SESRIC – UN-HABITAT Webinar on Measurement Methods for SDG 11 and the New Urban Agenda in the OIC Countries

Overview of Geospatial Data Integration in Urban Monitoring

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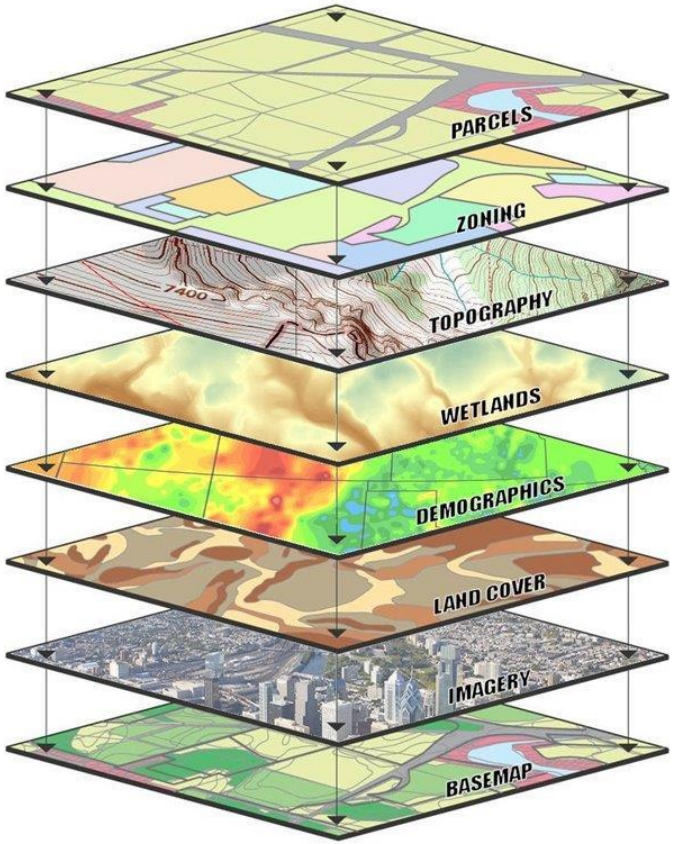
Overview



- All indicators in all global and local frameworks are connected to space, but some require direct spatial measurements
- **GA Resolution 68/261** … calls for data disaggregation by, among others geographic location in accordance with the Fundamental Principles of Official Statistics
- **A/RES/71/313 –** Recommends integration of new data sources into statistical systems for SDGs monitoring (incl geospatial data)

In SDG 11 …..

- Locational attributes affect results in at least 8 indicators – 11.1.1, 11.2.1, 11.3.1, 11.5.1, 11.5.2, 11.6.1, 11.6.2, 11.7.1
- At least 3 indicators require direct spatial data, use GIS techniques for measurement – 11.2.1, 11.3.1, 11.7.1
- Characteristic specific estimates can be achieved for several other indicators – 11.1.1, 11.5.1,

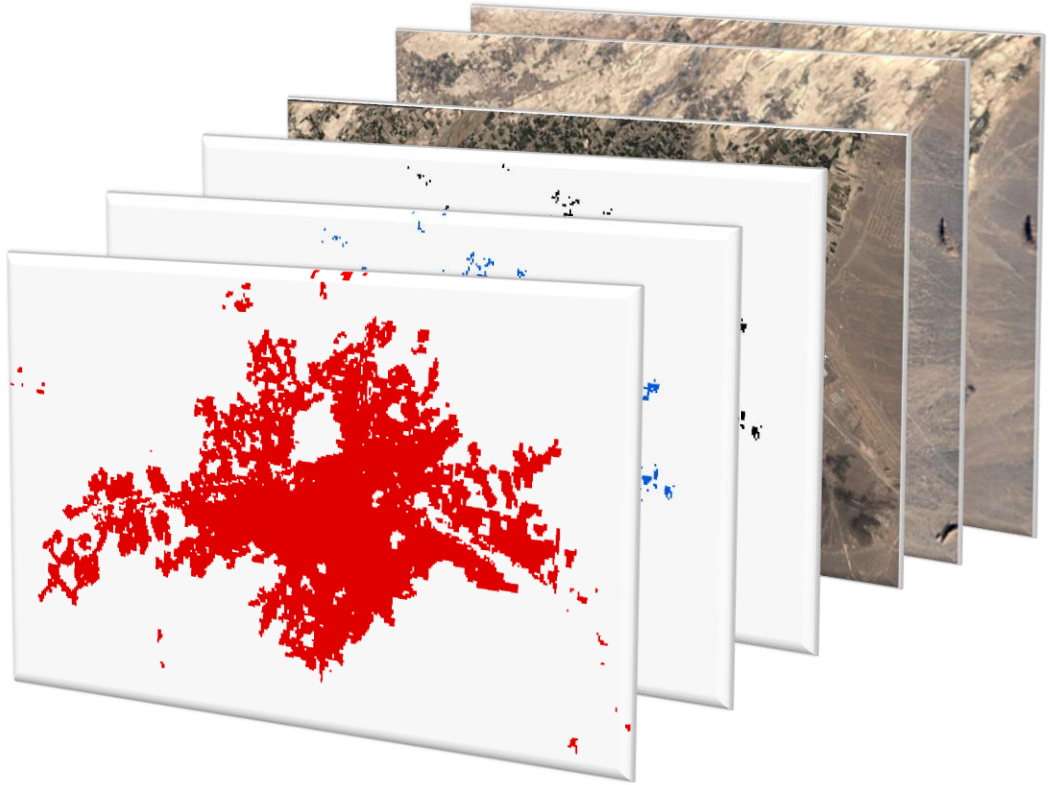
Spatial data and geospatial technologies in SDG 11 are needed to

