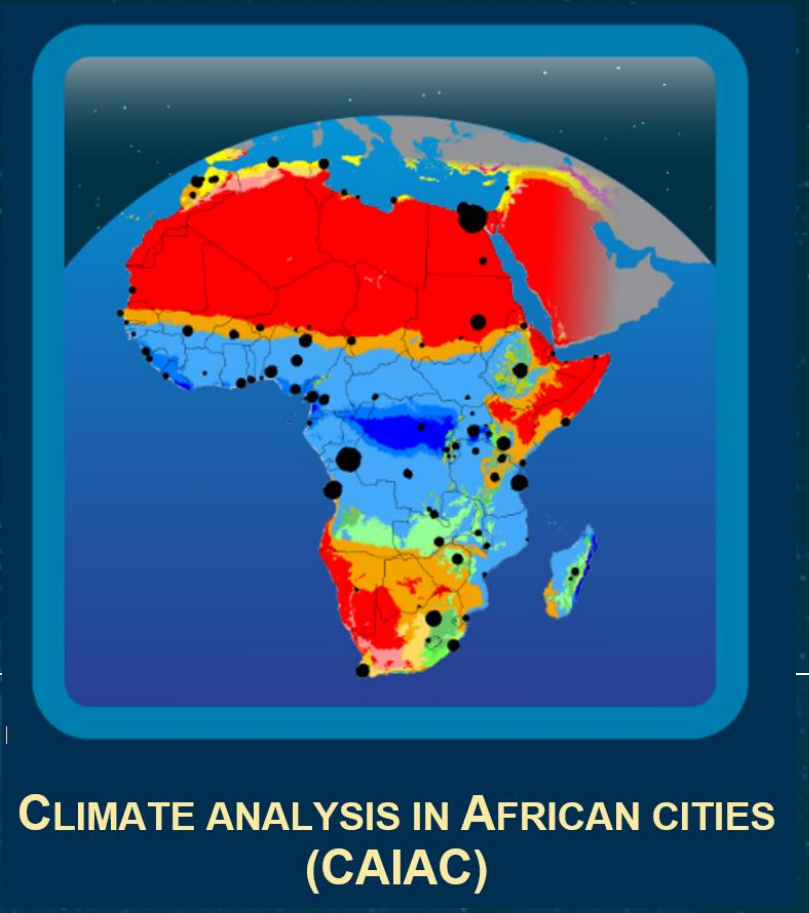
Colocation Day 1 BOG 3



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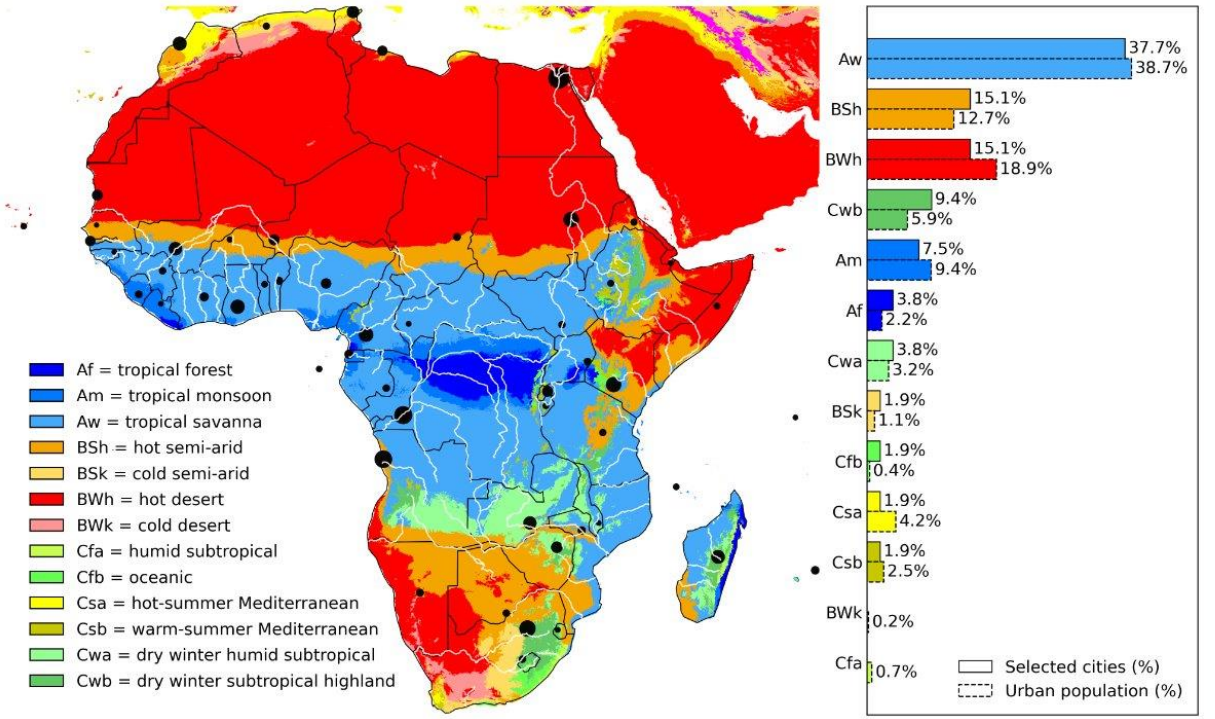
Project Objectives

