



GCRF Africa Catalyst Case Study:

# Reducing climate change vulnerability using sustainable infrastructure



## The global issue

**The Glasgow Climate Pact agreed at COP26 may not have met expectations but it did offer some more assertive climate actions to reach net zero. Parties agreed the need to reduce global greenhouse gas emissions by 45% by 2030 to limit global warming to 1.5°C.**

Countries then set out their own targets, detailing how they plan to cut greenhouse gas emissions. But none of them can do so successfully without drastically rethinking their infrastructure systems. Existing unsustainable infrastructure is responsible not just for driving climate change, but also for destroying nature, increasing biodiversity loss, and contributing to pollution and waste. Real progress has been made but more still needs to be done.

The UN Environment Programme set out 10 guiding principles to successfully integrate sustainability into infrastructure planning and delivery. Principle seven of the International Good Practice Principles for Sustainable Infrastructure states that: “infrastructure should create employment, support local businesses and build amenities that benefit communities, thereby maximizing and safeguarding its economic benefits.”

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International Good Practice Principles for Sustainable Infrastructure, United Nations Environment Programme

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## National responses

As parties to the UN Framework Convention on Climate Change (UNFCCC), Kenya, Rwanda and Uganda all committed to limiting global warming to 1.5°C. This case study showcases partners in these countries who are enhancing climate-resilient infrastructure in Africa, using funding from the Royal Academy of Engineering Global Challenges Research Fund (GCRF) Africa Catalyst sustainable infrastructure programme.



All four projects demonstrate how each country is working on sustainable infrastructure while ensuring economic benefits for the local community.

## What is happening on the ground?

### RWANDA

Although Rwanda benefits from locally available construction materials, such as volcanic ash and compressed earth, built environment professionals are over-reliant on imported materials. High transportation costs make this dependence unsustainable and carry a hefty carbon footprint. Also, if calculations are not accurate at the design stage, construction materials end up being wasted, which has both economic and environmental repercussions.

The University of Rwanda, in collaboration with Mass Design Group and Arup, is creating a toolkit for measuring and reducing embodied carbon emissions in design and construction projects. Embodied carbon refers to all the CO<sub>2</sub> that is emitted in producing materials. The toolkit provides easy calculations to determine the embodied carbon footprint of materials. It also includes a benchmark of embodied carbon for different types of buildings in Rwanda and sustainability targets. The university plans to train built environment practitioners to use the toolkit so they can make climate-smart decisions.

With the funding received from the GCRF Africa Catalyst sustainable infrastructure programme in support of the decarbonisation of the construction sector, the project aims to demonstrate that using locally sourced materials not only reduces costs but creates opportunities for local masons to use their skills, thereby boosting demand for workers in the profession.

It is also investigating ways in which the construction sector can avoid materials being wasted at the design stage and how it can benefit from the circular economy. Reusing materials will reduce embodied carbon and increase jobs in the recycling industry.



### KENYA – MOI UNIVERSITY

Kenya's household electricity prices are the fourth highest in Africa, at 0.22 US dollars per kilowatt hour, behind only Rwanda, Cape Verde and Mali. By contrast, electricity in Ethiopia costs just 0.02 US dollars per kilowatt hour. Affordable energy is crucial to boosting Kenya's economy.

Moi University is addressing this issue by building an online information platform for renewable energy access in Kenya. The platform is a one-stop information hub for users of renewable energy service providers, entrepreneurs, researchers, innovators, and the business community.

The university is working with a consortium of UK universities, the Institution of Engineers Kenya (IEK), Konza Development Authority, and others to host technical data on solar energy in the region as well as data on technical services, such as engineers and technicians. The platform will also contain data on available products, information on best practice in renewable energy and policy, regulations and guidelines on renewable energy, and information on financial support options.

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**“I got more confidence on inspiring women engineers, learnt how to be a good speaker, a good leader.”**

Institution of Engineers, Tanzania Women Chapter member.

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IEK, Moi's industry partner, has been advocating to the government of Kenya for affordable regulations that would drive down the cost of renewable energy. It has provided information on the benefits of creating shared costs systems, such as schemes allowing micro grids to be purchased by communities rather than single individuals, compared with increasing import taxes on solar technologies.

IEK will also help the government implement a sustainable transportation system. The aim is to promote the availability of clean and affordable energy across the country. Its approach includes an electric mobility project producing 500,000 electric vehicles by

2025. IEK will assist the government by providing data collected through the platform and developing policies for the promotion and adoption of renewable energy.

While Moi University's platform will provide the business community with information regarding lower cost renewable technologies and scale-up opportunities, IEK is influencing policy at a national level to drive down the cost of renewable energy for businesses.

