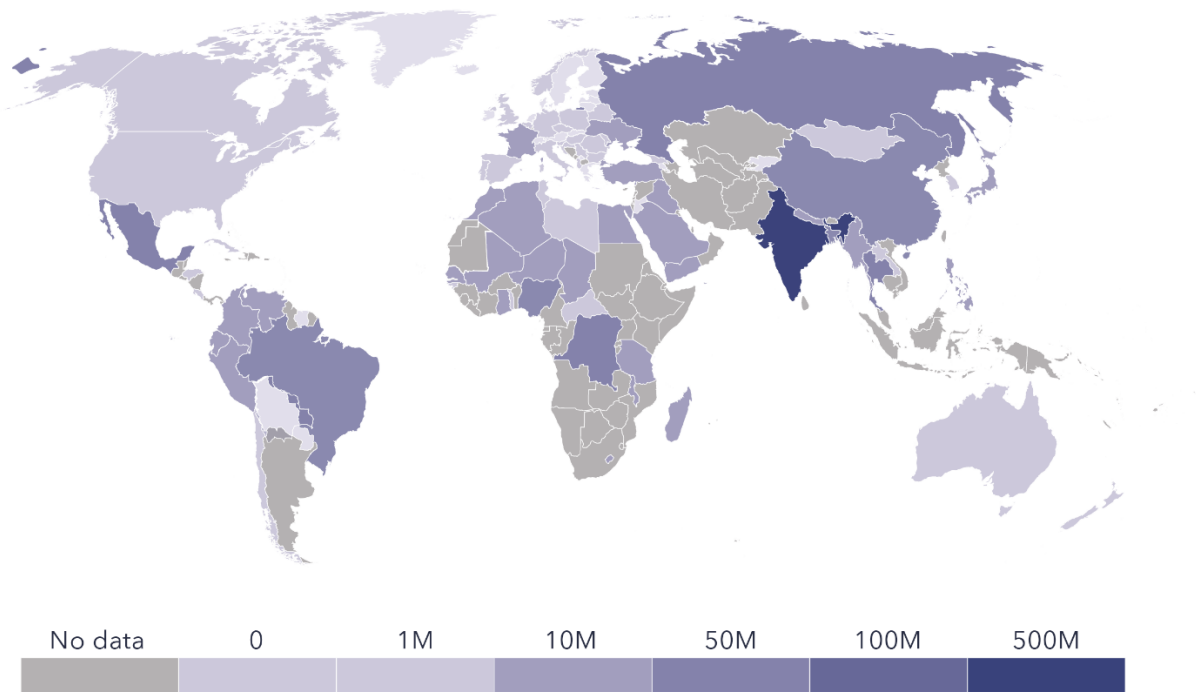
²¹ Kushner, J., 'From Human Waste To Community Space', Umande Trust, 2016, <<http://umande.org/From-Human-Waste-To-Community-Space>>, accessed 4 March 2022.

²² Gonsalves, Gregg S., Edward H. Kaplan and A. David Paltiel, 'Reducing Sexual Violence By Increasing The Supply Of Toilets In Khayelitsha, South Africa: A Mathematical Model', *PLOS ONE*, vol. 10, no. 4, 29 April 2015.

ACCESS TO SAFELY MANAGED SANITATION IN AFRICAN COUNTRIES IS LOW

NUMBER OF PEOPLE WITHOUT ACCESS TO SAFELY MANAGED SANITATION, 2020

Safely managed sanitation is improved facilities which are not shared with other households and where excreta are safely disposed in situ or transported and treated off-site.



MAP ADAPTED FROM:
Our World In Data - <https://ourworldindata.org/sanitation>
DATA SOURCE:
WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation - <https://washdata.org/data/household#!/>

Figure 3: Access to safely managed sanitation in African countries is low²³

Municipal waste collection, disposal and management are lagging in cities, leading to detrimental environmental and health impacts. Between 2010 and 2018, only 52.2 per cent and 75.1 per cent of the municipal solid waste was collected in sub-Saharan Africa

²³ Ritchie, Hannah, and Max Roser, 'Sanitation', Our World in Data, September 2019, <<https://ourworldindata.org/sanitation>>, accessed 4 March 2022.

and Northern Africa respectively.²⁴ While this represents a gap in collection, the waste that does get collected is often not disposed of properly and ends up in uncontrolled dumpsites and landfills or is burned openly. This causes air, water and soil pollution, diseases and emissions of greenhouse gases like methane. Additionally, hazardous waste moved from wealthier countries and dumped illegally in Africa can harm health and well-being in cities like Koko, Lagos, Accra and Abidjan.²⁵

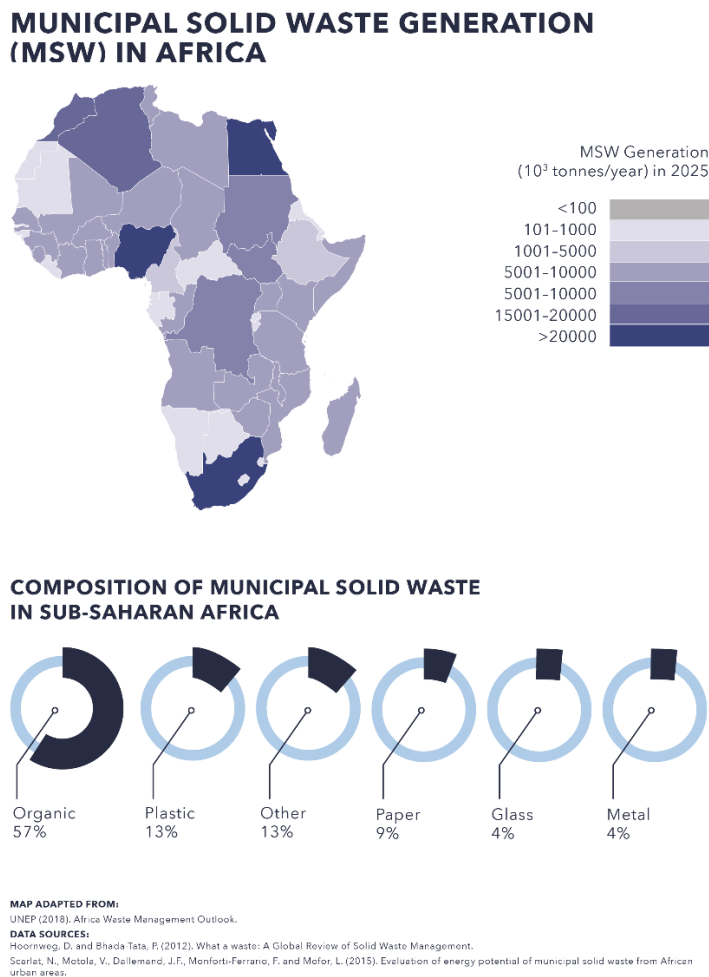


Figure 4: Projected municipal solid waste (MSW) generation in Africa in 2025. / MSW composition in Africa in 2012 ²⁶

²⁴ United Nations Statistics Division, 'Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable', United Nations Department of Economic and Social Affairs, <<https://unstats.un.org/sdgs/report/2019/goal-11>>, accessed 4 March 2022.

²⁵ Andersen, Inger, 'Africa must tell the rest of the world that we are not their dumping ground', Mail & Guardian, 13 February 2020, <<https://mg.co.za/article/2020-02-13-africa-must-tell-the-rest-of-the-world-that-we-are-not-their-dumping-ground>>, accessed 4 March 2022.

²⁶ United Nations Environment Programme, *Africa Waste Management Outlook*, UNEP, Nairobi, 2018.

In the absence of adequate, well-maintained protective infrastructure and drainage systems, climate change events such as floods, droughts, sea level rise and heatwaves have already severely affected urban populations and will continue to do so. The projected temperature increases of 1.5-3 degrees by 2050 may lead to many African countries being poorer in 2100 than today,²⁷ since external shocks and hazards disproportionately affect the urban poor. Research shows that 84 out of the 100 fastest-growing cities globally are at extreme risk due to a warming planet, and this includes 79 in Africa.²⁸ Rising sea levels affect about 30 million Africans living within the flood hazard zone around the Atlantic and Indian Ocean.²⁹ Low adaptive capacity, blockage of watercourses and drainage systems, and poor solid waste management amplify this population's vulnerability. Droughts will significantly affect urban water supply, posing a major threat to public health.

Air pollution is a growing environmental problem that adversely affects public health, and projected urban growth is likely to increase future emissions. Indoor air pollution is the primary cause of respiratory illness among children and women in Africa's informal settlements and overall, air pollution cost Africa one-third of its GDP in 2013, considering the economic costs of premature deaths.³⁰ In primary cities (such as Nairobi, Accra and Lagos), traffic congestion on poorly planned and maintained roads, coupled with a growing number of vehicles, exacerbates air pollution. While Africa's current contribution to global carbon emissions is low at 3%,³¹ as cities grow, so will air pollution and carbon emissions.

Failure to plan and manage public and green space in African cities is a missed opportunity, as they can provide protection and unlock a range of socio-economic benefits. Green spaces occupy a very small percentage of the total land area in many African cities. For example, the rate is less than 10 per cent in several towns in South Africa, less than 3 per cent in Lagos and 10.7 per cent (including green and other open spaces) in Kumasi.³² This is much lower than the accepted minimum standard of 15 per cent³³ required to maintain well-being, improve mental health and mitigate urban heat island effect. As cities expand, a significant land conversion will likely occur in biodiversity hotspots over the coming decades if expansion is left unchecked, resulting in large-scale

²⁷ Burke, Marshall, Solomon M. Hsiang and Edward Miguel, 'Global non-linear effect of temperature on economic production', *Nature*, vol. 527, 21 October 2015, pp. 235–239.

²⁸ Rowling, Megan, 'Fast-growing African cities at 'extreme risk' from climate change - analysts', Reuters, 14 November 2018, <www.reuters.com/article/instant-article/idUKL8N1XN5MP>, accessed 4 March 2022.

²⁹ Global Center on Adaptation, *State and Trends in Adaptation Report 2021: Africa*, GCA, 25 October 2021.

³⁰ African Development Bank, Organisation for Economic Co-operation and Development, and United Nations Development Programme, *African Economic Outlook 2016: Sustainable Cities and Structural Transformation*, OECD Publishing, Paris, 23 May 2016.

³¹ Global Carbon Project, 'Supplemental data of Global Carbon Budget 2021 (Version 1.0)', Integrated Carbon Observation System, 2021, <<https://doi.org/10.18160/gcp-2021>>, accessed 4 March 2022.

³² Mensah, Collins Adjei, 'Urban Green Spaces in Africa: Nature and Challenges', *International Journal of Ecosystem*, vol. 4, no. 1, 2014, pp. 1-11.

³³ AfDB, OECD, and UNDP, *African Economic Outlook 2016*, p. 176.

environmental depletion. Weak land use planning systems and enforcement can result in encroachment of ecologically sensitive areas and urban green spaces that are necessary for carbon sequestration and flood risk management.

Despite fragmented successes in digital innovation, there is a digital divide between different parts of the population. In 2020, only 50 per cent of individuals in urban Africa had access to the internet due to the high cost of connecting broadband services.³⁴ Only 5 per cent and 20 per cent of secondary cities lie within 10 kilometres of the high-speed terrestrial fibre-optic network in Central and West Africa respectively.³⁵ This impedes connectivity and the ability to leverage digital technology to attain prosperity. It also limits cities' competitiveness to attract private sector investment and foreign direct investment that can help nurture innovation and create jobs.

The lack of proper access streets in Africa's informal settlements hinders last mile connectivity to city services. Inadequate right-of-way of access streets creates a challenge to the provision of infrastructure, including storm water drains, street lights, water, electricity and sewerage, which are best provided along paved roads and footpaths. In Moyiba, an informal settlement in Freetown, Sierra Leone, walking is a key mode of transport. However, only 11 per cent of the walking routes mapped for analysis are paved, and are exposed to mudslides, potholes and open electrical wires.³⁶

With multiple actors providing services in African cities, there are challenges and opportunities related to different service delivery models. While the informal sector makes a substantial contribution, its unregulated nature can make services unaffordable. In Kampala, for example, households in informal settlements paid for water sourced from standpipes and natural sources distributed by private vendors at three times the price of piped water.³⁷ There is a lack of private sector investment and public-private partnerships (PPPs) in infrastructure due to a perception of high risk (operations, political, construction, finance), poor enabling environment (sector policy and reform measures, legislation, and institutional capacity to manage the PPP cycle), and the difficulty of getting the business case right.³⁸

³⁴ International Telecommunication Union, 'Measuring digital development: Facts and Figures 2021', ITU, 2021, <www.itu.int/itu-d/reports/statistics/facts-figures-2021>, accessed 4 March 2022.

³⁵ African Union Commission and Organisation for Economic Co-operation and Development, 'Overview: Priorities to make digitalisation work for all in Africa', *Africa's Development Dynamics 2021: Digital Transformation for Quality Jobs*, AUC and OECD Publishing, Addis Ababa and Paris, 19 January 2021.

³⁶ Oviedo, Daniel, et al., 'Walking off the beaten path: Everyday walking environment and practices in informal settlements in Freetown', *Research in Transportation Business & Management*, vol. 40, September 2021.

³⁷ Beard, Victoria A., and Diana Mitlin, 'Water access in global South cities: The challenges of intermittency and affordability', *World Development*, vol. 147, November 2021.

³⁸ Menzies, Iain, *Delivering Universal and Sustainable Water Services: Partnering with the Private Sector*, Water and Sanitation Program Guidance Note, World Bank, Washington, D.C., 31 March 2016.

DELAYED DEVELOPMENT PATHWAY

BUSINESS AS USUAL: AFRICAN URBANIZATION OUTPACES ECONOMIC GROWTH

Constrained pathway with delayed development

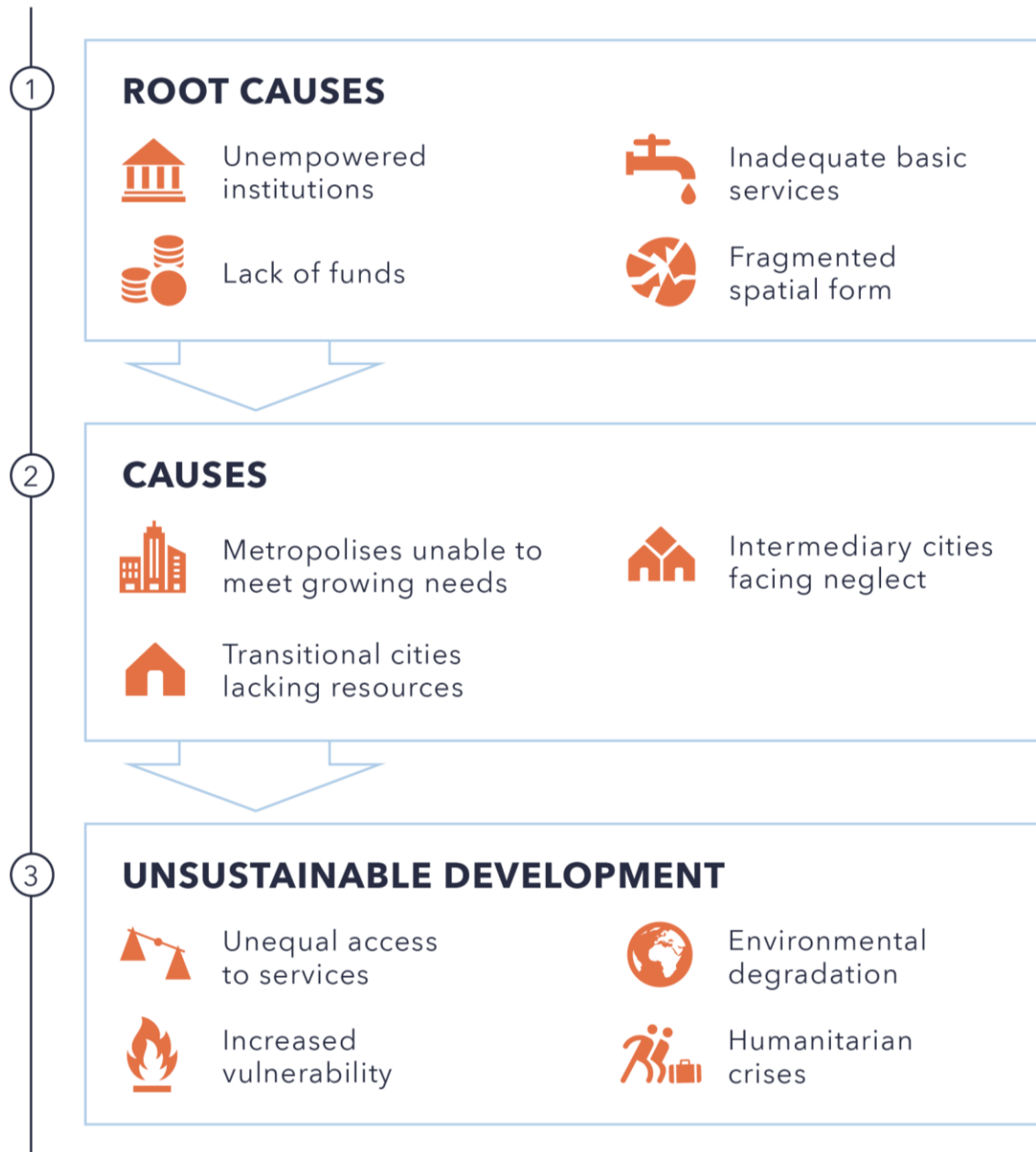


Figure 5: African urbanization outpaces economic growth

SECTION 2

SUCCESSFUL INITIATIVES IN AFRICAN CITIES

African cities are implementing different initiatives with a variety of service delivery approaches. This section identifies different service delivery models and approaches that have worked in African cities to improve access to services. The first subsection recognizes the multitude of actors working to provide services, including local governments, private sector organizations, community-based organizations and unregulated businesses. It explores the different roles these actors can play across various service delivery models. The second subsection explores successful initiatives for urban infrastructure that connects (people, goods and services), protects (people, ecosystems, assets and services from natural and man-made hazards), and provides (supplying resources and services that support well-being in cities).