- ESA CCI EXPRO+ "Climate Analysis In African Cities", 18 months project led by VITO with uOttawa and ACMAD
- Assess present and future urban heat stress and flooding for 54 representative African cities at 300 m resolution
- Combine EO, climate projections and urban growth: UrbClim for heat, SAHEL for flooding and GeoDynamiX for land-use and population change
- Contribute to the IPCC Special Report on Cities



Skeleton overview of the approach

1. Select a representative city sample

54 cities chosen to cover African climate zones, city size and stake holder priorities.

2. Build present and future urban form and population

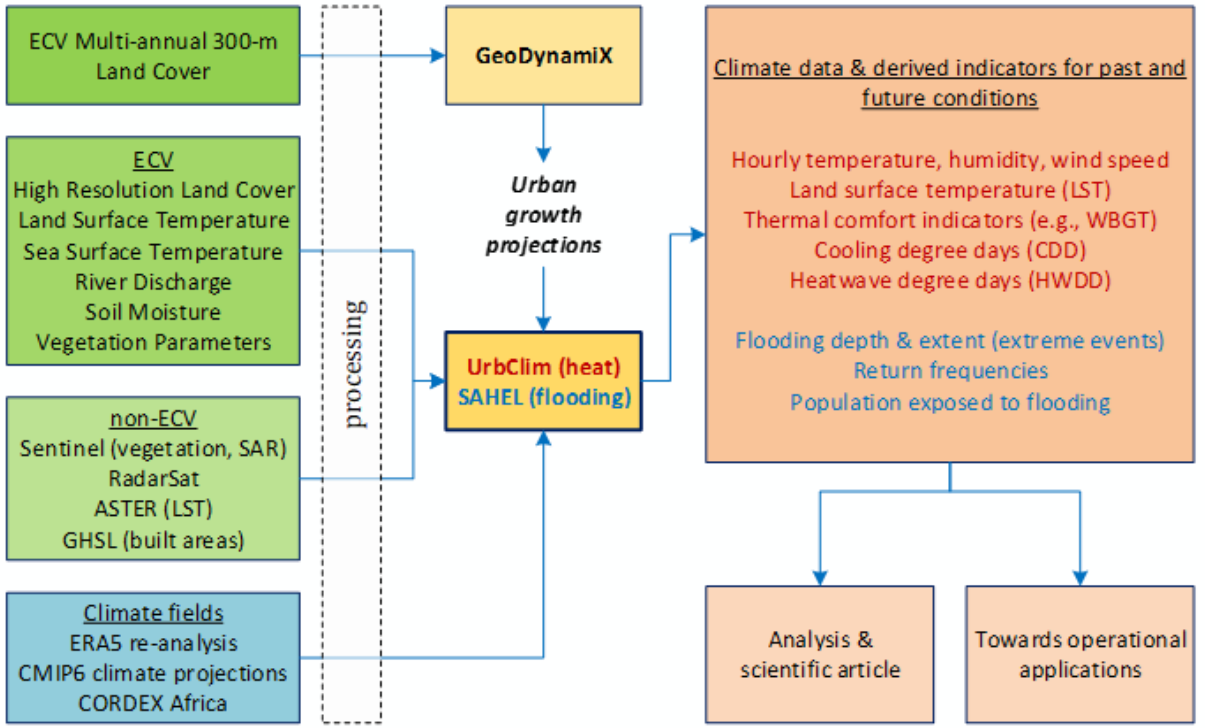
GeoDynamiX simulates annual land-use and population change to 2100 under SSP2 and SSP3

