

Analysis of OpenStreetMap data quality at different stages of a participatory mapping process: Evidence from informal urban settings

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Humanitarian
OpenStreetMap
Team



MISSING
MAPS




Overview



- Introduction
- Participatory mapping process
- Definition of mapping stages
- Current results from mapping stages
- Summary of findings
- Potential future opportunities

Research questions



- What is the level of spatial data quality one can expect at different stages of the mapping process leading to final update of the OpenStreetMap database?
- What are the factors influencing quality?

Our ongoing project relevance to OpenStreetMap



One thing we are doing differently is that we are systematically adapting OpenStreetMap to develop a spatially-regulated sampling method in health research in a multi-country informal urban setting.

Improving Health in Slums Collaborative (2019), **A protocol for a multi-site, spatially-referenced household survey in slum settings: methods for access, sampling frame construction, sampling, and field data collection.** BMC Medical Research Methodology, 19. 109. doi:10.1186/s12874-019-0732-x

Our ongoing project: title and goals

Short term

- Map slums
- Map health services & facilities
- Understand usage

Medium term

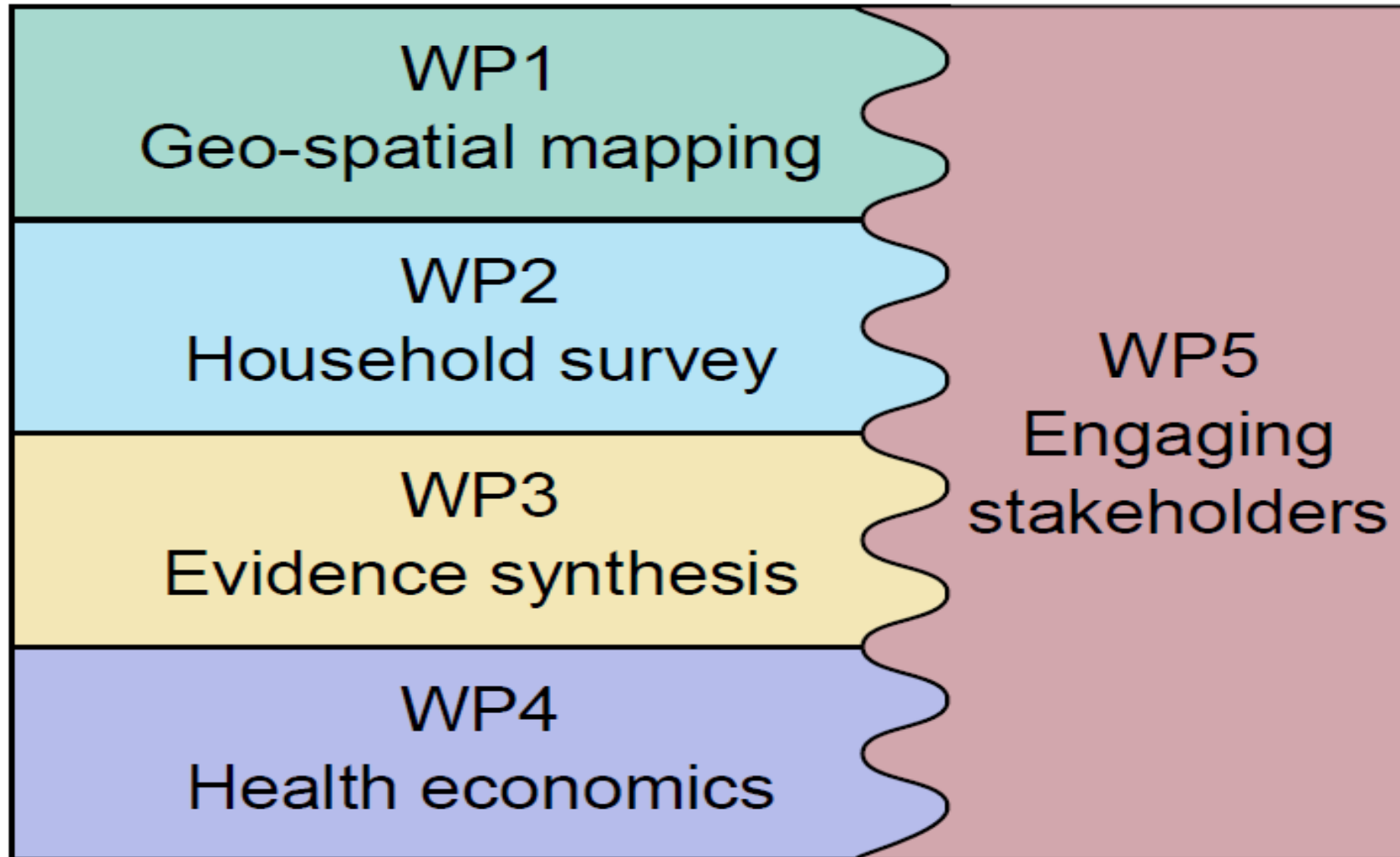
- Identify cost associated with seeking health care

Long term

- Build models of health services
- Create platform of funded activities

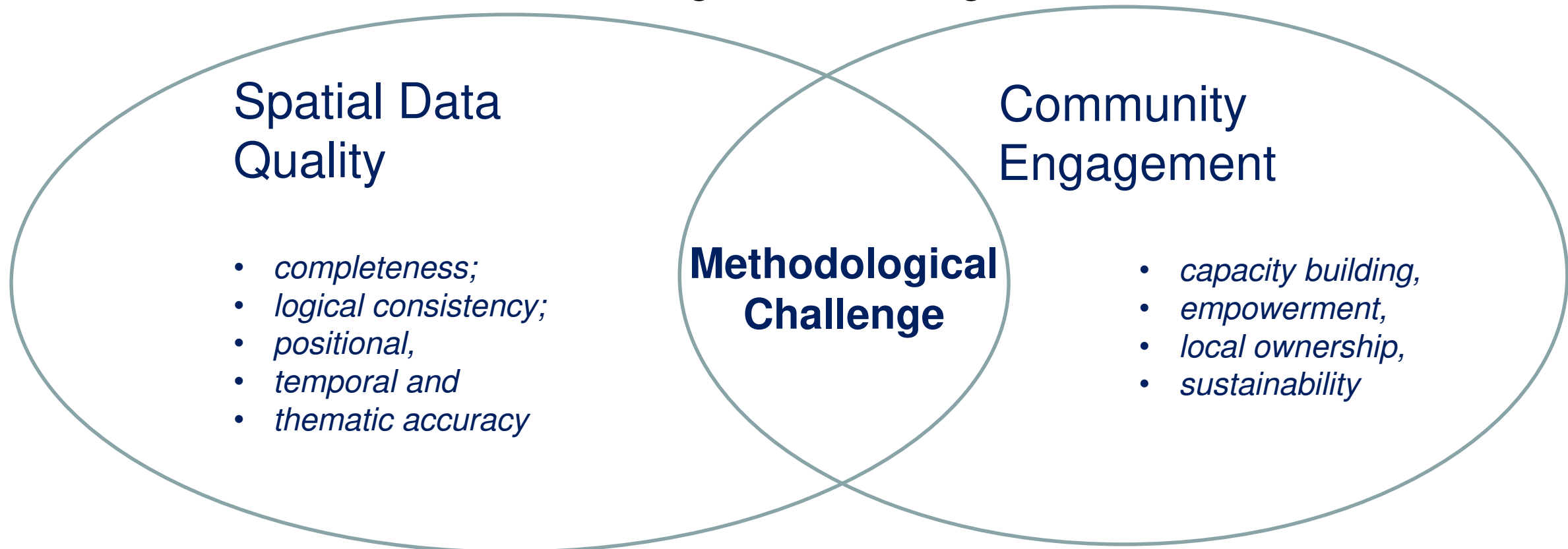
- Involve people who can change things
- Synthesis of existing evidence

