SLUMAP

Remote Sensing for Slum Mapping and Characterization in sub-Saharan African Cities

Towards scalable and transferable slum mapping

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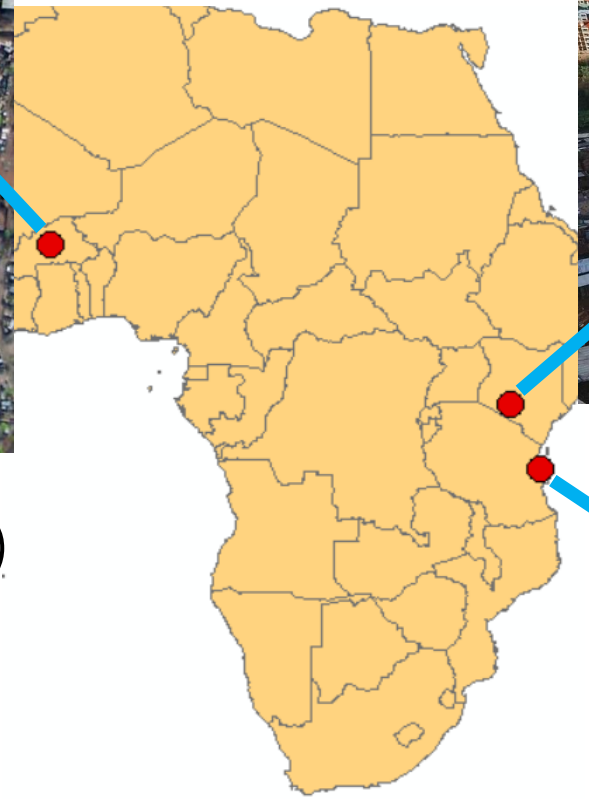
Rationale

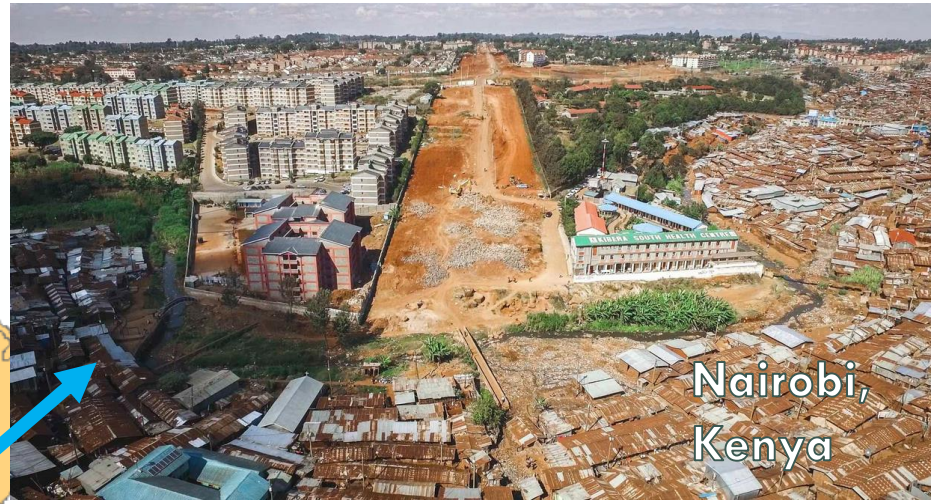
- About 1 billion people in the world are slum dwellers (30% of urban population)
- In sub-Saharan Africa, slums keep growing
- Spatial data on slums are needed at different levels
  - International level : SDG 11 + New Urban Agenda (UN) '*By 2030, ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums*'
  - Local level: City planning and slum upgrading programs
  - Community level: Local communities and NGOs
- But data often incomplete, outdated, and/or inconsistent

  ➡ Slum dwellers are excluded from the benefits of urbanization
- Assessment of the potential and limitations of EO to tackle this issue

