

ALBATROSS

Advancing knowledge for Long-term Benefits
and Climate Adaptation through Holistic Climate
Services and Nature-based Solutions

WP2 - Uliege contributions : migration trends and urbanisation patterns in sub-Saharan African cities

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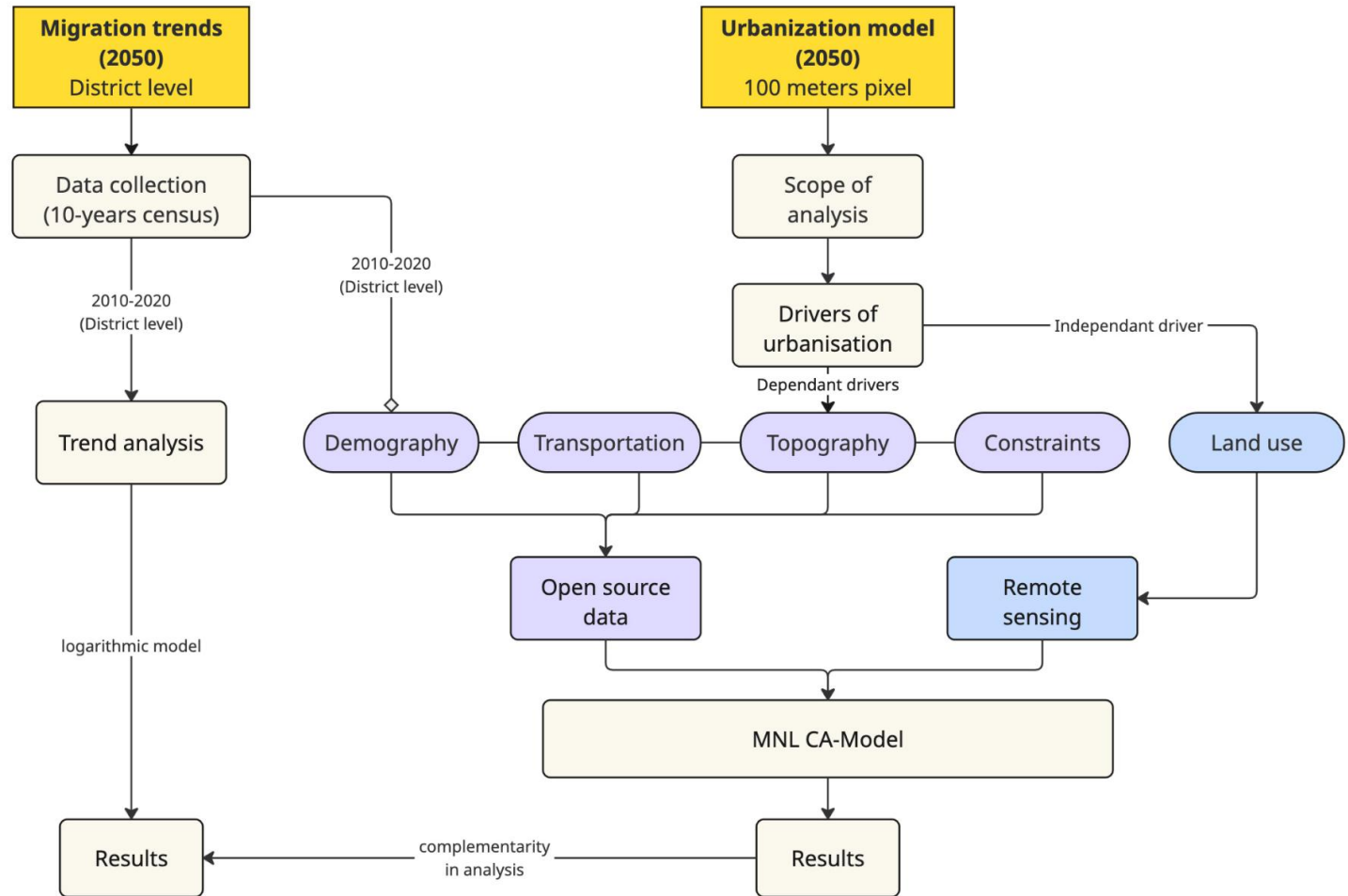
WP2 – Uliege contribution (T2.3)

Goal (Task 2.3): Migration trends and urbanisation patterns under current and project climate scenarios