Work packages (WPs) in the project

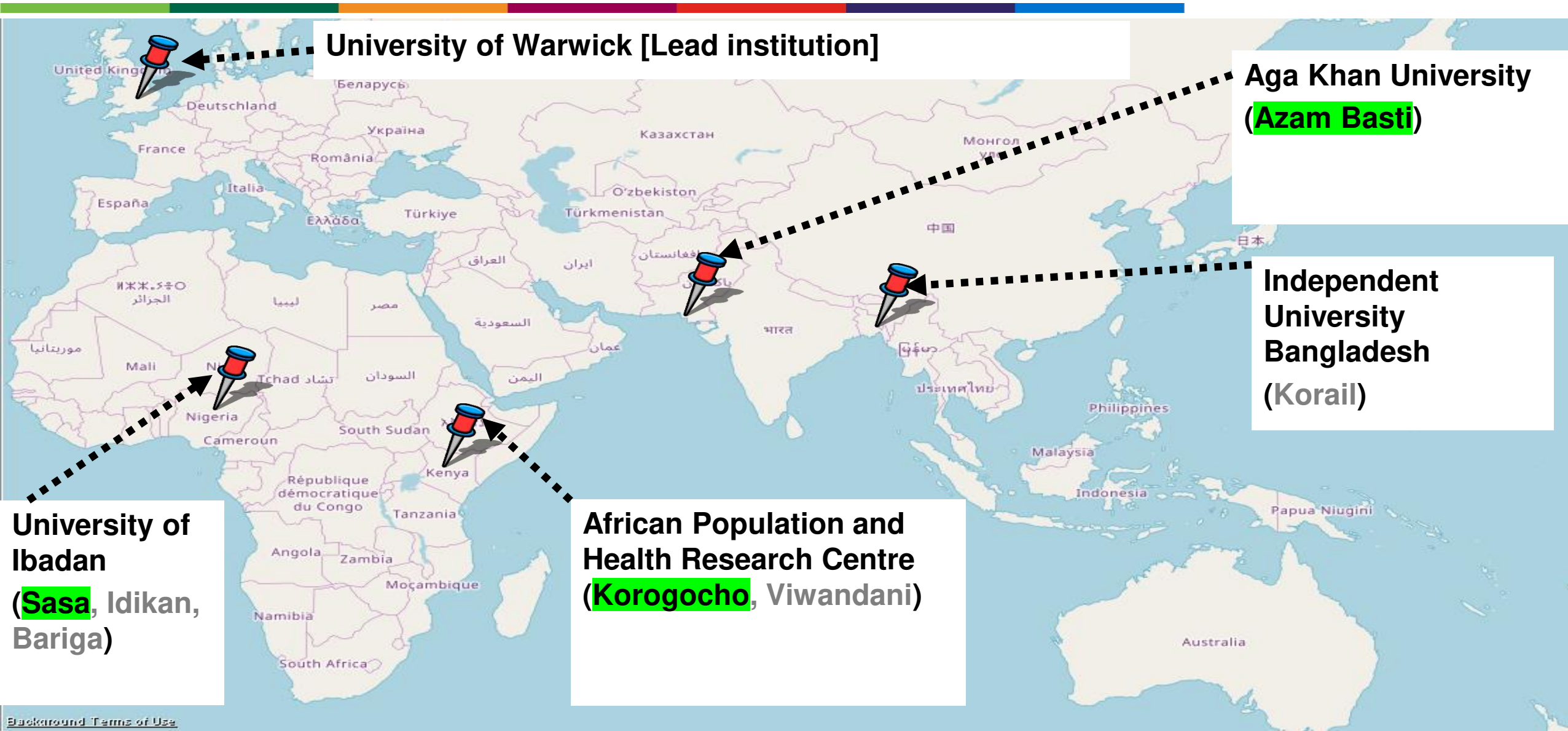


A methodological challenge

Combination of methods from geospatial data science and social research to tackle a methodological challenge:



Project partners (study sites)



