

An introduction to Building morphology

8 august 2021

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African Population and
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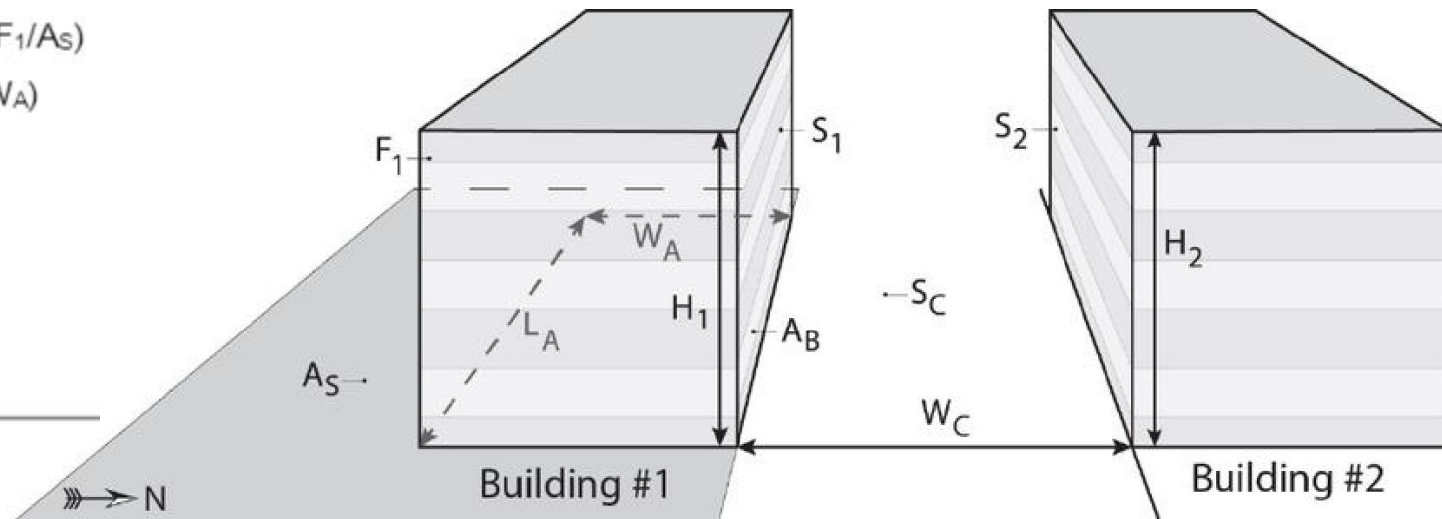
- **Urban morphology and building morphometrics**
- **Morphometrics through RS and GIS**
- **Examples**

Urban morphology: assumption and focus

- ❖ **Main assumption:** The characteristics of urbanization, such as demography, socioeconomic status, and ecology can be manifested by the physical appearance of urban forms.
- ❖ **Focus:** the area of urban studies that explores the physical form of cities in space and the way it changes in time in relation to the agents of such change (Kropf, 2017). The study is based on the analysis of space, traditionally mostly visual and qualitative (Dibble et al., 2015); its objects are the fundamental elements of urban form (building, plot, street) (Moudon, 1997).

Elements for urban morphology: Buildings & Streets

Category	Variable
Building Characteristics	Site Plan Area (A_S)
	Building Footprint Area (A_B)
	*Building Height (H_1)
	Building Plan Area Ratio (A_B/A_S)
	Frontal Area Index (S_1/A_S & F_1/A_S)
	Complete Aspect Ratio (L_A/W_A)
Street Canyon	*Building Height #2 (H_2)
	Height-to-Width Ratio
	*Street Canyon Width (W_C)
	*Street Canyon Orientation
	Surface Albedo (Paving ¹)



Morphometrics

```
>>> buildings_df['eri'] = momapy.EquivalentRectangularIndex(buildings_df,
...                                                           'area',
...                                                           'peri').series
>>> buildings_df['eri'][0]
0.7879229963118455
```

Morphometrics: Many morphological metrics can be derived.(building adjacency , compactness, long axis length ,etc)