Two Objectives (D 2.5):

- **Urbanisation model** based on disaggregate projections
 - Developing a **cellular automaton model** assessing urbanization patterns up to 2050
 - Two hubs : Dar-es-Salaam (Tz), Kumasi (Gh) + *Antananarivo (Mg)*
- **Migration model based** on aggregate projections
 - **Temporal analysis** based on demographic data
 - District level for the 7 hubs (national level for each country)

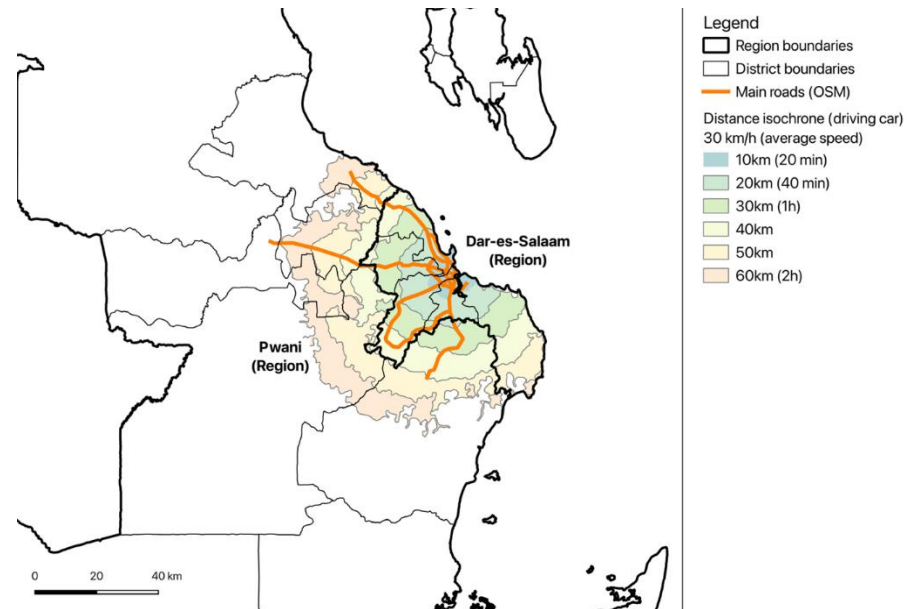
1- Process



2- Scope of analysis

Scope of Analysis

- Identify assumed **functional urban area** for two hubs
- Based on **isochrones** : peak hour and average travel time (Melbye et al, 2015)
- Delineation is carried out at district level



3- Satellite-based analysis



Remote sensing

- Sentinel-2 covers the entire global south (20m resolution)
- Classification for land-use (Anderson, 1979)

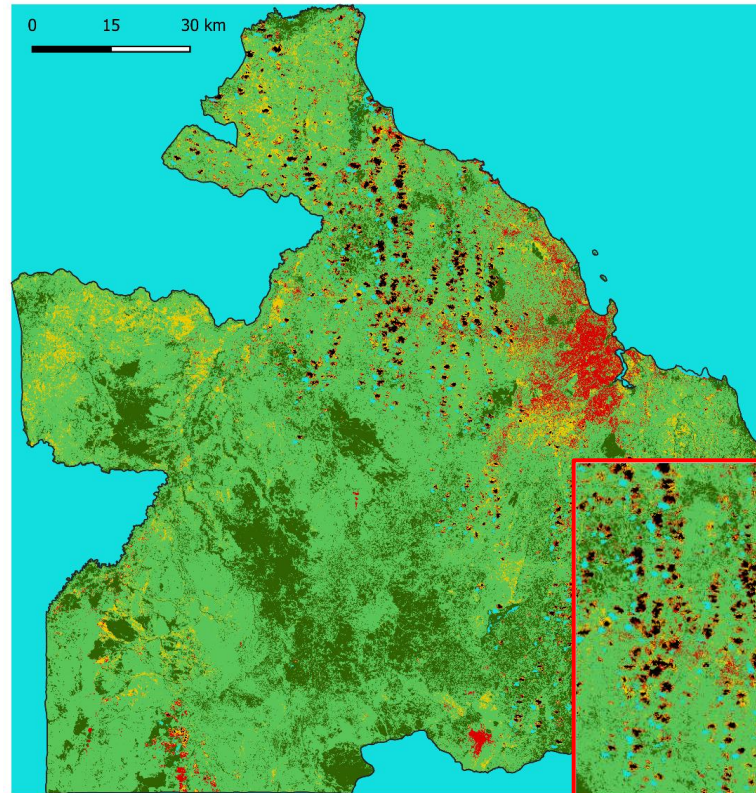
Class	Content
1	Built-up area
3	Rangeland (herbeous, shrub-brush) + <i>growing crops</i>
4	Forest
5	Water
7	Barren land (bare land, sandy areas, quarries) + <i>bare fields</i>

