DIGITAL EARTH PARTNERSHIP

ACCELERATING DIGITAL EARTH OBSERVATION SERVICES FOR RESILIENT DEVELOPMENT

OCTOBER 2023

Caroline Gevaert | cgevaert@worldbank.org

GFDRR Global Facility for Disaster Reduction and Recovery

Administered by THE WORLD BANK IBRD • IDA | WORLD BANK GROUP

esa

The

DIGITAL EARTH PARTNERSHIP

aims to enhance the resilience of vulnerable countries and communities to climate change & natural hazard disasters through greater access to and adoption of frontier earth observation tools & services.

TRADITIONAL APPROACH TO DATA MANAGEMENT: OBSOLETE, ANALOG, CORRECTIVE

DATA IS:

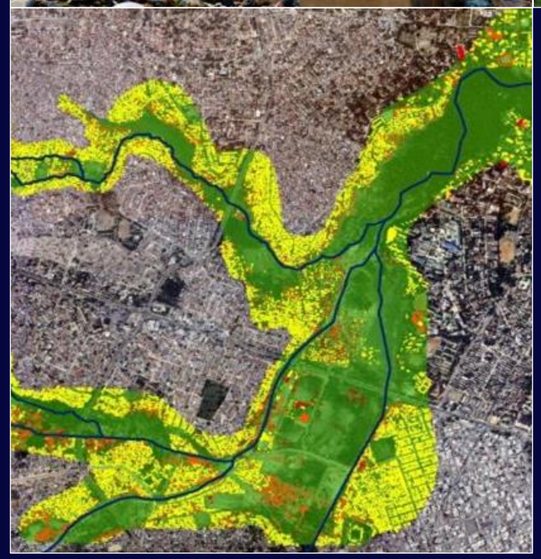
⇒ non-existent

⇒ inaccurate or obsolete

⇒ inaccessible

⇒ analog, or proprietary format

⇒ expensive



LEADS TO:

⇒ response approach that is corrective not preventative

⇒ $$ correction **16x >** $$ prevention

Traditional Approach to Risk Data Collection

Applications of Frontier Earth Observation & AI

for Disaster Risk Management, Climate Change Resilience & Sustainable Development

FLOOD HAZARDS

- Flood Event Mapping
- Flood Historical Mapping
- Flood Hazard Mapping

GEO HAZARDS

- Terrain Deformation
  - Landslide Hazard Assessment
  - Landslide Inventory
  - Subsidence
- Seismic related Activity
- Coastal Erosion
- Harsh Weather