2.1 Service delivery models and approaches in African cities

The diversity of governance actors and agendas complicates urban service delivery in African cities, but it is also an opportunity to leverage various skills and resources by adopting appropriate collaborative urban service delivery models.

Key actors in urban governance and service delivery models in African cities include all levels of government, political parties, traditional leaders, universities, large private sector organizations, informal businesses, international agencies and civil society organizations. Hybrid service delivery, with the inclusion of different actors, has filled gaps, exploited overlaps, and provided alternatives where centralized systems fall short in African cities. However, states have resisted accounting for hybrid models, generally regarding them as unmodern and aiming to regulate rather than support their development.³⁹

Facilitating engagement and collaboration between different actors can address urban service delivery challenges in Africa. Collaboration for PPPs comprising different stakeholders is an untapped opportunity. Informal service providers represent a critical (but poorly leveraged) component of service delivery to some of urban Africa's poorest citizens. Technologically or institutionally innovative means of providing urban services are emerging from private and civic actors. In many African cities, partnerships with these players can provide a better financial and governance fit than mega-projects. National and local governments need to facilitate the scaling and integration of these services into formal systems if they are to underpin sustainable growth.⁴⁰

³⁹ Cirolia, Liza Rose, 'Fractured fiscal authority and fragmented infrastructures: Financing sustainable urban development in Sub-Saharan Africa', *Habitat International*, vol. 104, October 2020.

⁴⁰ Cartwright, Anton, et al., *Developing Prosperous and Inclusive Cities in Africa - National Urban Policies to the Rescue?* Working paper, Coalition for Urban Transitions, London and Washington, D.C., 2018.

This section illustrates the responsibilities of key stakeholders in the following service delivery models: the role of government, formal private sector or PPPs, community-based infrastructure approaches and the role of the informal sector.

SERVICE DELIVERY MODELS

The service delivery models discussed here include delivery through approaches and actors:

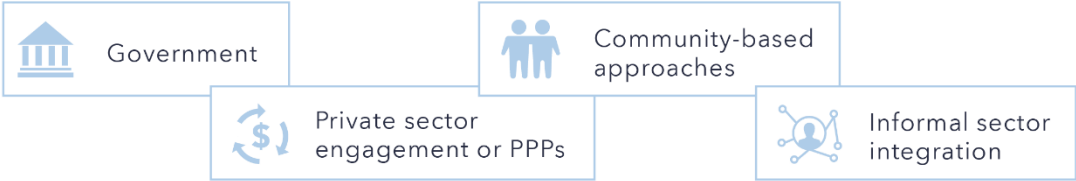


Figure 6: Service delivery models

2.1.1 Formal - government



Governments play a key role in enabling service delivery to urban residents supplied by state-provided services as well as people living outside those formal areas.

Efficient service delivery is a result of good planning and implementation of high-impact projects that leverage expertise and resources from diverse actors. Infrastructure planning is a critical function allowing municipal governments to identify priority projects. They create a project financing pipeline for preparation and implementation to build socio-economic infrastructure that boosts municipal revenues. Strengthening the evidence base and institutional capacity and clearly delineating responsibilities for long-term planning can help local governments respond better to development needs. A whole life cycle approach should be promoted, with maintenance of existing infrastructure prioritized over new projects to improve performance and build resilience. Governments are the primary financiers and implementers for infrastructure services such as drainage, as they are largely non-revenue generating services. Similarly, the government can regulate the quality and affordability of the energy sector and create the enabling environment for private sector actors (at multiple scales) to collaborate. For example, recently, the South African government liberalized the energy sector by raising the limit on self-generation of power from 1 MW to 100 MW.⁴¹ Finally, for municipal waste management, local governments can develop and enforce regulations and incentives for waste reuse, recycling and recovery. They can also regulate and control illegal dumping of solid waste from developed economies in African cities.

⁴¹ McLeod, Duncan, 'Private companies can now produce 100MW of electricity', TechCentral, 10 June 2021, <<https://techcentral.co.za/private-companies-can-now-produce-100mw-of-electricity/108001>>, accessed 4 March 2022.

2.1.2 Formal - private sector engagement or PPPs



PPPs in sub-Saharan Africa have untapped potential, with projects concentrated in a few countries — South Africa, Nigeria, Kenya and Uganda.

Between 2012-2017, PPP infrastructure projects in sub-Saharan Africa were concentrated in the energy sector (78 per cent) — mostly renewables — followed by transport (22 per cent) and water and sanitation (0.5 per cent).⁴² In 2018, private sector investment comprised 12 per cent of the \$101 billion financial commitments to African infrastructure.⁴³ Engaging the private sector through the PPP mode can help mobilize capital to build, operate and maintain infrastructure given limited public funds. It can introduce innovation and technology transfer from the private sector, improve efficiency of project delivery, and provide funds for long-term asset maintenance through revenue collection to ensure financial sustainability over the asset life cycle. For the waste sector, private investment through the PPP mode can facilitate waste recycling and recovery. Beyond investments, projects can leverage private sector management skills, technical expertise and efficiencies when handled through models such as the lease or affermage arrangements and management contracts.

Robust regulatory and institutional frameworks are needed to attract private finance for infrastructure projects. The success of PPP in the water sector hinges on strong political support and a long-term commitment from partners.⁴⁴ The challenge is that the region performs below the global average in each of the four PPP thematic coverage areas — project preparation, procurement, unsolicited proposals and contract management. To scale up urban infrastructure development and fill the financing gap, local governments should increase the private sector's involvement to unlock investments, especially in the energy and ICT sectors. The emergence of independent power providers across sub-Saharan Africa is an enormous opportunity to leverage private sector investment.⁴⁵

⁴² World Bank, *Africa's Pulse: An Analysis of Issues Shaping Africa's Economic Future*, no. 15, World Bank, Washington, D.C., April 2017.

⁴³ Organisation for Economic Co-operation and Development and African Center for Economic Transformation, *Quality Infrastructure in 21st Century Africa: Prioritising, Accelerating and Scaling up in the Context of Pida (2021-30)*, OECD and ACET, 2020, p. 21.

⁴⁴ World Bank Group and Water and Sanitation Program, *Water PPPs in Africa 2014*, World Bank and WSP, 1 January 2014.

⁴⁵ Eberhard, Anton, Katharine Gratwick, Elvira Morella, and Pedro Antmann, 'Independent Power Projects in Sub-Saharan Africa: Investment trends and policy lessons', *Energy Policy*, vol. 108, September 2017, pp. 390-424.

2.1.3 Community-based approaches



Community-based infrastructure is developed through community-led and non-government-funded initiatives, depending on residents' needs and aspirations.

This model is a low-cost approach wherein community-based groups and NGOs can fill the gap in infrastructure provision in areas lacking planned government programs.⁴⁶ They address the community's real needs and can improve well-being, particularly for the poor, for whom they can provide employment and skill building opportunities.

Initiatives across Africa are working to disburse funds to support community priorities. An example is the Devolved Climate Finance Alliance, which supports resilience building in Kenya, Mali, Senegal and Tanzania.⁴⁷ Improved access to finance for small-scale water and sanitation service providers (both community-based organizations and the private sector),⁴⁸ such as community water kiosks and private pit latrine emptiers, can help scale and improve service provision, as they offer essential services to urban poor populations.⁴⁹ However, community-based services can become less effective in communities and contexts with low resource availability and capacity. Therefore, for long-term sustainability, this model requires support from and partnerships with government, the private sector and other actors, along with capacity development at community levels.

2.1.4 Informal sector integration



The informal sector — comprising small-scale, informal enterprises — plays a significant role in service delivery and employment generation in African cities.

It provides an estimated 66 per cent of total employment to the urban poor in sub-Saharan Africa.⁵⁰ Given the size and contribution of the informal sector and enterprises to employment, governments need to recognize and engage with them for service delivery.

⁴⁶ Smit, Warren, 'Urban Governance in Africa: An Overview', *International Development Policy | Revue internationale de politique de développement*, vol. 10, 1 October 2018, pp. 55–77.

⁴⁷ Crick, Florence, 'Local climate finance mechanism helping to fund community-prioritised adaptation', International Institute for Environment and Development, <www.iiied.org/local-climate-finance-mechanism-helping-fund-community-prioritised-adaptation>, accessed 4 March 2022.

⁴⁸ Mehta, Meera, and Kameel Virjee, *Financing Small Water Supply and Sanitation Service Providers: Exploring the Microfinance Option in Sub-Saharan Africa*, Water and Sanitation Program, December 2003.

⁴⁹ Van den Berg, Rogier, Betsy Otto and Aklilu Fikresilassie, 'As Cities Grow Across Africa, They Must Plan for Water Security', World Resources Institute, 11 May 2021, <www.wri.org/insights/cities-grow-across-africa-they-must-plan-water-security>, accessed 8 June 2021.

⁵⁰ Kathage, Angus Morgan, 'Understanding the informal economy in African cities: Recent evidence from Greater Kampala', World Bank Blogs, 14 March 2018, <<https://blogs.worldbank.org/african/understanding-the-informal-economy-in-african-cities-recent-evidence-from-greater-kampala>>, accessed 4 March 2022.

Investors and planners should focus future investments on integrating the informal sector into the formal service delivery process.⁵¹

Arising from increasing demand, non-existent or inadequate government provision, and persistent water shortages, the informal sector fills much of the gap in service delivery. Fragmented networks in African cities have created complex, accidental hybrid service delivery systems that involve diverse actors and arrangements.⁵² Bulk, centralized water and energy infrastructures seldom supply informal settlements, as distribution to these areas requires micro-extensions and improvisation. Many urban agglomerations have been termed ‘pirate cities’,⁵³ in which people must rely on pirate operators, such as mobile water vendors or illegal electricity connections, in the absence of state provision.

With strong regulatory, institutional and legal frameworks, the informal sector’s involvement can provide adequate and sustainable basic services. When considering service delivery through the informal sector, the technical complexity of projects and the informal sector’s capacity are key considerations. For example, power sector projects should not be delivered through the informal economy due to their technical complexity and potential fire risk. The informal sector can play a key role in waste management through household waste collection. AfDB is promoting city-wide inclusive sanitation — a hybrid approach to address issues across the sanitation value chain — for urban sanitation systems to be safe, equitable and sustainable.⁵⁴

2.2 Successful infrastructure initiatives in African cities

Infrastructure that provides access to energy, clean water, sanitation and waste services is the foundation for a healthy, environmentally sustainable and inclusive city. Infrastructures such as flood defences, sea walls, and natural and man-made drainage systems protect against shocks, environmental risks and climate change impacts and are the baseline for a resilient city. Infrastructures such as access roads and digital services connect people, goods and services that enable equitable economic and social opportunities and have vital functions during emergencies such as pandemics or floods. African cities are successfully adopting initiatives for urban infrastructure services. This section showcases some approaches that are replicable and scalable in similar contexts for service provision, protection and connection.

⁵¹ Cartwright et al., ‘Developing Prosperous and Inclusive Cities in Africa’.

⁵² Cirolia, ‘Fractured fiscal authority and fragmented infrastructures’.

⁵³ Simone, AbdouMaliq, ‘Pirate Towns: Reworking Social and Symbolic Infrastructures in Johannesburg and Douala’, *Urban Studies*, vol. 43, no. 2, 1 February 2006, pp. 357–370; Resnick, Danielle, ‘Urban Governance and Service Delivery in African Cities: The Role of Politics and Policies’, *Development Policy Review*, vol. 32, 6 June 2014, pp. 3–17.

⁵⁴ International Water Association, *A Call to Action: Regulating for Citywide Inclusive Sanitation*, IWA, 2021.

2.2.1 Service provision in cities

- Access to energy



mini grids



rooftops PVs



solar street lights



green buildings



energy entrepreneurs

Access to energy can be improved with renewable energy-based solutions that lower carbon emissions, meet the increasing urban energy demand, build climate resilience and improve air quality. This is untapped potential. With a few exceptions, cities in sub-Saharan Africa have not competed for the \$286 billion that was invested in renewable energy and fuels globally in 2015. [Case study: Private sector engagement in renewable off-grids in Kenya, Tanzania and Uganda](#)

Solar mini-grid or off-grid solutions — These are effective as standalone solutions as they can be installed easily, are cost-effective and accrue social and environmental benefits by increasing energy access and lowering emissions. Off-grid solutions work well where connection to the main grid is capital-intensive and resource mobilization is a challenge. Innovative delivery and financing models have emerged due to the decrease in technology costs. In East Africa (especially Kenya), smaller systems, such as solar lights, are deployed based on direct cash sales and larger systems have been deployed through lease-to-own or fee-for-service approaches.⁵⁵ *Private operators* can run the mini-grids and collect a tariff to finance operations and ensure the long-term accessibility and affordability of energy services. While this approach is useful to provide energy access in the urban context, especially in informal settlements, land availability for the installation of solar panels and tenure security are key considerations. The operation of mini-grids still faces a series of challenges due to the lack of appropriate local partners, technical and financial deficits, weak legal and policy frameworks and poor enabling environments. To date, only a few examples of functional mini-grid projects have moved beyond the installation stage into sustainable operations in Africa.⁵⁶ [Case study: Mini-grids in Tanzania, Senegal and Kenya](#)

Rooftop photovoltaic systems — Installing solar power generating systems on public facilities and rooftops requires a life cycle approach and resources to operate and maintain them effectively in the long term. Batteries need to be replaced after 5-15 years, but poor planning, lack of maintenance budgets or both often lead to breakdowns. In 2015, 1.13 million small-scale solar lighting systems were sold in sub-

⁵⁵ International Renewable Energy Agency, *Future of Solar Photovoltaic: Deployment, investment, technology, grid integration and socio-economic aspects*, A Global Energy Transformation: paper, IRENA, Abu Dhabi, November 2019.

⁵⁶ Peters, Jörg, Maximiliane Sievert and Michael A. Toman, 'Rural electrification through mini-grids: Challenges ahead', *Energy Policy*, vol. 132, September 2019, pp. 27–31.

Saharan Africa, offering users new opportunities to generate and distribute their own electricity.⁵⁷

Solar powered street lighting — Solar street lighting can minimize installation and operation costs, lower crime rates, improve road safety, reduce electricity consumption from street lighting and ensure trading continues beyond daylight hours. Across sub-Saharan Africa, solar-powered LED street lights can reduce installation costs by 25 per cent, electricity consumption by 40 per cent and maintenance costs by 60 per cent compared to conventional grid-based lighting. While urban solar street lighting installation is a good solution, the lights often malfunction due to lack of maintenance, dust, battery issues, and lack of protection against battery and panel theft. It is also important to consider the whole life cycle of the input material to prevent solar waste in the future. [Case study: Solar street lights in Jinja, Kampala, Freetown, Dakar](#)



Solar street lights in Kampala, Uganda. © Shutterstock/George_TheGiwi

Green buildings — Energy efficient buildings present a valuable opportunity to reduce emissions since residential buildings are the second largest energy consumer in many African cities.⁵⁸ Designing new energy efficient buildings and retrofitting existing ones to reduce energy requirements are effective demand management measures.⁵⁹ Passive design, installation of roof lights and energy efficient lights, appropriate material use and insulation can improve the thermal efficiency of new and existing buildings and have a major impact on their future energy requirements.

⁵⁷ Cartwright et al., 'Developing Prosperous and Inclusive Cities in Africa'.

⁵⁸ Strydom, Adel, 'Africa leads the way in green buildings – a key enabler for renewables on the continent', ICLEI – Local Governments for Sustainability, 5 February 2020, <<https://talkofthecities.iclei.org/africa-leads-the-way-in-green-buildings-a-key-enabler-for-renewables-on-the-continent>>, accessed 4 March 2022.

⁵⁹ Rode, Philipp, Ricky Burdett and Joana Carla Soares Gonçalves, 'Buildings: investing in energy and resource efficiency', *Towards a green economy: pathways to sustainable development and poverty eradication*, United Nations Environment Programme, 2011, p. 353.

African *city governments* are developing green building guidelines, codes and by-laws to set certain legal requirements for building efficiency that reduce energy demand and negative environmental impact. [Case study: Solar home systems, Kenya](#); [Case study: Green building guidelines in KwaDukuza Municipality South Africa](#)

Energy entrepreneur model — The energy entrepreneur (EEs) model is perhaps the most effective in providing energy solutions for communities. EEs are reliable, self-dependent and enterprising individuals chosen from various *communities* by solar solution distributors with the help of recognized financial institutions. They have the mandate of carrying out promotional and marketing activities, installation, customer education and after sales services for people at the grassroots. This model works with various stakeholders, with each playing a key role in establishing and managing the network of EEs. This model includes the solar distributor, the EEs and financial institutions. [Case study: Energy entrepreneur model in Ethiopia and Cameroon](#)

- **Access to clean water**



PPPs



legislation



management

Water is supplied in African cities through public-private partnerships, community public partnerships, management by local autonomous urban water utilities, and community self-help systems. There are also capital-intensive projects like dams, centralized piped systems and aqueducts. Engaging the *private sector* to expand access to drinking water has been successful in some cities in Africa. [Case study: Urban water supply expansion project, Ghana](#); [Case study: Administrative reforms engaging the private sector, Uganda](#); [Case study: Administrative reforms engaging the private sector, Ouagadougou](#).