RS & GIS: Data source and tools



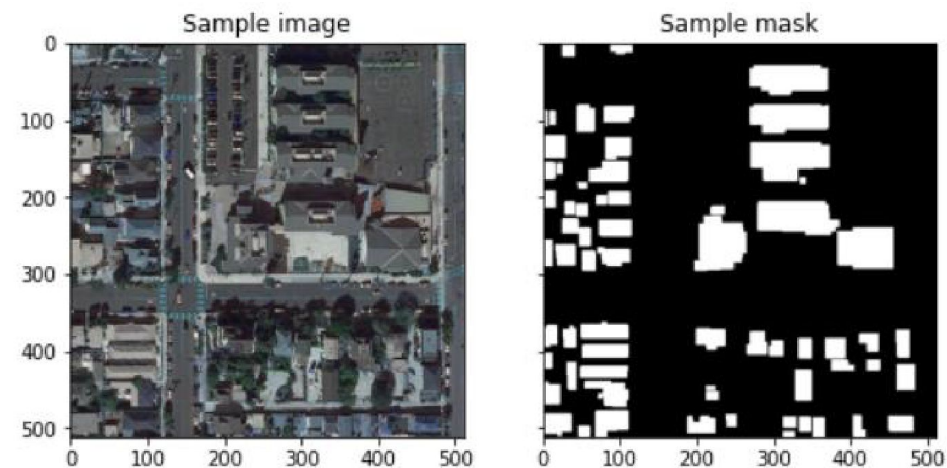
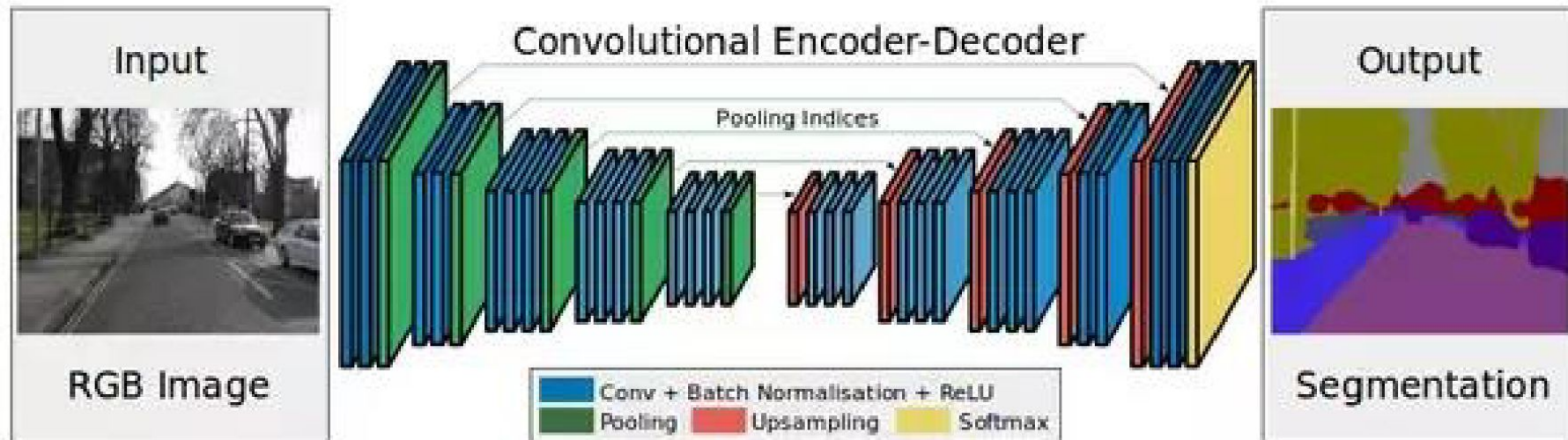
Basic urban
elements from
image features

