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Volunteering for the future – Geospatial excellence for a better living

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# Tenure from Space: Can Remote sensing be used in Support of Land Administration?

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# Outline

- Background
- Boundary detection
- Identification tenure
- Examples
- Conclusion

# Overview

- At global level, a huge task is waiting to realize the agenda in relation to tenure security

- The SDG, goal 1, target 1.4 aims for security of tenure for all, especially for the poor and the vulnerable (UNDP, 2015)

# Real world -Technology

To assist in solving problems

↑

Information on tenure

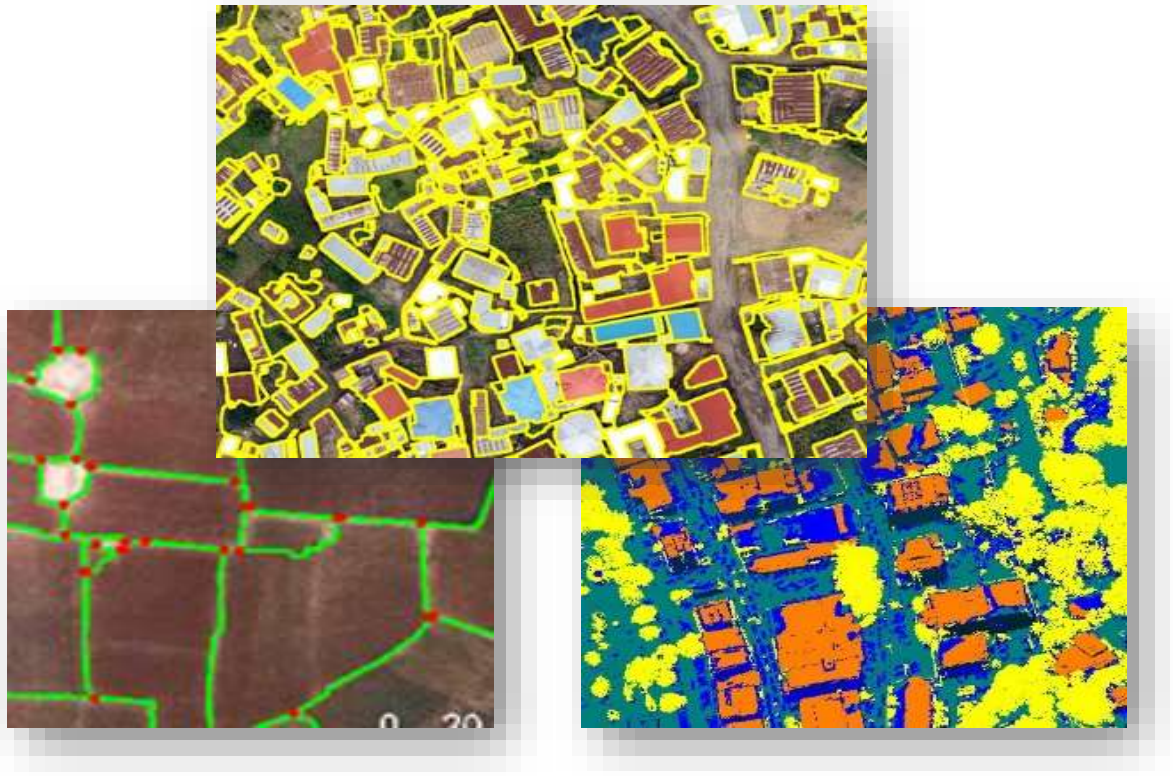
↑

Image-based identification

Image source: Google Earth

# Responsible Land Administration

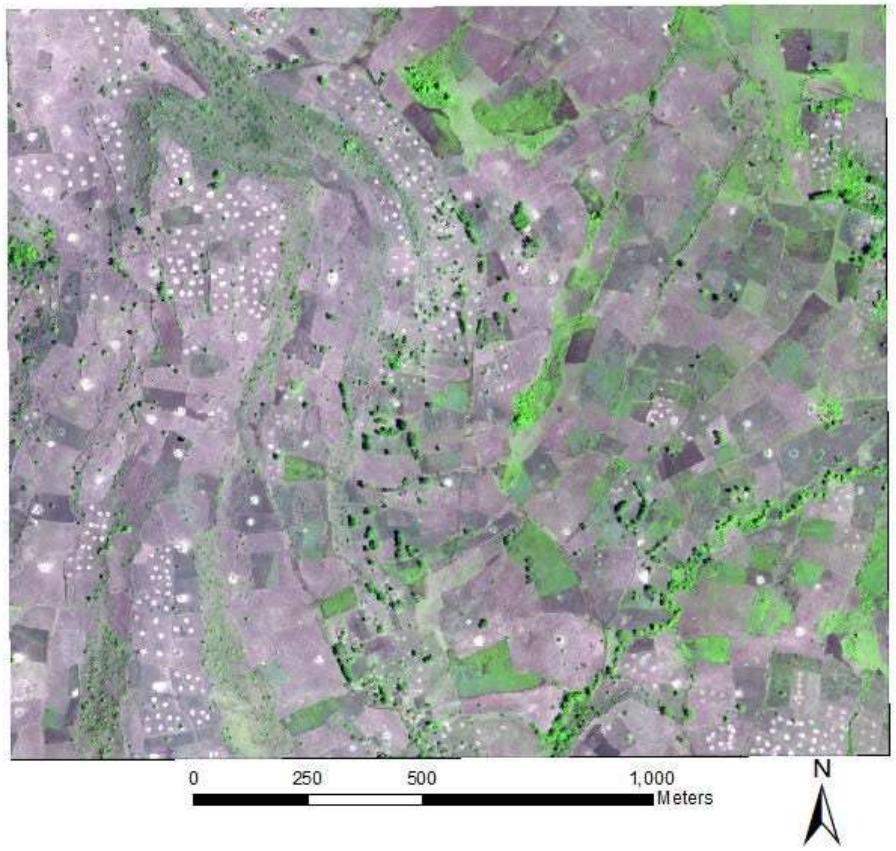
- **How to use geo-ICT** for land tenure
  - formal and informal
  - rural and urban
  - ownership and other forms?
- **Automation** in feature extraction
- **FFP** fit-for-purpose approach (time, money, quality)

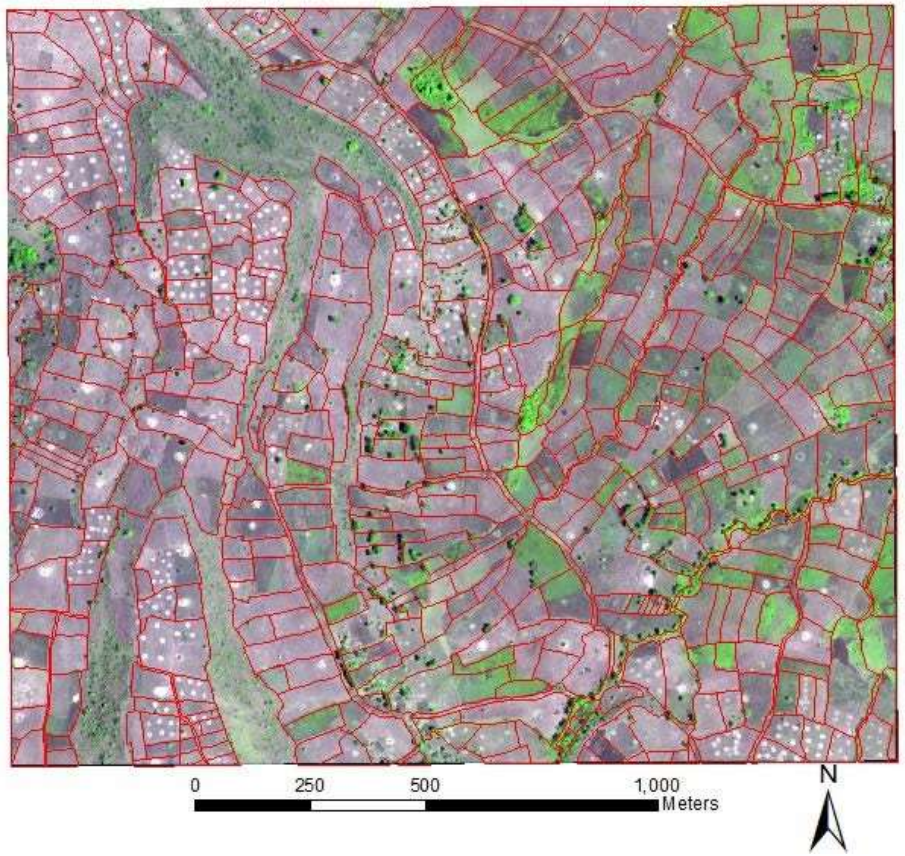


https://its4land.com/

- Mean-shift segmentation
- Segmentation using Estimation of Scale Parameters (ESP) tool
- Multi-resolution segmentation (MRS) eCognition
- Developed plugin for QGIS (incl. Machine learning) – its4land QGIS