Sample images of Azam Basti slum

Satellite image

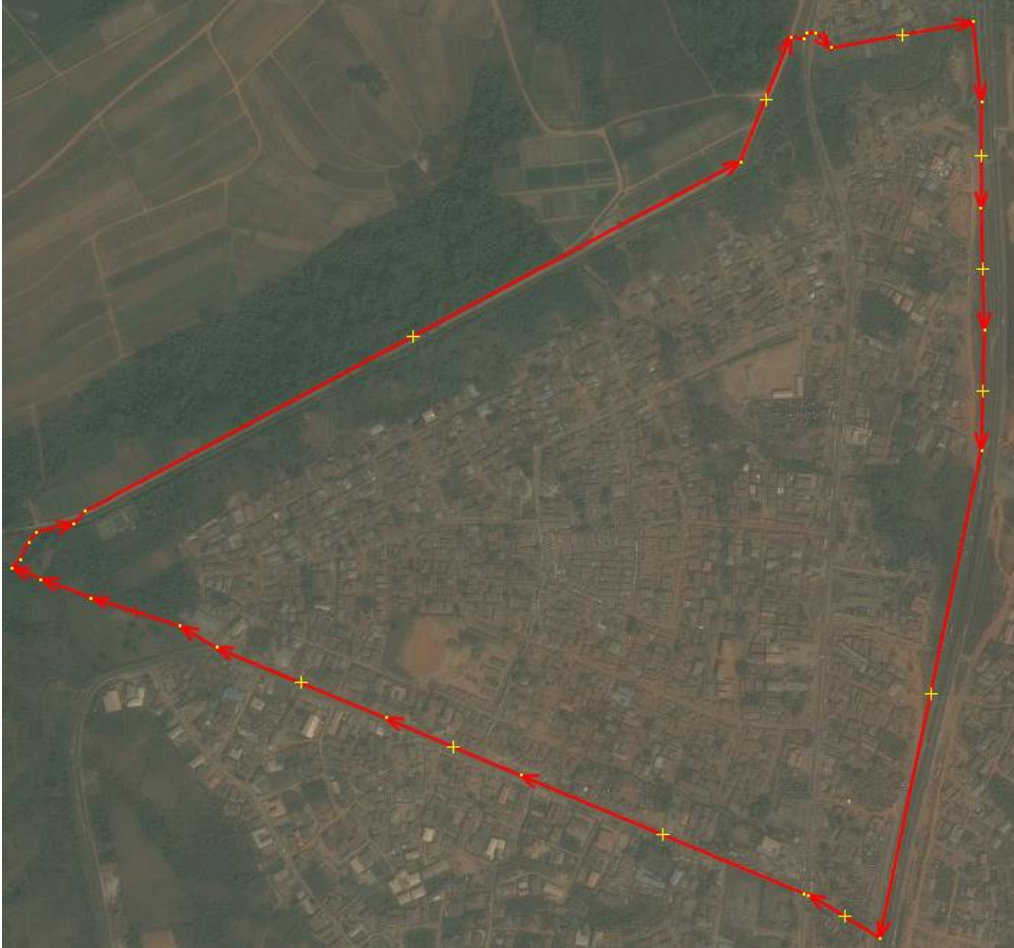


Building structures on the ground



Sample images of Sasa slum

Satellite image



Building structures on the ground



Sample images of Korogocho slum

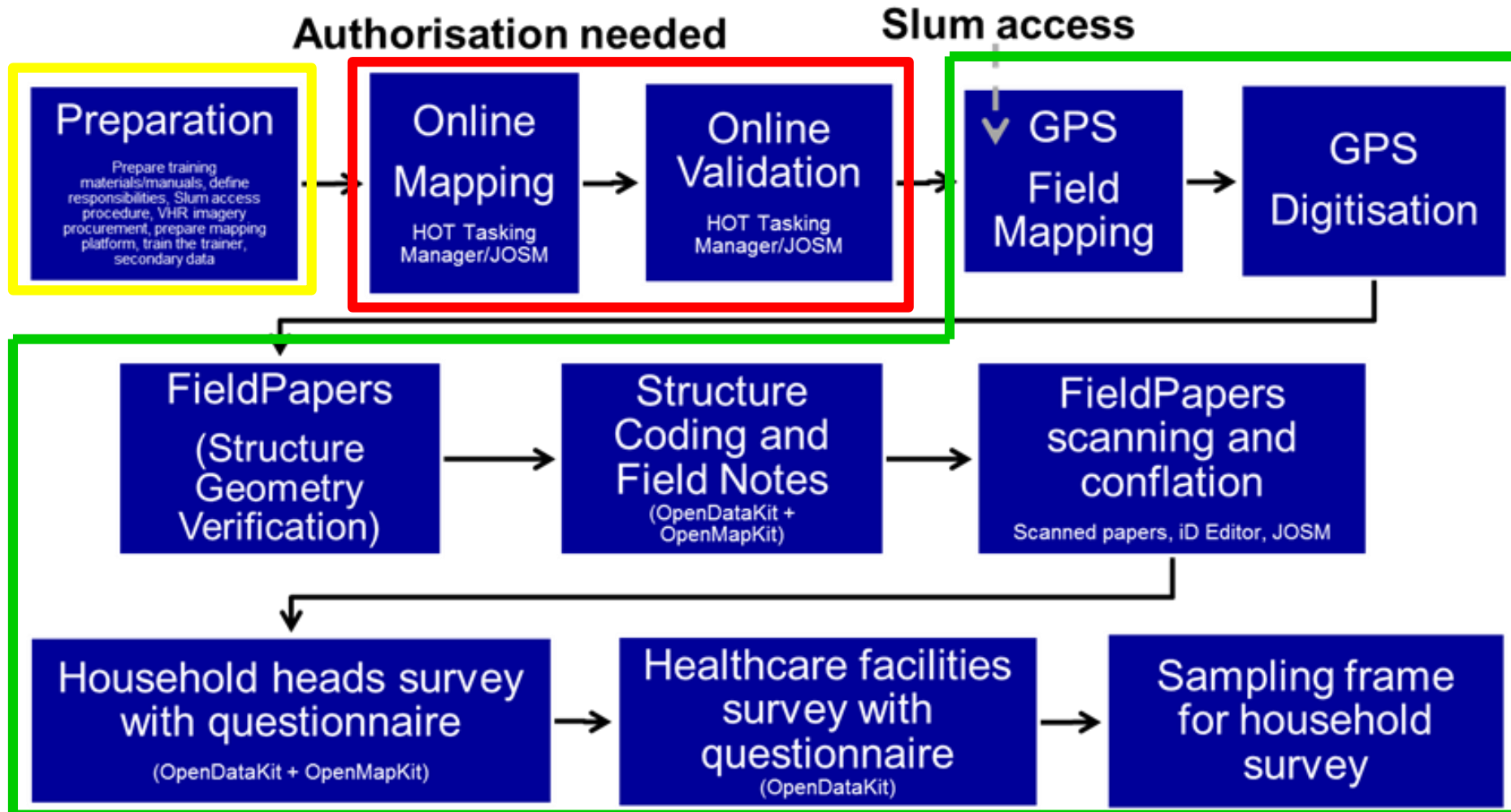
Satellite image



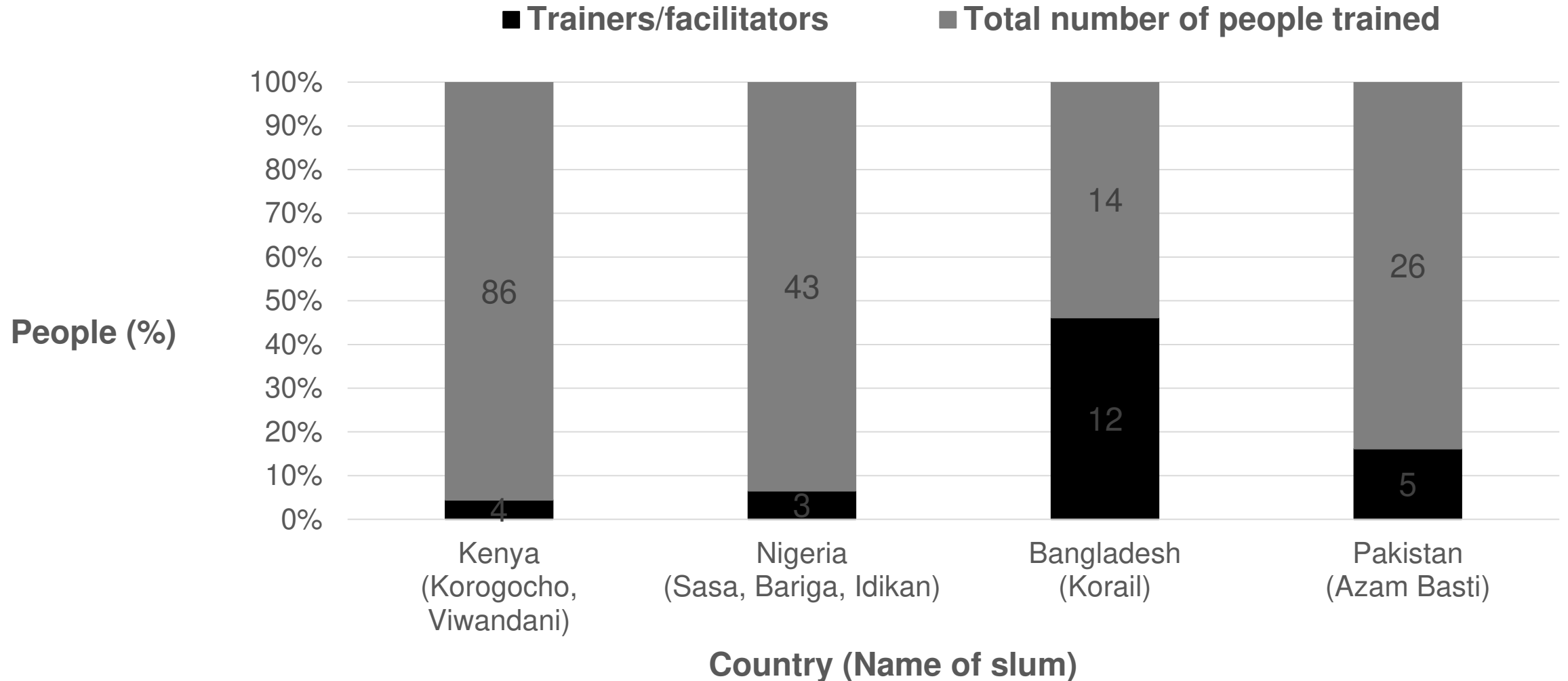
Building structures on the ground



Participatory mapping process



Participants and mapathon statistics: all sites



Participants and online mapping events