Meaningful
measurements

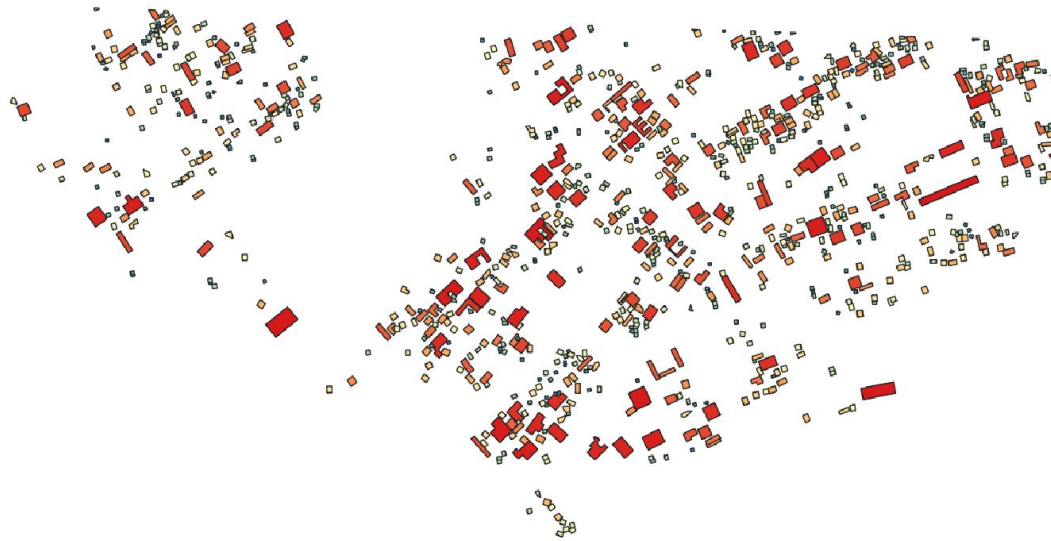


Moving towards open science: Freely available Google Earth images, open-source deep learning model for building extraction, MOMEPY urban morphology measurement tools.