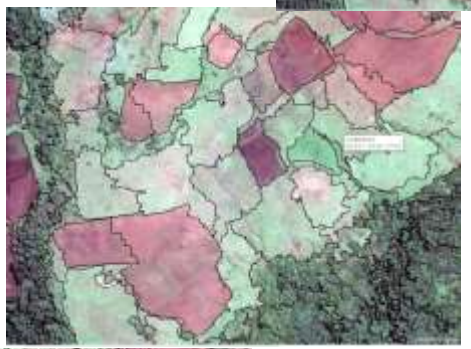
# Image subset with the reference layer - Ethiopia



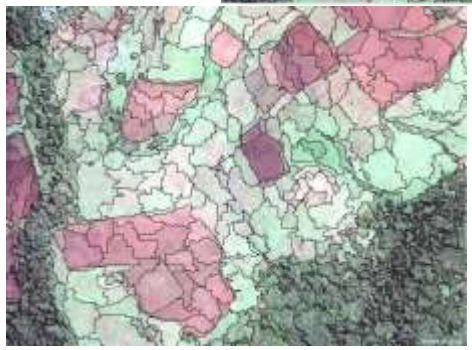



# Boundary extraction

Level 3



Level 2



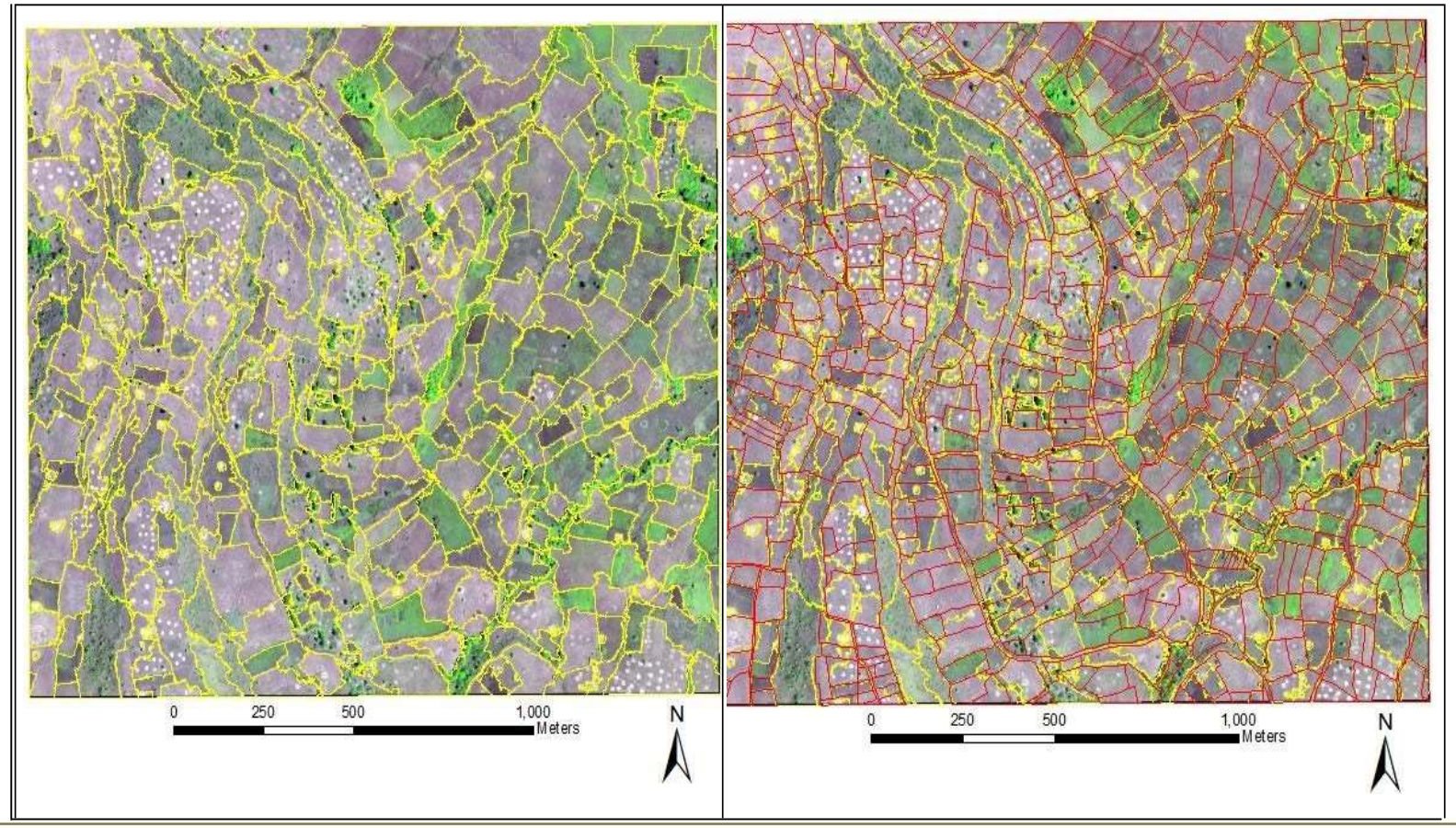
Level 1

Output

Choice of spatial level

Post-processing

# Extracted boundaries




**Boundaries** Extracted Reference

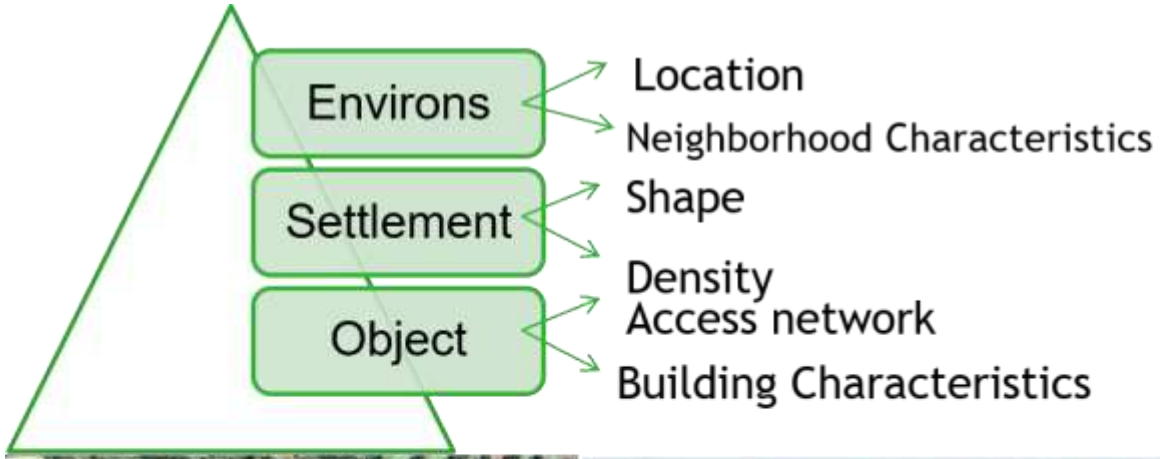