EXPOSURE

- Urban Asset Mapping
- Population Mapping
- Non-urban Asset Mapping

RISK ASSESSMENT

- Vulnerability Assessment
- Risk Mapping
- Loss Cost Mapping

Blended Approach for Maximum Impact

LOCAL PARTICIPATION

- context
- calibration
- training

ARTIFICIAL INTELLIGENCE

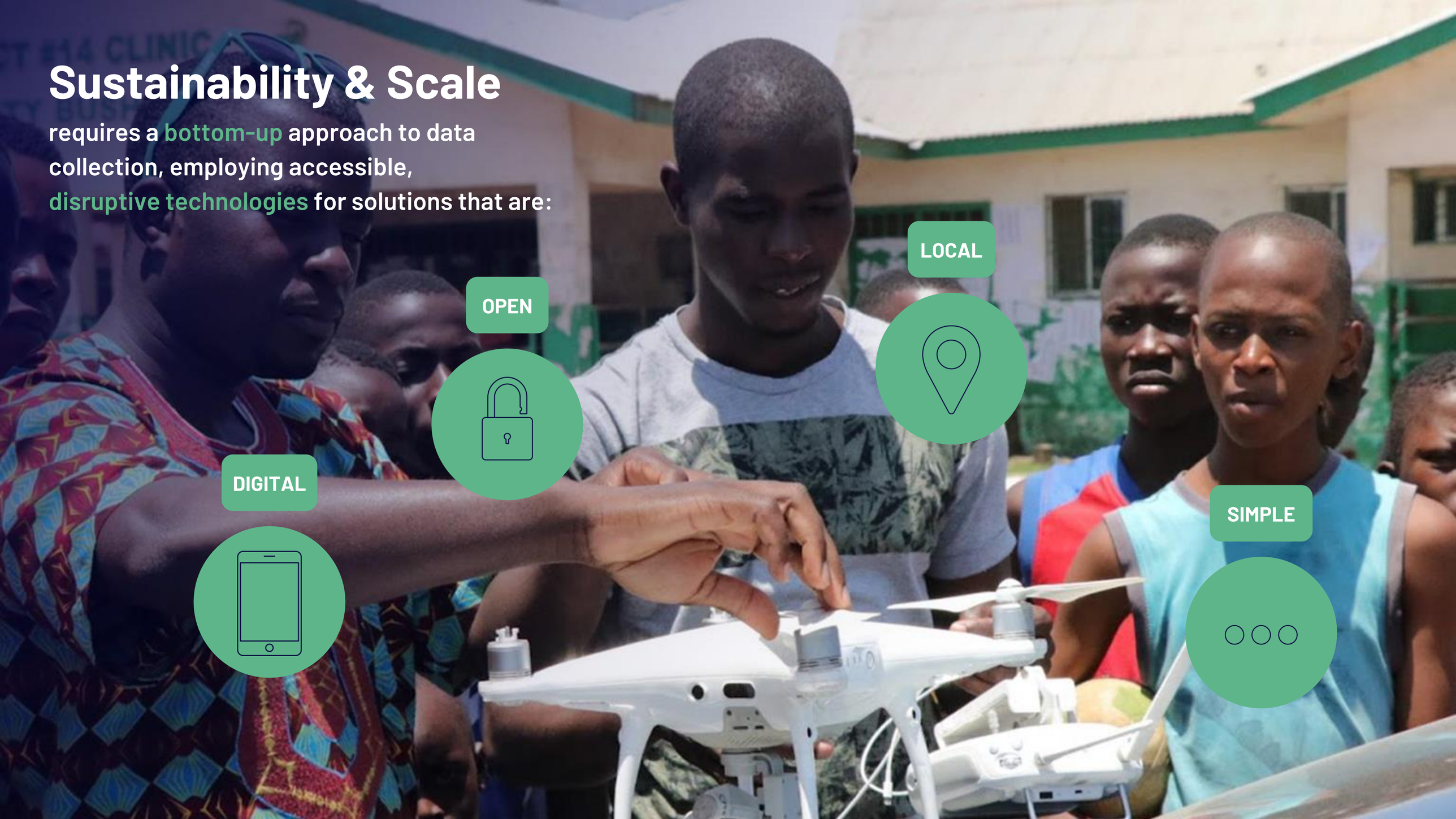
- customization
- cost reduction
- analysis potential

EARTH OBSERVATION

- independence
- trust
- cost effective at scale

Sustainability & Scale

requires a bottom-up approach to data collection, employing accessible, disruptive technologies for solutions that are:



A Responsible, Inclusive Approach

Co-creation of geospatial data address locally articulated needs pool expertise and resources

Strong ethical frameworks protect the vulnerable, and ensure shared benefits of disruptive tech

Local Capacity Building critical for adoption, sustainability and continued tech development

Skill Development introduce marketable digital skills, and potential employment opportunities

RESILIENCE ACADEMY

Skills, Sustainability, Research & Reforms

Resilience Academy

Resilience Academy trains young people with tools, knowledge, and skills to address the world's most pressing urban challenges and to discover solutions for resilient urban development.

The original Resilience Academy, Tanzania, is a partnership between four academic institutions in Tanzania, with the University of Turku (UTU) from Finland, the Government of Tanzania, the World Bank, and the Foreign, Commonwealth and Development Office (FCDO).

There are FOUR main components to the initiative:

INTERNSHIP PROGRAM

- engages Tanzanian university students to 8-week trainings with the industry.
- engages students and community members in digital geospatial data collection

CLIMATE RISK DATABASE (CRD)

- digital geospatial data sets managed and shared on Geonode.
- all data sets collected by student interns and TURP stakeholders are stored in CRD.

OPEN E-LEARNING MATERIALS

- educational materials for e-learning of practical data and analysis skills. Materials are used in the university degree programs

RESEARCH & INNOVATION ACTIVITIES

- research activities are built on novel data, technology and application ideas around urban resilience.

Example – Waste management

550
Youth Mappers

770+
km of Drains

20,000 informal dumps

Interactive data map

100
Clean ups

500
Tonnes removed

https://www.worldbank.org/en/news/video/2019/10/30/solid-waste-trash-mapping---community-driven-solutions-for-urban-waste

MONITORING URBAN FOREST CANOPY WITH AI

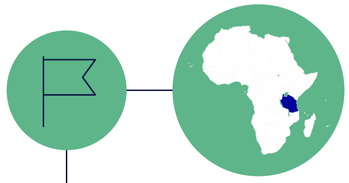
Technological approaches to support Nature based solutions

Cities require comprehensive forest inventory to support the regular monitoring of the growth and health of planted trees

In addition to field based inventory, baseline canopy detection using RS allows for scaled approach

APPROACH:

- Using high-res imagery local mappers identified, digitized and labeled representative samples of existing urban canopy cover.
- This data was used to train a ML algorithm, to classify historic imagery, and establish a “greening’ baseline.
- Tree canopy map is produced for the whole urban expanse
- Repeat as needed for change detection



Soil Mapping & Erosion Modeling: Tanzania

Tanzanian Urban Resilience Project

specs.