- Identify/ distinguish urban from non-urban areas
- Extract indicator specific information
- Disaggregate population data

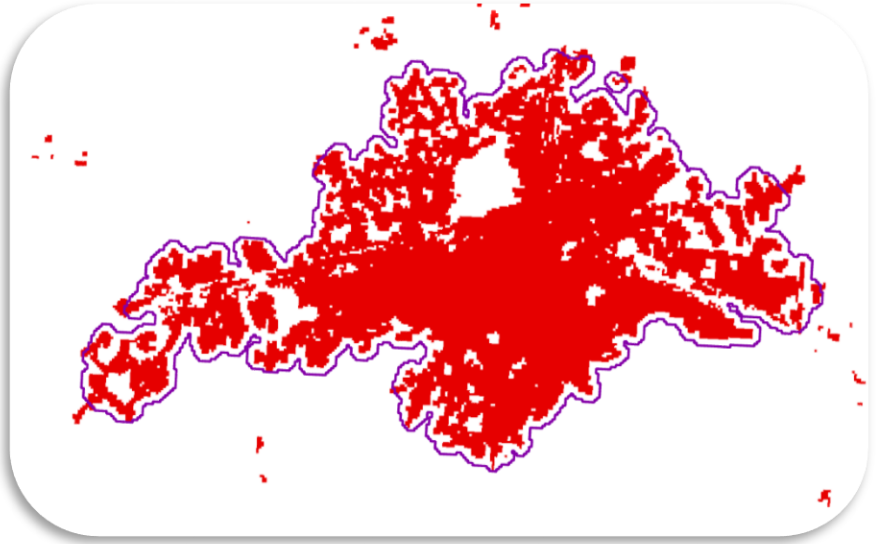
Example 1: Indicator 11.3.1 Computation Workflow

1. Decide the two years for which the indicator is to be computed – can be 1, 5, 10 year intervals etc

2. Extract built up areas for each measurement year: (Geospatial Process)



3. Delimit city boundaries for most recent year: (Geospatial Process integrating population data)



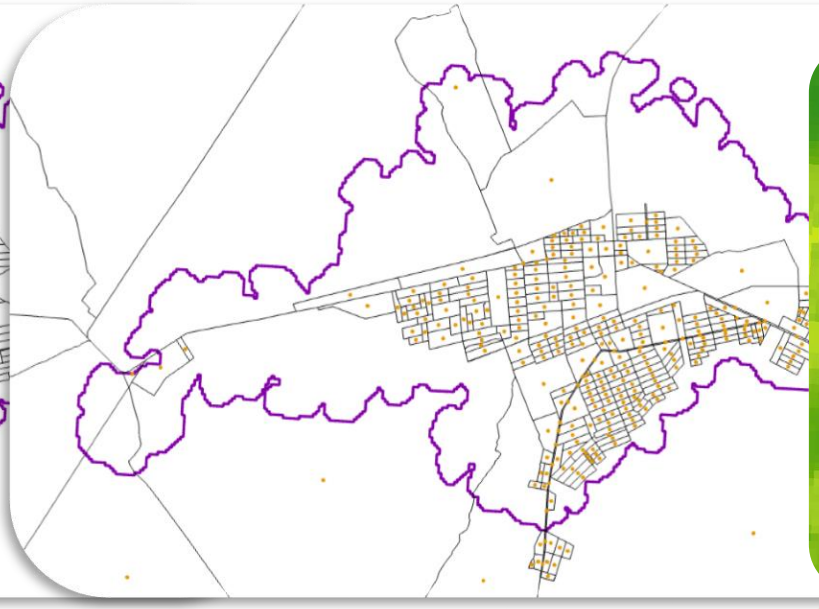
4. Compute land consumption rate based on total built up area within boundary for each analysis year (Geospatial Process)