Blended financed PPP programs wherein development finance institutions can fund the forwarding infrastructure from concessional loans have the potential to improve water supply. With the blended teams of *government, sponsor and financier*, PPPs can help leverage diverse experience, expertise and tenacity to create basic service of significant value. [Case study: Kigali Bulk water supply project](#)

Legislation for water use and technology is a key instrument to safeguard the provision of drinking water to citizens. New technologies make effective and inclusive tariff-setting easier. This can be promoted through *government-enforced* legislation. An example is installing electronic flow-limiters to regulate the provision of free water to poor households. [Case study: Legislative framework and technologies for access to water, South Africa](#); [Case study: Innovative billing system with mobile payments for low-income users, Nairobi](#)

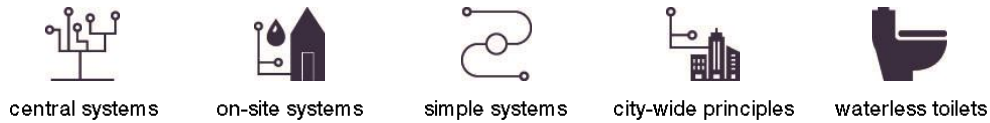


Mobile payments are used to pay for water bills in Nairobi. © Bloomberg/Getty/Trevor Snapp

Integrating management of water resources and land, protection of boreholes, and nature-based solutions are critical to maintaining the quality of drinking water. *Multi-level government agencies* investing in upstream measures to manage water sources is a cost-effective solution that mitigates pollution at the source. Coordinating land use planning with the management of natural resources, including water resources and water supply, is essential. For example, Swakopmund, Namibia, a city of 42,000 surrounded by environmentally sensitive areas, limits development to zoned 'townlands' and has protected watersheds with integrated environmental, sector and land use planning.⁶⁰ Projects improving access to water should invest in distribution networks and address water pollution. [Case study: Lake Victoria Basin Resource Efficiency and Cleaner Production \(LVB-RECP\)](#)

⁶⁰ Lall, Henderson and Venables, *Africa's Cities: Opening Doors to the World*, p. 31.

- **Access to sanitation**



Sanitation initiatives fall within two classes in Africa — centralized and decentralized systems. The *government-led* centralized system involves the transfer of sewage from different households to a central waste water treatment plant through a pipeline network system. It is mostly common in developed countries or cities but is prohibitively expensive for cities in developing countries. Where this system is available in cities of developing countries (e.g., Abuja and Kinshasa), it does not cover the whole city.⁶¹ It is critical to sustainably manage rivers and other water bodies by reducing pollution through sewerage infrastructure development. [Case study: Nairobi Rivers Basin Rehabilitation and Restoration Program - Sewerage Improvement Project](#)

In decentralized systems, sewage is collected, treated and reused or disposed of at or near the collection point — for example, via on-site sanitation systems. This arrangement accounts for 60-100 per cent of sanitation systems in most African cities and can be in the form of simple traditional latrines, pit latrines (with slab, ventilated private septic tanks, sewers, self-provisioned drains, composting toilets, hanging toilets, buckets and Ventilated Improved Pit latrines).⁶² [Case study: Latrines for all in Togo Sokodé City](#)



⁶¹ Nansubuga, Irene, et al., 'A review of sustainable sanitation systems in Africa', *Reviews in Environmental Science and Bio-Technology*, vol. 15, 13 May 2016, pp. 465–478.

⁶² Satterthwaite, David, et al., *Untreated and Unsafe: Solving the Urban Sanitation Crisis in the Global South*, Working paper, World Resources Institute, Washington D.C., 18 December 2019.

The alternative sewerage system (for example, simplified sewer system) is widely viewed as a cost-effective option that is flexible in location and layout for urban sanitation planning, especially for informal settlements. Simplified sewer systems have relaxed design codes and good design principles, with the use of small sewer pipes laid at shallower depth, reduced water needs and manholes replaced by inspection chambers. They can be built and repaired with locally available materials, and their construction can provide short-term employment to local labourers. [Case study: Simplified Sewer System in Dar es Salaam](#)

The AfDB is facilitating the development of the African Urban Sanitation Investment Fund to build a pipeline of projects adopting city-wide inclusive sanitation (CWIS) principles. At least 30 per cent of the funds will be targeted towards financing non-sewered sanitation innovation that directly serves low-income communities. CWIS has many benefits. Firstly, it offers holistic solutions to provide equitable sanitation services, drive innovation, and organize finances for sustained service delivery outcomes. Secondly, it allows safe handling of human waste along the sanitation service chain, from toilet to treatment, ensuring that waste is managed for resource recovery and reuse. Finally, it allows authorities to demonstrate political will. Unless the sanitation service chain is approached holistically, all other investments will not achieve the intended public health and environmental impacts.⁶³

Creating markets for service delivery with waterless toilets — Sewerage social enterprises in many low-income communities can serve poor households, sometimes through off-grid solutions. Millions of people at the bottom of the pyramid live in communities that are not connected to the sewerage system. Most of them use pit latrines or engage in open defecation. To address the problem, dozens of *social enterprises* have devised innovative toilets that require no water. These low-cost in-home or community-based units represent a huge improvement over makeshift sanitation solutions and create jobs for people who install and service them. The business model usually involves a mix of *private companies, NGOs, local entrepreneurs, and often, local government agencies*. Under a typical serviced toilet model, the firm supplies and installs the toilet and evacuates and often processes the waste. Local franchisees or operators usually service community toilets, keep them clean, collect fees, and sell other services at the toilet site.⁶⁴ [Case study: Waterless toilets, Kenya](#)

⁶³ Gambrill, Martin, Rebecca J. Gilsdorf and Nandita Kotwal, 'Citywide Inclusive Sanitation—Business as Unusual: Shifting the Paradigm by Shifting Minds', *Frontiers in Environmental Science*, vol. 7, 11 February 2020.

⁶⁴ Esper, Heather, Ted London and Yaquta Kanchwala, *Improved Sanitation and Its Impact on Children: An Exploration of Sanergy*, Impact Case Study No. 2, The William Davidson Institute, Ann Arbor, 2013.

- **Municipal waste management**



Private (formal and informal) sector engagement is instrumental in waste collection. The informal sector can play a role in point collection to centralized sites or transfer stations. This can allow economical and environmentally safe collection and removal of large amounts of garbage across municipalities throughout the country, with local municipalities involved in waste management and disposal of waste at local plants. [Case study: Private sector engagement in waste collection, Tunisia](#)

Waste recycling — Only 4 per cent of Africa’s municipal solid waste (MSW) is recycled, largely by informal waste pickers who recover valuable resources from the waste at little or no cost to municipalities.⁶⁵ With an estimated 70-80 per cent of the MSW generated in Africa being recyclable, providing support to scale up the recycling industry can create employment opportunities through the *informal sector* and boost the local economy. South Africa has become a leader in metal packaging recycling, with over 75 per cent of metal packaging recovered through private sector participation.⁶⁶ The input recycling rate for all plastics in South Africa was 46.3 per cent in 2018.⁶⁷ [Case study: Waste recycle in Kenya, Cote d'Ivoire and Johannesburg](#)

Waste-to-energy solutions offer a way to manage non-hazardous waste, otherwise destined for landfill sites, to generate energy for industrial or domestic use. There is limited adoption of waste-to-energy practice in Africa, with successful examples in South Africa and Ethiopia. Other plants are at various stages of development, including those that produce energy from landfill gas, biogas facilities running on food waste and anaerobic digestion power plants running on vegetable waste. The challenge is primarily related to a lack of systematic waste collection, the high moisture content and low calorific level of waste in Africa, and the significant scale of investment required. While uptake is at a nascent stage in Africa, using appropriate waste-to-energy technologies based on comprehensive waste characterization studies presents an opportunity. [Case study: Community cooker initiative, Waste-to-energy system in Kenya](#); [Case study: Waste-to-energy projects in South Africa and Ethiopia](#); [Case study: Liquid waste to energy, Bugolobi waste water treatment plant, Uganda](#)

⁶⁵ UNEP, *Africa Waste Management Outlook*.

⁶⁶ Who Owns Whom, *Recycling of Waste and Scrap in South Africa 2021*, WOW, April 2021.

⁶⁷ Sadan, Zaynab, and Lorren de Kock, *Plastics: Facts and Futures – Moving beyond pollution management towards a circular plastics economy in South Africa*, World Wide Fund for Nature, Cape Town, South Africa, 2020.



Community cookers in Kibera, Kenya create heat for cooking by burning waste. © Community Cooker Foundation

Composting waste — Several examples demonstrate the successful use of composting as a waste management technique in African cities.⁶⁸ Municipal solid waste can be converted into compost, an organically approved fertilizer. Organic waste can be treated to produce biogas, and the by-product can be used as a fertilizer because of its rich nutrient content. [Case study: Composting of solid waste, Cape Town](#)

With electronic waste growing rapidly in Africa, e-waste recycling and management is getting attention. The quantity of e-waste in Africa is increasing swiftly due to the increase in domestic use of electronic items as well as illegal transboundary imports from developed countries owing to the absence of regulations that prohibit import of used materials. *Informal* e-waste collectors and individual actors who have organized themselves into an association in Abidjan, Côte d'Ivoire manage e-waste collection and repair/reuse.⁶⁹

⁶⁸ UNEP Africa Waste Management Outlook.

⁶⁹ Ibid.

2.2.2 Protection of people, ecosystems and assets from hazards

- **Protection infrastructure**



sea wall



dune rehab



revetments

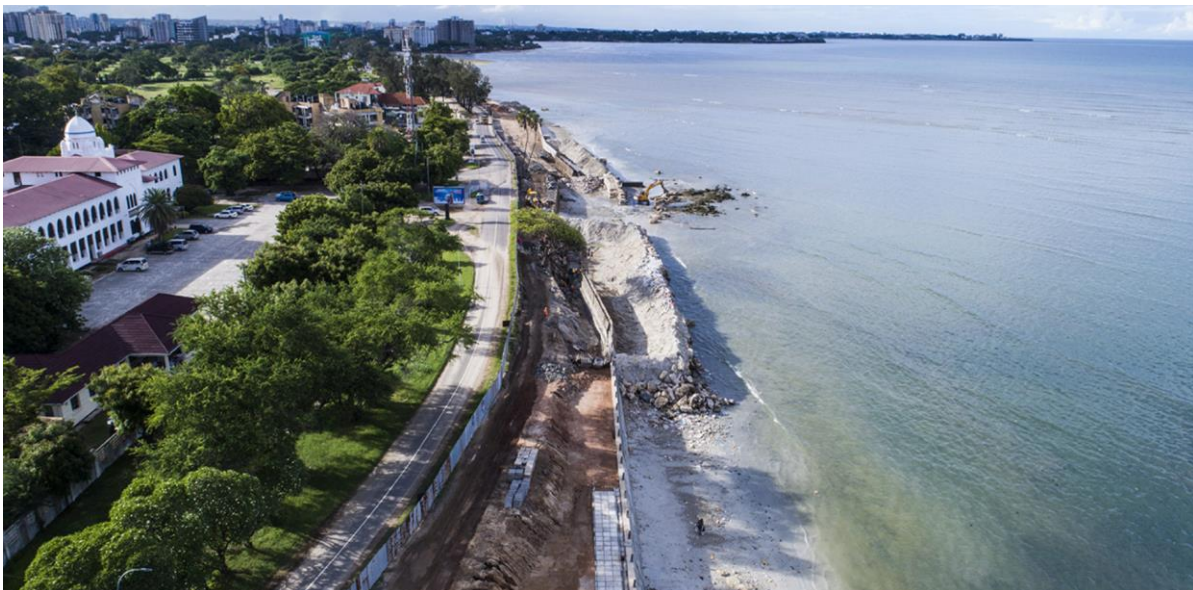


mangroves



reforestation

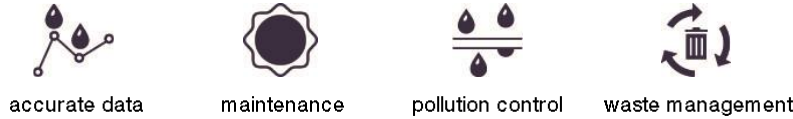
Coastal protection infrastructure in cities along Africa's coastline can shield communities settled on the adjacent land from the impacts of coastal hazards. With the climate rapidly changing, appropriate planning and implementation of coastal protection infrastructure (such as sea walls, beach nourishment, dune rehabilitation, sea dikes, etc.) is paramount to safeguard communities in Africa's coastal cities and should be based on the characteristics of the coast, availability of materials, usage and human needs. [Case study: Revetment to protect from storm surges, Lagos](#)



More than 2,400 metres of sea walls were constructed along Tanzania's coast. © UNOPS

Implementing nature-based solutions can protect against environmental hazards and build climate resilience. Nature, such as mangroves and wetlands, protects from coastal erosion and flooding to secure lives and livelihoods. In Dar es Salaam, the Msimbazi Opportunity Plan is helping manage flood risk. The approach involves river dredging, ecological interventions through upstream reforestation to reduce erosion and sedimentation, and improved land use planning and enforcement to keep people and assets safe, with reclamation of hazardous areas to prepare them for urban development. [Case study: Ecosystem services provided by the Nakivubo Swamp, Kampala](#)

- **Drainage**



Drainage system improvements can only work when the entire system is well understood and considered during design and implementation. Developing an evidence base of accurate rainfall data for the region is critical to predict storm events and the amount of rainfall that will occur over the long term. This is key for designing urban drainage systems for flood protection. Further, drainage systems carry sediments and other pollutants to rivers, reducing the quality of surface water, endangering the lives of aquatic organisms and causing water pollution. Therefore, maintenance, desilting and pollution control are key considerations for drainage systems. [Case study: World Bank financed Flood Prevention and Drainage Project, Senegal](#)



Reservoirs and drainage works built in Dakar to prevent flooding. © Agence de développement municipal (ADM)/PROGEP

Sustainable urban drainage systems have increasingly become a viable option to manage flood risk in urban areas. Moreover, integrating drainage and solid waste systems is critical for the success of drainage projects since solid waste blocking drains is the primary reason for their failure. Every drainage project should have a strong component of solid waste management.

2.2.3 Connecting people, goods and services

- Digital technologies



Adopting digital technologies enhances efficiency and transparency in all sectors while providing employment opportunities for urban youth, based on the context and needs of the communities. The Smart Cities Blueprint, unveiled during the 2017 Transform Africa Summit in Kigali, provides a framework for African cities to leverage technology, fast track ICT-driven initiatives and use data generated by citizens (using data and analytics, social media and mobile broadband) to optimize resources, connect people, and improve business, trading and urban management.⁷⁰ However, solutions must be contextually relevant and not imported from abroad. For example, while smart surveillance systems have helped curb crime and enhance security in cities globally, trust needs to be established between the authorities and citizens for such initiatives to be successful in African cities. Similarly, the introduction of smart buses with free Wi-Fi and cashless payment in Kigali was accompanied by connectivity issues, as the technology was not suited to local conditions.⁷¹



Smart buses with cashless payment in Kigali, Rwanda. © The New Times

⁷⁰ The Infrastructure Consortium for Africa Secretariat, *Infrastructure Financing Trends in Africa – 2016*, ICA Secretariat, 2017.

⁷¹ Siba, Eyerusalem and Mariama Sow, 'Smart city initiatives in Africa', Brookings, 1 November 2017, <www.brookings.edu/blog/africa-in-focus/2017/11/01/smart-city-initiatives-in-africa>, accessed 4 March 2022.

Human capacity and government investment in research and development need to be improved for digitalization-related initiatives to be successfully implemented and operationalized. The private sector has a role to play through on-the-job capacity building of government stakeholders following implementation of technology solutions in order to automate manual processes over time. [Case study: Open Cities Africa project - information infrastructure for urban resilience, 11 cities in sub-Saharan Africa](#); [Case study: Digital database of urban areas for decision-making, Kenya](#)

Harnessing technology to overcome information asymmetries and high upfront capital costs — The evolution of mobile phone banking has allowed low-income households to develop a formal history of savings and credit, and access services. Africa has leapfrogged in the mobile money sector to expand access to financial services in low resource environments. Two-thirds of global mobile money transactions take place in sub-Saharan Africa,⁷² a number that increased further during the COVID-19 pandemic. Companies such as Off-Grid Electric and M-KOPA Solar have tapped into this digital resource, creating financial products that enable poor households to purchase solar generation systems incrementally.⁷³ [Case study: Mobile payment for solar energy](#)

⁷² Parekh, Nidhi and Aimee Hare, 'The rise of mobile money in sub-Saharan Africa: Has this digital technology lived up to its promises?', Abdul Latif Jameel Poverty Action Lab, 22 October 2020, <www.povertyactionlab.org/blog/10-22-20/rise-mobile-money-sub-saharan-africa-has-digital-technology-lived-its-promises>, accessed 4 March 2022.

⁷³ Cartwright et al., 'Developing Prosperous and Inclusive Cities in Africa'.

- **Improved access roads**



Special planning areas can be designated in informal settlements to upgrade access roads and align with infrastructure services such as drainage. Narrow access roads in informal settlements offer limited opportunity to meet increasing traffic and need through road widening based on city-wide engineering and construction codes. Alternative planning and design standards offer a solution to meet growing needs. For the zoning of a small area in the city, localized standards can be developed and applied for road design. Access roads must be maintained and managed regularly, with considerations for seasonal variation and necessities. [Case study: Special planning area, Mukuru, Nairobi](#)



Improved roads in Mukuru, Nairobi. © Peter Muiruri

SECTION 3: OPPORTUNITIES TO SCALE UP ESSENTIAL SERVICES IN AFRICAN CITIES

African cities require high-impact innovations in a rapidly urbanizing context to address the mounting needs of the population. This section proposes a theory of change that responds to the lack of services at city level, environmental risks and the need to urgently ramp up service delivery both to catch up on backlogs and to enable future city growth. The theory is based on clear strategic directions to transform delivery of urban services. Finally, the recommendations given include projects and programmes for integrated, cross-sectoral infrastructure planning and service delivery, as well as different infrastructure services.