3- Satellite-based analysis

BAU scenario

- From 2016 to 2025
- Extending the model to **2050**

Dar-es-Salaam **2016**



Dar-es-Salaam may 2016 land-use

Classification (Anderson)

Multispectral bands reference

- Built-up
- brush, herbesous, burns
- forest cover
- water
- bare floors, bare fields
- clouds (special class)

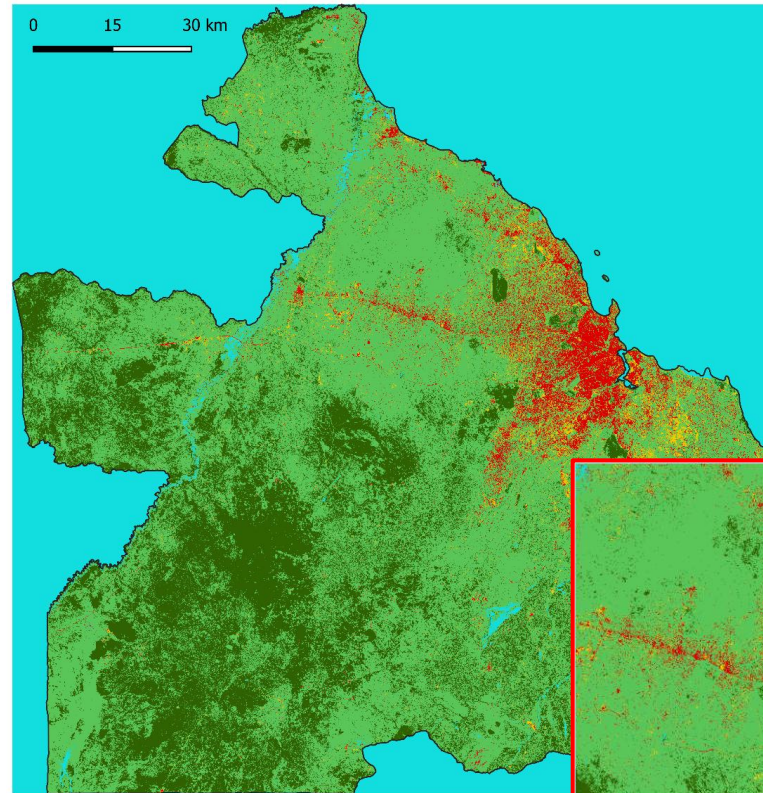
Réalisation Nicolas Greiner, 2025. Orfeo ToolBox 3.0.3, QGIS

3- Satellite-based analysis

BAU scenario

- From 2016 to 2025
- Extending the model to **2050**

Dar-es-Salaam **2025**



Dar-es-Salaam may 2025 land-use

Classification (Anderson)
Multispectral bands reference

- Built-up
- brush, herbesous, burns
- forest cover
- water
- bare floors, bare fields

Réalisation Nicolas Greiner, 2025. Orfeo ToolBox 3.0.3, QGIS

Satellite-based analysis

BAU scenario

- From 2016 to 2025
- Extending the model to **2050**

Kumasi **2016**



Kumasi january 2016 land-use

Classification (Anderson)