Involving the local community

- Local partners and community: mapping and reflecting on space



Bangladesh mapathon



Nigeria mapathon

Sample photos of ground-truthing/field work Involving the local community

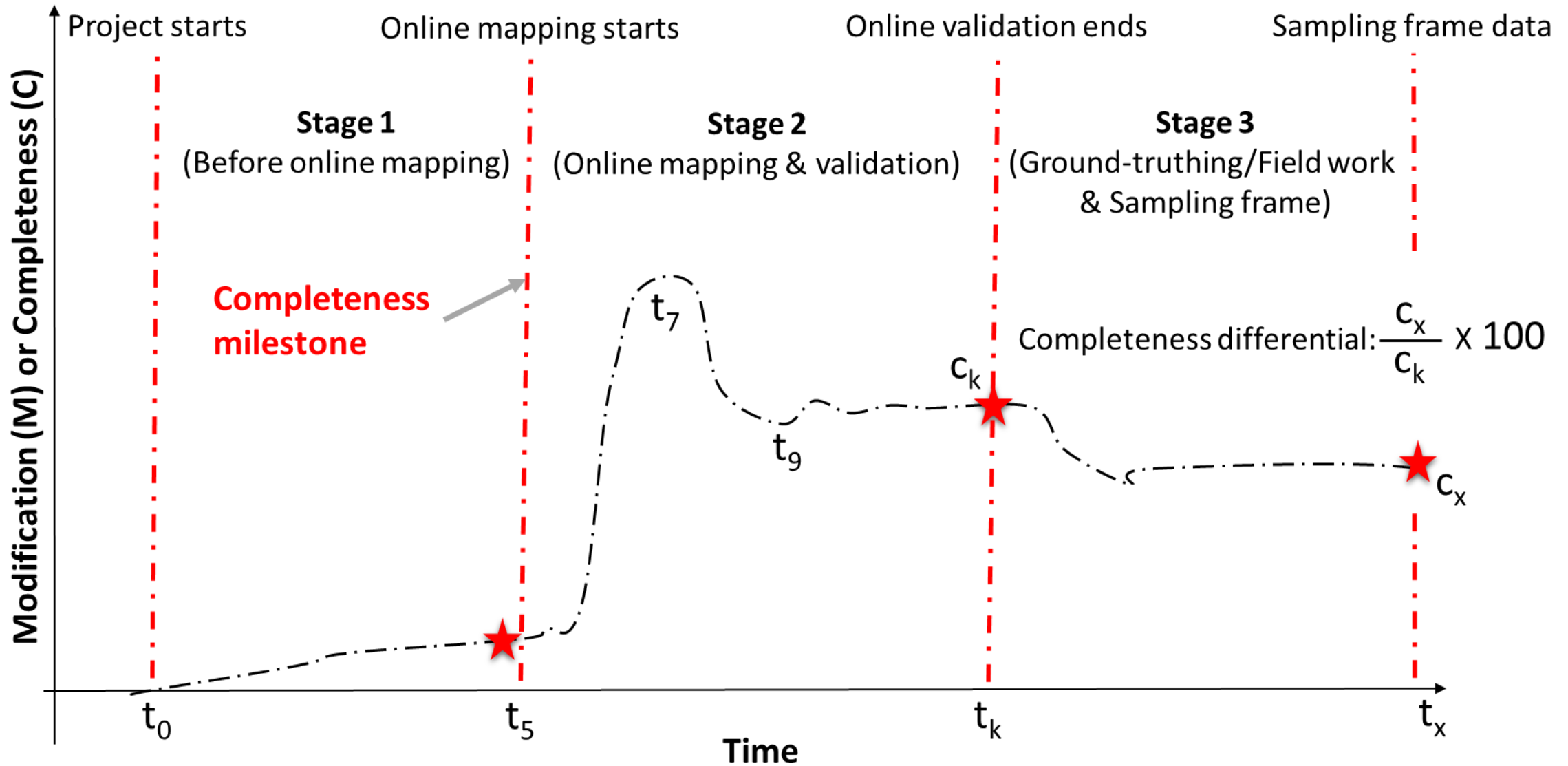


Bangladesh field work

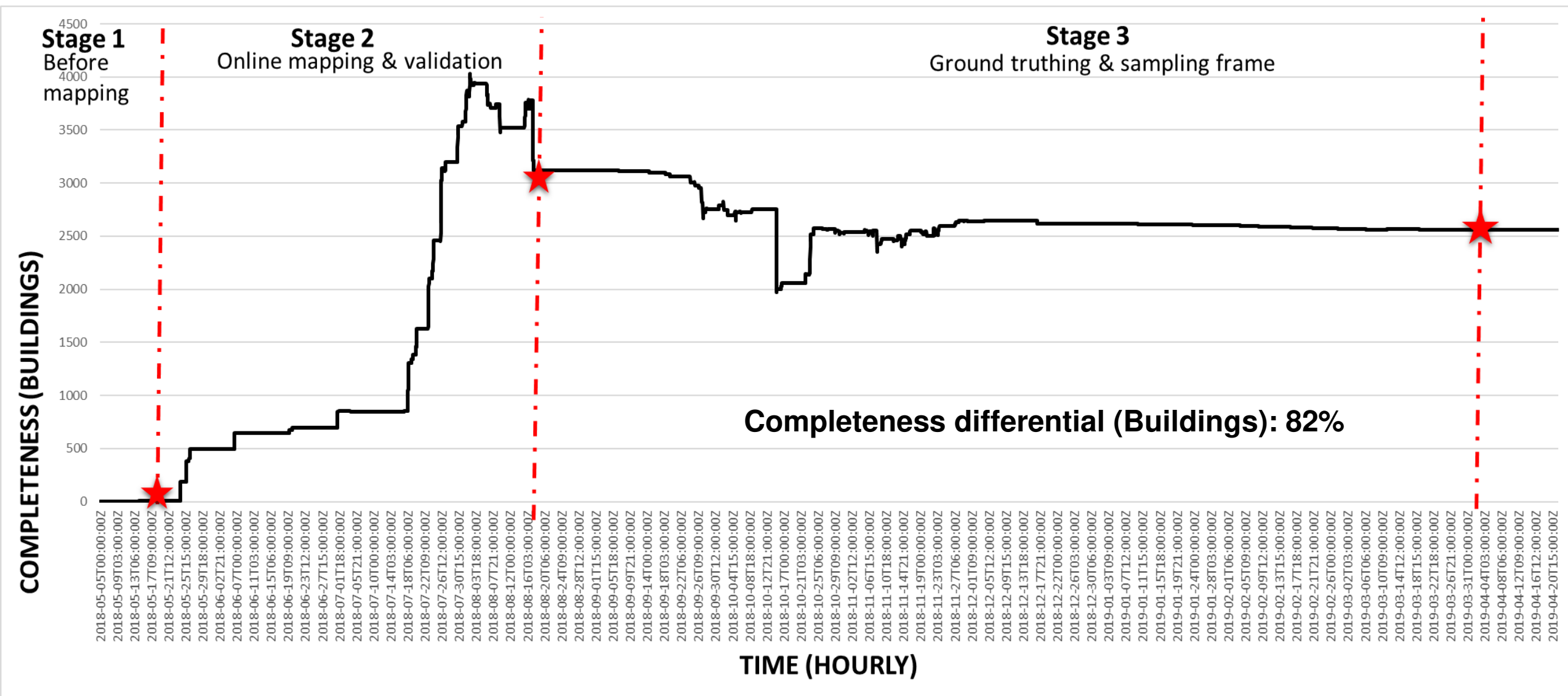


Kenya field work

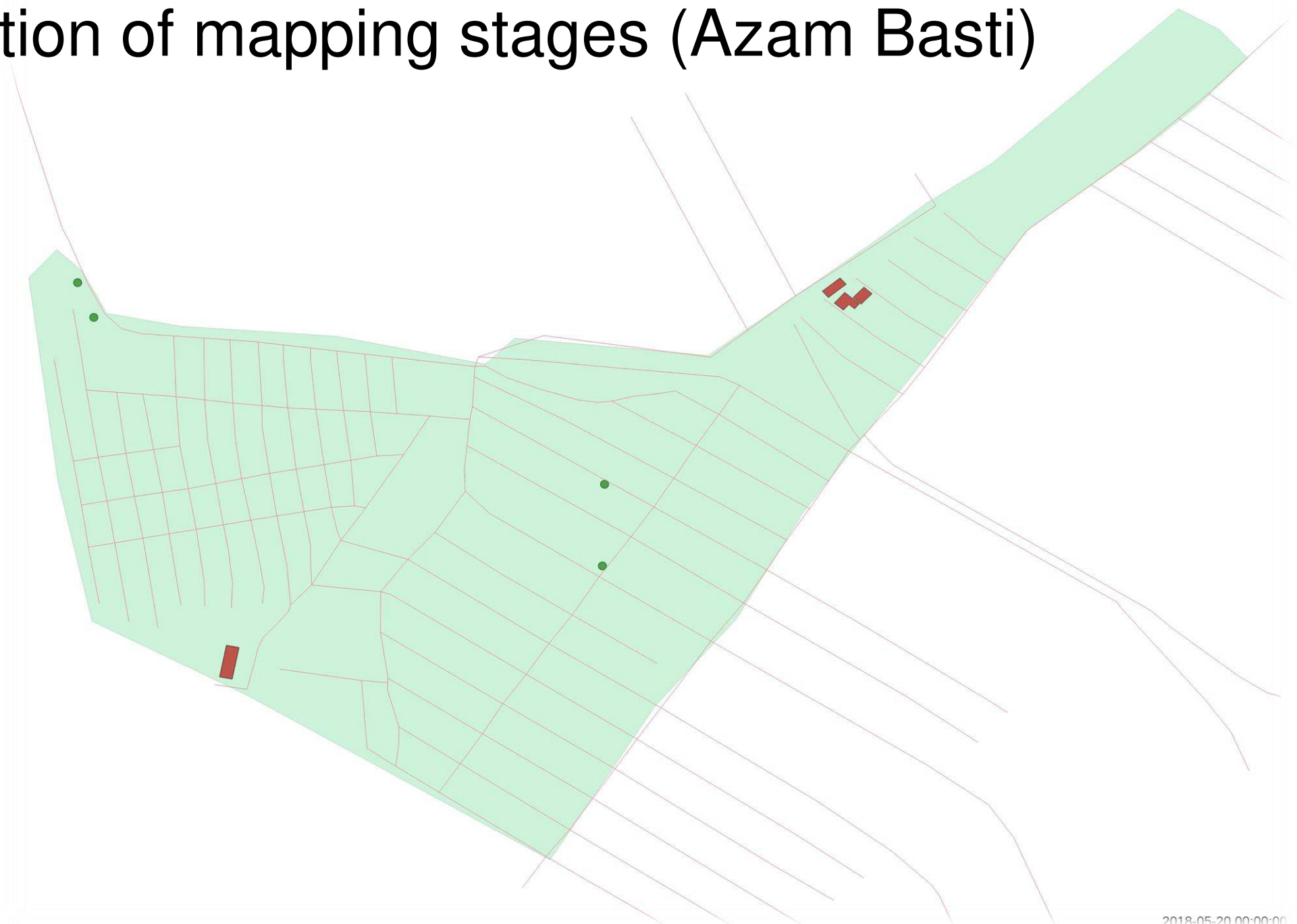
Conceptual definition of mapping stages



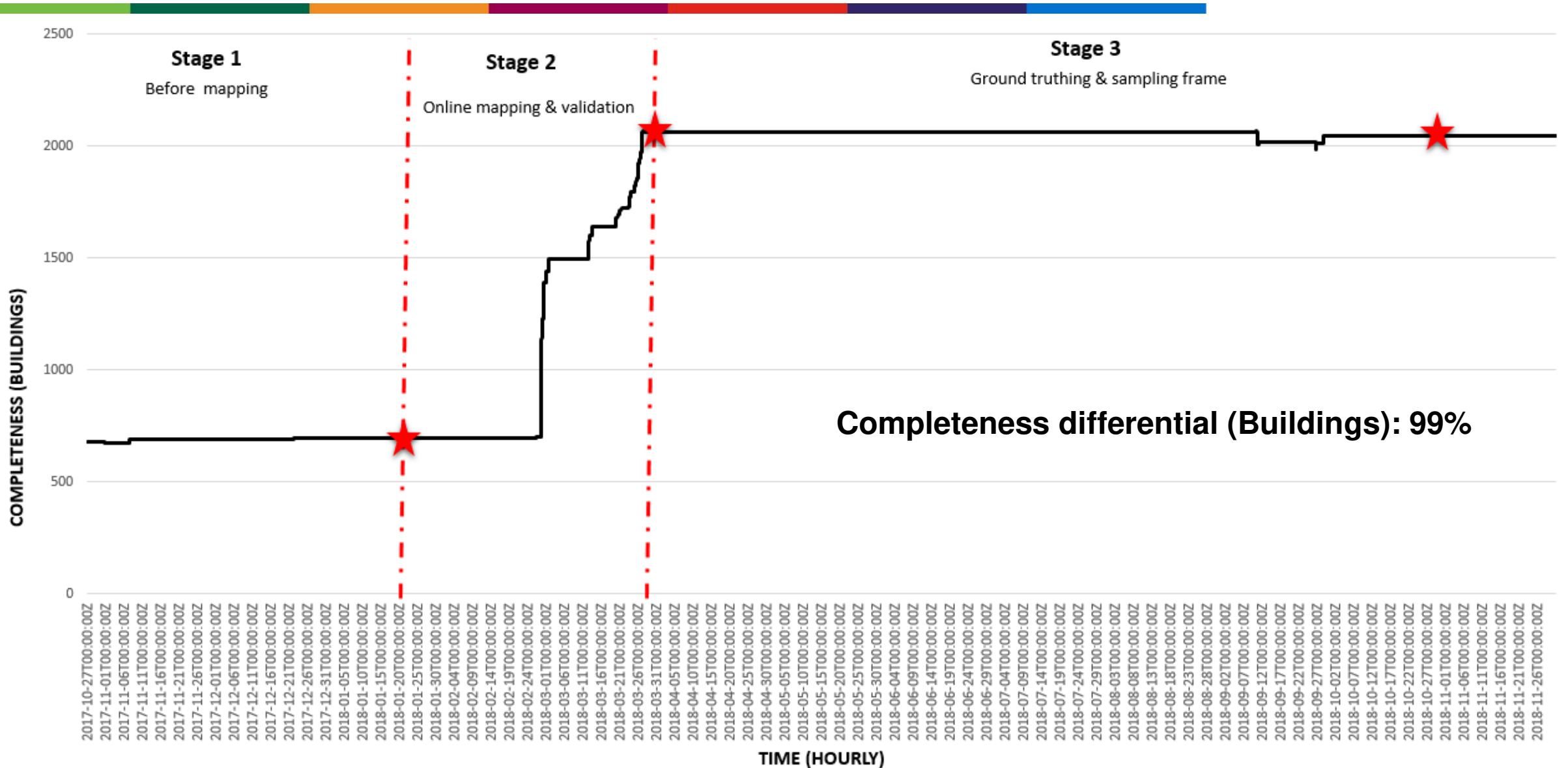
Mapping stages – Azam Basti (Buildings)