3.1 Theory of change for city services to enable transformational development

While Africa’s urban transformation presents several challenges, it also offers opportunities to actualize innovative urban infrastructure solutions. Facilitating sustainable growth requires moving away from a technical fixation on planning, financing and engineering services towards new and creative approaches to service provision. This shift could be a unique opportunity for African cities to become hubs of innovative infrastructure solutions and imaginative experiments that address backlogs and increasing service needs.

The metropolitan/city regions are characterized by a defined urban form that makes retrofitting urban infrastructure networks a challenge due to space-constrained existing urban fabric. In cities with existing infrastructure, the maintenance of ageing assets should be prioritized to improve their performance and enhance resilience to hazards and environmental risks. As peri-urban areas continue to grow, the nature of their urban form can impact the accessibility of critical services and therefore needs to be considered while developing projects and programmes.

Secondary cities, if capacitated, have the potential to provide logistics, services and supply chain hubs to support national economic growth. Much of the future urban growth in Africa is expected to be in secondary cities or small and medium-sized towns.⁷⁴ They offer significant potential to create markets and transform and drive rural and regional development, given their ability to take alternative pathways and avoid some of the challenges of delivering services in primary cities. A prerequisite for this is national level incentivization. A shift away from mega-cities towards secondary cities in Africa is conceivable, creating an opportunity for them to play a key role in supporting post-COVID recovery efforts.⁷⁵

⁷⁴ Organisation for Economic Cooperation and Development (OECD) and Sahel and West Africa Club (SWAC), *Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography*, West African Studies, OECD Publishing, Paris, 7 February 2020.

⁷⁵ Ijjasz-Vasquez, Ede and Megha Mukim, 'Doubling down on city competitiveness for COVID-19 recovery', Brookings, 16 March 2021, <www.brookings.edu/blog/future-development/2021/03/16/doubling-down-on-city-competitiveness-for-covid-19-recovery>, accessed 4 March 2022.

Cities hosting IDPs and refugees experience the increased burden of delivering services to a much larger population than planned for and require innovative approaches to ensure integration with host communities. Out of the top 10 refugee-hosting countries in the world, 5 are in Africa – Ethiopia, Kenya, Uganda, the Democratic Republic of Congo, and Chad.⁷⁶ Increasing numbers of IDPs and refugees — driven by climate change, conflict or economic opportunities — are moving to cities for better access to services, safety and livelihood opportunities. Urban refugees often end up in informal settlements, adding pressure on limited resources. Therefore, cities need to identify and address the specific needs of refugees and migrants, helping them to settle or to transit while also addressing the needs of host communities to ensure integration.

Meeting the need for essential services — including water, sanitation, waste management and energy — will continue to be a challenge with a business-as-usual approach, given the projected urban population growth across Africa. Figure 7 shows the theory of change and how a transformative approach to infrastructure can help achieve development outcomes in Africa.

⁷⁶ Subulwa, 'Urban Refugees'.

THEORY OF CHANGE

Transformative development in African cities through sustainable and resilient urban infrastructure

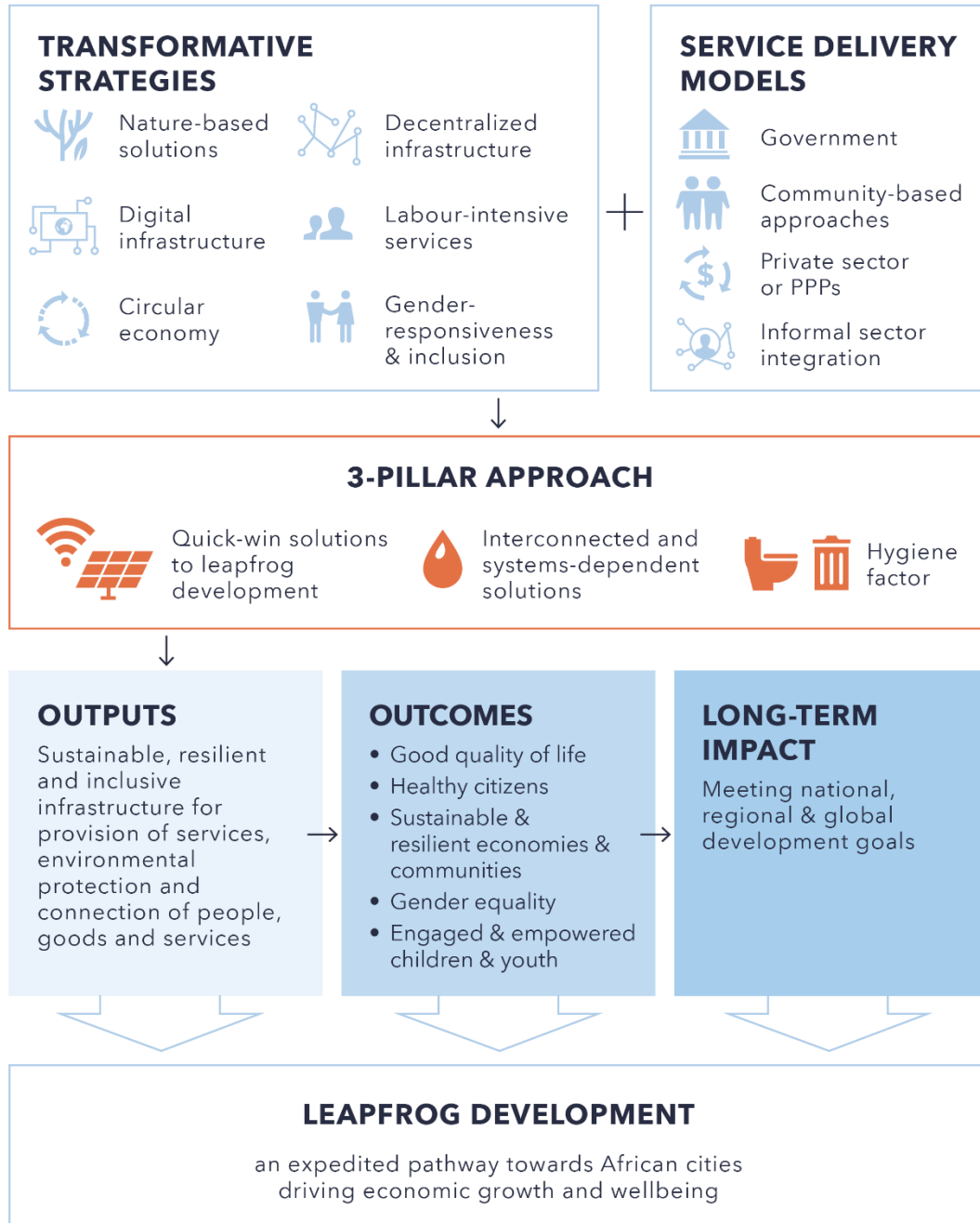


Figure 7: Theory of change: transformative development through sustainable and resilient urban infrastructure⁷⁷

⁷⁷ African Union, 'Linking Agenda 2063 and the SDGs', <<https://au.int/agenda2063/sdgs>>, accessed 4 March 2022.

3.2 Strategic direction to support better delivery of urban services

It is critical to align investment decisions with sustainable and resilient infrastructure to avoid locking in expensive and unsustainable development patterns. Infrastructure solutions and assets are designed to last several decades and therefore need to account for the long term. It is also costly to get them wrong. To meet the needs of all, especially the most disadvantaged and marginalized groups in society, sustainable, resilient and inclusive infrastructure solutions should consider whole life costs.

Innovative and transformative approaches can be applied across different essential infrastructure functions to spur sustainable development in African cities, as shown in Figure 8. The transformative strategies that offer potential include: nature-based solutions, digital infrastructure, circular economy, decentralized infrastructure, labour-intensive services, and gender-responsiveness and social inclusion.

INNOVATIVE APPROACHES MAPPED AGAINST SECTORS FOR APPLICATION

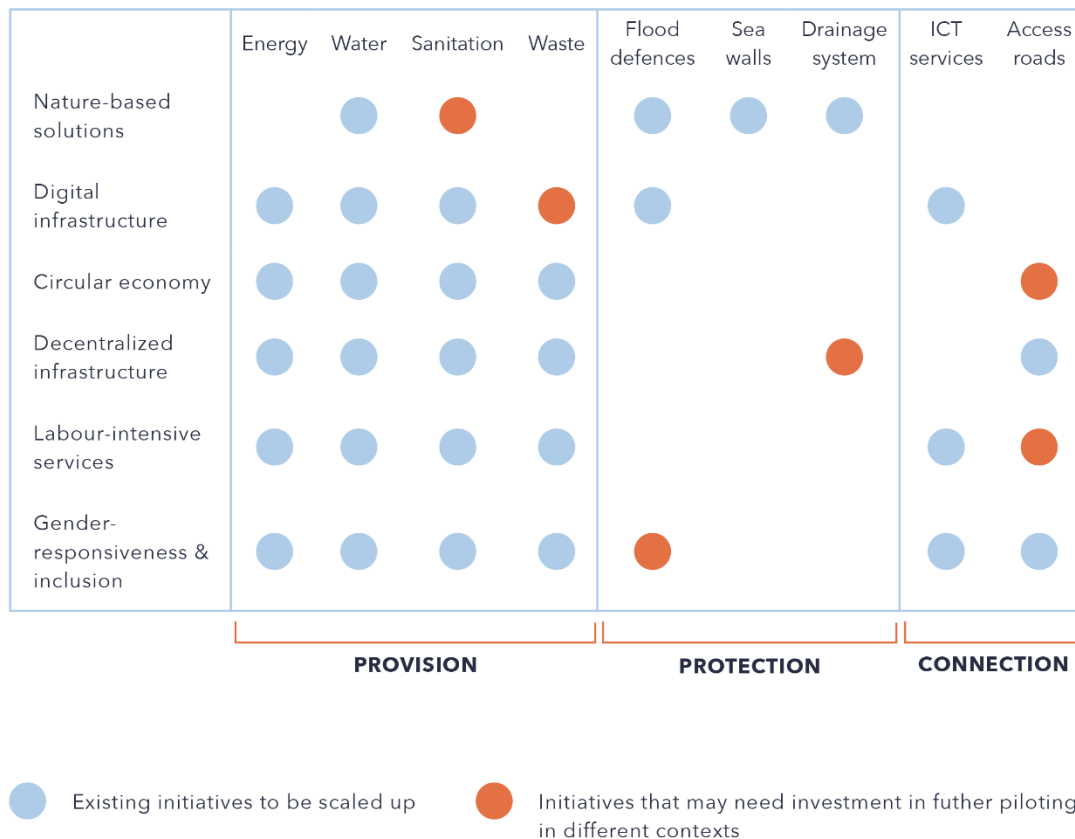


Figure 8: Innovative approaches mapped against sectors for application (Green dots: existing initiatives to be scaled up, yellow dots: initiatives that may need investment for further piloting in different contexts)

3.2.1 Nature-based solutions

Nature-based solutions are multi-functional and cost-effective and can meet service needs, provide societal benefits and enhance well-being by mainstreaming natural processes into urban environments, especially through water, waste water, flood defences and drainage. Local governments can derive a wide range of benefits from nature-based solutions and green infrastructure, such as improving public health, reducing costs and pollution, and building resilience against environmental risks by implementing actions to protect, sustainably manage and restore natural ecosystems. These solutions support water resource management, storm water drainage, ecological regeneration and waste water treatment, and they are being used across Africa at different scales in conjunction with grey infrastructure. For example, constructed wetlands are used for secondary treatment of urban waste water in Ismailia, Egypt.⁷⁸ Some examples of nature-based solutions application include green spaces to restore water systems and mitigate urban heat island effect, rooftops gardens,⁷⁹ sustainable urban drainage standards and regulations for flood protection, and slope stabilization through vegetation for landslide and erosion risk reduction. Other benefits can be carbon sequestration, improved biodiversity and groundwater recharging.

CASE STUDY: Freetown Emergency Recovery Project: Slope Stabilization, Remediation and Rehabilitation Works	
Location	Freetown, Sierra Leone
Duration	2018-2019
Partners	UNOPS Government of Sierra Leone World Bank UK Department for International Development
Background	In August 2017, an unprecedented landslide and flood disaster devastated Freetown in Sierra Leone, leading to 1,141 people being declared dead or missing and over 6,000 people affected. There was also major destruction of infrastructure, including 349 houses, bridges, roads, schools, and health facilities affected.

⁷⁸ Abdel-Shafy, Hussein I. and Ahmed Dewedar, 'Constructed Wetlands for Urban Wastewater Treatment in Egypt', *Sustainable Sanitation Practice*, no. 12, 2012, pp. 27–32.

⁷⁹ Greyling, Shawn, 'Rooftop Gardening In The Inner City', Joburg.co.za, <<https://joburg.co.za/rooftop-gardening-inner-city/>>, accessed 4 March 2022.

Objectives	The project aimed to reduce risk exposure for the citizens of Freetown, especially in the areas directly affected by the landslide. It also aimed to reduce vulnerability to similar events and to improve long-term resilience of the area. The project was part of the Freetown Emergency Recovery Project, established by the World Bank.
Infrastructure sector	Protective infrastructure — landslide and flood protection
Project outputs	As part of technical assessment and design, UNOPS conducted desk studies, onsite surveys, geotechnical modelling, rock fall analysis and analysis of the extent of slope remediation required. An environmental and social impact assessment and environmental and social management plan were developed. The project used nature-based solutions to improve landslide and flood protection. Approximately 140,000m ³ of debris was reused to form a stable landform. The main watercourse was reformed and the existing feeder streams and springs were formalized. Approximately 27,000 trees were planted to stabilize the soil, many of them from the IUCN Red List of Threatened Species.
Positive impacts/outcomes	The earthworks, drainage channels and plantings minimize the risk of future landslides, especially during the rainy season. The project provided job opportunities for locals to help support economic recovery for those most affected by the landslide. Further, the plants being grown to revegetate the area can provide fruit, nuts, seeds, kernels and leaves that can be used for food, medicine and as a source of income. The local forest reserve was also extended to prevent future encroachment.



Left: Landslide and flood disaster in Freetown, Sierra Leone. ©UNOPS
 Right: Construction worker on the landslide site in Sierra Leone. ©UNOPS

3.2.2 Digital infrastructure and leapfrog technologies to unlock growth

Adopting technology and digitalization for various services (waste management, safety, etc.) can improve efficiency and effectiveness, while promoting technology hubs can boost innovation, job creation for urban youth and economic growth.⁸⁰ In light of the COVID-19 pandemic, accessible ICT has proven to be a powerful tool enabling teleworking, telehealth and online education to ensure connectivity and resilience of communities worldwide. As Africa is now the fastest-growing region in the world with regard to mobile phone and internet access, leveraging this growth to promote sustainable development is imperative (for example, Digital Ambassadors in Johannesburg;⁸¹ Harambee Youth Employment Accelerator⁸²). There is already a prevalence of digitally driven solutions to meet surging demand in African cities, such as ride hailing apps, mapping programmes, mobile payment systems and service accountability tools that can be scaled up and replicated to bridge the digital divide and promote digital transformation. To this end, technology hubs have emerged across the continent, especially in North Africa, that catalyze innovation and create jobs. For example, a pilot GIS tracking system, wherein a platform connects customers to latrine emptying services and ensures the safe disposal of waste, was used in Kampala to improve faecal sludge management in low-income communities.⁸³ Another opportunity lies in smart surveillance to curb crime and ensure security.

3.2.3 Circular economy

African cities have the opportunity to build next-generation sustainable economies by adopting circular economy principles and reshaping material and resource use across yet to be developed water, sanitation, waste and energy systems. Opportunities exist at different scales across the intertwined urban resource systems of water and sanitation, waste, and energy . Recycling and reuse of waste water can improve efficiencies in the water system. For example, used potable water can be treated and reused for flushing toilets, irrigation or other purposes. Treating, upcycling and recycling municipal solid waste, instead of sending it to a dumpsite or burning it, is important to save land and avoid negative environmental impacts. African cities are undertaking projects that produce fertilizer from food waste to divert organic waste away from landfills. Other examples of circular economy principles being applied in African cities include using renewable energy, sustainable urban drainage systems, generating biogas from organic waste/landfill gas⁸⁴, producing coal briquettes from household

⁸⁰ AUC and OECD, 'Overview: Priorities to make digitalisation work for all in Africa', *Africa's Development Dynamics 2021*.

⁸¹ Jozi Digital Ambassadors, 'Jozi Digital Ambassadors', <<http://digitalambassadors.org.za>>, accessed 4 March 2022.

⁸² Harambee, 'What We Do', <www.harambee.co.za>, accessed 4 March 2022.

⁸³ Lemasagarai, Jisas, 'Digital Solutions for the Urban Services Divide: The GSMA Innovation Fund for Digital Urban Services', *TheCityFix*, 23 June 2021, <<https://thecityfix.com/blog/digital-solutions-for-the-urban-services-divide-the-gsma-innovation-fund-for-digital-urban-services>>, accessed 4 March 2022.

⁸⁴ Warner, Hugo, Joanna Bingham and Deborah Ohui Nartey, *The Circular Economy: Our Journey in Africa So Far*, Footprints Africa, 2021.

waste⁸⁵, converting waste water to electricity, and using cow dung for energy generation.⁸⁶ Regulations in the waste sector, sharing knowledge and good practices, collecting and managing data on different waste streams, and awareness campaigns are critical to implement circular economy principles.