# Boundary detection – Magnified view

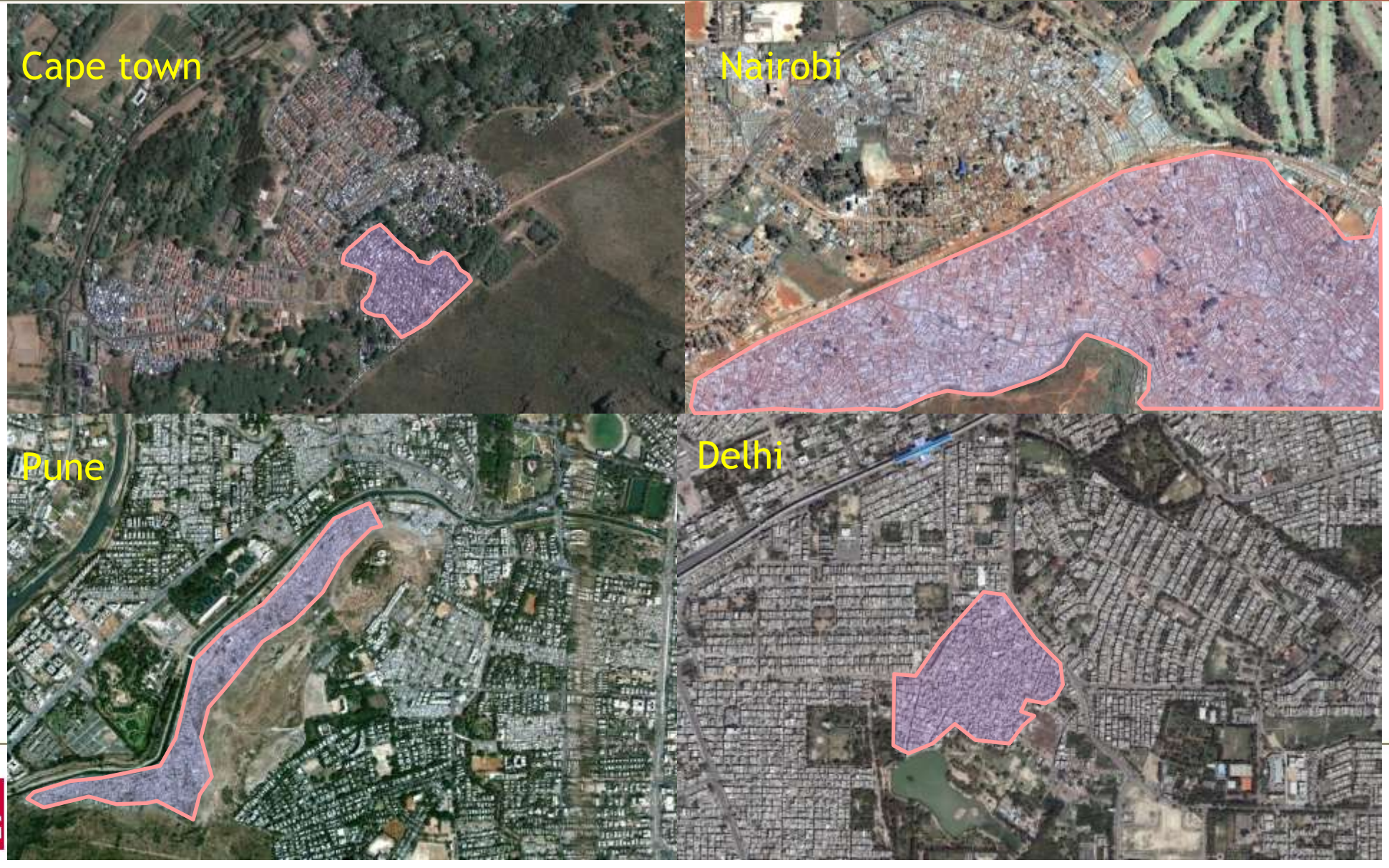
Reference

Detected boundaries using feature extraction

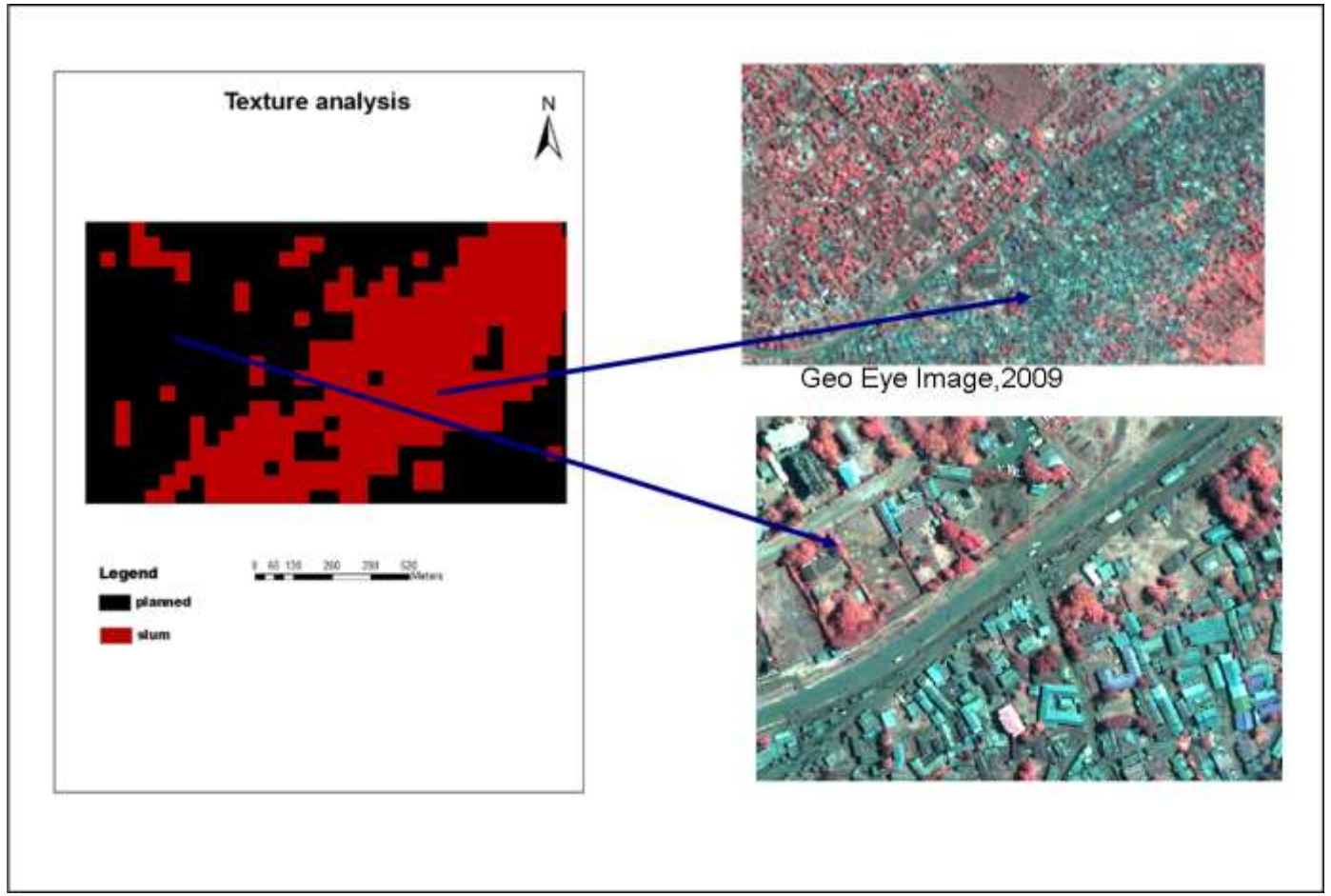
# Mapping informality using Remote Sensing

