belspo

ONEKANÁ

" *to make visible*

Earth **O**bservation-based mod**e**lling for ma**k**ing thermal inequality visible in **A**frican cities

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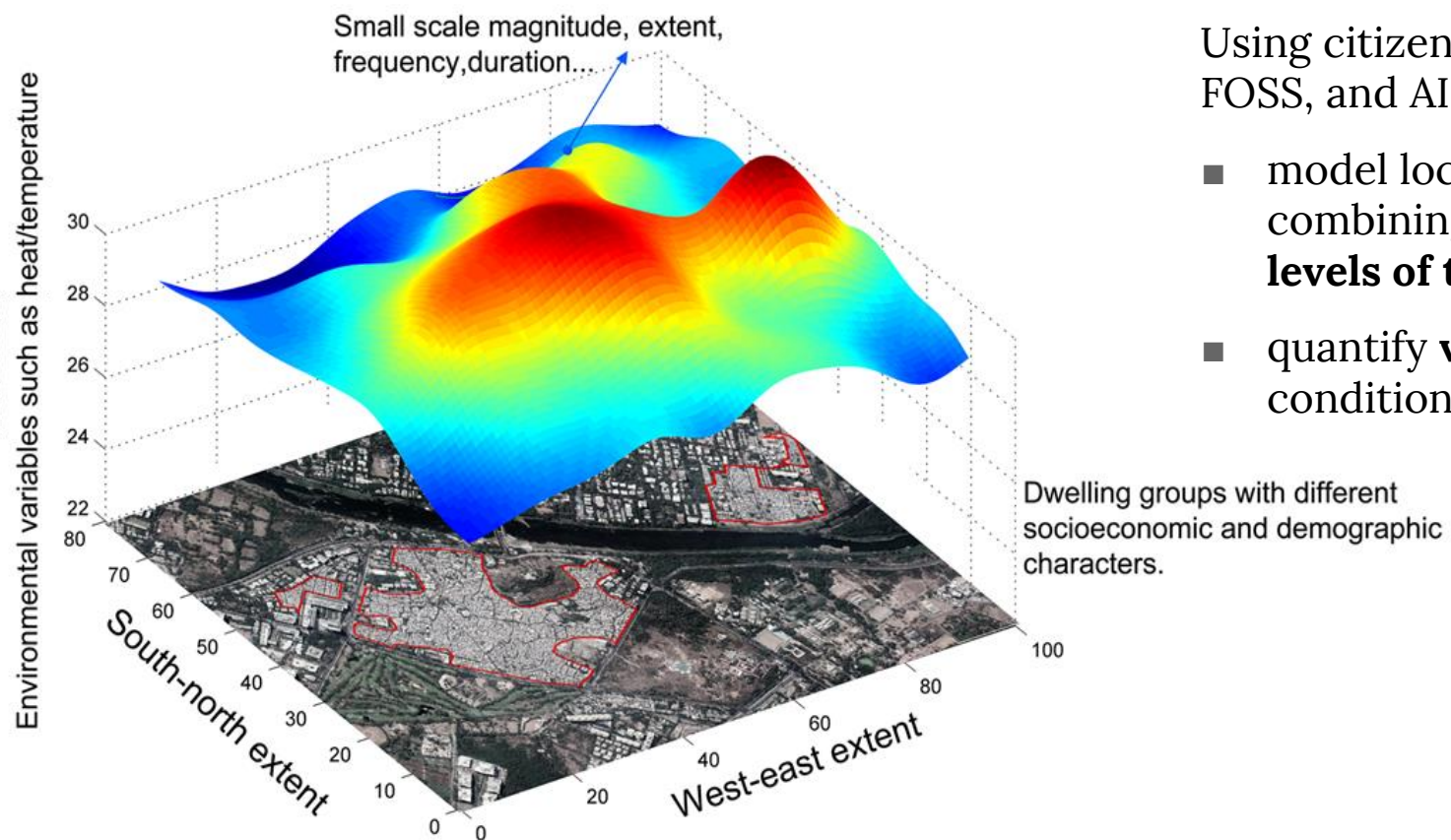
ITC
UNIVERSITY
OF TWENTE.

WHAT?

Research question: How and why are urban dwellers with different levels of deprivation divergently exposed to variations of temperatures and extreme heat ?

Hypothesis

Using citizen science & open or low-cost satellite images, FOSS, and AI, it is possible to:

- model location, extent and characteristics of areas combining both **high levels of deprivation and high levels of temperature variation/extreme heat**

- quantify **vulnerable population** exposed to such conditions

Small scale magnitude, extent, frequency, duration...