3.2.4 Decentralized urban infrastructure systems

Decentralization of urban waste, water, sanitation and energy systems that are small-scale, locally embedded, and underpinned by robust municipal governance and finance have the potential to meet service delivery needs and build resilience in African cities. In cities that have various sources of potable water, rainwater harvesting and aquifers can supply water at the district scale. Solutions such as grey water and rainwater treatment and reuse can be implemented at the building scale. Renewable energy presents opportunities in the form of solar home systems, regulating off-grid services and managed storage since they can often be deployed rapidly and at lower costs. Off-grid energy and sanitation technologies create scope for a wider array of actors to provide cost-effective urban services. These technologies may be well suited to extend services to urban areas that are rapidly changing or have small budgets. In the narrow streets of informal settlements, for example, waste pickers and biodigester toilets can avert the need for expensive and administratively complex bulk infrastructure while meeting citizens' needs.⁸⁷

CASE STUDY: Sanitation improvement in the informal settlement of Kasokoso in Kampala	
Location	Kampala, Uganda
Duration	2019-2020
Partners	Cities Alliance, ACTogether (Uganda) & UNOPS European Union (EU) Swedish International Development Cooperation Agency (SIDA)
Background	UNOPS, in conjunction with Cities Alliance and other partners (AcTogether-U), completed a feasibility study to support the implementation of safeguards related to the construction of the Kampala-Jinja Expressway (KJE). The KJE is a road project by the Government of Uganda that is anticipated to

⁸⁵ Ramsay, Deanna and Mary Njenga, 'Five things to know about briquettes and sustainable bioenergy in Africa', 4 May 2021, <<https://forestsnews.cifor.org/72344/five-things-to-know-about-briquettes-and-sustainable-bioenergy-in-africa?fnl=en>>, accessed 27 May 2022.

⁸⁶ Marini, Marta, *African Cities: Is there Space for Circularity? Main facts, trends and case studies on African urban Circular Economy*, FEEM Report No. 2-2021, 21 April 2021.

⁸⁷ Cartwright et al., 'Developing Prosperous and Inclusive Cities in Africa'.

	<p>displace approximately 30,000 people due to the new alignment that cuts through the highly dense informal settlements of Kasokoso and Kinawataka in Kampala. The main finding of the study was the strategy to upgrade the slums of Kasokoso and Kinawataka.</p> <p>During community consultations, the residents identified sanitation as one of the key issues that needed immediate attention as part of the upgrading strategy. With a high density of about 200 persons per acre, the Kasokoso and Kinawataka settlements have limited toilets and showers due to spatial and financial constraints of households.</p> <p>Currently, the residents use pit latrines, which pose safety risks to children and teenage girls and accessibility challenges to persons living with disabilities (visual, mental and mobility-related). In addition, there are public health issues around the disposal of waste from the pit latrines, excessive rain and flooding within the settlement and the high water table (occasioned by the presence of Kinawataka wetland), resulting in increased instances of groundwater contamination. The construction of the pit latrine toilets is also unaffordable for households that live on an income of less than a dollar a day.</p>
Objectives	The project aimed to improve access to adequate sanitation services in the Kasokoso and Kinawataka informal settlements.
Infrastructure sector	Sanitation
Project output	<p>Two prototypes of the Biofil toilet bio-digester system were developed for Kinawataka communities.</p> <p>The Biofil system is affordable and can be constructed with local materials. It uses tiger worms, which convert faecal matter into compostable material with minimal odour.</p>
Positive impacts/outcomes	15 residents were trained in the construction of the toilets, which were well-received by the settlements. The project is being scaled up with funding from SIDA.



Biofill toilets addressing the challenge of sanitation (toilets and showers) in urban informal settlements in Uganda.

©UNOPS/Philip Maina

3.2.5 Labour-intensive services

A labour-intensive, rather than capital- or technology-intensive, approach to the provision of sanitation, renewable energy and community access roads should be adopted to meet the goals of employment generation and green growth in African cities. Labour intensity can be integrated across the life cycle of urban infrastructure, from planning and construction to operations and maintenance of services. There are numerous inspiring cases of labour-intensive service delivery models being successfully used in African cities for provision of sanitation, (renewable) energy and community access roads. For example, South Africa implemented a programme to increase labour-intensive methods for civil works such as upgrades to roads, bridges and pavements (sidewalks).⁸⁸ In community-based sanitation projects, community plumbers provide a valuable service in ensuring the maintenance of sanitation systems. Renewable energy generation creates more jobs directly or indirectly along the entire value chain while simultaneously promoting green growth. Compared to conventional sources, energy generation through solar photovoltaic cells, landfill gas or biomass plants creates more

⁸⁸ International Labour Organization, 'Gundo Lashu (Our Victory): Labour intensive public roads programmes in South Africa', ILO, 1 December 2010, <www.ilo.org/global/publications/world-of-work-magazine/articles/WCMS_160226/lang--en/index.htm>, accessed 4 May 2022.

jobs per unit of energy produced.⁸⁹ Labour-intensive construction of access roads in small-scale communities and informal settlements can generate inclusive employment and have socio-economic benefits, especially with the involvement of women.

Waste management services in underserved, densely populated areas present an opportunity to engage small and micro-enterprises to provide waste collection, transportation and recycling services.

CASE STUDY: Improving sanitation in and access to disadvantaged neighbourhoods of the city of Conakry	
Location	Conakry, Guinea
Duration	2014-2016
Partners	UNOPS Ministère de la Ville et de l'Aménagement du Territoire European Union
Background	Several disadvantaged neighbourhoods in Conakry faced issues of high youth unemployment, crime, and high infant and maternal mortality due to limited access to these areas. Potholes and debris on unpaved roads made it difficult for taxis, police vehicles and ambulances to enter. Further, sanitation infrastructure was also severely lacking.
Objectives	The project aimed to enhance the living conditions of the population in disadvantaged neighbourhoods of Conakry by implementing systems for water, sanitation and solid waste management.
Infrastructure sector	Road; Water — Drainage, Flood Protection; Sanitation — Toilets; Waste Management
Project output	The project used the labour-intensive method to rehabilitate and construct urban roads and sanitation infrastructures in five municipalities of Conakry to create employment for youth. Given the local flood risk, the project considered integrating climate-resilient standards in the infrastructure. The project included rehabilitation and/or construction of 6 kilometres of roads and 56 latrines, and training of 5 national engineers on the management of labour-intensive works. Local community members were

⁸⁹ International Labour Organization, 'Green jobs and renewable energy: low carbon, high employment', Fact sheet, 4 August 2014.

	<p>hired as labourers, and more than 100,000 person-days of work were created. The project also implemented a maintenance system by setting up 10 local management committees to ensure local ownership by communities and allow sustainable maintenance of works.</p>
<p>Positive impacts/outcomes</p>	<p>The communities have better access to social services, such as healthcare, with road improvement. The neighbourhoods have improved hygiene and sanitary conditions with trash bins close to communities to pre-collect garbage. The team of engineers of the Ministère de la Ville et de l'Aménagement du Territoire became more competent in the management of labour-intensive works. The project provided employment and additional income for local households, and local workers acquired construction skills, which will help them get employment in the future.</p>



Rehabilitation works conducted by UNOPS in the neighbourhood of Kaloum. © UNOPS

3.2.6 Gender-responsiveness and social inclusion

Mainstreaming gender and social inclusion-related considerations across the infrastructure life cycle in all sectors can reduce violence against women and girls, and enable equal access to critical services and socio-economic opportunities for all. Gender-responsive and inclusive infrastructure can address inequalities in cities and empower vulnerable and marginalized groups, such as women and girls, persons with disabilities, youth, the elderly, the poor, etc.⁹⁰ Solutions that address these issues include improvement and installation of street lighting, closed-circuit television (CCTV) in public spaces, safe access roads, disabled-friendly public spaces and transport, and child-friendly cities. Inclusive cities have plans, policies and programs that explicitly include improved access to basic services for displaced, underserved and marginalized populations. National and municipal governments can work to build stronger communities and convivial spaces among all inhabitants, in places where migrants live, rather than targeting migrants or refugees with specific programmes.⁹¹ International partners need to target investment to scale and improve existing services for displaced, underserved and marginalized residents. The private sector can provide direct support through business activities and indirect support by investing in cities and supporting humanitarian actors. Through collaboration, each actor can employ their relative strength towards the goal of inclusive city planning.

CASE STUDY: Essential Service Delivery Through the Community Upgrading Fund in Monrovia	
Location	Monrovia, Liberia
Duration	2019-2021
Partners	Cities Alliance - Liberia Country Programme Comic Relief, FCDO, SIDA and local communities
Background	The Greater Monrovia area is characterized by socially fragmented communities that live with enormous backlogs on basic and social infrastructure services, including an absence of road access, drainage, toilets, and drinking water. This lack of infrastructure has an impact on people's lives and severely undermines cohesion, productivity and health, all of which are worsened by the exposure to climate-induced risks.

⁹⁰ Morgan, Geoffrey, et al., *Infrastructure for gender equality and the empowerment of women*, UNOPS, Copenhagen, 2020.

⁹¹ International Rescue Committee, *Urban Refuge How Cities Are Building Inclusive Communities*, IRC, 31 October 2018.

Objectives	The project aimed to address backlogs in essential services such as water, sanitation, and education infrastructure in Greater Monrovia.
Infrastructure sector	Water, Sanitation, Buildings — Schools
Project output	<p>The Community Upgrading Fund (CUF) improved access to essential services for 498,594 people in Greater Monrovia’s informal settlements. It operated through an innovative local and donor/partner financing mechanism for the planning and implementation of basic and social infrastructure services. It involved the design and construction of 104 community water kiosks, 6 toilet and shower facilities, and 2 kindergarten school blocks. During COVID-19, 100 water points were rehabilitated and repaired. Over 100 individuals were trained in community water management, basic plumbing, operations and maintenance.</p> <p>The CUF is anchored around a locally replicable people-centred governance framework, which allows targeted funding to be easily leveraged. The CUF scales up essential services and supports a quick response to community needs through capitalized funding and revenue from community base enterprise operations, e.g., charges from community use of services: water kiosks, sanitation facilities, the sport field and community town halls built by the CUF.</p>
Positive impacts/outcomes	The installation of multiple water points improved access to water for persons with disabilities in the community. The reduction in time children spent collecting water helped improve school attendance. The project enhanced community resilience, improved adaptive capacity, enabled access to urban services, reduced inequalities and encouraged economic empowerment in the urban space, especially for women and youth.



Cities Alliance improved essential water and sanitation services and conducted training on community water management in Greater Monrovia. © Cities Alliance

3.3 Recommendation of infrastructure programs and initiatives in African cities

The financing agenda for sustainable urban development should leverage existing infrastructure systems, actors and service delivery models that have proven to work in African cities and introduce new approaches where they offer leapfrogging opportunities. Off-grid, informal, and innovative service delivery systems and technologies remain untapped since financial institutions have favoured large-scale investments that provide predictable risk-return profiles. Resources should be mobilized with a good understanding of heterogeneity within existing hybrid urban service delivery systems. Strong government institutions, policies, laws and clear processes to oversee and regulate the provision of services will ensure better planning, delivery and management of infrastructure services. This will encourage innovation and help governments attract private sector investment through PPPs for infrastructure projects related to these services. Investments comprise capital and underpin operational and governance systems. It is necessary to channel investment in, regulating, coordinating, digitizing, and incrementally integrating informal, community-based and other small-scale systems of service delivery into formal systems. The financing agenda should be driven by affordability, accessibility and quality of services to achieve sustainable and resilient development.⁹²

3.3.1 Recommendations for integrated, cross-sectoral infrastructure planning and service delivery

Integrated, cross-sectoral infrastructure planning at the local government level is critical to ensure the right projects are prioritized and implemented. Grant funding can be used for system-level, cross-sectoral studies and assessments, capacity building at the local level, and project preparation to create bankable or investable projects that attract the private sector funding required for implementation.

- Strengthen governance and coordination at city level for planning, delivery and management of urban infrastructure. This includes integration between waste and energy systems governance to implement waste-to-energy programmes, between municipal waste and water systems governance to ensure solid waste does not litter drains, and between sewerage and water systems governance to ensure faecal sludge does not pollute water channels.
- Support governments to undertake city-level infrastructure needs assessments and system-level analyses to understand the interconnectedness of systems and implement integrated infrastructure planning approaches.
- Support the development of a pipeline of bankable projects that integrate different infrastructure systems and enhance their interconnectedness.

⁹² Cirolia, 'Fractured fiscal authority and fragmented infrastructures'.

CASE STUDY: Greater Banjul Area 2040 Development Plan	
Location	Greater Banjul Area, The Gambia
Duration	2019-2022
Partners	Ministry of Lands and Regional Government, Banjul City Council, Kanifing Municipal Council, Brikama Area Council, Gambia Port Authority African Development Bank UNOPS
Background	In the Greater Banjul Area (GBA), essential services are provided by national public companies (for water, sewerage, drainage), and municipalities (for waste). The different institutions develop these services independently as a reaction to the population and economic growth. The explosive and unplanned urban growth in the recent decades, coupled with the lack of integrated planning, has resulted in service provision imbalances. The consolidated urban areas of Banjul and Kanifing have relatively good service levels, while the more recent urban expansion areas of Brikama and Kombo have low levels of coverage. Isolated and, sometimes, substandard and inadequate solutions for service delivery solutions have emerged, entailing incremental costs borne by the residents or the provider. Additionally, this leads to negative externalities for the environment and overall quality of life.
Objectives	The Greater Banjul Area 2040 Development Plan aims to promote sustainable urban development within the GBA by proposing solutions for the provision of essential services in an integral and comprehensive manner. The plan will reduce current risk exposure in the built environment and increase climate change resilience while ensuring the protection of environmentally sensitive areas. It aims to guide public and private investment in relation to land use planning and infrastructure services, and provide guidelines to mainstream consideration of gender and inclusion within all development actions.
Infrastructure sector	All
Project output	The project started by clarifying the institutional roles and hierarchy of Infrastructure Sector Plans and Policies and facilitating cross-sectoral and inter-sectoral planning discussions between authorities and urban planners. The integrated planning process was based on data and evidence on consumer views and needs. This cross-cutting cooperation supports the identification of investment priorities for the GBA, consistent with the new urban development strategy.

	<p>The long list of projects identified along the process was prioritized based on detailed multi-criteria analysis and stakeholder engagement, resulting in the final projects that are part of the Greater Banjul Area 5 Years Investment Plan. Their selection was based on their strategic relevance to the GBA Development Plan 2040 and linkages to the wider national and local policies, their potential impact on sustainable development in the GBA, as well as their implementability over the next five-year period.</p> <p>The project outputs include land use and development plans, a five-year investment plan, pre-feasibility studies for priority projects, capacity assessments, and technical assistance and training for partners.</p>
<p>Positive impacts/outcomes</p>	<p>The expected impact of the Greater Banjul 2040 Development Plan is to contribute to the creation of sustainable cities and communities through integrated urban infrastructure planning and improved land management capacity of national and local level institutions.</p>



Left: Women using a community tap in Kunkujang. © UNOPS/Jason Florio
 Right: Waste collector at a dump site in Bakoteh. © UNOPS/Jason Florio

3.3.2 Recommendations for infrastructure service-based projects and programmes

The recommendations for different services in this section follow a three-pillar approach of: 1) quick-win, wide impact work on renewable energy and digital infrastructure underpinning other critical leapfrog technologies and acceleration; 2) interconnected, system-based and critical intervention of water, acknowledging that urban water supply, drainage and flood defence require multi-level governance and coordination; and 3) the hygiene factor of sanitation and waste management, which are fundamental services for basic human health.

African cities can replicate and scale up innovative strategies and solutions using different service delivery models. The recommendations are based on the findings from the previous sections and highlight key opportunities that emerge from ongoing initiatives in



urban Africa. They should be read in tandem with the previous sections and case studies in the Appendix.

1. Quick-win solutions to leapfrog to more sustainable development

Renewable energy and digital infrastructure underpin other critical leapfrog technologies and can accelerate wider impact, especially with private sector engagement.













• Renewable energy in African cities











Renewable energy can help African cities lower carbon emissions, meet increasing urban energy demand, build resilience against climate change impacts and improve air quality. Renewable energy, especially solar, offers promising options to improve energy access for communities that are unserved or underserved by grids. As technology continues to advance, solar and wind energy will become more efficient, user-friendly, cost-effective, accessible and sustainable, and will help African cities leapfrog the traditional fossil-fuel dependent model and avoid locking in unsustainable energy pathways. Different types of solutions and service delivery models can be applied to provide energy services based on the particularities of a given context (see Table 1).





Innovative approaches for renewable energy	Service delivery model	Transformative strategy
<p>Renewable energy policies, regulations, targets, strategies and institutional capacity at city level</p> <p>Set policies, regulations and targets to increase the share of renewables in cities' energy mix.⁹³ Accelerate renewables in all sectors through an integrated approach across land use, power, buildings, transport⁹⁴ and industry sectors to increase urban energy efficiency.</p> <p>Develop strategies to steer a shift away from centralized energy supply generation managed by national utilities towards empowering local governments to scale up renewable energy, such as sourcing power from solar plants and landfill gas. Enable policies and regulatory frameworks by cities – such as local net metering and feed-in tariffs – to support the deployment and use of renewable electricity.</p> <p>Develop or mandate a unit at the local government level to drive the uptake of renewable energy over the short, medium and long terms. This unit can facilitate stakeholder collaboration, information exchange and action plan implementation. Build capacity (in skills, experience</p>		

⁹³ Only 18 African cities had renewable energy targets as of 2018.







⁹⁴ Strategies for the transport sector are covered in a different paper.