Multispectral bands reference

■ Built-up

■ brush, herbesous, burns

■ forest cover

■ water

■ bare floors, bare fields

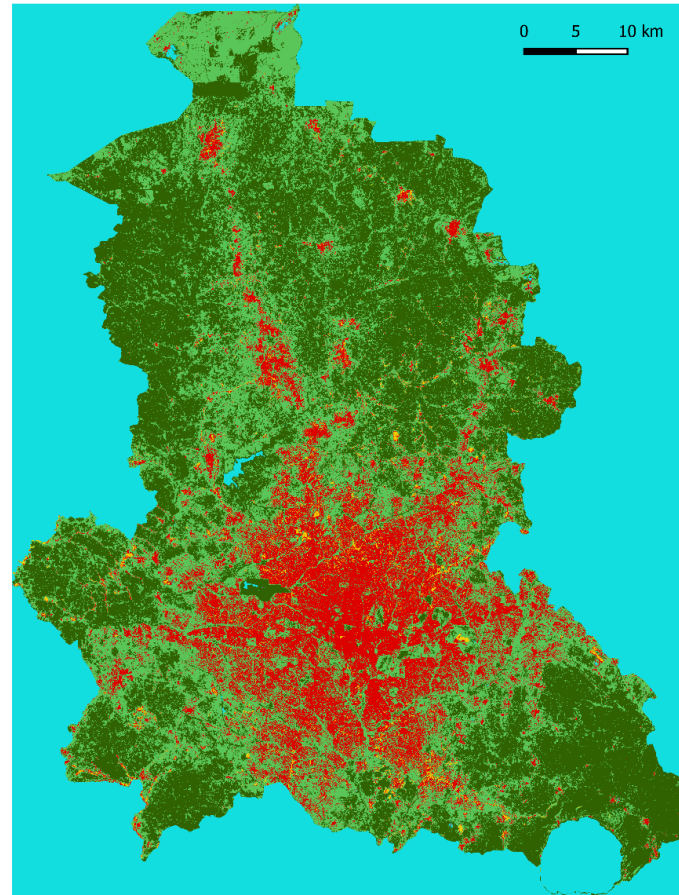
Réalisation Nicolas Greiner, 2025. Orfeo ToolBox 3.0.3, QGIS

Satellite-based analysis

BAU scenario

- From 2016 to 2025
- Extending the model to **2050**

Kumasi **2025**



Kumasi january 2025 land-use

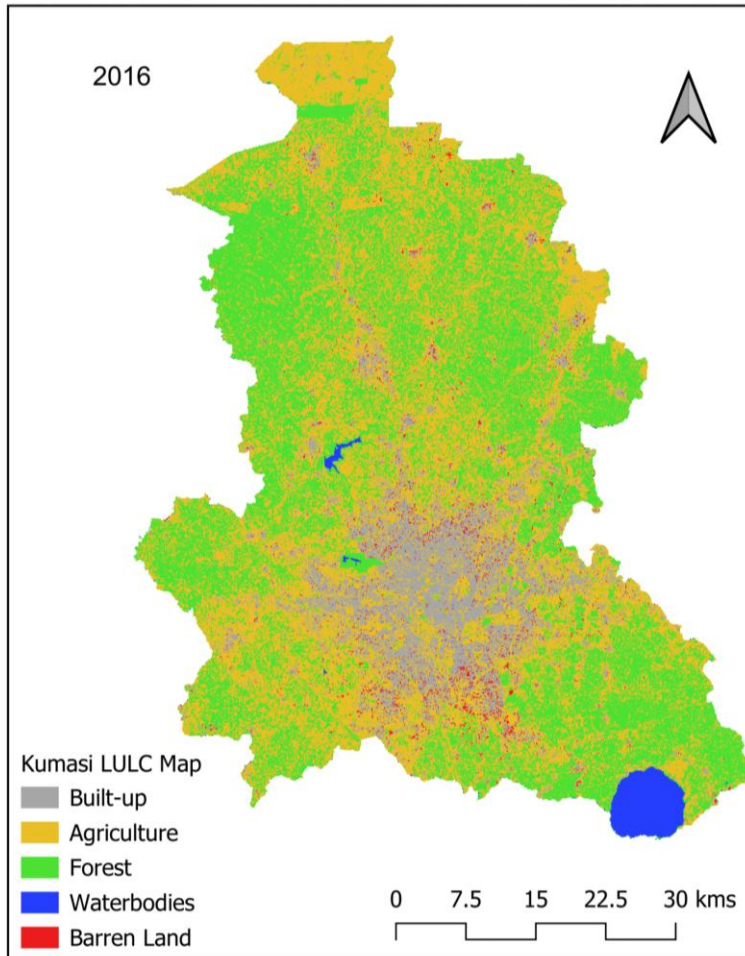
Classification (Anderson)

Multispectral bands reference

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Réalisation Nicolas Greiner, 2025. Orfeo ToolBox 3.0.3, QGIS