Case studies

Source: IRD





Source: Johnny Miller – http://unequalscenes.com

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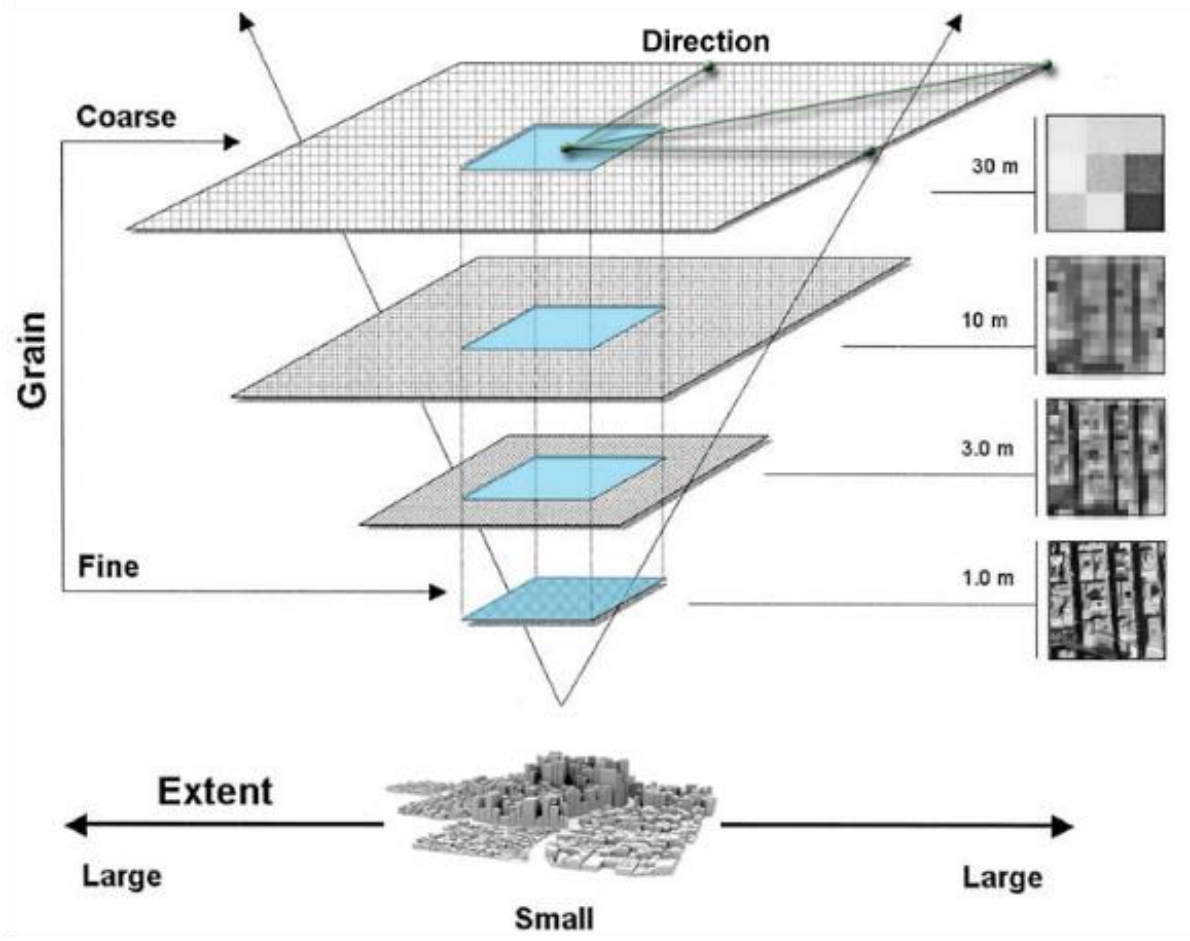
+ 1 secondary city (likely Kisumu, Kenya)