<p>and knowledge as well as human and financial resources) to plan, deliver and manage renewable energy deployment in cities through partnerships between municipalities and external organizations (such as academia, NGOs, community-based organizations, development institutions and other cities).</p>		
<p>Database for energy in cities</p> <p>Build databases at the local government level and give investors access to statistical data and information on the key parameters needed for investment and for project-level decisions, such as grid expansion plans, consumer baseload, customer willingness to pay, etc.</p>		
<p>Green building guidelines, codes and certification</p> <p>Develop and/or adopt green building guidelines, codes and certifications to increase energy efficiency, and use alternate material in buildings to promote resource efficiency and circular economy in cities.</p> <p>Example: Green building guidelines in KwaDukuza, South Africa</p>		
<p>Regulations and incentives for renewable energy through building permit process</p> <p>Develop and enforce building regulations that include renewable energy use as a requirement for obtaining a building permit. Provide financial incentives on fees or fast-track permits for the use of decentralized solar photovoltaic systems integrated in new and existing buildings.</p> <p>Examples: Renewable energy incentives in Accra; Regulations for rooftop photovoltaic systems on buildings in Nairobi</p>		
<p>Solar street lighting</p> <p>Use solar powered street lighting to improve road safety and security, and reduce dependence on the grid. This can offer significant upfront and operational cost savings compared to conventional lighting.</p> <p>Example: Solar street lights in Jinja, Kampala, Freetown, Dakar</p>		
<p>Policies and finance for clean cooking</p> <p>Enable clean cooking technologies and waste-to-energy facilities through policies, strategies and finance for poverty alleviation and the energy and health sectors.</p>		
<p>Blended finance and PPPs for renewable energy</p>		

<p>Development finance can be instrumental in attracting and blending with private finance and PPPs to deliver decentralized renewable energy solutions. Local governments can develop PPP platforms to facilitate private sector engagement with municipalities and accelerate implementation of renewable energy.</p> <p>Example: Liberalization of the power sector in South Africa, raising the limit on self-generation of power</p>		
<p>Private mini grids: flexible business models</p> <p>Engage the private sector to operate solar-based mini-grids and ensure long-term operational and financial sustainability with customer tariff. This decentralized renewable energy-based solution can serve unconnected and underserved populations in informal settlements.</p> <p>Example: power purchase agreements with utility & off-grid feed-in tariffs in Kenya, solar off-grids in M-Kopa Kenya, Tanzania and Uganda, solar home systems (d.light in Kenya targeting peri-urban customers)</p>		
<p>Consumer finance business models (pay-as-you-go, mobile money)</p> <p>Employ consumer finance business models (for example, pay-as-you-go and mobile money) and private investment to enable markets to accelerate uptake of decentralized renewable options (such as Pico Solar and Solar Home System markets) for informal settlements. Develop a clean cooking service in partnership with private providers using pay-as-you-go service in informal settlements, with smart meters to monitor use and mobile money-based payments.</p>		
<p>Digitalization and smart technology</p> <p>Adopt digitalization and smart technology to attract private sector investment and foreign direct investment in renewables. Digital technologies and other innovations can help utilities and distribution system operators monitor, operate and control assets and service delivery.</p>		
<p>Mini-grids — community and NGO partnerships</p> <p>Implement solar mini-grids in partnership with community-based organizations and NGOs.</p> <p>Example: mini-grids in Tanzania, Senegal and Kenya</p>		
<p>Loans for energy efficiency retrofitting</p> <p>Give homeowners' associations and homeowners loans and subsidies to retrofit buildings for energy efficiency.</p>		

<p>Hybrid service delivery models</p> <p>Use innovative hybrid service delivery models to provide energy with various stakeholders, including the solar distributor, the energy entrepreneur and financial institutions. For example, in the energy entrepreneur model, a trained local community member ensures last mile connections to households based on a contract with a government or private sector supplier.</p> <p>Example: Energy entrepreneurship in Ethiopia and Cameroon</p>		
<p>Small-scale pilot delivery systems</p> <p>Set up small scale pilot delivery systems to test the deployment of renewable technologies with a view to scale up in partnership with small-scale enterprises.</p>		

Transformative strategies

	Nature-based solutions		Digital infrastructure		Circular economy
	Decentralized infrastructure		Labour-intensive services		Gender-responsiveness & inclusion

Service delivery models

















	Government		Private sector or PPPs		Community-based approaches		Informal sector integration
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Table 1: Renewable energy: innovative approaches mapped against service delivery models for application. (Examples are discussed in section 2 and can be scaled up or replicated.)







- **Digital infrastructure in African cities**

Digital infrastructure is the backbone for a digital economy that can enable local governments, the private sector and communities to leapfrog to a higher standard of service delivery and livability for citizens. Technology-driven initiatives should focus on developing collaborative and inclusive approaches that value the context, culture and economy of each city. Supporting the expansion of internet use, especially mobile internet, is instrumental in bridging the digital divide and promoting digital transformation in African cities. Different types of solutions and service delivery models can be applied to provide digital infrastructure-based solutions based on the particularities of a given context (see Table 2).

Innovative approaches for digital infrastructure	Service delivery model	Transformative strategy
<p>Institutional capacity development</p> <p>Promote research and development and capacity building in government institutions. Governments can leverage the technical expertise of the private sector to provide government stakeholders with on-the-job capacity building while rolling out technology solutions.</p>		
<p>E-governance and participatory planning</p> <p>Apply e-governance and participatory planning approaches using ICT-driven solutions to establish trust, transparency and cooperation between the local government and citizens.</p>		
<p>Safe city strategies with smart surveillance technologies and emergency communication networks</p> <p>In partnership with communities, promote smart surveillance systems to implement safe city strategies to curb crime, discourage gender-based violence, and enhance urban safety and security, especially for women and girls.</p> <p>Examples: Open Cities Africa, Dar es Salaam Emergency Response Plan</p>		
<p>Broadband infrastructure for network connectivity to catalyze digital transformation</p> <p>Catalyze digital transformation through broadband infrastructure, especially in intermediary cities, by establishing partnerships between government and large private sector firms to install the latest technologies in network connectivity. African cities have the advantage of not having substantial telecommunication cable installations and can leapfrog to the latest 5G/LTE network.</p>		
<p>Mobile payment-based solutions</p> <p>Implement mobile payment-based solutions in partnership with private telecom firms to improve access to water, sanitation, energy and waste services for low-income households in informal settlements.</p>		
<p>Information infrastructure for urban resilience</p>		

<p>In partnership with communities, develop data and information infrastructure to enhance urban resilience using digital technologies and mobile phones.</p> <p>Example: Open Cities Africa project in 11 cities</p>		
<p>ICT-driven citizen participation</p> <p>Implement ICT-driven initiatives that foster collaboration with the community, transparency and inclusion based on contextual realities. Deploy technology to encourage citizen participation and inclusion in municipal governance.</p> <p>Example: Digital Ambassadors in Johannesburg</p>		
<p>Innovation platforms</p> <p>Engage innovation platforms and hubs, as well as youth accelerators, for the private sector (start-ups and entrepreneurs) to ideate solutions for efficient services. This can provide employment opportunities for urban youth.</p> <p>Example: Harambee Youth Employment Accelerator</p>		

Transformative strategies

	<p>Nature-based solutions</p>		<p>Digital infrastructure</p>		<p>Circular economy</p>
	<p>Decentralized infrastructure</p>		<p>Labour-intensive services</p>		<p>Gender-responsiveness & inclusion</p>

Service delivery models








	<p>Government</p>		<p>Private sector or PPPs</p>		<p>Community-based approaches</p>		<p>Informal sector integration</p>
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Table 2: Digital infrastructure: innovative approaches mapped against service delivery models for application. (Examples are discussed in section 2 and can be scaled up or replicated.)











2. Interconnected and systems-dependent solutions

- **Water systems in African cities**

The water sector in African cities is a critical one that requires system-level interventions to efficiently manage water resources that are increasingly under pressure from urbanization and climate change. Urban development must be integrated with basin-level planning and coastal systems. Innovative solutions should be implemented based on an integrated urban water resource management (IUWRM) approach that contextualizes water sources, water supply, waste water, storm water and rainwater within an integrated urban water management framework. In informal settlements, this entails upgrading access roads and aligning infrastructure for drainage. This approach requires governance, multi-level coordination and decision-making with a long-term horizon. Different types of solutions and service delivery models can be applied to provide water services based on the particularities of a given context (see Table 3).







Innovative approaches for water systems	Service delivery model	Transformative strategy
<p>Institutional reforms for integrated and efficient management of urban water resources in a closed loop system</p> <p>Implement policies, legislations and institutional reforms on IUWRM to guide local authorities towards integrated management of water resources in a closed loop system, following circular economy principles. The policies and strategies should be supported by implementation plans, financing strategies, technological developments and decision-making tools. Water supply and drainage planning should be based on scenarios that consider climate change impacts, assess both water quantity and quality, estimate future demand, recognize the importance of efficiency for water operations and address the needs of the most vulnerable groups of the population.</p>		
<p>Land use planning and zoning to protect watersheds</p> <p>Institutional frameworks should facilitate the alignment of urban development, land use planning and zoning with basin management to protect watersheds and maintain the quantity and quality of water supply. They should enable coordination and communication between departments, levels of government, communities, informal economy and other stakeholders.</p> <p>Example: integrated environmental, sector and land use planning in Swakopmund, Namibia</p>		

<p>Legislations and regulations for rainwater harvesting and household-level treatment of rainwater</p> <p>Develop and enforce legislations and regulations for rainwater harvesting, groundwater recharge, and water treatment and reuse to promote the circular water economy and diversify the sources of urban water supply.</p>		
<p>Nature-based solutions for water services and flood protection</p> <p>Offer institutional capacity building, frameworks and guidance on implementing nature-based solutions that provide water services and protect from flood risks. Invest in solutions such as reforestation, sustainable urban drainage systems, slope stabilization through vegetation, ecosystem-based adaptation, urban green spaces, mangrove plantation, etc.</p> <p>Examples: upstream reforestation of watersheds, sustainable urban drainage system for flood prevention in Dakar, slope stabilization through vegetation in Freetown, ecosystem-based adaptation in Kampala</p>		
<p>Digital database of urban water and sanitation for decision-making</p> <p>Build digital databases of urban areas, including information on water supply, sewage disposal, and demographic, topographic and urban planning data to enable analyses of service delivery needs.</p> <p>Example: digital database of urban areas in Kenya</p>		
<p>Policies or legislation for tariff systems, subsidies and rebates</p> <p>Introduce pricing policies that reflect the true costs of developing and delivering water supplies, and promote tariff systems, taxes, and subsidies to maximize benefits for low-income groups while maintaining sustainable operations of the system. Use pricing instruments such as increasing block-rate structures, charges for excess use, and rebates and subsidies.</p> <p>Example: electronic flow-limiters for poor households in Cape Town, Durban and Johannesburg</p>		
<p>Sea walls or revetments to protect from storm surges</p> <p>Invest in sea walls/revetments to protect coastal cities from storm surges and coastal hazards.</p> <p>Example: revetments in Lagos, Nigeria</p>	 	
<p>Government-led reforms engaging the private sector to increase water access</p>	 	

<p>Engage the private sector through management contracts and water concessions between the water utility and private operators to build and run water networks and expand water supply to informal settlements.</p> <p>Example: Administrative reforms engaging the private sector in Ouagadougou, Kampala, Jinja, and Entebbe</p>		
<p>Blended financed PPP programs</p> <p>Make use of blended financed PPPs, wherein development finance institutions can finance the forwarding infrastructure from concessional loans, to improve water supply.</p> <p>Example: Kigali Bulk Water Supply Project</p>		
<p>Innovative billing system with mobile payments for low-income users</p> <p>Implement innovative billing systems in partnership with mobile money companies or telecom providers to develop mobile payment systems for low-income communities.</p> <p>Example: mobile payments for low-income users in Nairobi</p>		
<p>Incentivize resource efficiency and cleaner production</p> <p>Incentivize the private sector to increase the use of and invest in cleaner and more resource-efficient industrial production technologies and greener supply chains.</p> <p>Example: Lake Victoria Basin Resource Efficiency and Cleaner Production</p>		
<p>Integrated urban water resource planning with community participation</p> <p>Develop IUWRM master plans for cities through a participatory planning process, engaging communities to develop a shared vision and strategies for the future that reflect their needs and are based on knowledge of water management.</p>		
<p>Community-based urban water management in informal settlements</p> <p>Establish community-based urban water resource management in informal settlements unserved by centralized water supply systems. Establish partnerships between city government and civil society groups, youth and women’s groups so that the decentralized system empowers the residents of low-income, informal settlements to contribute to the design, implementation and management of appropriate solutions.</p> <p>Example: Simplified Sewer System in Dar es Salaam</p>		

<p>Community-based adaptation in flood-prone areas</p> <p>Enable community-based adaptation to enhance the resilience and hazard-preparedness of the urban poor living in flood-prone areas. Develop data and information infrastructure for flood risk management with participation of the local community, civil society, academia and technology companies using mobile technology and other ICT. Implement nature-based solutions that are driven and led by communities, such as reforestation.</p> <p>Example: Open Cities Africa project in Mwanza City</p>		
<p>Upgrading access roads integrated with drainage infrastructure in informal settlements</p> <p>Upgrade access roads in alignment with drainage infrastructure in informal settlements, employing localized planning and design standards in partnership with the community.</p> <p>Example: upgrading access roads in Nairobi</p>		
<p>Access to microfinance for small-scale water service providers to scale up services for the urban poor</p> <p>Implement hybrid service delivery models involving partnerships between government, small-scale enterprises (or the informal sector) and the community to leverage entrepreneurial solutions. Microfinance can scale up services for the urban poor in informal settlements with solutions like small piped water works, affordable or on-site water supply, etc.</p>		
<p>Non-revenue water reduction through cooperation with small-scale enterprises (or informal sector)</p> <p>Implement non-revenue water reduction solutions and conserve scarce water resources through increased cooperation with the private sector, including small-scale enterprises (or the informal sector) and large-scale private contractors. Reduce water loss with appropriate design, construction, operation and maintenance of systems, and by monitoring changes in user behaviour.</p>		
<p>Regulatory framework for informal private sector networks to deliver services</p> <p>Create a robust regulatory framework for informal private sector networks to deliver adequate and affordable water supply services.</p> <p>Example: Regulatory frameworks in Juba, Kismayo and Baidoa</p>		

Transformative strategies

	Nature-based solutions		Digital infrastructure		Circular economy
	Decentralized infrastructure		Labour-intensive services		Gender-responsiveness & inclusion

Service delivery models



	Government		Private sector or PPPs		Community-based approaches		Informal sector integration
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Table 3: Water systems: innovative approaches mapped against service delivery models for application. (Examples are discussed in section 2 and can be scaled up or replicated.)





3. Hygiene factor

Sanitation and the management of waste are fundamental for basic human health and become critical as more people move to cities and live in high density neighbourhoods. Sustainable waste management and sanitation practices can transform informal settlements into neighbourhoods.







- **Sanitation services in African cities**

Sustainable sanitation services are critical enablers for enhancing public health and achieving positive environmental and socio-economic outcomes for all. Waste water management interventions that include decentralization and resource recovery will not only produce environmentally acceptable effluents, but also reduce the overall costs of sanitation systems and make them affordable, especially in informal settlements. Governments should develop programs based on the ‘polluter pays’ principle to improve the cost-effectiveness of treatment and generate revenue for constructing facilities to collect, treat, and reuse waste water. There are multiple benefits of working with the informal sector and communities for sanitation services. Different solutions and service delivery models can be applied to provide sanitation services based on the particularities of a given context (see Table 4).

Innovative approaches for sanitation services	Service delivery model	Transformative strategy
<p>Constructed wetlands for waste water treatment</p> <p>Constructed wetlands for waste water treatment can immobilize a range of emerging pollutants and are a low-cost solution.</p> <p>Example: constructed wetlands in Egypt</p>		
<p>Digital database of sanitation data for decision-making</p> <p>Develop digital databases of urban areas, including information on water supply, sewage disposal, and demographic, topographic and urban planning data to enable evidence-based decision-making.</p> <p>Example: digital database of urban areas in Kenya</p>		
<p>Liquid waste-to-energy facilities</p> <p>Build waste water treatment plants that convert liquid waste into energy by fermenting sludge to produce biogas and electricity to operate the facility.</p> <p>Example: Bugolobi waste water treatment plant</p>		
<p>Guidance and regulatory support for decentralized sanitation</p> <p>Provide guidance and regulatory support for the implementation of decentralized solutions such as simplified sewerage.</p>		
<p>City-wide inclusive sanitation programme</p> <p>Implement city-wide inclusive sanitation principles to serve low-income communities.</p>		
<p>Digital infrastructure-based solutions for sanitation management</p> <p>Implement digital infrastructure-based solutions, such as GIS tracking systems, to improve sanitation management in low-income communities.</p> <p>Example: GIS tracking system for faecal sludge management in Kampala</p>		
<p>Low water consumption public toilets or toilet malls</p> <p>Build low water consumption public toilets for informal settlements. The toilets should run on a build-operate-transfer model with a five-</p>		

<p>year contract, wherein the private provider constructs and operates the system with revenue from the toilets and their associated services.</p> <p>Example: Ecotact toilet malls with low water consumption in Nairobi</p>		
<p>Low-cost, alternative sewer systems</p> <p>Build low-cost, alternative sewage systems (for example, a simplified sewer system) through a participatory design process involving communities living in informal settlements. A community-based association can construct and operate the system and its construction can provide short-term employment to local labourers.</p> <p>Example: simplified sewer system in Dar es Salaam</p>		
<p>Solar-powered toilet to treat and recycle waste water</p> <p>Build solar-powered toilets that treat and convert waste water into disinfected water that is recycled for flushing or irrigation using power from mounted solar panels. They are suitable for informal settlements and can be equipped with sensors and a mobile phone-based maintenance guide to enable the community to repair the system.⁹⁵</p>		
<p>Alternative toilets and community-based sanitation programmes</p> <p>Develop community-based sanitation programmes in informal settlements, building alternative toilet systems such as compost or incinerating toilets that are virtually odour-free and operate with little or no water.</p>		
<p>Access to microfinance for small-scale sanitation service providers</p> <p>Provide access to microfinance for small-scale sanitation service providers such as private pit latrine emptiers to scale up service provision in informal settlements.</p>		

Transformative strategies

	<p>Nature-based solutions</p>		<p>Digital infrastructure</p>		<p>Circular economy</p>
	<p>Decentralized infrastructure</p>		<p>Labour-intensive services</p>		<p>Gender-responsiveness & inclusion</p>

⁹⁵ Sustainia, 'Solar-Powered Toilet Treats And Recycles Wastewater', Global Opportunity Explorer, 27 June 2018, <<https://goexplorer.org/solar-powered-toilet-treats-and-recycles-wastewater>>, accessed 4 May 2022.