$$\mathbf{LCR}\ (\%) = \frac{\mathbf{Vpresent} - \mathbf{Vpast}}{\mathbf{Vpast}} * \frac{\mathbf{1}}{\mathbf{T}}$$

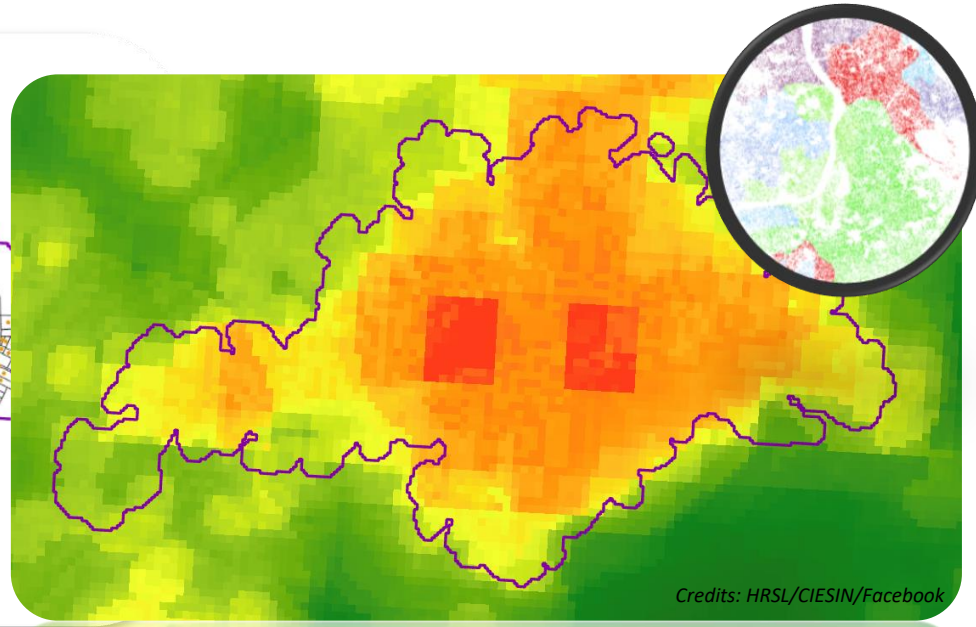
Vpresent - total built up area in current year
Vpast - total built up area in previous year
Y - number of years between the two measurement periods

5 Integrate population for each analysis year (Geospatial + Population/Statistical Processes)

Block level/ Census EA tracts?



Aggregation of individual HH data?



Modelled population / grids?

6 Compute population growth rate

$$\mathbf{PGR}\ (\%) = \frac{\mathbf{LN}(\mathbf{Pop_{t+n}}/\mathbf{Pop_t})}{(\mathbf{y})}$$

LN - natural logarithm value
Pop_t - population within the urban area in the initial year
Pop_{t+n} population within the urban area in the current year
y is the number of years between the two measurement periods