SLUMAP

Free and
Open
Source
Software

Main objectives

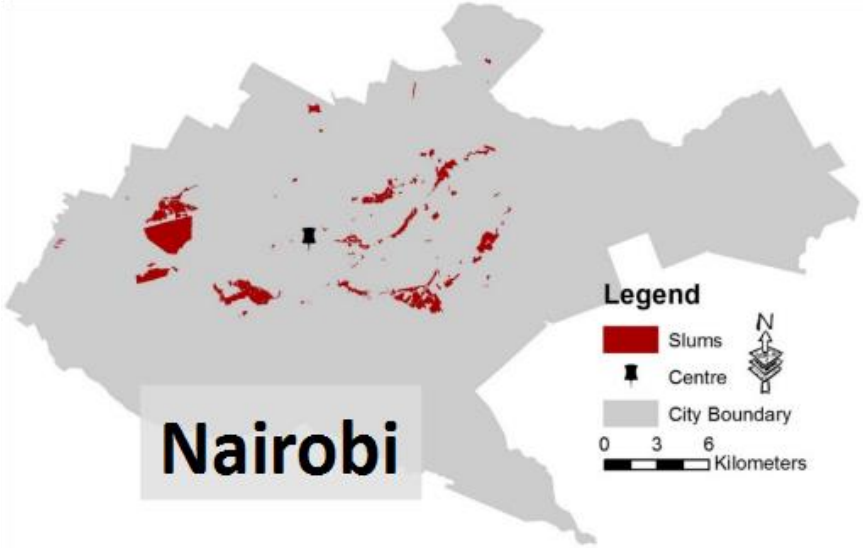


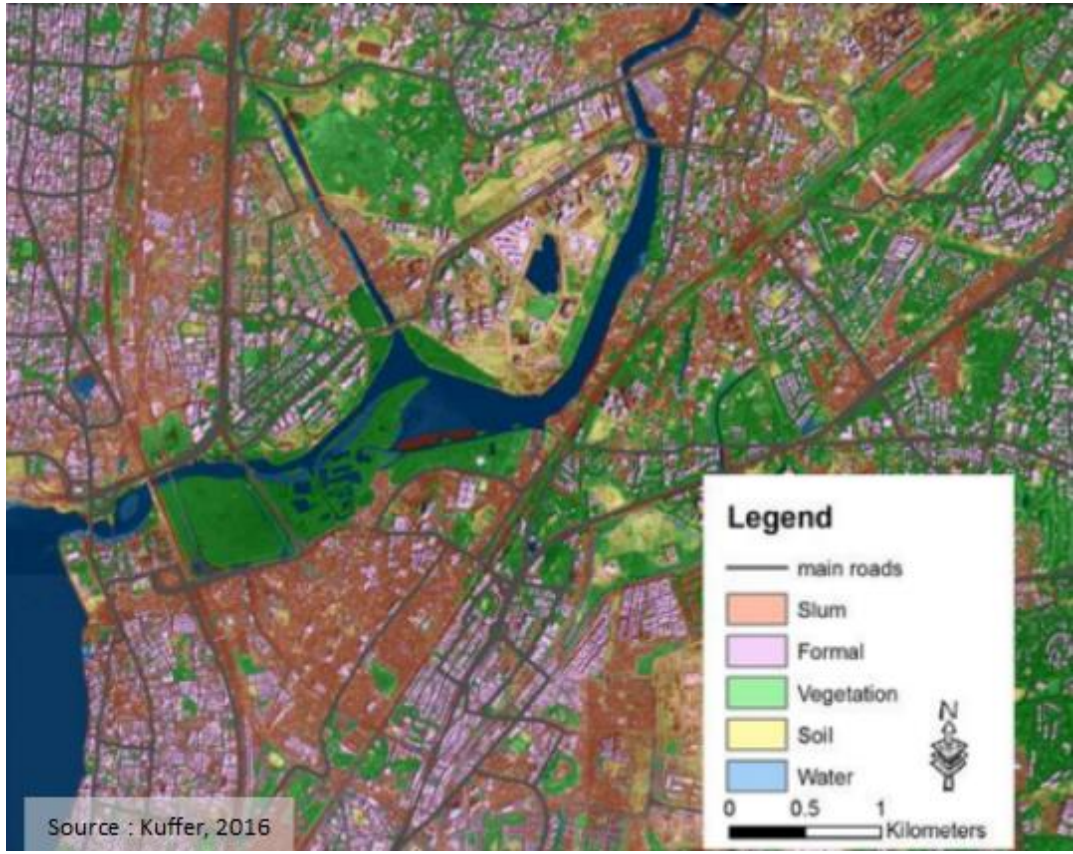
Source : Wang, Kuffer and Pfeffer, 2018

- Developing methods for
  - producing citywide slum maps
  - characterizing slums
- Assessing the contribution of imagery with different spatial and spectral resolutions
- Evaluating their cost-efficiency (costly VHR is not necessarily the optimal solution)
- Designing SoA scalable methods based on FOSS
- Assessing their transferability across several case studies
- Formulating recommendations on the most suitable methods, tools and data