Service delivery models

























	Government		Private sector or PPPs		Community-based approaches		Informal sector integration
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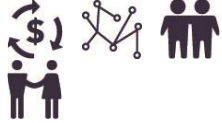



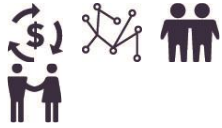
Table 4: Sanitation: innovative approaches mapped against service delivery models for application. (Examples are discussed in section 2 and can be scaled up or replicated.)

- **Sustainable waste management in African cities**







The biggest opportunity for waste is in the circular economy, where holistic waste management can reduce the need for some waste infrastructure, especially landfills. Cities should focus on diverting organic waste away from landfill sites towards composting and bioenergy recovery. They should focus on refurbishment, repair, reuse and recycling of materials such as paper, metal, plastic, e-waste and construction materials to reduce overall waste. Single-use products should be discouraged where appropriate and where end-use markets do not exist. Waste management and recovery can create opportunities for small-scale enterprises and community-based approaches as well as advanced treatment technologies. Waste services and technologies should be carefully selected based on their sustainability and suitability for local conditions, and they should be implemented with the appropriate service delivery models (see Table 5).

Innovative approaches for waste management	Service delivery model	Transformative strategy
<p>Policies and incentives for waste reuse, recycling and recovery</p> <p>Develop policies, legislation and incentives to promote waste reuse, recycling and recovery. Invest in increasing public awareness and transforming attitudes towards waste generation, recycling and management. Provide standards and guidelines for the reuse of materials in construction from demolition, recycled processes, etc.</p>		
<p>Building institutional capacity for sustainable waste management</p> <p>Build institutional capacity to enforce policies and regulations for sustainable waste management. Create a framework for multi-stakeholder partnerships between government, private sector, civil society and the informal sector.</p>		
<p>Investing in waste-related data</p> <p>Develop waste-related databases on collection, quantity, sources and composition of solid waste generated, recycled and landfilled, as well as labour statistics on municipal waste workers.</p>		

<p>Regulations to prohibit waste dumping from developed economies</p> <p>Enforce regulations to prohibit the transboundary movement of waste to prevent illegal dumping of hazardous and non-hazardous waste generated in developed economies.</p> <p>Example: Bamako Convention</p>		
<p>Facilities for hazardous waste management</p> <p>Build facilities for the safe treatment and disposal of hazardous waste, including healthcare risk waste.</p>		
<p>Waste-to-energy facilities</p> <p>Build waste-to-energy facilities to generate energy for cities and reduce the number of landfills. This should be supported by incentives for the private sector to invest in waste recycling.</p> <p>Example: waste-to-energy systems in Freetown, Durban, Addis Ababa</p>		
<p>Favorable employment regulations and policies in waste recycling</p> <p>Waste reuse and recovery is prevalent in Africa and should be further encouraged by favourable regulations and policies to implement waste recycling programmes with industries that can also provide job opportunities. For example, plastic materials can be recycled to manufacture fencing posts and aluminium waste can be recycled into kitchen utensils.</p> <p>Example: Waste recycling of plastic, aluminium, etc. in Kenya, Abidjan, Johannesburg</p>		
<p>E-waste collection and recycling</p> <p>Manage electronic waste sustainably through partnerships with the industry to collect and refurbish e-waste, and create a supply chain and recycling sites.</p> <p>Example: e-waste collection in Abidjan</p>		
<p>Recycling with PPP model or private sector engagement</p> <p>Partner with the private sector to compost municipal waste and enable commercial scale recovery of protein from organic waste to produce biogas and nutrient-rich fertilizer.</p> <p>Example: Composting waste in Cape Town</p>		
<p>Community-based waste-to-energy systems</p>		

Community cooker initiatives in informal settlements can transform waste into energy for improved livelihoods and healthier communities. They rely on community-based operations and provide alternatives to charcoal, firewood and paraffin for cooking, boiling water and other uses.		
Community-based e-waste management Train local communities (especially in informal settlements) to repair, reuse and recycle technology waste, or e-waste, and repurpose it to create household products in order to turn a potential hazard into a valuable resource for the people.		
Informal sector-led household waste collection, sorting and recycling Recognize the role of the informal sector and waste management workers in municipal waste collection, sorting and recycling. Support and integrate them into formal waste management systems. Improve working conditions and provide adequate personal protective equipment for the health and safety of waste management workers.		
Technologies for recycling household waste for income Adopt low-technology, low-capital, labour-intensive and culturally appropriate technologies for reuse and recycling, such as the production of briquettes from municipal waste with the engagement of women's enterprises.		

Transformative strategies

	Nature-based solutions		Digital infrastructure		Circular economy
	Decentralized infrastructure		Labour-intensive services		Gender-responsiveness & inclusion

Service delivery models





	Government		Private sector or PPPs		Community-based approaches		Informal sector integration
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Table 5: Waste management: innovative approaches mapped against service delivery models for application. (Examples are discussed in section 2 and can be scaled up or replicated.)

CONCLUSION

Africa faces a critical turning point. The challenges to development are plentiful — including rising poverty, the pressures of rapid urbanization and the climate crisis — but so are the opportunities. As this report has aimed to show, African cities can combat poverty and get development on par with the speed of urbanization by adopting transformative approaches suited to their individual contexts. The report also outlined the range of actors and service delivery models active in the region, highlighting ways in which their involvement and collaboration can spur positive change. By providing examples of innovations already taking place in African cities, the report aimed to identify areas with untapped potential and pinpoint activities that can be replicated for wider benefits.

It is difficult to understate the importance of aligning investment decisions with sustainable, resilient and inclusive infrastructure to avoid locking in expensive and unsustainable development patterns. Governments can achieve this by breaking away from the business-as-usual approach, and the transformative strategies presented in this report — including those already being implemented in Africa — show ways of doing this. When prioritizing investments, stakeholders may also be guided by the three-pillar approach outlined in this report. Quick-win, wide impact work on renewable energy and digital infrastructure, system-based intervention of the water sector, and tackling the hygiene factor of sanitation and waste can help African cities achieve their development goals — from reducing poverty and inequality to responding to the climate crisis.

As the given examples prove, city-led innovation in urban infrastructure development and service delivery is already on the rise in African cities. However, the region has its own particular set of challenges that must be addressed via tailored, location-specific measures to ensure long-term sustainable development. This includes establishing strong infrastructure governance mechanisms backed by policies and regulatory frameworks for government-led service delivery. Second, PPPs and community-based groups should be leveraged. Finally, governments and finance institutions should engage with the informal sector or small-scale providers, given their significant contribution to the service delivery process.

At the local government level, programs should be implemented to strengthen governance and coordination at city level for the planning, delivery and management of urban infrastructure. Secondly, assessments and analyses of city-level infrastructure needs should be undertaken to ensure integrated infrastructure planning. Finally, a pipeline of bankable projects should be developed that combine different infrastructure systems and enhance their interconnectedness. Overall, an integrated, systems-based infrastructure planning approach at the local government level is important.

African cities hold a wealth of potential to leapfrog development. The key to setting down a path of progress lies in ensuring sustainable, reliable and equitable access to basic services, including energy, clean water, sanitation and digital connectivity. Infrastructure is vital for this. African cities can harness their potential by investing in interconnected, resilient infrastructure systems, adopting innovative strategies and tailoring them according to the needs of individual locations, and fostering collaboration between a diverse range of stakeholders. Efforts are already underway in many cities, and now is the time to scale them up across the region to set Africa down the path of sustainable development.

SCALING UP ESSENTIAL SERVICES IN AFRICAN CITIES

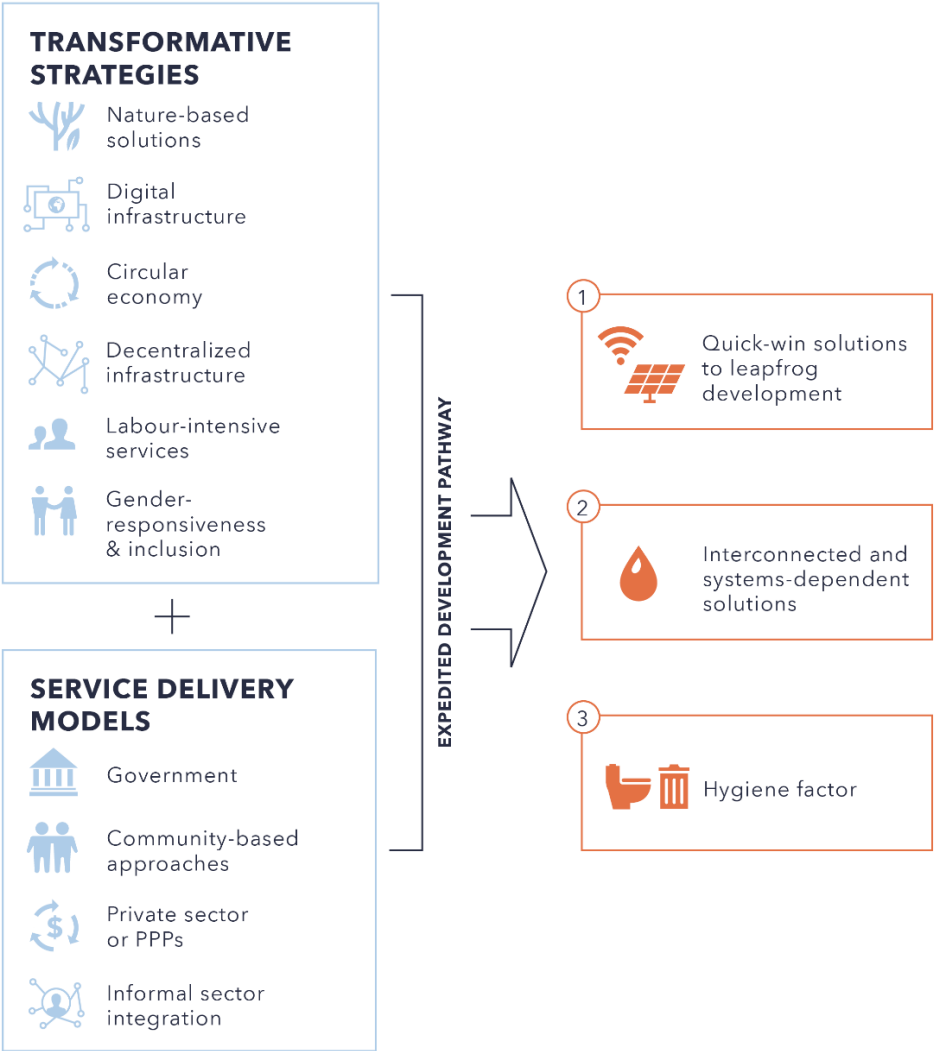


Figure 9: Scaling up essential services in African cities

APPENDIX

CASE STUDIES FROM AFRICAN CITIES

Case study: Latrines for all in Togo Sokodé City - Fecal sludge management and microcredit services

In Sokodé, Togo, improved access to private toilets in old neighbourhoods, where private toilet access rates are among the lowest, was primarily driven by the establishment of Neighbourhood Sanitation Committees (CAQs). The CAQs were set up by neighbourhoods as they undertook the role of social enterprise and technical manager for the construction of toilets. The CAQs were further organized into a federation headed by a woman, with the target of constructing toilets until 100 per cent coverage in the concerned neighbourhoods was achieved.⁹⁶

An endogenous microcredit mechanism was put in place as a revolving fund to guarantee the continuing and sustainable supply of toilets. Implementation of the sanitation value chain steps generated benefit flows, making a positive impact on the economy of Sokodé municipality. The Sokodé case study revealed the following:

- The use of microcredit encouraged/facilitated the financial participation of all households in the acquisition and payment of desludging services.
- Delegation to private operators had the potential to ensure the collection and treatment of all sludge.
- Valorization of treated sludge for market gardening generated additional resources that will contribute to the partial or total coverage of the on-site sanitation sub-sector operations.

⁹⁶ African Development Bank Group, *Toilets for all in Sokodé through Faecal Sludge Valorisation and Microcredit: Project Completion Report*, AfDB, February 2019.

Case study: Mini-grids in Tanzania, Senegal and Kenya

In Tanzania and Senegal, public-private cooperation has made the development of mini-grids possible. In Kenya, mini-grids are owned and operated by the government, private individuals and the community. The Kenyan experience shows that mini-grids can work effectively, provided all the bottlenecks are largely dealt with. There are also few mini-grid projects built purely with private ownership, and companies financed by loans from development banks own and operate the grid. Private mini-grids charge higher tariffs than main grids but have flexible business models such as Power Purchase Agreements with Kenya Power and off-grid feed-in tariffs. The mini-grids provided by the community are usually carried out in partnership and collaboration with an NGO. In terms of cost, mini-grids have a fee of around \$10, a cheaper connection than that of the main grid.⁹⁷

Case study: Private sector engagement in renewable off-grids in Kenya, Tanzania and Uganda

The off-grid renewable energy company M-Kopa Solar, a subsidiary of the East African telecommunications corporate Safaricom, illustrates what is possible when energy services understand what households want and can afford. Operating in Kenya, Tanzania, and Uganda, it connected 330,000 households to solar energy systems by 2015. M-Kopa estimates that 80 per cent of its customers live on less than \$2 a day — but in 2016, the company earned more than \$60 million. The company's success shows that when the service offering and systems are right, significant financial resources can be mobilized from within poor and informal urban communities.⁹⁸

Case study: Solar street lights in Jinja, Kampala, Freetown, Dakar

In Jinja, Uganda, the city government could not fulfil its financial obligations to electricity providers, causing street lights to be disconnected and a consequent increase in crime rates and drop in economic activities. With financial support of \$531,000 from the World Bank, Jinja installed its first solar street lights in 2016, which saved the city over \$15,000 in installation costs compared to conventional street lighting installation. A total of 204 solar street lights have been installed, excluding the ones installed by private firms on their premises.⁹⁹ In Kampala, the Kampala Capital City Authority installed around 1,800 solar street lights, with around 750 in the central business district. Similar initiatives are documented in other places, particularly in Freetown, South Africa and Dakar.¹⁰⁰

⁹⁷ Pueyo, Ana, 'Pro-Poor Access to Green Electricity in Kenya', Institute of Development Studies Evidence Report 135, IDS, Brighton, May 2015.

⁹⁸ Cartwright et al., 'Developing Prosperous and Inclusive Cities in Africa'.

Case study: Solar home systems, Kenya

In Kenya, a 15-watt solar home system costs on average [\\$9 per month for 36 months](#). The distributed renewable energy sector recognizes this market. In fact, [about 35 per cent](#) of solar lighting product sales in Kenya are made in these peri-urban areas. A number of off-grid solar companies, including d.light, have begun to specifically target peri-urban customers. [Evidence](#) has shown that the willingness to pay for decentralized renewables is proportionally much higher than the desire to pay for a grid connection, especially as reliability is an important user criterion.

Case study: Green building guidelines in KwaDukuza Municipality South Africa

The KwaDukuza Municipality in South Africa has developed green building guidelines that rely on passive design as a cost effective way to improve thermal efficiency and daylighting and reduce energy use in buildings. With requirements such as appropriately designed shading devices for large windows, insulation of ceilings, windows, floors and exposed water pipes, and building design that reflects the contextual geographical environment, the guidelines aim to optimize temperature and lighting in the buildings, and reduce electricity consumption. To ensure the implementation of guidelines, city leaders need to be made aware of them. It is also important to develop processes and the capacity to include the guidelines in application forms and procedures developers and builders have to follow when building new houses.¹⁰¹

⁹⁹ Gillard, Ross, et al., *Sustainable urban infrastructure for all: Lessons on solar-powered street lights from Kampala and Jinja, Uganda*, Coalition for Urban Transitions, London and Washington, D.C., 2019.

¹⁰⁰ Dhenin, Marianne, 'Africa's Solar Street Lights Offer Glimmer of Potential', Bloomberg, 4 May 2021, <www.bloomberg.com/news/articles/2021-05-04/uganda-embraces-the-power-of-solar-street-lights>, accessed 4 May 2022.

¹⁰¹ Strydom, 'Africa leads the way in green buildings'.

Case study: Energy entrepreneur model in Ethiopia and Cameroon

The energy entrepreneur model has been tested in Ethiopia and Cameroon since 2014. In Cameroon, an NGO plays an intermediary role among all the partners (solar solution distributors, financial institutions and EEs) by compiling purchase orders, centralizing kit deliveries, facilitating payments to EEs on behalf of the distributors, coordinating after-sales activities, and monitoring the performance of EEs.¹⁰²

Case study: Urban water supply expansion project, Ghana

In Ghana, the \$169.9m urban water system project in 2014 was financed by World Bank IDA grants of \$103m (and \$50m of additional funding). The main goal of the project was to significantly increase access to the piped water system in Ghana's urban centres, with an emphasis on improving access, affordability and service reliability for the urban poor.

Case study: Legislative framework and technologies for access to water, South Africa

In South Africa, national legislation requires local governments to provide every citizen with a basic allowance of free water every month. New technologies make effective and inclusive tariff-setting easier. Cape Town, Durban and Johannesburg, South Africa, have installed electronic flow-limiters that provide poor households with the daily 300 liters of free water that legislation demands. Once this volume is reached, the flow-limiters reduce supply to a trickle that can be augmented only if payment is made.

Case study: Innovative billing system with mobile payments for low-income users, Nairobi

The Nairobi City Water and Sewerage Company applies an innovative billing system that allows low-income customers to track their consumption and pay in smaller installments than the regular monthly bill when using East Africa's mobile money system.

¹⁰² Allet, Marion, 'Energy entrepreneurs: an innovative model to reach the last mile', *Field Actions Science Reports*, Special Issue 15, 7 October 2016, pp. 138–147.