- **Soil erosion heightens flood impacts in Dar es Salaam**
- **Soil data is lacking, hindering the accuracy of flood modelling**
- **A team of young professionals & students used open source apps & measurement tools for collection of soil samples**
- **The subsequent profiles showed:**
  - which areas are most susceptible to erosion,
  - which are experiencing the most erosion, and
  - how this influences flooding and river dynamics

Cost
<25% of typical cost

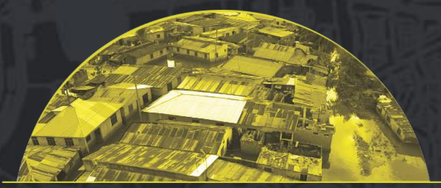
Mappers
16

Area Mapped
643 sites
2,752 sq km

Example – Zanzibar Buildings Survey

15
Government
Surveyors

20
University
Youth



2,400 km sq

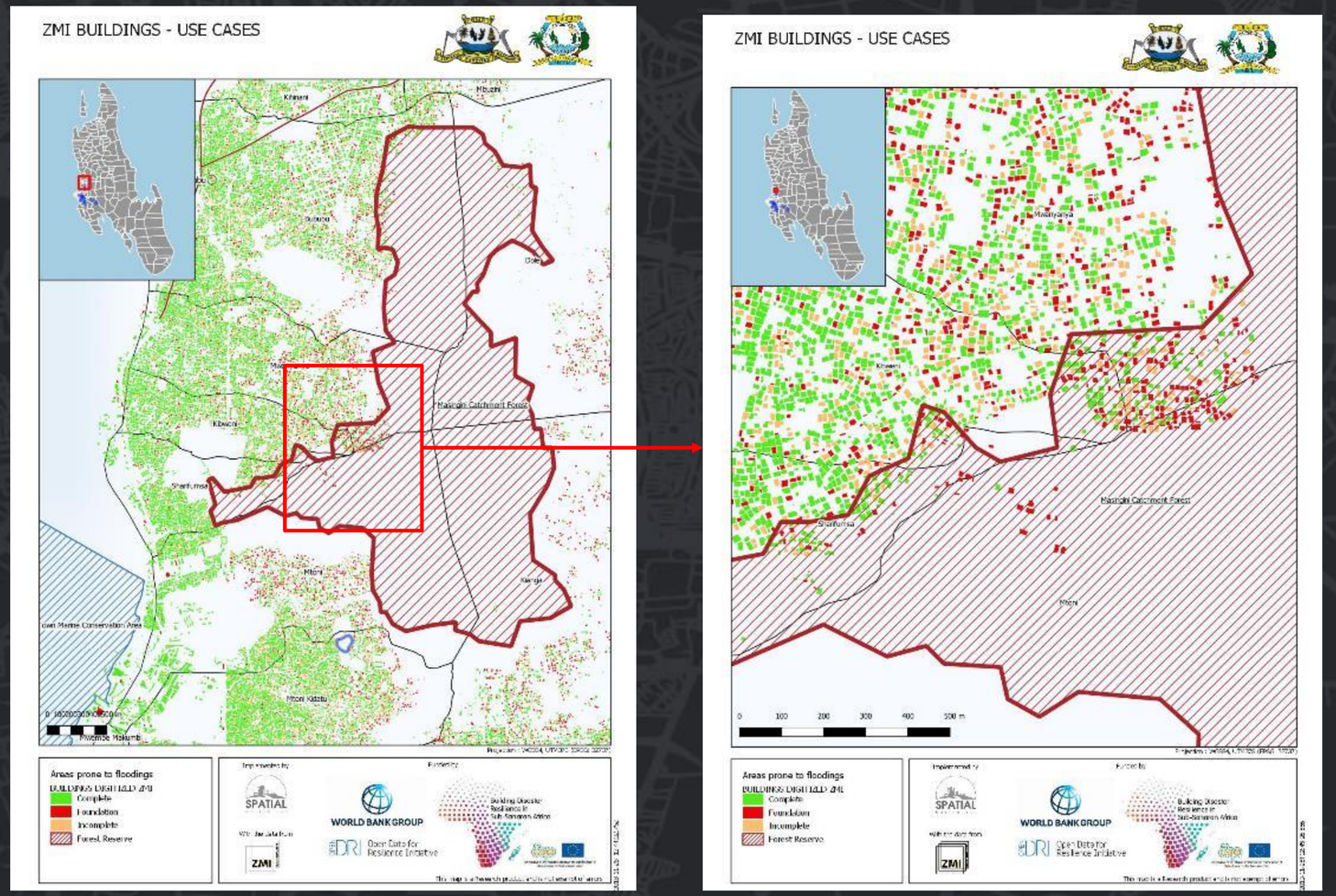
2,500 Flights

<20%
of typical cost

https://www.youtube.com/watch?v=qVEdhSodIeE

Drone Data Digitization

1. 2500 km² surveyed
2. 500,000 buildings digitised
3. AI competition
4. Digital Surface Model
5. 4 Start-up companies



Open Cities Africa

2018-2020

OPEN DRI Open Data for Resilience Initiative

specs.

1,500,000
Features Mapped

16
Participating Cities

1,600
Mappers

1,000's
Citizens Engaged

3