Citywide slum mapping

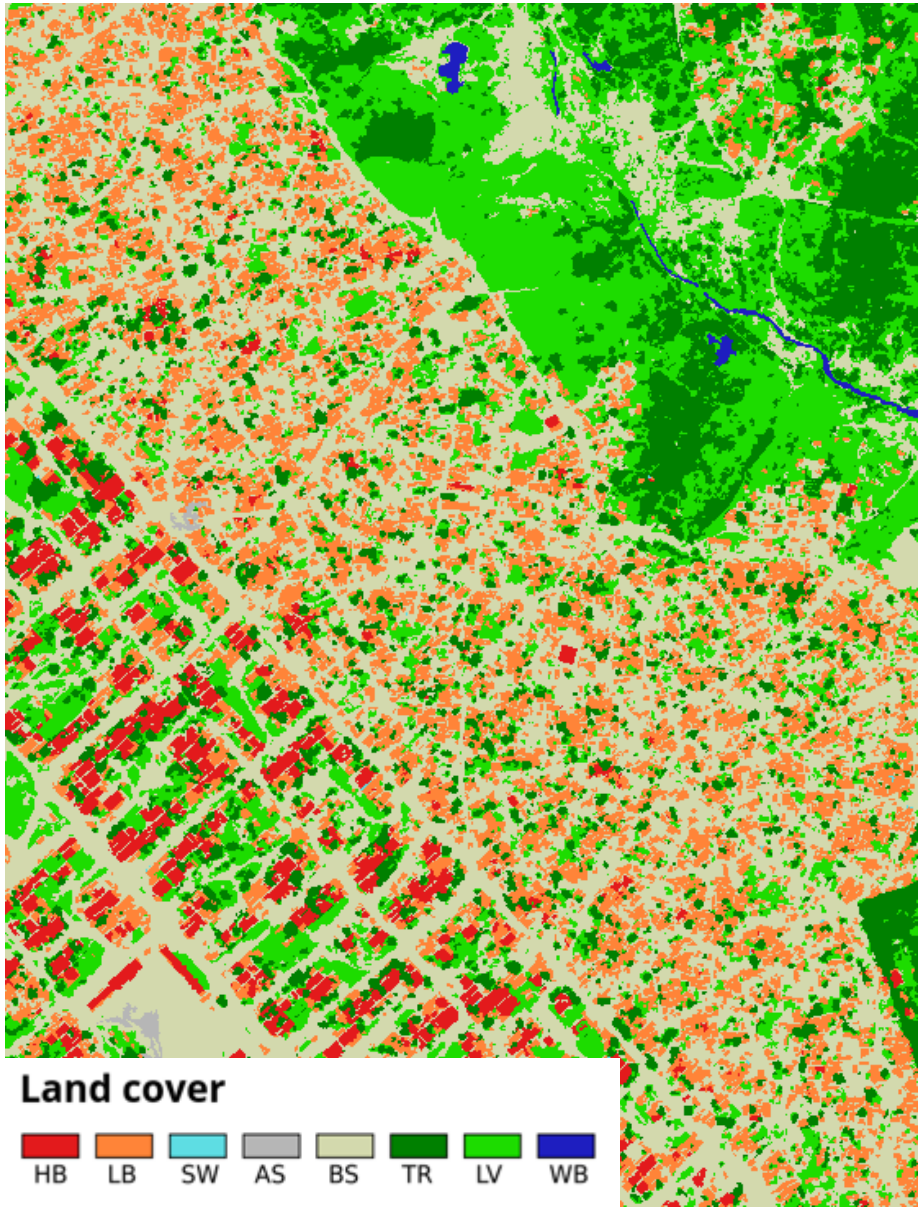
- S2 (full band set and subsets) & Spot 6/7 (1.5m and resampled to 5 m)
- Evaluating contribution of S1(cloud cover)
- Pixel-based approach as a starting point – OBIA will be tested
- Machine learning for producing slum probability maps