Case study: Lake Victoria Basin Resource Efficiency and Cleaner Production

The Lake Victoria Basin Resource Efficiency and Cleaner Production (LVB-RECP) project falls under the World Bank-led Lake Victoria Environment Management Program Phase 2, which aims to improve management of critical natural resources within the Lake Victoria basin.¹⁰³ LVB-RECP catalyzes private sector agro-processing enterprises in the Lake Victoria Basin to increase use of, and investment in, cleaner and resource-efficient industrial production technologies and green supply chains.

Resource Efficient and Cleaner Production (RECP) mechanisms employ a holistic approach, applying preventive management strategies that increase the productive use of natural resources including energy and water, minimize generation of waste and greenhouse gas emissions, and foster safe and responsible production.¹⁰⁴ The World Bank financed the private sector to pilot a mechanism to reduce city pollution in the lake through RECP. The RECP program engages private industry within the Lake Basin to assess its production systems and adopt greener practices and technologies.

Case study: Nairobi Rivers Basin Rehabilitation and Restoration Program — Sewerage Improvement Project

The project objective is to improve the access, quality, availability and sustainability of waste water services in Nairobi City with a view to contribute to the restoration of Nairobi Rivers Basin. Severe pollution of the Nairobi rivers, the city of Nairobi's main source of water supply, from large quantities of untreated domestic and industrial wastes informed the African Development Bank-financed Nairobi Rivers Basin Rehabilitation and Restoration Program: Sewerage Improvement Project (SIP) Phase I and II at the request of the government of Kenya. The project aimed to rehabilitate and expand waste water infrastructure in both formal and informal settlements of Nairobi. The specific objectives of the SIP included: (i) increasing sewerage coverage in Nairobi City from 48 per cent in 2018 to 60 per cent by 2021; (ii) reducing pollution levels of the Nairobi rivers by collecting and treating 80,000m³/d of waste water and (iii) enhancing sustainability of sewerage operations through increased revenue collection.¹⁰⁵

¹⁰³ Lake Victoria Basin Commission, 'Engaging Private Sector for Green Growth in the Lake Victoria Basin (EPSGG-LVB) Project', LVBC, <www.lvbcom.org/Projects/EPSGG-LVB%20Project>, accessed 4 May 2022.

¹⁰⁴ United Nations Industrial Development Organization, 'RECP Experiences in the Project Lake Victoria Environmental Management Programme (LVEMP II), United Millers Limited Bakery Division (UML-Bakery)', UNIDO.

¹⁰⁵ African Development Bank Group, *Environmental and Social Impact Assessment Summary, Nairobi Rivers Basin Rehabilitation and Restoration Program: Sewerage Improvement Project Phase II*, AfDB, 26 February 2018.

Case study: Simplified Sewer System in Dar es Salaam

In 2013, the community in Vingunguti developed a flexible, affordable and scalable sewer design as an innovative sanitation solution through a participatory design process involving the whole community living in informal settlements. The community members selected the route along which the pilot network would run, and they set up a community-based association to construct and operate the system. A local committee was set up to organize payment, and users and sanitation authorities were accountable for maintaining the system. The system included pipes with a smaller diameter, allowing them to be installed at a shallower depth than the conventional sewer system. During the pilot phase, 230 people (44 households) were connected. With the completion of the pilot phase, the municipality recognized this as a viable option for the Kombo settlement area and officials at Dar es Salaam Water and Sewerage Authority agreed to charge communities a minimal tariff. Community technicians were equipped with skills related to construction of the system. The communities have received training in low-cost bio digester toilet construction and have started upgrading their latrines. The utility company is responsible for providing oversight and quality assurance. This system reduces investment costs by up to 50 per cent in comparison to conventional sewerage systems, and it emphasizes the importance of local community participation.¹⁰⁶

Case study: Administrative reforms engaging the private sector, Uganda

The government of Uganda, supported by international development agencies, instituted a performance improvement process that involved, among other administrative reforms, engaging the private sector through management contracts. In Uganda, the National Water and Sewerage Corporation (NWSC) provides water and sewerage services to Kampala, Jinja, and Entebbe. Corruption and underperformance plagued the utility for years. Despite an average tariff of \$1 per cubic meter, NWSC ran a monthly deficit of about \$300,000, thanks in part to 50 per cent water losses, poor customer service, low collection efficiency (about 71 per cent), and outstanding accounts averaging about 420 days. Following government-led reforms, between 1998 and 2006, the share of the urban population with access to water soared from 48 per cent to 70 per cent, as the rate of new annual connections rose from 3,300 to 23,300. The total number of connections increased from 50,800 to 148,300 over this period. Unaccounted for water decreased from 51 per cent to 28 per cent, and the corporation moved from a loss to a profit (after depreciation) of \$3 million.

¹⁰⁶ Slum Dwellers International, 'Simplified Sewer System in Dar es Salaam', SDI, 30 May 2018, <<https://sdinet.org/2018/05/simplified-sewer-system-dar-es-salaam/>>, accessed 4 March 2022.

Case study: Administrative reforms engaging the private sector, Ouagadougou

In Ouagadougou, Burkina Faso, the local water utility (ONEA) provides piped water to 86 per cent of the city's population, including informal settlements, through a partnership with the private sector. Water is available an average of 23 hours a day, despite widespread poverty and the fact that 25 per cent of the city's population lives in informal settlements. In 2000, only half the residents had access to water. The utility's mandate requires that it service only formal communities. To get around this constraint, ONEA entered into five year water concessions with private operators to build and operate water networks in five informal settlements. ONEA sells bulk water to the operators at \$0.55 per cubic metre; the final price charged to users is regulated to cross-subsidize water for low-income households and discourage excessive water consumption.

Case study: Kigali Bulk Water Supply Project

The Kigali Bulk Water Supply Project is one of the first PPP water supply and treatment projects to be undertaken in sub-Saharan Africa¹⁰⁷ and showcases the value of innovative, well-coordinated blended finance in practice with investment from both public and private sources.^{108,109} It is also a prime example of the importance of blended teams of government, sponsor and finance arranger, as it pools experience, expertise and tenacity to create basic service of significant value. The water project represents the largest known build, operate and supply water deal in the region.¹¹⁰ It is considered to be successful because it is contributing to the Emerging Africa Infrastructure Fund (EAIF) fund's key goal of mobilizing private capital into infrastructure projects across the African continent. The two main lenders to the project — EAIF and the African Development Bank, covering \$40.6m of the capital cost of the \$60.8m project — both contributed to the debt finance by lending \$19m each. An additional contribution of \$2.6m of junior debt was financed by EAIF to Kigali Water Limited (KWL). The balance in equity finance was provided by KWL's ultimate owner, Metito. Delivering up to 40 million litres of water a day, the new plant is expected to grow Kigali's existing water capacity by one third. The project has an enormous social and economic impact potential.

¹⁰⁷ Cattaneo, Emilio, 'Kigali Water: Lessons from one of sub-Saharan Africa's first water PPPs', World Bank Blogs, 22 March 2018, <<https://blogs.worldbank.org/ppps/kigali-water-lessons-one-sub-saharan-africa-s-first-water-ppps>>, accessed 4 March 2022.

¹⁰⁸ Organisation for Economic Co-operation and Development, 'Making Blended Finance Work for Water and Sanitation: Unlocking Commercial Finance for SDG 6 – Policy Highlights', OECD, August 2019.

¹⁰⁹ Principles for Responsible Investment, 'PRI Awards 2019 case study: Kigali Bulk Water Supply Project', PRI, 10 September 2019, <www.unpri.org/showcasing-leadership/pri-awards-2019-case-study-kigali-bulk-water-supply-project/4838.article>, accessed 4 March 2022.

¹¹⁰ Ibid.

Case study: Waterless toilets, Kenya

In Kenya, Ecotact operates “toilet malls,” which serve as retail outlets for basic necessities such as prepaid mobile cards, snacks, and shoe cleaning services.¹¹¹

Case study: Community cooker initiative, waste-to-energy system in Kenya

In Kenya, the Community Cooker initiative uses waste as fuel to create energy for cooking, boiling water, baking, creating steam and many other uses.¹¹²

Case study: Waste-to-energy projects in South Africa and Ethiopia

The few examples of waste to energy projects in Africa are the eThekweni landfill gas, which generates 7.5MW of electricity from two landfill sites in Durban, South Africa and the Reppie waste to energy facility in Addis Ababa, Ethiopia, with an energy output of 50MW generated from residual municipal and commercial solid waste and other types of solid waste. Large cities in South Africa such as Johannesburg, Cape Town, Pretoria, Pietermaritzburg and Rustenburg are also building waste to energy facilities.

In collaboration with Enviro UK, Durban Solid Waste designed a treatment system whereby landfill gas is captured for electricity generation. Durban’s closed-loop landfill site, Mariannahill landfill, generates between 450,000 kWh and 650,000 kWh of electricity per month from waste products. The site generates approximately \$24,500 per month from the sale of electricity at a power purchase tariff.¹¹³

¹¹¹ Esper, *Improved Sanitation and Its Impact on Children*.

¹¹² PLANNING Systems Services, ‘The Community Cooker’, <www.planning-kenya.com/csr.html#!?p=0>, accessed 4 March 2022.

¹¹³ United Nations Human Settlements Programme, ‘Durban’s closed-loop landfill site, South Africa’, chapter 6.1 in *Urban Patterns for a Green Economy: Optimizing Infrastructure*, UN-Habitat, Nairobi, 2012, p. 34.

Case study: Liquid waste-to-energy, Bugolobi waste water treatment plant

The Bugolobi-Nakivubo waste water treatment plant, under the National Water and Sewerage Corporation in Uganda, treats 33 million litres of water daily before discharging it into Lake Victoria. This is an illustration of liquid waste-to-energy. It is co-financed by the Ugandan government, the African Development Bank, the French Development Agency, the European Union and the German development agency Kreditanstalt für Wiederaufbau. The plant has a capacity of 45,000 m³ per day. The facilities of the Bugolobi sewerage and waste water treatment plant allow the fermentation of sludge for the production of biogas, which will produce 630 kilowatts of electricity, part of which is used to operate the waste water treatment plant. Furthermore, it is expected that residues from the sludge methanization process will be distributed as fertilizer to local farmers.

Case study: Private sector engagement in waste collection, Tunisia

In Tunisia, Envitou-STAS provides containers to allow for economical and environmentally safe collection and removal of large amounts of garbage across municipalities throughout the country, with local municipalities usually involved in waste management and disposal at local plants.¹¹⁴

Case study: Waste recycling in Kenya, Cote d'Ivoire and Johannesburg

In Kenya, Ecopost is used to provide job opportunities for people by getting them to collect plastic waste and solving Kenya's plastic waste problem. These collected plastic materials are processed/recycled to manufacture environmentally friendly fencing posts, thereby providing alternatives for the use of timber. In Abidjan, Côte d'Ivoire, aluminium waste is recycled into kitchen utensils.¹¹⁵ There is also evidence of waste recycling in Johannesburg, South Africa.

¹¹⁴ World Bank, *Social Entrepreneurship in Tunisia: Achievements and Ways Forward*, World Bank, Washington, D.C., February 2017.

¹¹⁵ Kouamé, Alfred, 'Recyclage: l'aluminium pour produire des ustensiles de ménage à Abobo, Fraternité Matin', Fraternité Matin, <www.fratmat.info/article/67176/%C3%89conomie/recyclage-laluminium-pour-produire-des-ustensiles-de-menage-a-abobo>, accessed 4 May 2022.

Case study: Composting solid waste, Cape Town

The Cape Town experience has shown that composting is possible in Africa. In 2004, the city successfully transformed 2 per cent of its solid waste into compost, a kind of organically approved fertilizer. Now, the commercial scale recovery of protein from organic waste is being done by AgriProtein. The Bio2watt plant in Bronkhorstspuit, South Africa also treats organic waste to produce biogas. The by-product from the Bio2watt can be used as a fertilizer because of its rich nutrient content. These examples demonstrate the capacity of African cities to successfully use composting as a waste management technique.¹¹⁶

Case study: Revetment to protect from storm surges, Lagos

In Lagos, the construction of seven kilometres of revetment along the Atlantic coast — the Great Wall of Lagos — was conceived to protect sections of the city from storm surges and coastal erosion. Together with a breakwater on the Lagos Bar Beach section of the Atlantic Ocean, the Great Wall provides significant protection to the adjacent coastal land from the impacts of coastal hazards.

¹¹⁶UNEP, *Africa Waste Management Outlook*.

Case study: Ecosystem services provided by the Nakivubo Swamp, Kampala

The ecosystem services provided by the Nakivubo Swamp to the Greater City of Kampala, Uganda, in terms of water purification was estimated at \$2 million/year, which would be the cost of the infrastructure required to provide a similar service. The cost of managing the wetland to optimize its waste treatment potential and maintain its ecological integrity is only about \$235,000 per year. Significant conservation benefits were also derived from the decision. This demonstrates how natural capital-driven solutions offer substantial opportunity to enhance service provision and urban climate resilience.¹¹⁷

Case study: World Bank Financed Flood Prevention and Drainage Project, Senegal

The main non-climatic factors that contribute to recurrent flooding in Senegal include the absence of investment in drainage systems in the suburbs of Dakar, weak urban governance, uncontrolled urban growth and occupation of low lying areas that obstruct the natural channels for storm water drainage. The World Bank project contributed to reducing the risk of flooding in the peri-urban areas of Dakar through a combination of infrastructure and non-infrastructure measures, including the construction of priority primary drainage infrastructure for evacuation of rainwater to the sea, and the pumping of groundwater aquifer in Thiaroye to reduce rate of increase in the groundwater table.¹¹⁸

¹¹⁷ Russi, Daniela, et al., *The Economics of Ecosystems and Biodiversity for Water and Wetlands*, Institute for European Environmental Policy, London and Brussels, Ramsar Secretariat, Gland, 2013.

¹¹⁸ World Bank, 'Flood Prevention and Drainage Project', Project Information Document, World Bank, 12 November 2010.

Case study: Open Cities Africa project – information infrastructure for urban resilience, 11 cities in sub-Saharan Africa

The Open Cities Africa project, undertaken in 11 cities in sub-Saharan Africa, engages local government, civil society, and the private sector to develop the information infrastructure necessary to meet 21st century urban resilience challenges. The project is implemented through a partnership between the Global Facility for Disaster Reduction and Recovery and the World Bank, city governments across the continent, and a partner community of regional scientific and technology organizations, development partners, and technology companies. A mixed-method approach is deployed which includes digital technologies and field data collection via mobile and GPS. Three of the cities in which the Open Cities Africa project is being undertaken are Niamey, Dar es Salaam and Mwanza.

In Niamey, the government of Niger, in partnership with the World Bank and GFDRR, has been stepping up its efforts to systematically gather data and information on Niamey's exposure and vulnerability to flood risk using ICT.

In Dar es Salaam, under the Ramani Huria project funded by the UK Department for International Development (DfID), university students and local community members have created highly accurate maps of the most flood-prone areas of the city for flood resilience and development.

In Mwanza, Tanzania, the population has increased by 5.56 per cent since 2019, with the majority of its growth concentrated in unplanned areas. About 81 per cent of households in Mwanza are urban poor, living in hazard-prone areas that lack access to adequate municipal services such as water, sanitation, solid waste removal, electricity, and drainage. These shortcomings, together with acute, periodic flooding, contribute to a deteriorating environment that often leads to an increase in health and safety risks. Using mobile phones, more than 15,000 points on flood-prone areas, more than 80,000 points on urban exposure, and over 1700 drain segments with 145.013 kilometres of drainage lines and 4,300 drainage related points of interest have been mapped. Data collected provide authorities and communities with evidence to inform urban planning and hazard-preparedness in Mwanza city.

The Dar es Salaam Emergency Response Plan (DarMAERT) was launched by Dar es Salaam city authority in 2017, supported under the UKAID and World Bank partnership. Prior to the DarMAERT partnership, only half of the city was covered by an emergency communication network. With the addition of 3 repeater stations, 4 radio base stations, 6 mobile stations, 31 radio handsets and 6 table phones procured on behalf of Dar es Salaam, coverage has now reached 100 per cent of the metropolitan area.¹¹⁹

¹¹⁹ World Bank, *Tanzania Urban Resilience Programme: Annual Report 2018 (English)*, World Bank, Washington, D.C., 1 November 2018.

Case study: Digital database of urban areas for decision-making, Kenya

In Kenya, The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) is supporting the MajiData database, which contains data on some 2,000 urban areas, including details of their population, water supply, sewage disposal, topography and urban planning. These data can be easily retrieved and kept up to date, and they enable broad analyses of the situation at any specific location. Based on this, measures can be planned and tailored precisely to local needs.

Case study: Mobile payment for solar energy

Two 2016 commitments straddle the ICT and energy sectors. Mobisol, which International Finance Corporation (IFC) is supporting, combines solar energy with an affordable payment plan via mobile phone. In 2016, CDC Group invested in M-Kopa, which by May 2017 had connected over 500,000 homes to affordable solar power, with 500 new homes being added every day. Current customers will make projected savings of \$375m over the next four years, according to the company. It claims that customers will enjoy 62.5m hours of kerosene-free lighting per month.¹²⁰

Case study: Special planning area, Mukuru, Nairobi

In the densely packed informal settlement of Mukuru in Nairobi, members of the community were engaged through a participatory planning approach. They discussed county planning standards for road widths that, if applied in dense settlements like Mukuru, would lead to undesirable destruction of houses and displacement. As a result of the consultations, more flexible planning standards were introduced and adopted to minimize displacement of residents in the informal settlement.¹²¹

¹²⁰ ICA Secretariat, *Infrastructure Financing Trends in Africa – 2016*.

¹²¹ Horn, Philipp, 'Enabling participatory planning to be scaled in exclusionary urban political environments: lessons from the Mukuru Special Planning Area in Nairobi', *Environment and Urbanization*, vol. 33, no. 2, 29 April 2021, pp. 519–538.

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