3. Run urban climate and flood modelling

UrbClim ingests ERA5 and bias corrected CMIP6 with EO terrain inputs, SAHEL combines EO variables, hydrologic modelling and CNNs for flood extent

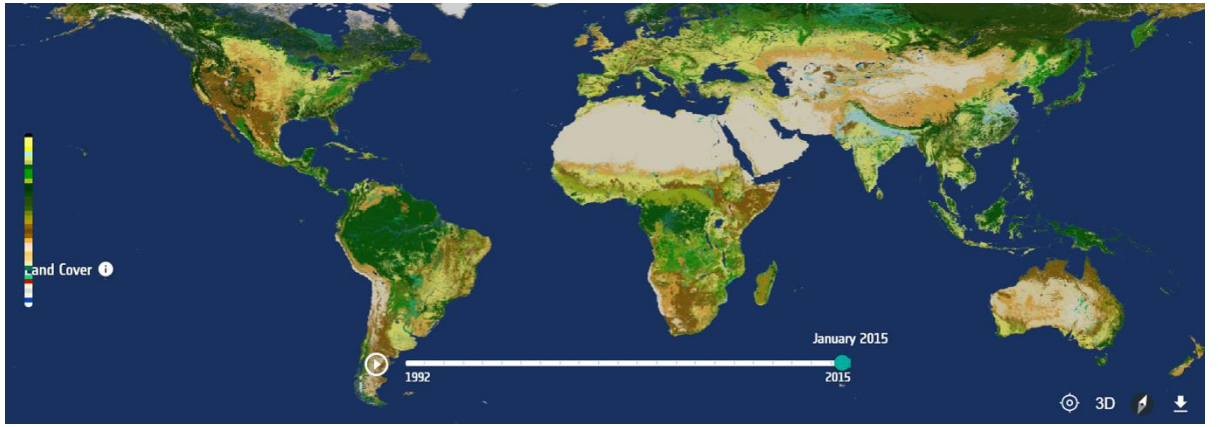
4. Derive indicators for decision support

Outputs include heat stress indicators, urban heat island intensity, flood extent and frequency.

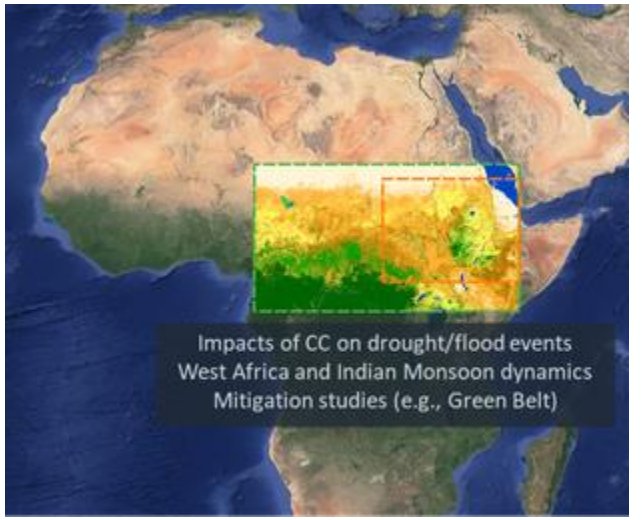


ECVs being used

- Correct and detailed representation of land surface (and its historical evolution) is crucial to correctly model future growth and urban climate