Environmental variables such as heat/temperature

South-north extent

West-east extent

Dwelling groups with different socioeconomic and demographic characters.
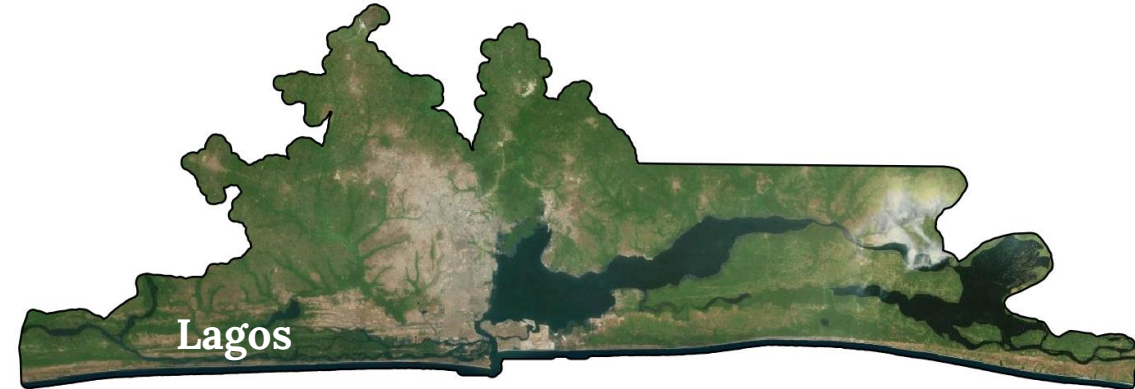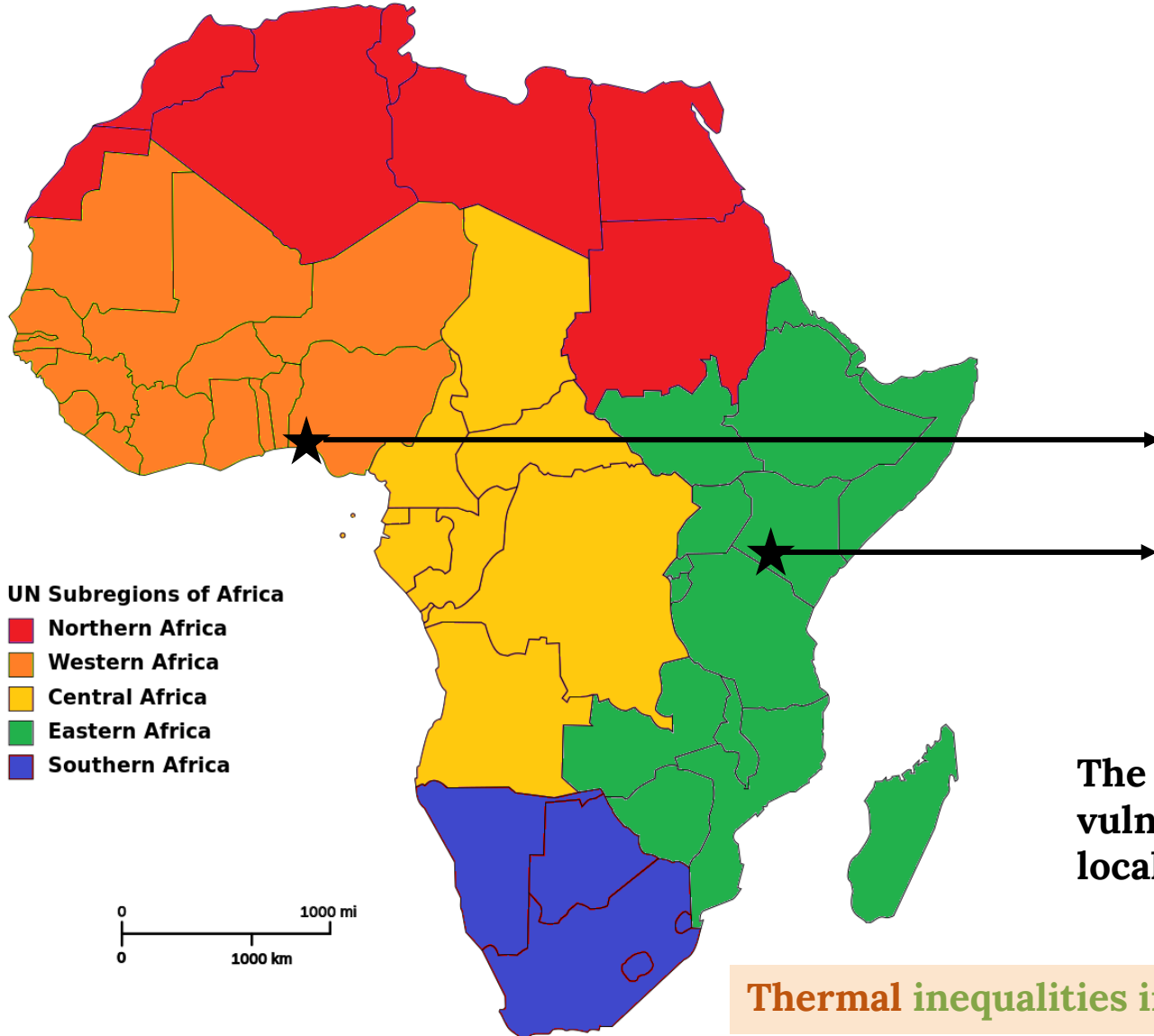
Methodology