Regional Knowledge Exchanges

40%
Female Participation in trainings in mapping

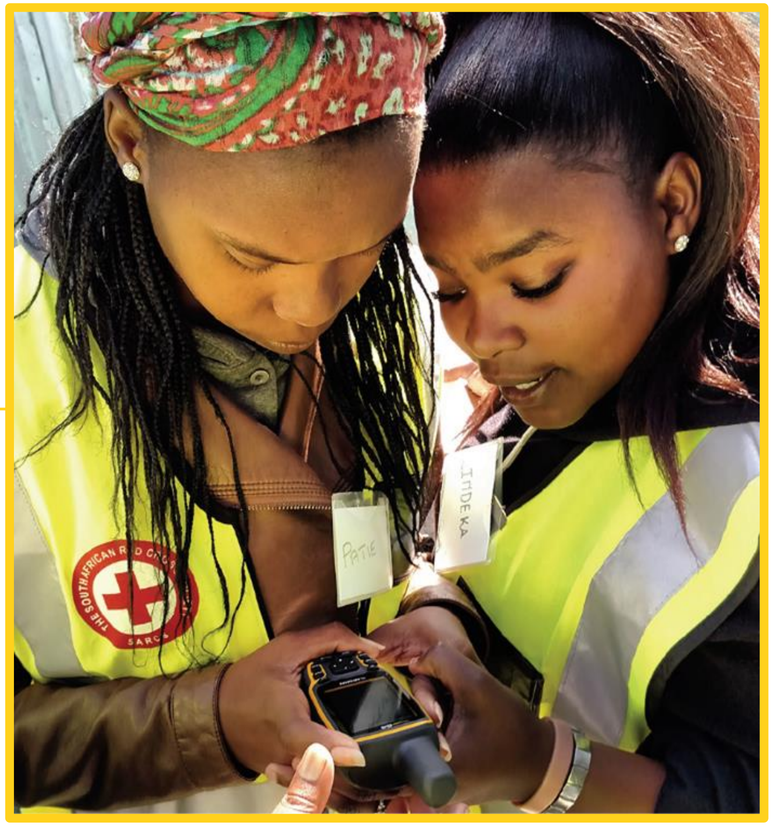
Digital & Paper Tools
Inform Policy & Investment Decisions

Cocreation Using Microtasking

using mobile platforms to perform simple digital-tasks-for-payment

novel way to employ new recruits

low to high skill options to suit the prior experience, training, and digital resources



STEP 1
Break workflow into Tasks

STEP 2
Find opportunities

STEP 3
Mobile learning/skills

STEP 4
Complete and upload

STEP 5
Work is validated

STEP 6
mobile payment

WSF Tracker: Exposure Data as a Public Good

NEW CAIRO CITY [EGYPT]

Microtasking Pilot Study: Mali

Identifying Solid Waste from Imagery w. MapSwipe

specs.

No. of Tasks
1,331,154

Workers
119

Task Type
Remote work
Low skilled

Task Description

The MapSwipe team built on the existing app to enable youth within Bamako to swipe through satellite imagery, identifying areas where solid waste sites are located. wipers would identify image cells where solid waste was visible, by tapping on the app. Each image was checked by 5 swipers for agreement.