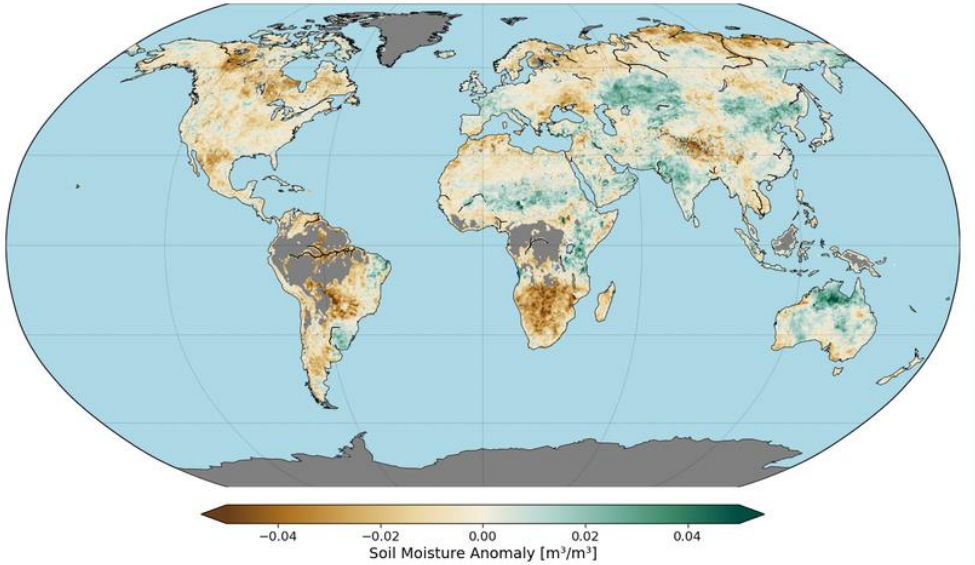
- ESA CCI Land Cover
  - Global coverage at 300m spatial resolution
  - Historical evolution
- ESA CCI High Resolution Land Cover
  - 10m spatial resolution for West-Africa

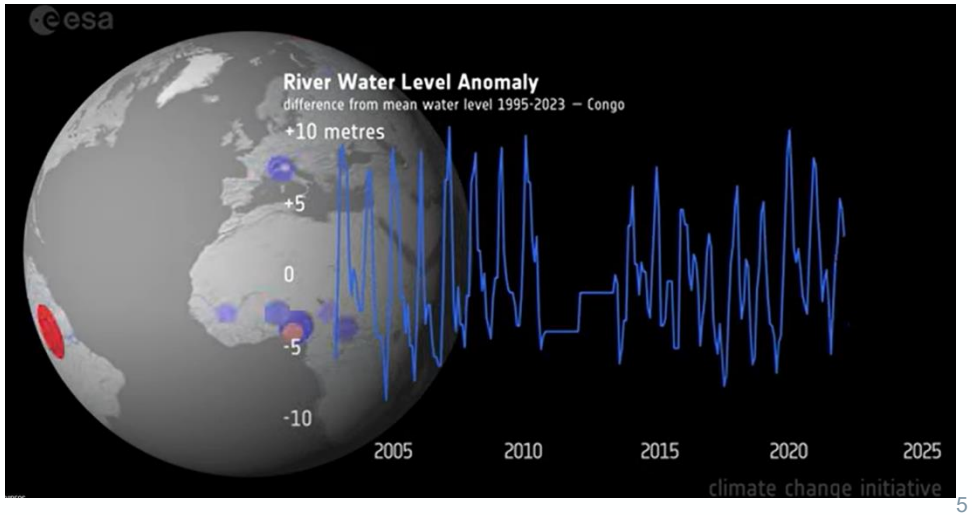


- Advantages
  - Historical record ideal for calibration of urban growth model
  - A lot of different vegetation classes
- Disadvantages
  - Only one urban class
  - 300m resolution is quite coarse

ECVs being used

- ESA CCI Land Surface Temperatures
  - EO benchmark to compare with heat modelling results
- ESA CCI Soil Moisture
- ESA CCI River Discharge
  - Important variables to include to calculate (future) return periods and runoff potential
- Their high spatial resolution & historical record is helpful to use as input data for the different model components and for independent validation of historical events