EARTH OBSERVATION   CITZEN SCIENCE

WHERE?

Study areas | Two SSA fast growing cities

- **Nairobi** affected by temperature variations
- **Lagos** affected by extreme heat

UN Subregions of Africa
- Northern Africa
- Western Africa
- Central Africa
- Eastern Africa
- Southern Africa

Lagos

Nairobi

The variability of heat exposure and the number of exposed vulnerable people are absent from existing data, models and local dwellers' knowledge.

Thermal inequalities in SSA cities are invisible: Need to put them on the map!

HOW?

Methodology | Citizen science & Earth Observation-based modelling (AI)

AIR TEMPERATURE variations and extremes

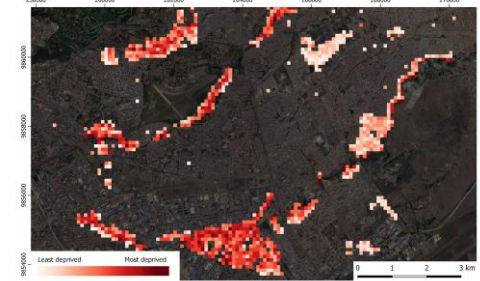**Data-poor context**
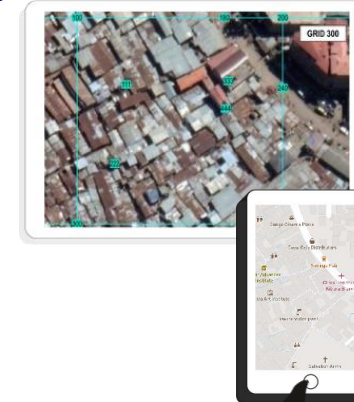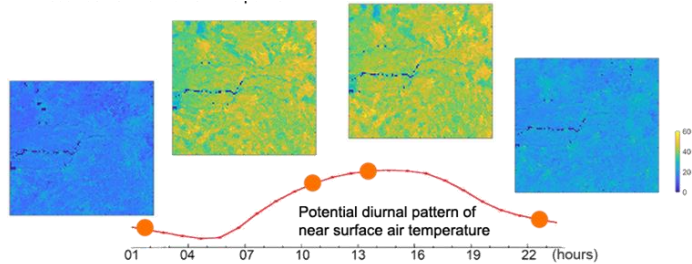
DEPRIVATION index

Surveys

EO-based model

Potential diurnal pattern of near surface air temperature

01 04 07 10 13 16 19 22 (hours)