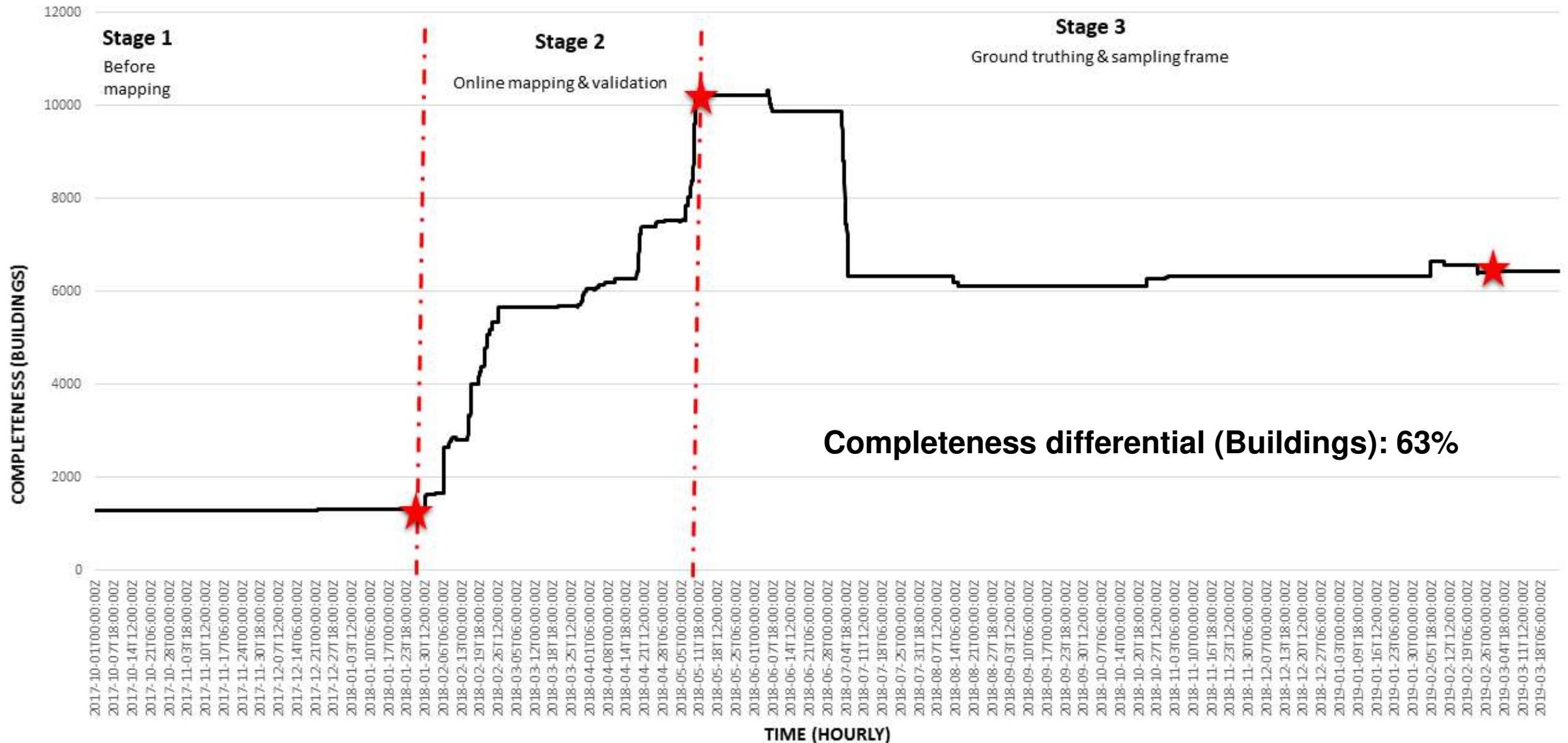
Animation of mapping stages (Azam Basti)



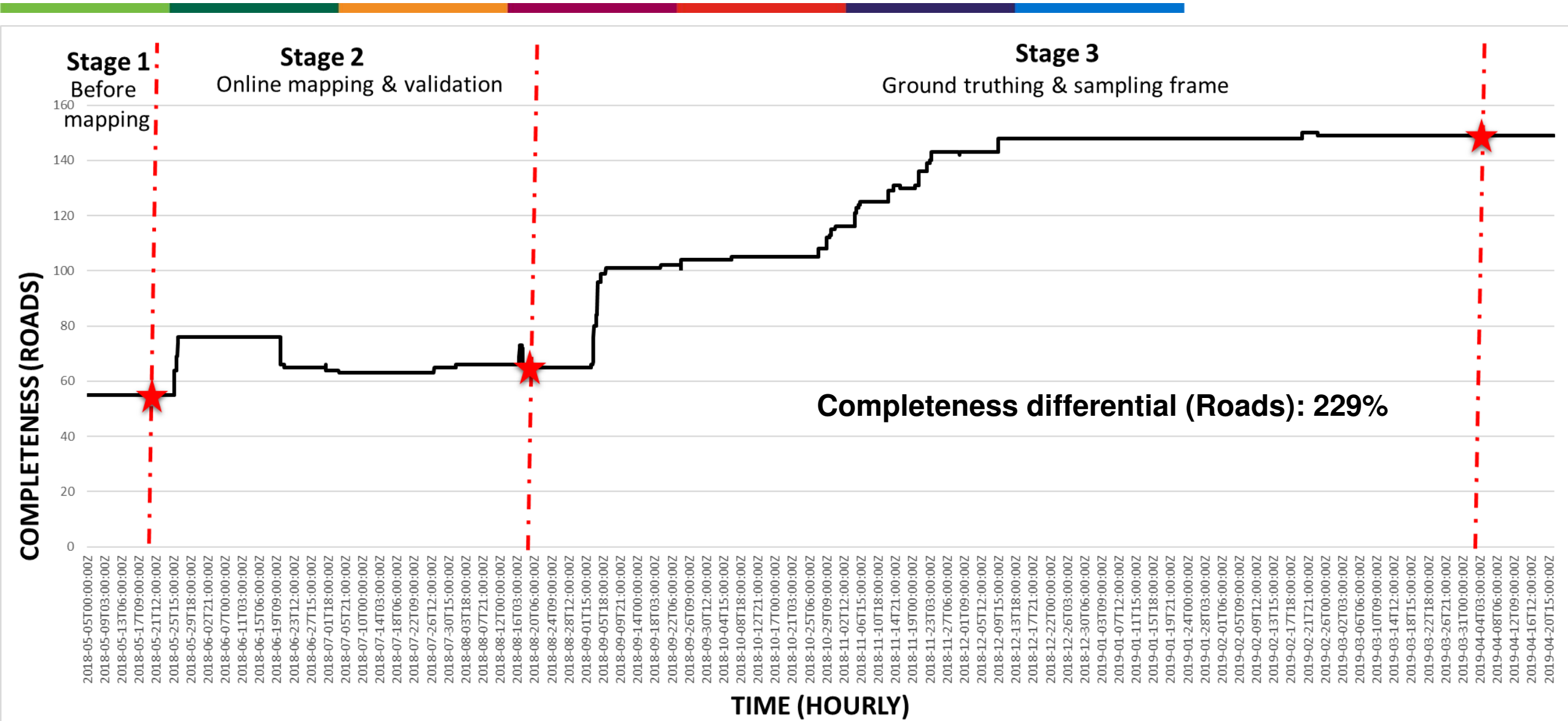
Mapping stages – Sasa (Buildings)