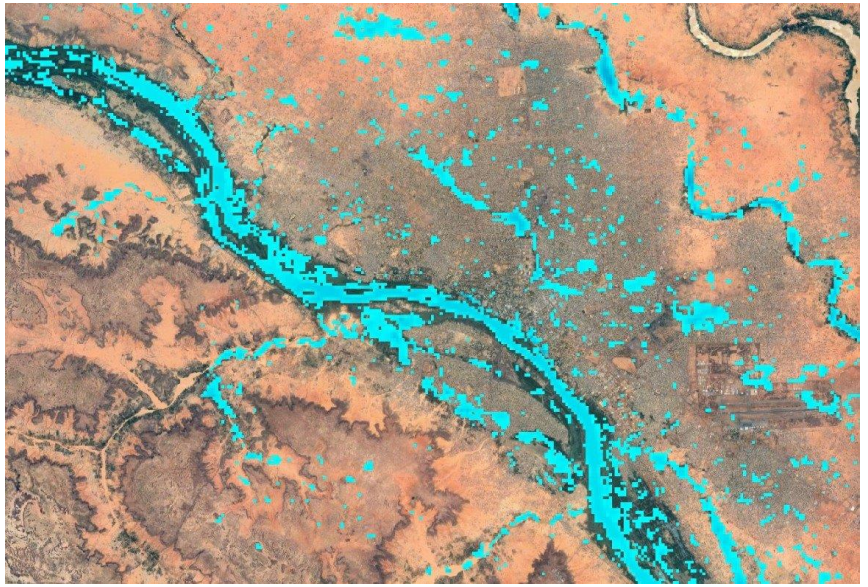




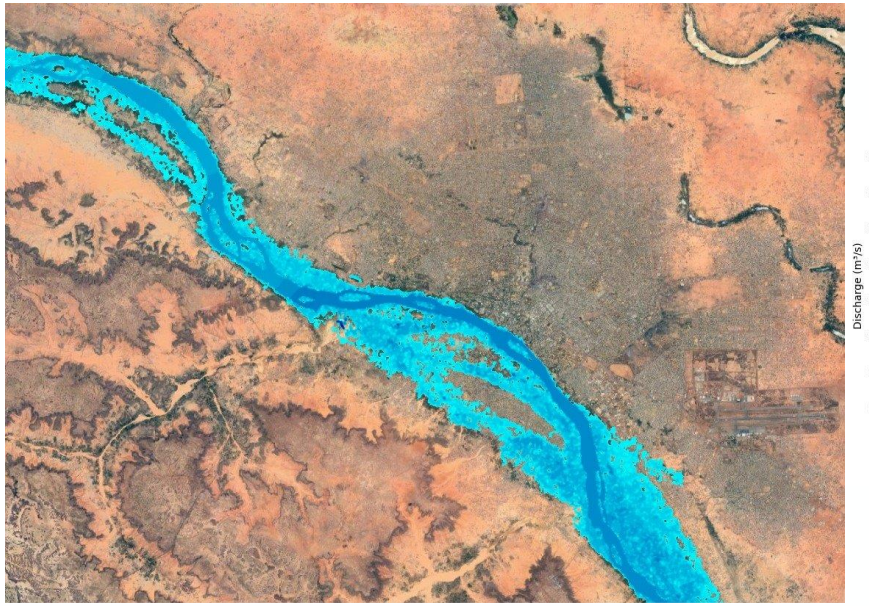
Results & relevance to the CCI community

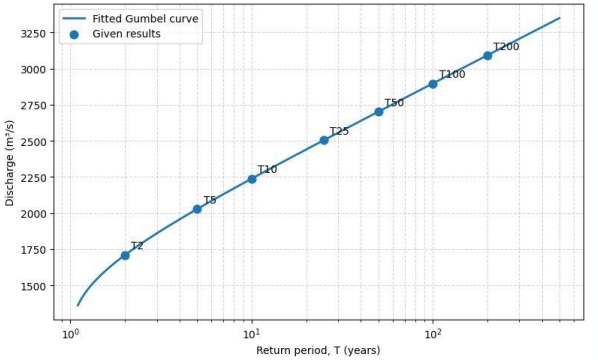
- Distinct but complementary hazard patterns across the city
- Pluvial flooding is more spatially scattered, highlighting local runoff accumulation and drainage related hotspots beyond the main river corridor