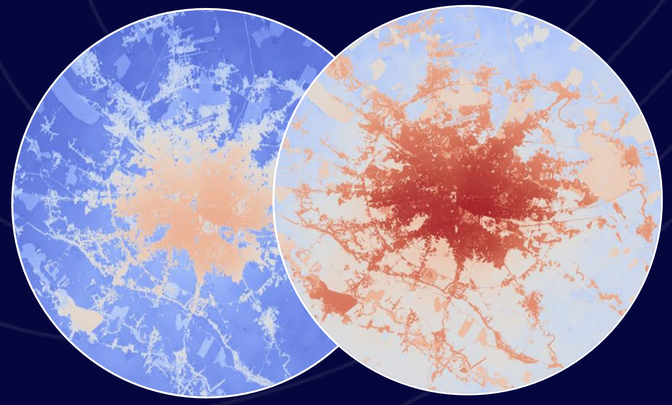
EXTREME HEAT IN CITIES

From assessment to action

1. BUILD EVIDENCE BASE

GFDRR has worked with climate modeling partners to deliver forward-looking heat stress projections, at urban or national scale, in South Africa, Tunisia, Romania, India and other countries.

Bucharest: projected number of hot nights per year



Present

2041-2060

TOOLS: Climate modeling; impacts assessment of health, labor & infrastructure channels; assess change in person-hours exposure.

2. ENGAGE STAKEHOLDERS

For a regional flagship study on extreme heat, GFDRR mobilized citizen science volunteers to conduct heat mapping using sensors fitted to motorbikes. Participants also identified localized options to mitigate heat exposure through a survey methodology using thermal cameras.

TOOLS: Citizen science assessment using vehicle-based, handheld and smartphone-based heat cameras.

3. IMPLEMENT ACTIONS

Building on climate modeling and citizen engagement, GFDRR has facilitated workshops to define governmental priorities on heat mitigation - working across heatwave emergency management, public health responses and 'cool cities' actions.

TOOLS: Multi-stakeholder planning workshops, defining investment options, implementation support.

DIGITAL EARTH FOR A RESILIENT CARIBBEAN

Exposure Datasets to support Disaster Risk Management

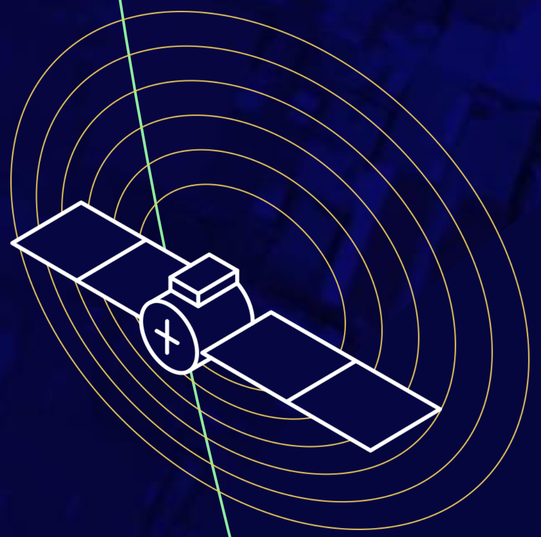
To raise awareness and enhance local capacity in the Caribbean to make use of Earth Observation (EO) data and services in support of resilient infrastructure and housing operations.

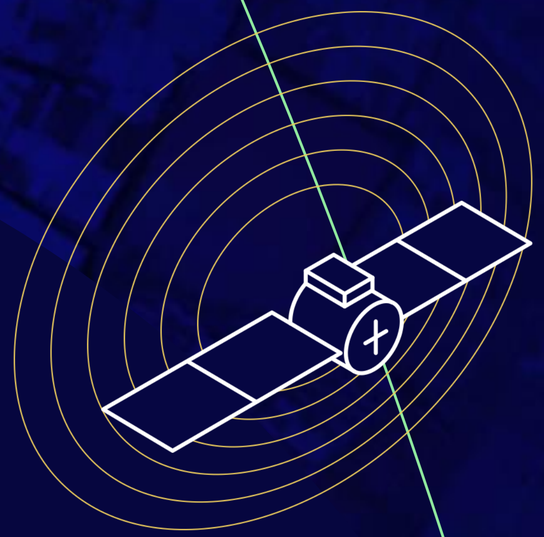
APPROACH:

- **Develop exposure typology** for areas/neighborhoods across the islands using multiple data streams, such as high resolution imagery, building footprints, and other local datasets

- Training and validation data would be captured through field work with a local implementing partner

- Generate a **replicable model to generate neighborhood level exposure datasets,** making use where possible of existing government datasets, and supplementing here needed.





THANK YOU

Join the partnership:

Caroline Gevaert | cgevaert@worldbank.org

WORLD BANK GROUP

esa