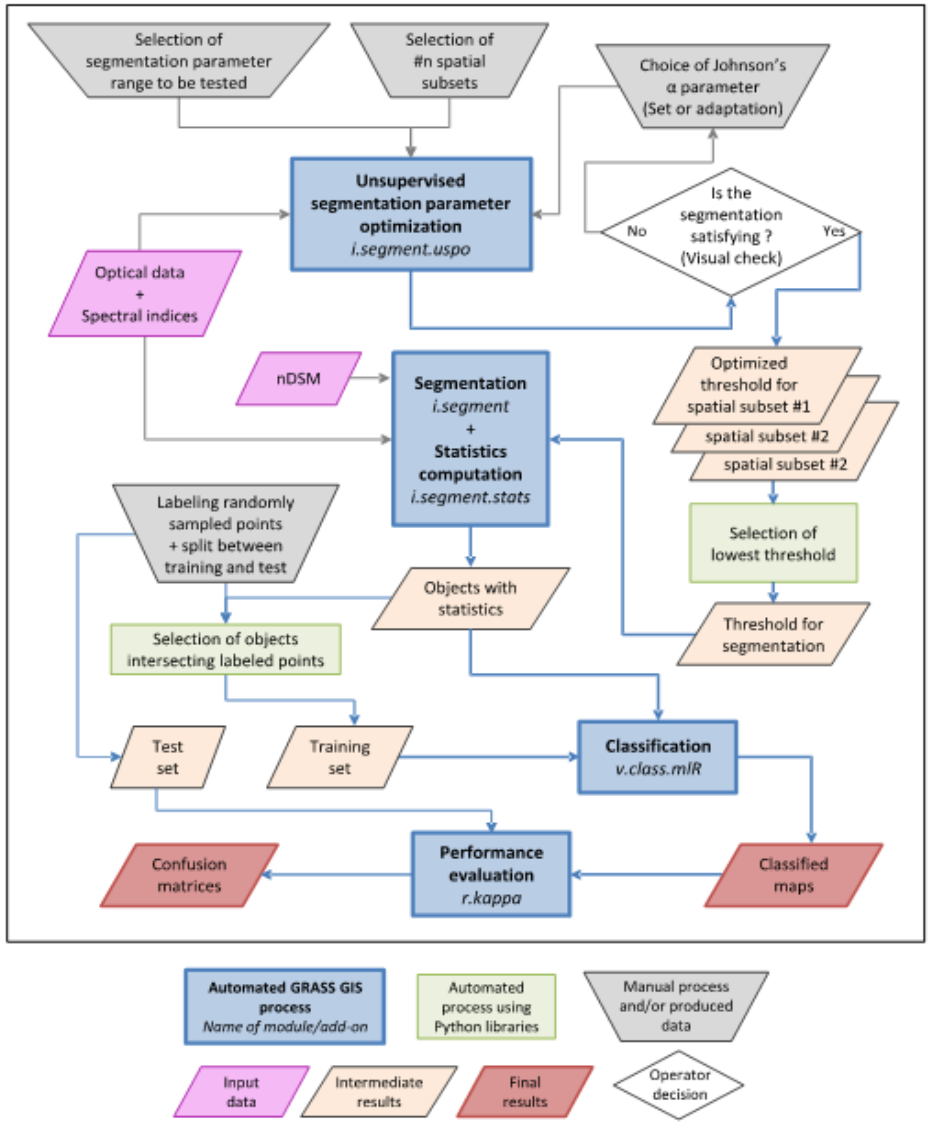


Slum environment characterization

- Comparing different spectral resolutions
  - WorldView-3 (30cm) 8 XS + 8 SWIR vs. 4 XS (VIS NIR)
- Comparing different spatial resolutions
  - WorldView-3 (30cm) 4 XS bands (VIS NIR)
  - SPOT 6/7 (1.5m)
  - SPOT 6/7 (resampled to 5m)
- OBIA approach
- Challenges: Computational optimization and transferability
- Producing a set of indicators relevant to stakeholders (road network, roof materials, built-up density, distance between structures, …)



OBIA toolchain



Source : Grippa, 2017

- Build on toolchain developed by ULB (MAUPP and REACT projects), to be adapted and extended
  - Specifically designed for handling large datasets
  - Performs parallel computing
  - Includes local unsupervised segmentation optimization
  - Computes and selects features for each segment
  - Classifies using ML algorithms (such as Extreme Gradient Boosting or Random Forest)

Framework / Compendium

- Outcomes summarized in compendium
- Most suitable scalable and transferable methods for mapping slums in sub-Saharan Africa
- Taking into account cost-benefits and user requirements

⇨ Open-access tool for science-based slum policy-making

SLUMAP

http://slumap.ulb.be/


By PSUP – UN-Habitat

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