Pluvial return period 200 years

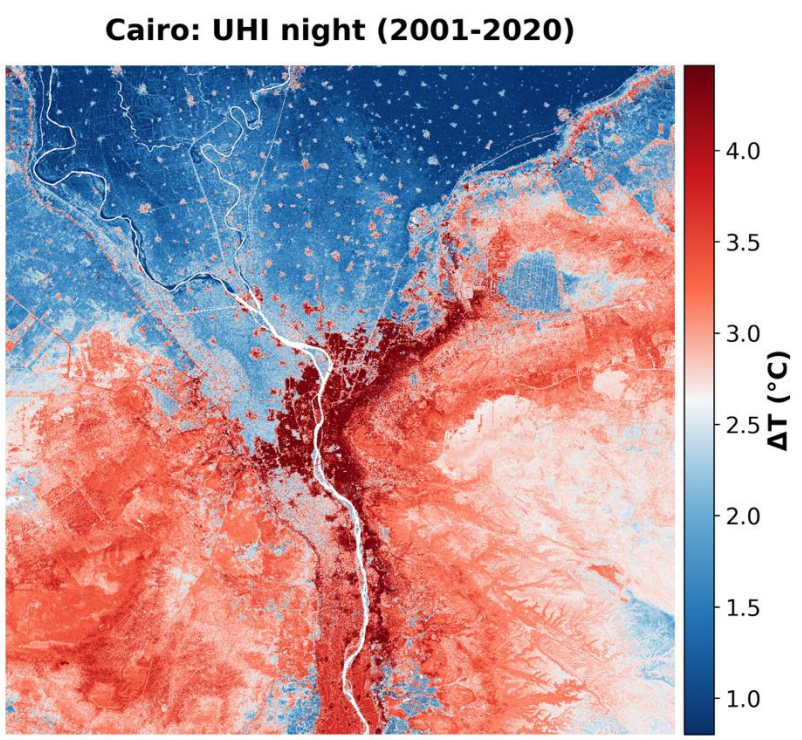


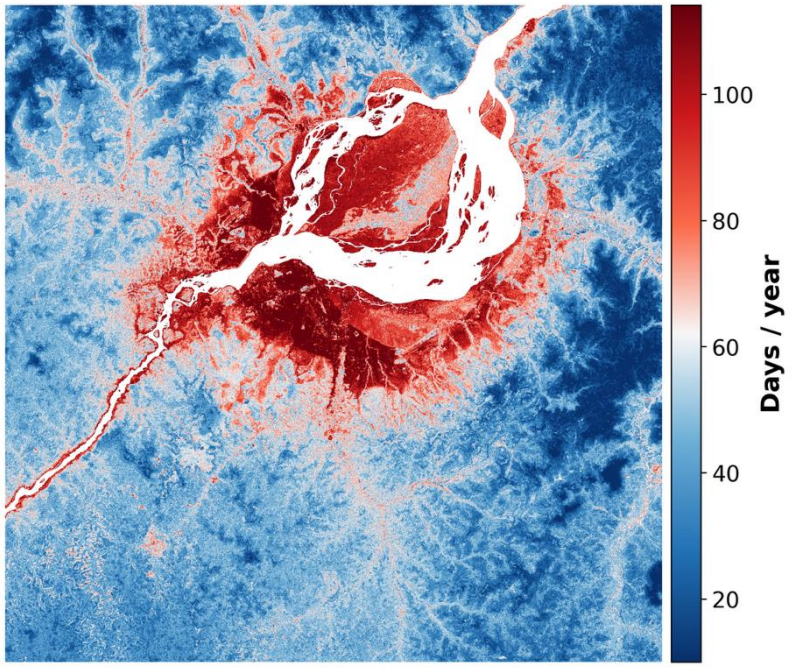
Fluvial return period 200 years



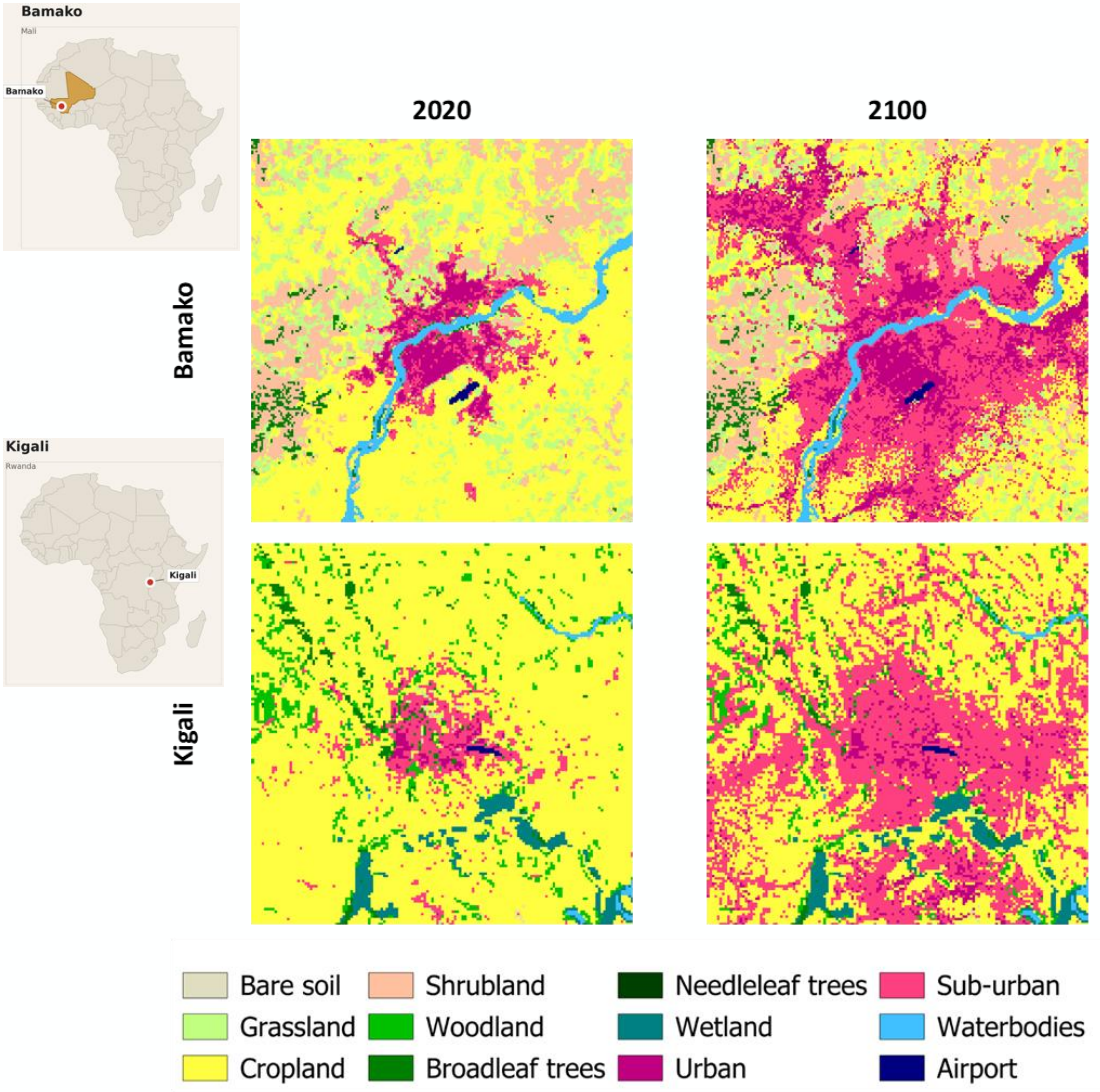


Results & relevance to the CCI community





Results & relevance to the CCI community



- Strong urban expansion by 2100 at the expense of cropland, grassland and shrubland
- Spatial patterns differ between cities: more structured expansion in Bamako and more fragmented and disperse growth pattern in Kigali
- Urban growth will directly affect heat exposure, surface properties and local climate risks

Results & relevance to the CCI community

- Final goal
  - Provide flood and urban heat maps for all 54 cities for present and future climate / urban growth at unprecedented 300m resolution

- Links & publications
  - Scientific publication submitted to PLOS Climate for inclusion in the IPCC Special Report on Cities
  - Space for climate Observatory (SCO): https://www.spaceclimateobservatory.org/e-safari#projets-lies
  - HORIZON-CL5-2026-07-D1-05 – Improving climate and weather models for Africa
  - Project webpage Climate analysis in African cities (CAIAC)