Surveys

EO-based model

AREAS WITH HIGH DEPRIVATION AND HIGH TEMPERATURE VARIATIONS

GRID 300

Least deprived   Most deprived

0 1 2 3 km

POPULATION distribution

Surveys

EO-based model

GRID 300

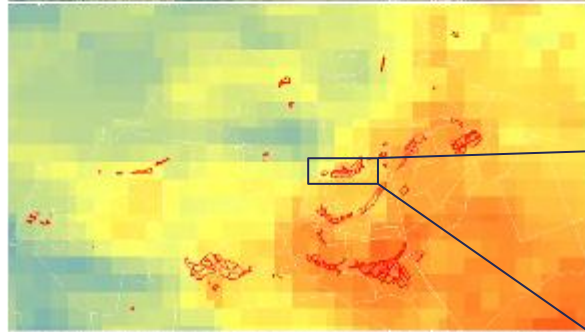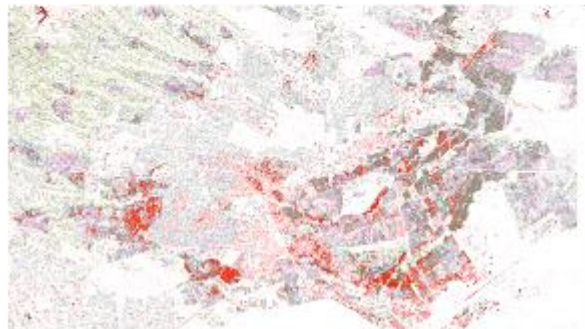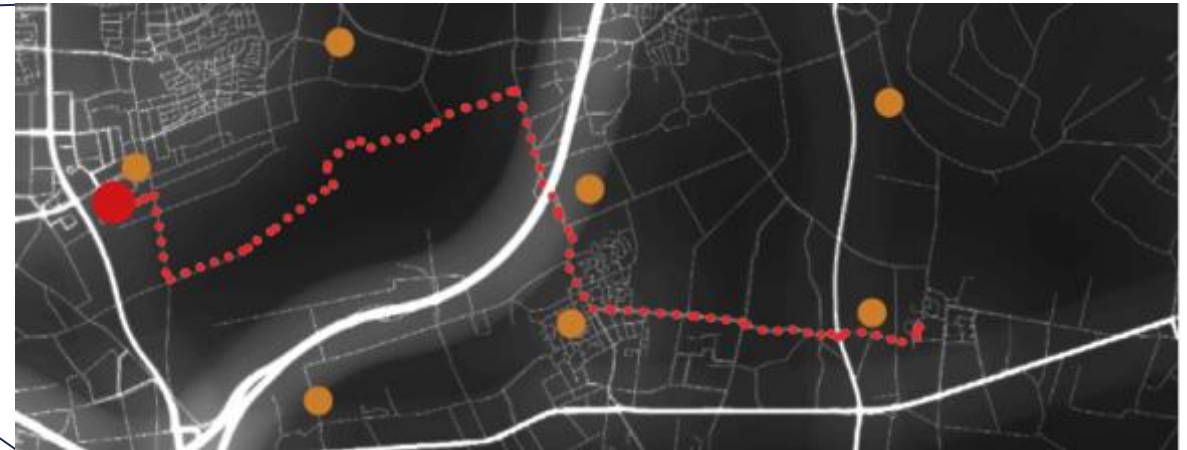**EXPOSURE**

Number of people exposed
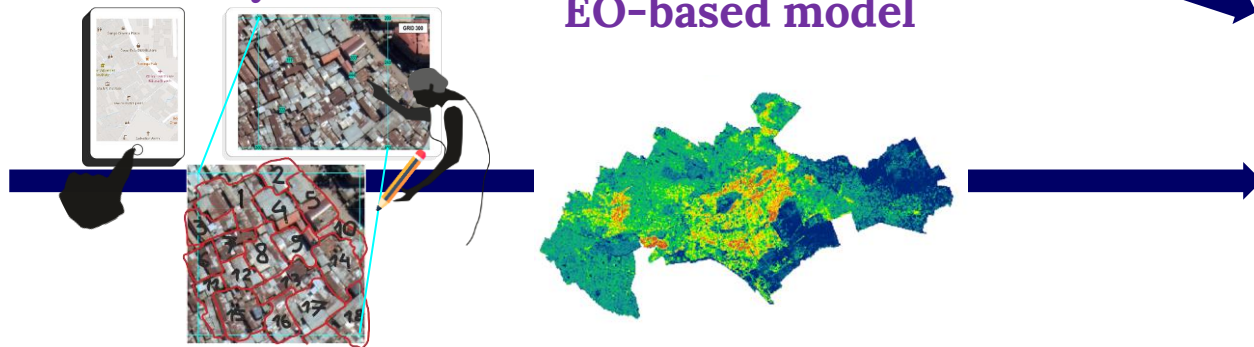
HOW?

Methodology | EO approach | **<u>Air Temperature</u> modelling**

- Main goal: High resolution temperature maps in both space and time in target neighbourhoods

- In-situ fixed measurements complemented by transects guided by varying urban environments

t_0: In-situ measurements (orange) complemented by transect (red) that will cover varying urban environments, and also stay close to the in-situ measurements for verification

FOR WHAT PURPOSE?

Societal Impact | Towards green and sustainable cities

- Better understanding of relationships between urban deprivation and exposure to temperature variations and extremes

- Transferable methods combining advancements in EO and citizen science

- Evidence of climate vulnerabilities of the urban poor
  - setting priorities – most vulnerable first
  - campaigning for more climate-resilient urban spaces

- Stimulating awareness and supporting advocacy with data

- Low-cost local adaptation measures – improving living quality

EARTH OBSERVATIONS FOR THE
SUSTAINABLE DEVELOPMENT GOALS

11 SUSTAINABLE CITIES AND COMMUNITIES

UN-HABITAT

Building Climate Resilience of the Urban Poor

Inhabitants and Local Businesses

Local and National Governments

Civil Society Organisations (e.g., NGOs, CBOs)

International Organisations (e.g., UN-Habitat)