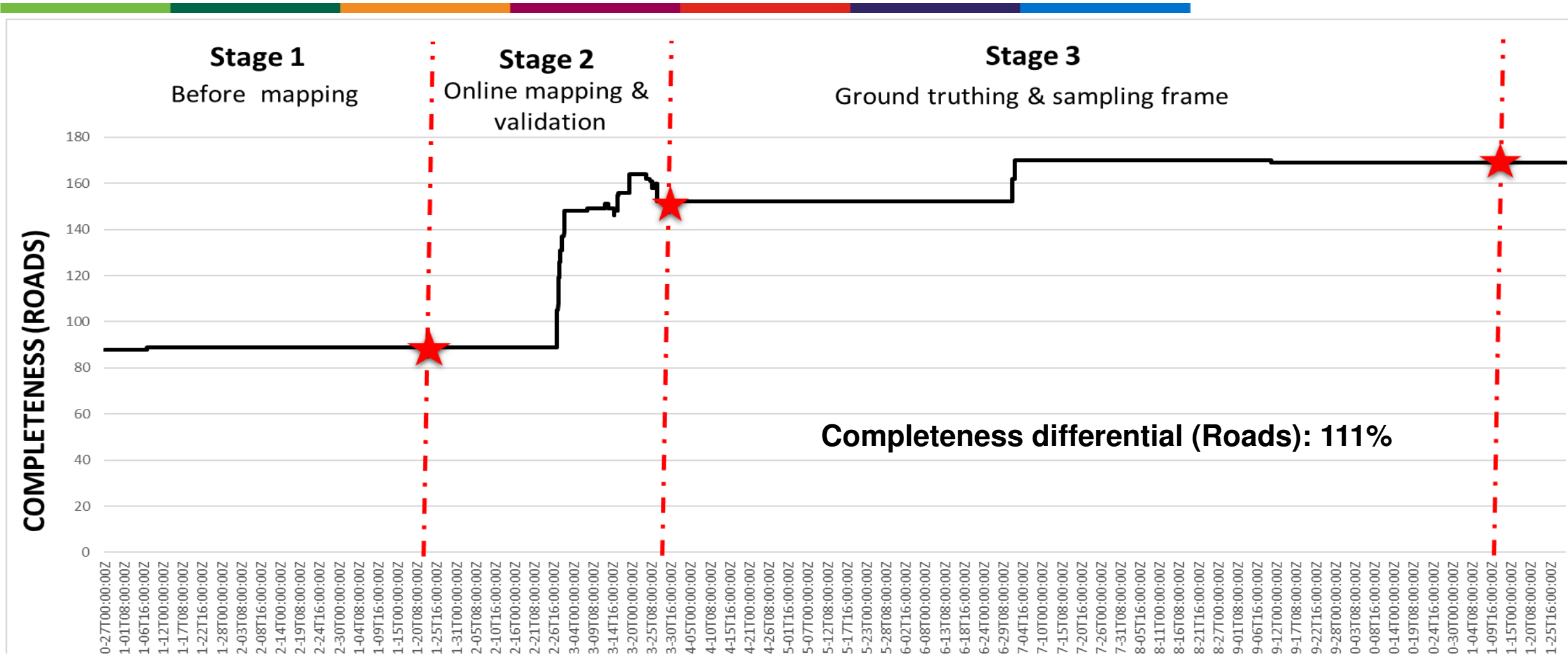
Mapping stages – Korogocho (Buildings)



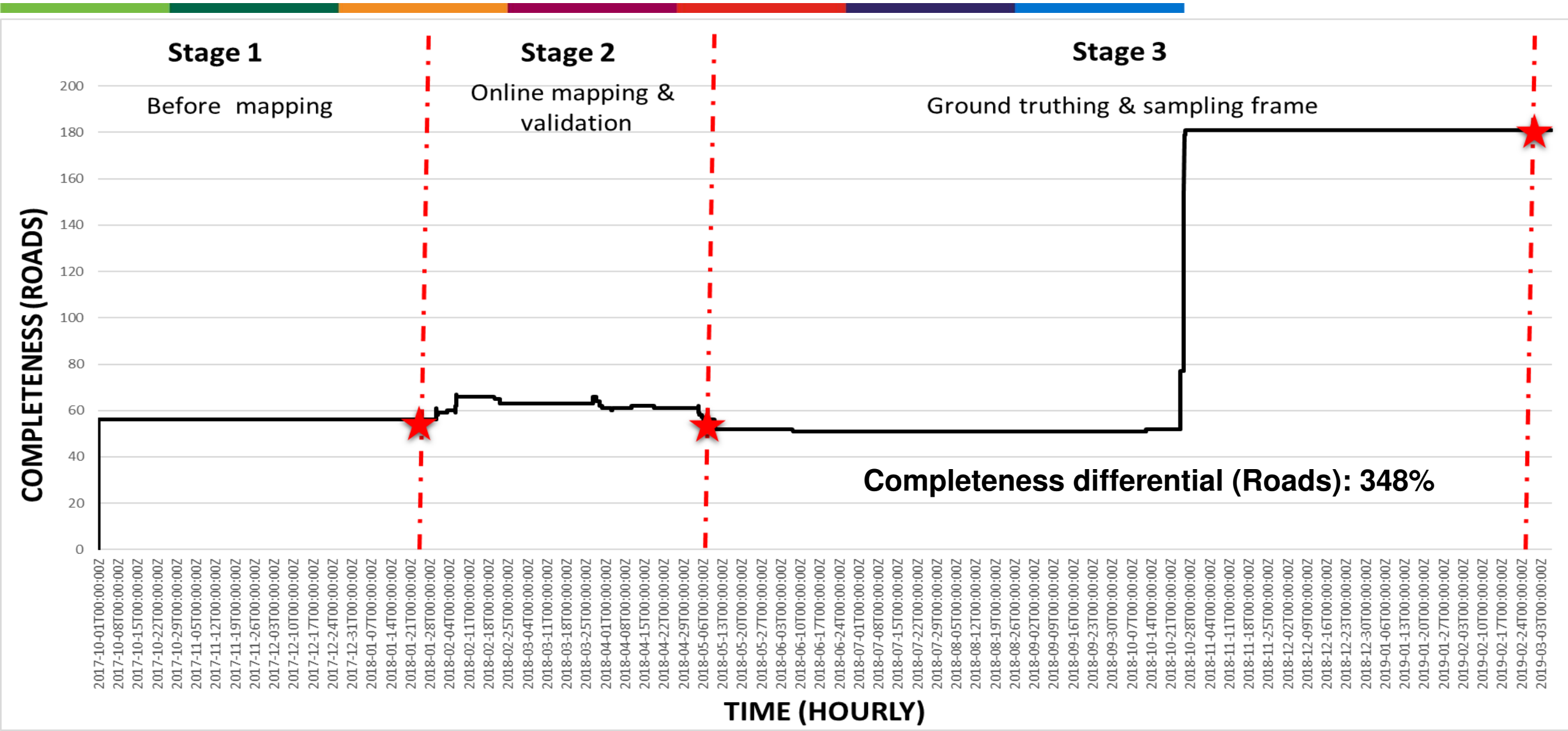
Mapping stages – Azam Basti (Roads/Footpaths)



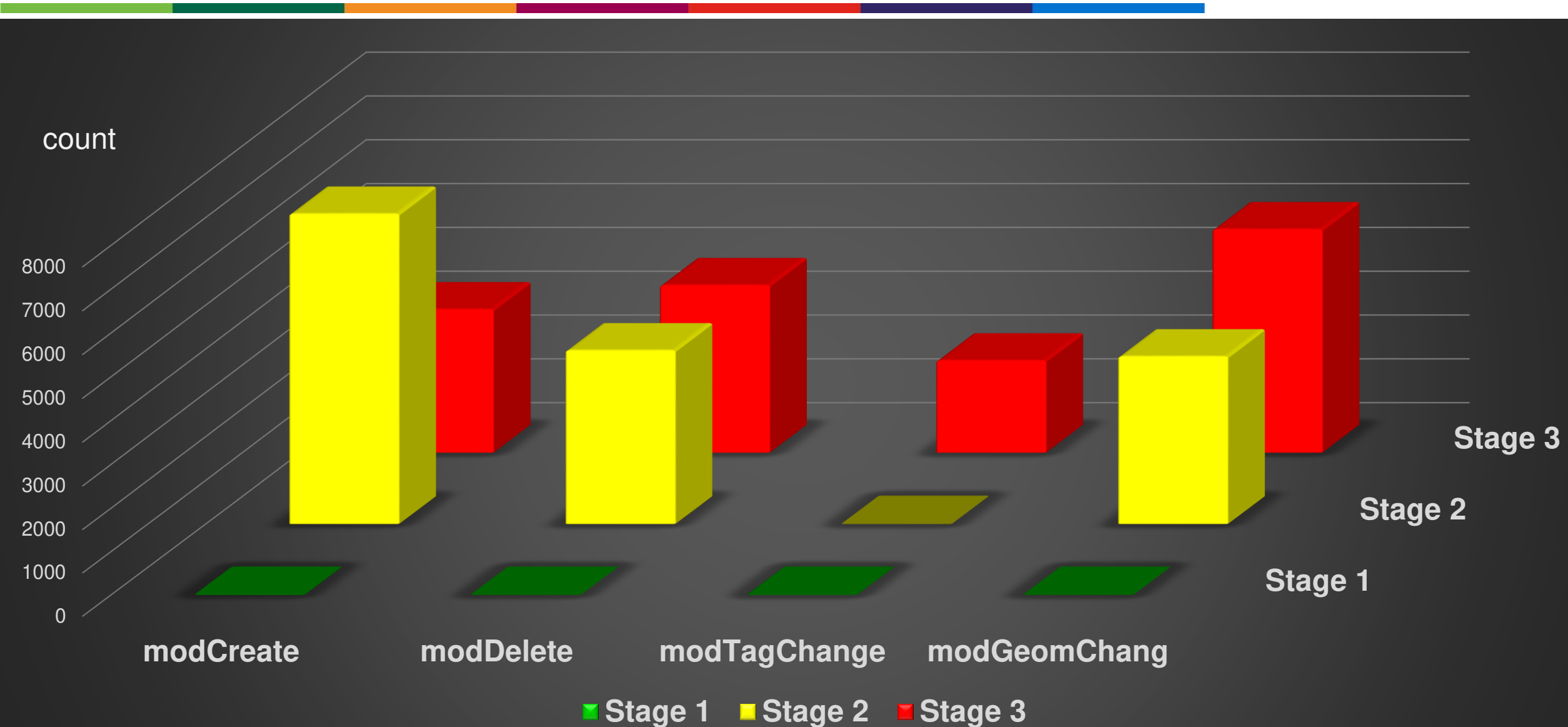
Mapping stages – Sasa (Roads/Footpaths)