The support received from the Royal Academy of Engineering promoted awareness-raising initiatives in renewable energy and fostered stakeholder involvement and academia collaboration to expand access to affordable clean renewable energy. One of the project's many achievements has been the creation of 'demonstration centres' as an innovative living dissemination tool that brings real industrial challenges closer to the university.

### KENYA – KOUNKUEY DESIGN INITIATIVE (KDI)

In Nairobi, more than 60% of residents live on just 6% of city land in underserved neighbourhoods where basic municipal services are limited and where flooding and fire are rife. The many challenges facing slum upgrading in Kenya require a combination of integrated and holistic infrastructure planning with community engagement that secures buy-in, collaboration and more effective responses from residents.

The Kounkuey Design Initiative (KDI) aims to positively address this need. Encouraging the cultivation of resilient infrastructure systems, the Royal Academy of Engineering has supported University College London (UCL), the Architectural Association of Kenya (AAK), Akiba Mahinani Trust (AMT), and Arup East Africa, to develop an Integrated and Inclusive Infrastructure Framework (3IF) that sustainably responds to this challenge. This will enable infrastructure planning to support sustainable development, poverty alleviation, equitable societies, and improved public health.

KDI's action puts residents of informal settlements at the centre of decision-making. KDI is creating a practical guide for communities so that residents are properly equipped to engage with infrastructure upgrades. The guide will help residents influence critical decision-making on settlement upgrading initiatives to ensure they have fair representation and inclusion as part of the urban processes that shape their lives. The 3IF framework includes a methodology to help policymakers increase consultation and get buy-in from residents when planning infrastructure projects.

The project is successfully co-developing all components of the 3IF Framework, including the perspectives of more than 20 government representatives, built environment professionals and civil society bodies that have participated as part of the workshops.

Inclusive infrastructure should allow residents to access markets and the city and contribute to the formal economy. KDI's project makes it easier and safer for inhabitants of informal settlements to do this. By taking the community's needs into consideration, including disabled people, women and youth, it ensures all interests from a diversity of actors are heard.



The benefits of inclusive infrastructures are many. For community members who earn their living by selling food on the roadside, having infrastructure that allows a free influx between formal and informal settlements creates new income-generation opportunities and improves livelihoods. Inclusive urban infrastructure development widens access to jobs and education, creating an environment for commerce to thrive. Access to water and sanitation services reduces related diseases, helps community members to save on medical expenses, and increases productivity, which directly impacts disposable income.

Inclusive and sustainable infrastructure improvements of informal settlements aim to enhance the living and working environments of thousands of people living in Kenya's slums. Making sure their voices are heard before, during and after improvements is crucial for supporting inclusive growth and urban poverty reduction, and that is what KDI hopes to achieve with the 3IF.

### UGANDA

Uganda's third National Development Plan seeks to maintain and develop productive infrastructure to reduce the cost of doing business and increase connectivity – especially for unserved and underserved areas.

Through the GCRF Africa Catalyst sustainable infrastructure programme, Makerere University is building a community-based roadmap for Ugandan policymakers. This aims to ensure resilience and sustainability requirements are incorporated into infrastructure planning and local participation is improved.

The Makerere University's roadmap builds on knowledge gathered during consultations with rural and urban underserved communities. During interviews, local people highlighted how trade is thriving after better transport systems were introduced. They also pointed to the increase of employment opportunities for rural and urban communities in infrastructure maintenance services such as unblocking drains and carrying out repairs.

By enabling communities to come up with solutions to their own problems, the project ensures local buy-in. This means that as it goes from one phase to the next, stakeholders are more likely to identify innovative solutions that are economically sustainable for them.

The project has helped to further the debate on what resilient and sustainable infrastructure means in Uganda, engaging national-level stakeholders from Kampala and the Apac region, as well as integrating community input and involvement.



### About

#### Kounkuey Design Initiative

Kounkuey Design Initiative (KDI) is a community development and design non-profit. It partners with under-resourced communities to advance equity and activate unrealised potential in its neighbourhoods and cities.

#### Makerere University

The College of Engineering, Design, Art and Technology (CEDAT) at Makerere University, Uganda, undertakes high-quality research relevant to the region and global development needs and consequently produces highly qualified graduates with specialised skills, as well as professional services and innovation for sustainable national and regional development.

#### University of Rwanda

University of Rwanda was established in 2013. It is committed to supporting the development of Rwanda by discovering and advancing knowledge while committing to the highest standards of academic excellence, preparing students for lives of service, leadership and solutions.

#### Moi University

Moi University was established in 1984 with a mission to preserve, create and disseminate knowledge, conserve and develop scientific, technological and cultural heritage through quality teaching and research; to create conducive work and learning environment; and to work with stakeholders for the betterment of society.

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