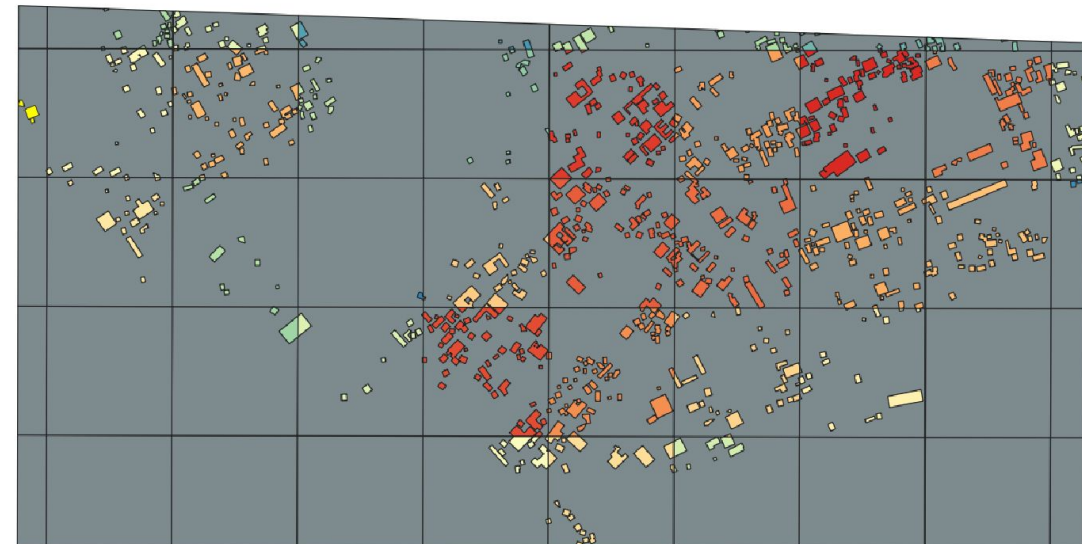
RS & GIS: Building extraction



RS & GIS: Morphology computation



- ◆ Building polygon based
- ◆ Gridded



Example: Study case in Nairobi and Khartoum

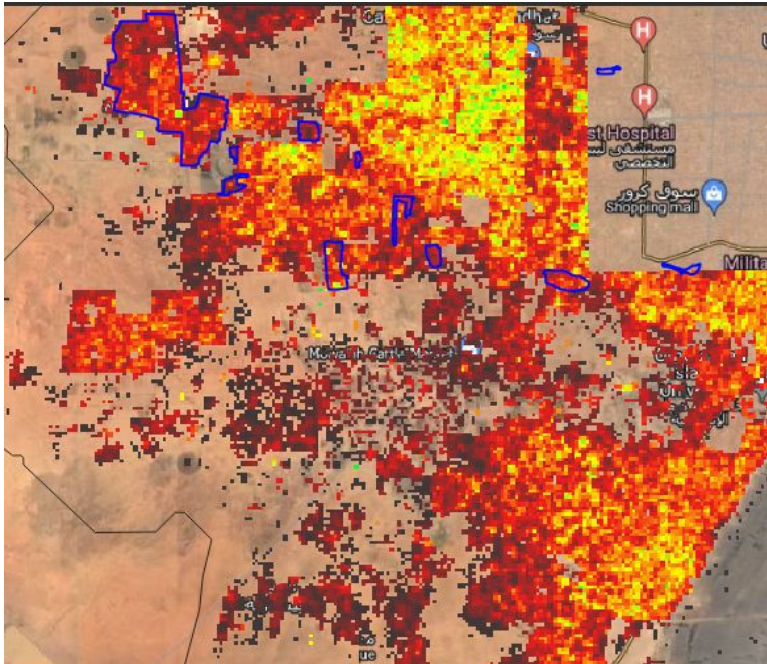


Fig 1 -Khartoum

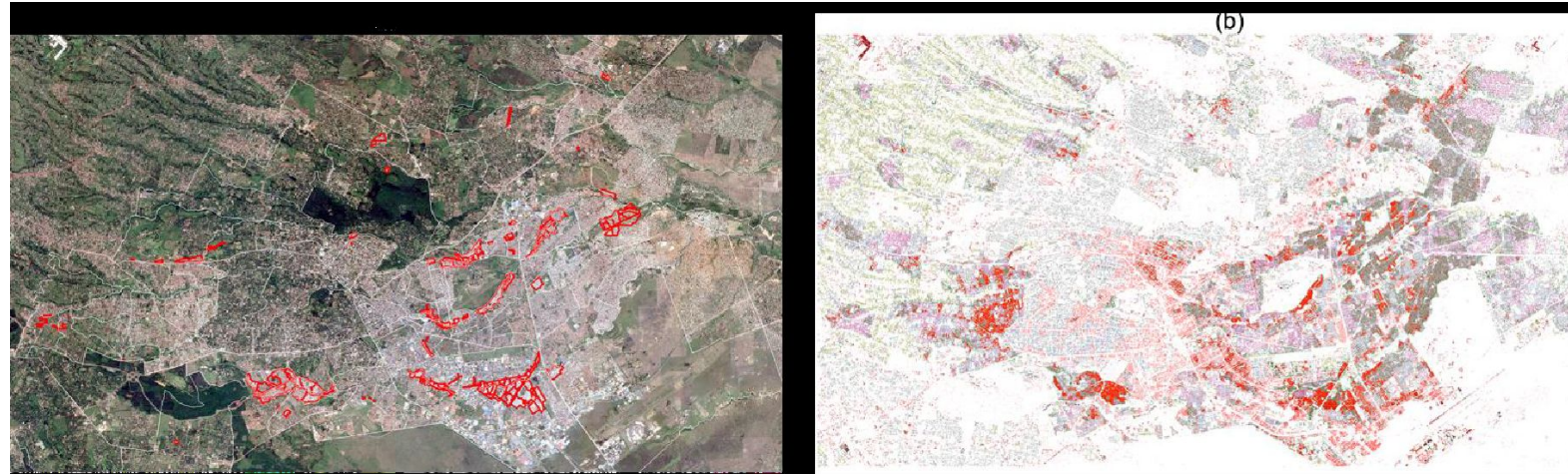


Fig 2- Nairobi

Morphological clusters vs. deprived neighborhoods identified by local authority

Questions