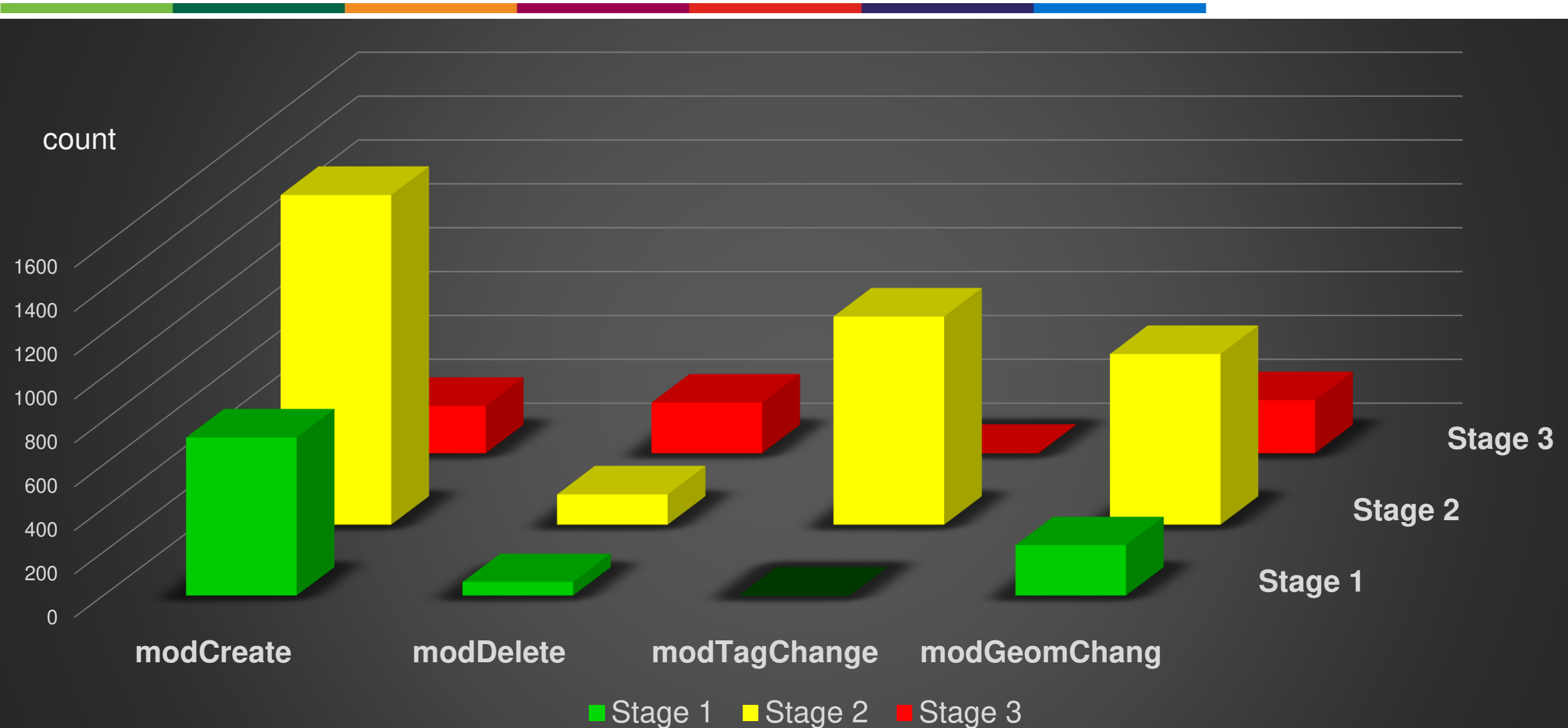
Mapping stages – Korogocho (Roads/Footpaths)



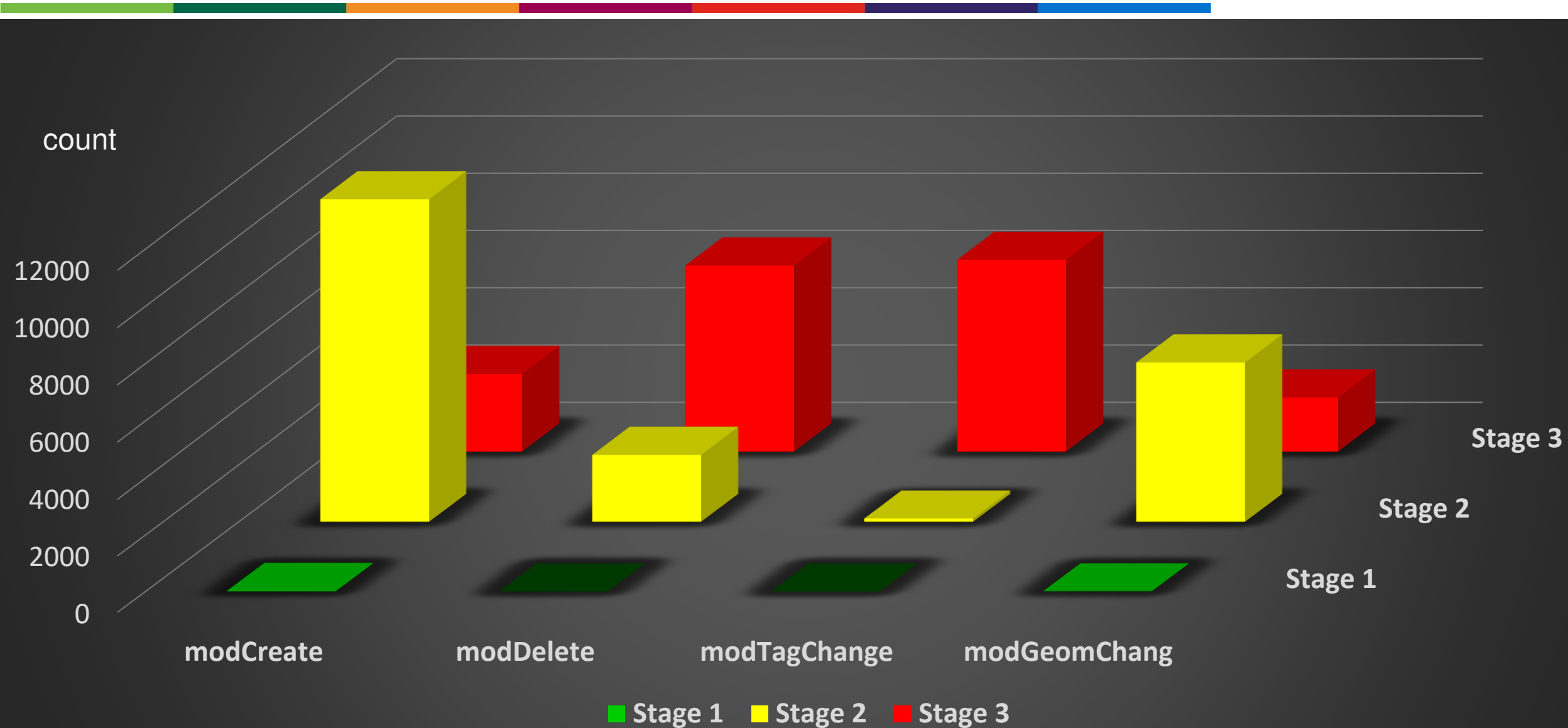
Modification of OSM Buildings – Azam Basti