# Characterizing Informal and other Settlements

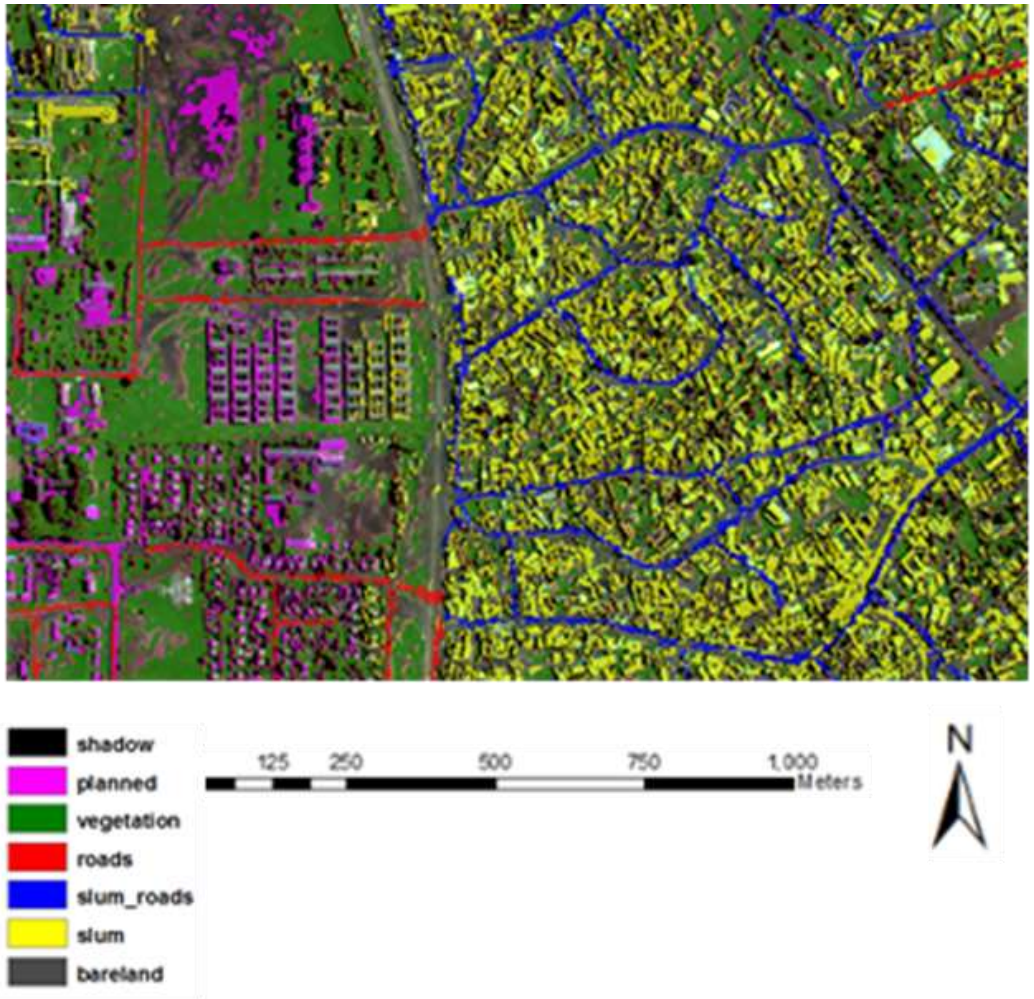



Cape town
Nairobi
Pune
Delhi

# Density as an indicator of informality

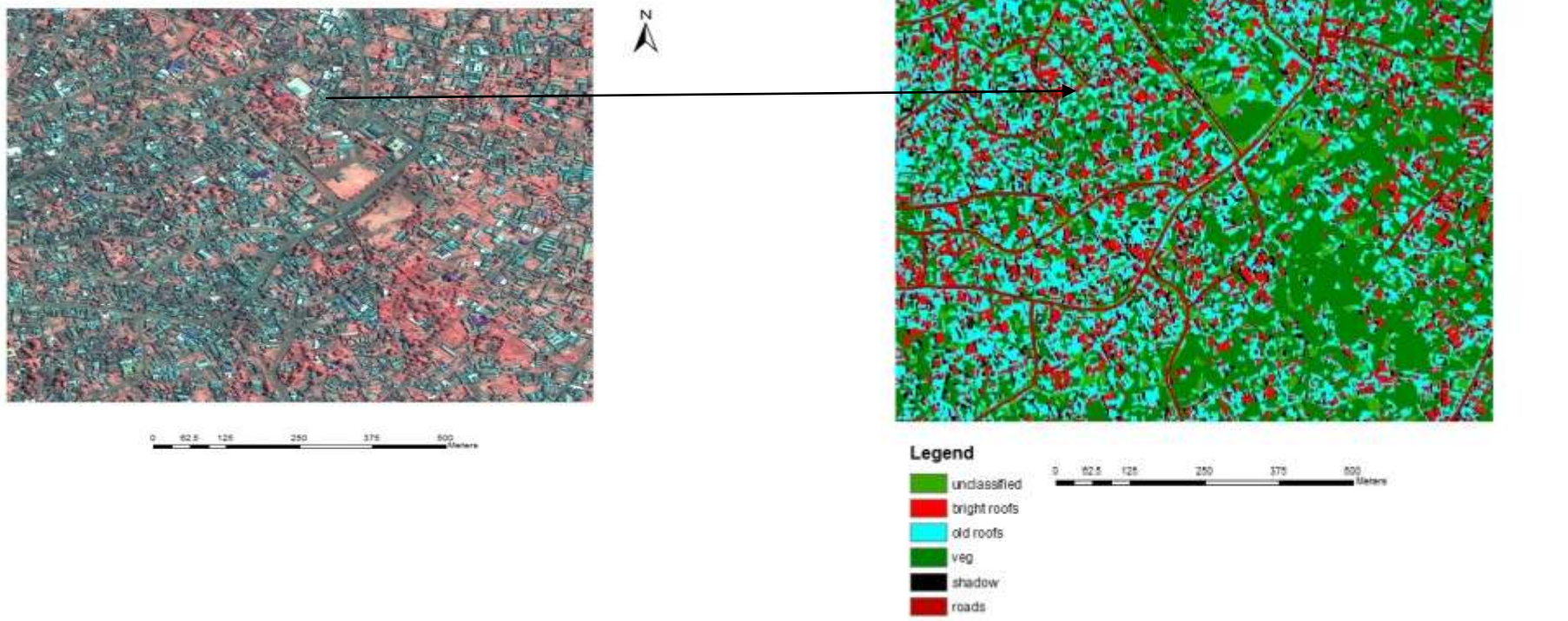


# Classified subset image of Kisumu, Kenya showing planned and informal areas



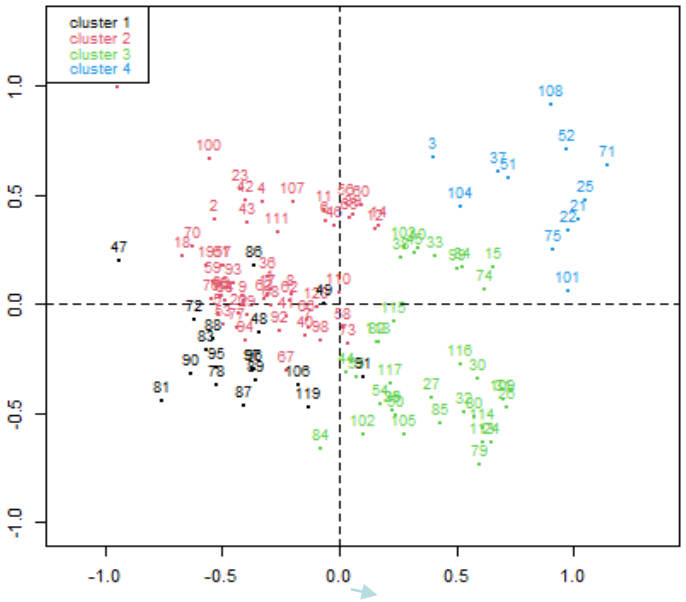

Mathenge, C. W. (2011). *Application of object oriented image analysis in slum identification and mapping: the case of Kisumu, Kenya*: University of Twente Faculty of Geo-Information and Earth Observation (ITC).

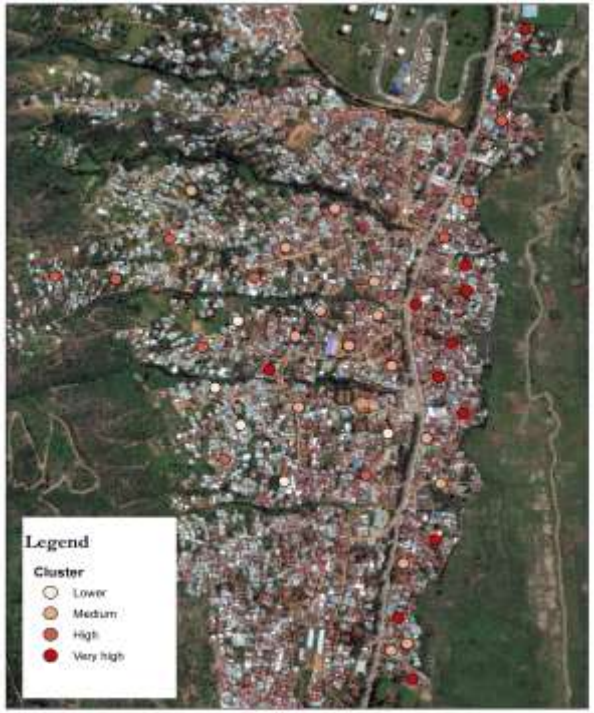
# Building characteristics – proxy for tenure security?




Mathenge, C. W. (2011). *Application of object oriented image analysis in slum identification and mapping: the case of Kisumu, Kenya*: University of Twente Faculty of Geo-Information and Earth Observation (ITC).

# Variation of perceived tenure insecurity in urban deprived areas



Dufitimana, Esaie (2021) Perceived tenure insecurity within deprivation: from a geospatial perspective, ITC MSc thesis M-GEO

# Relationship between deprivation and perceived tenure insecurity

Additional spatial information

- Zoning plan
- Access road
- Slope
- Wetland (conservation area)

*Variation of perceived tenure insecurity across the study area- linking to land cover features*

# Conclusions

- Automatic extraction worked well for mapping as it was able to capture boundaries that represent objects at the field level
- Current processing chains require user skills in parameter choice and validation is needed
- Image based identification can help identify settlements on government land and private land – facilitate possibilities of upgrading
- With the availability of multi-temporal data, updated maps can be generated and can act as appropriate base maps for land management and property registration
- There is potential for identification of variation in perceived tenue insecurity using Remote Sensing
- Further work in measurement and prediction of this variation

# Thank you