4- CA model calibration

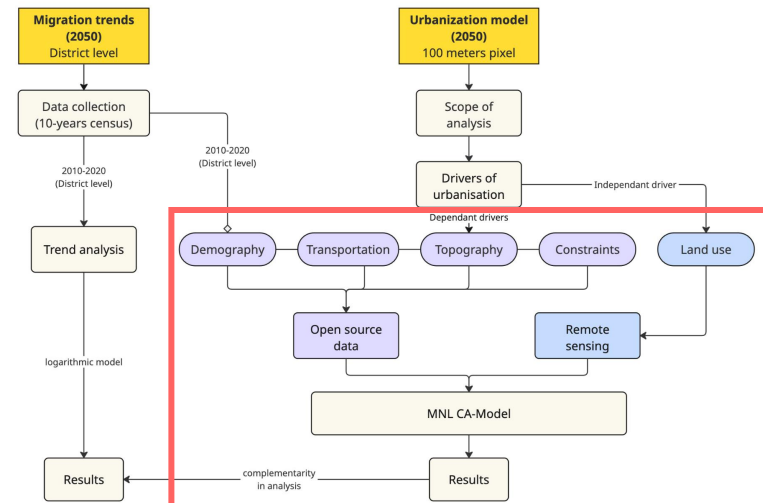


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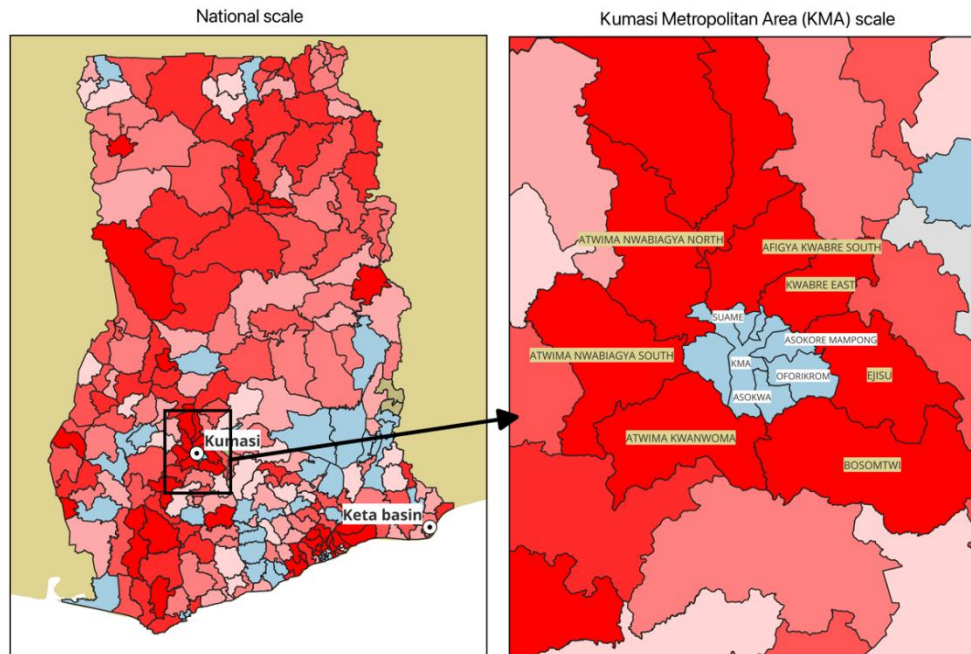
BAU scenario

- From 2015 to 2025
- Extending the model to **2050**

Kumasi 2030, 2040, 2050



5- Migration model – to be done



Réalisation Nicolas Greiner (2025). Sources secondaires : citypopulation.de (<https://www.citypopulation.de/>) from Ghana Statistical Service (Census)

Kumasi from 2010 to 2020

○ Data collection

- analyze past trends by from 10-years interval

○ Analysis trend

- Linear regression or **exponential model** : review is ongoing

To be done

○ Urbanisation model

- Improving remote sensing (iterative process)
- Setup of constraint drivers (coordinators hubs)
- CA-model calibration process

○ Migration model

- Linear or logarithmic **model** : **review is ongoing**
- Linear growth seems not to be fitted (preference for logarithmic models) because growth is not occurring everywhere as can be see with decline in Kumasi
- **Literature review** is to be done: increasing decline in household size with declining fertility could in future explain population growth in spreading (Tabutin, 2020).