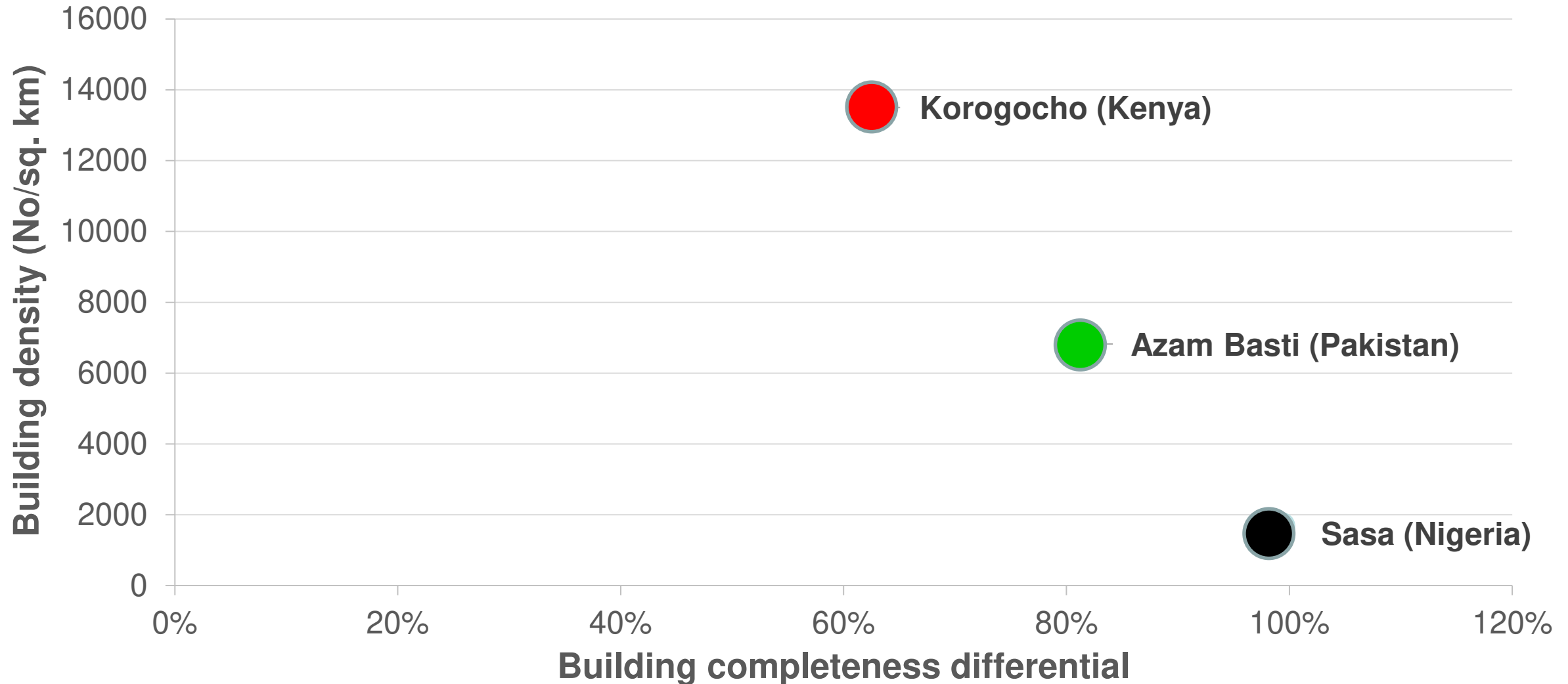
Modification of OSM Buildings – Sasa



Modification of OSM Buildings – Korogocho



Factors influencing quality (i): density of buildings



Factors influencing quality (ii): roof top architecture

Relatively difficult interpretation

Azam Basti

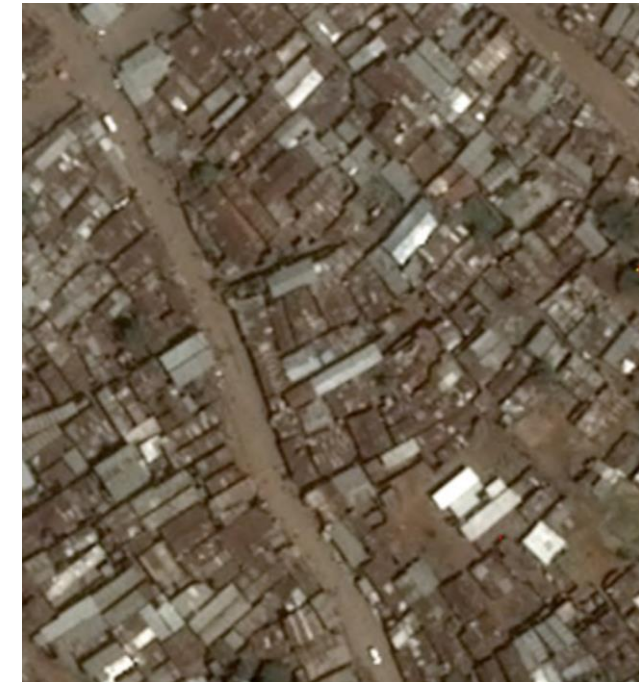


Relatively easy interpretation

Sasa

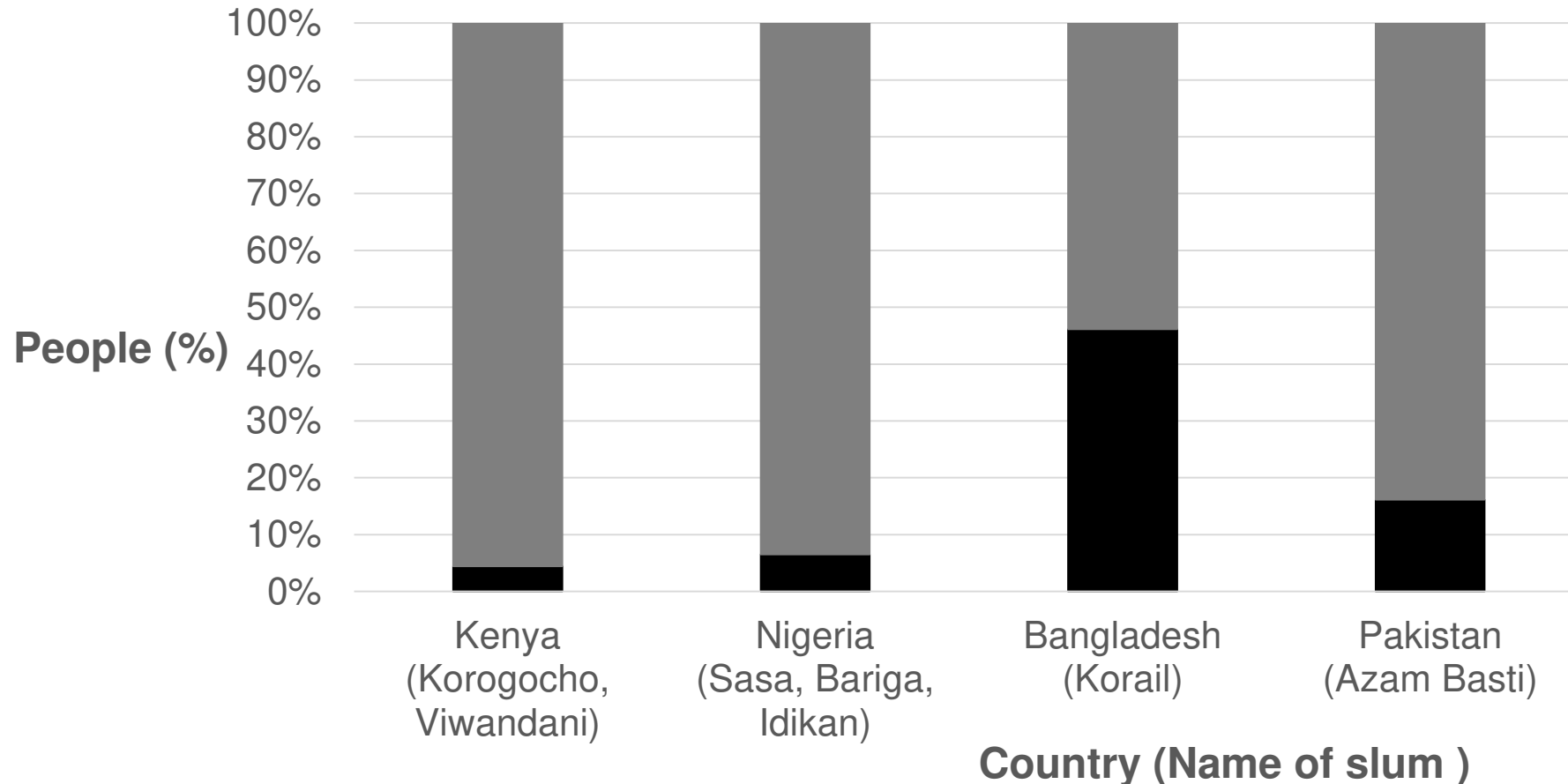


Korogocho



Factors influencing quality (iii): Computer skills, mapping skills and knowledge of tools

■ Trainers/facilitators ■ Total number of people trained



- **Capacity building is essential for slum community engagement in mapping activities**
- **Slum residents are the “local experts” with local knowledge.**

Summary of findings



- OpenStreetMap for health survey in informal urban settings
 - Ground-truthing is essential for areas with high density of buildings. Ground-truth estimates are about 1%-37% less than online mapping estimates.
 - Less dense areas can reasonably be used as a sampling frame without ground-truthing.
 - Roads are easy to interpret, useful and must be mapped at all stages. Ground-truth estimates are about 11% - 248% more than online mapping estimates.
 - Factors influencing data quality: density, roof top architecture, mapping skills, etc.
- The ohsome platform was very useful for historical OSM data analytics.
- Towards a framework for understanding spatial data quality at different mapping stages leading to OpenStreetMap update.

Potential future opportunities



- Combining participatory mapping and automated methods (e.g. machine-learning) for structure detection and population estimation (pilot ongoing)
- Improvement of workflows and mapping tools in support of a methodological framework for geospatial mapping health and wellbeing in urban poor areas
- Extending impact: potential future collaboration with local partners, OSM Community, and other researchers for data usage and further improvement

Thank You!

- Volunteers from the OpenStreetMap community, HOT and missing maps
- Collaborators and funders:



In collaboration with:



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