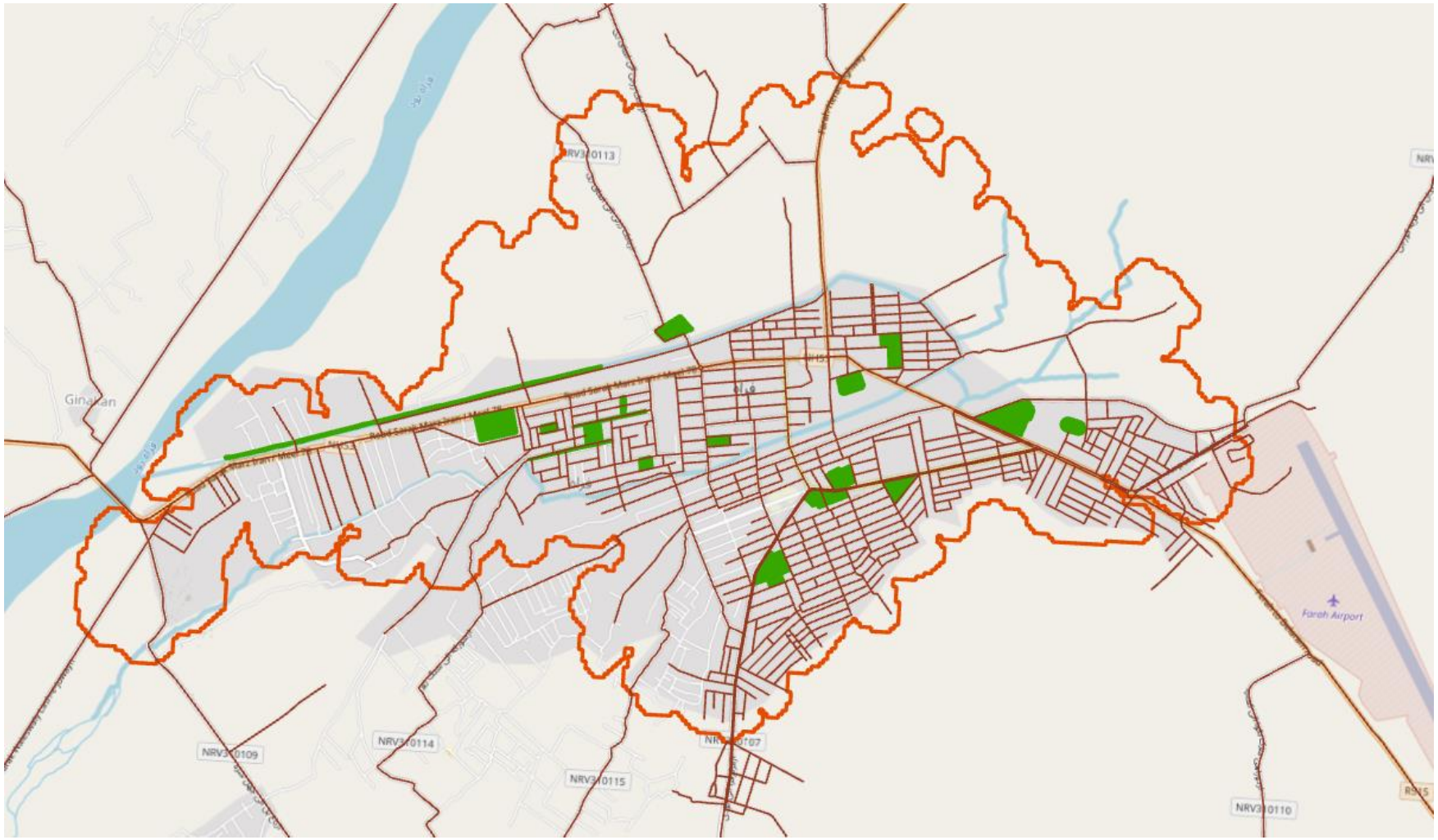
7 Compute core indicator: $\mathbf{LCRPGR} = \left(\frac{\mathbf{LCR}}{\mathbf{PGR}}\right)$

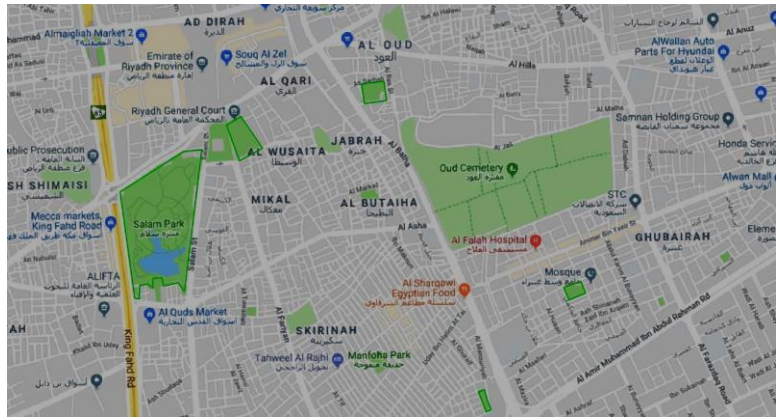
8 Compute secondary indicators

a) Land consumption per capita
b) Total change in built up area

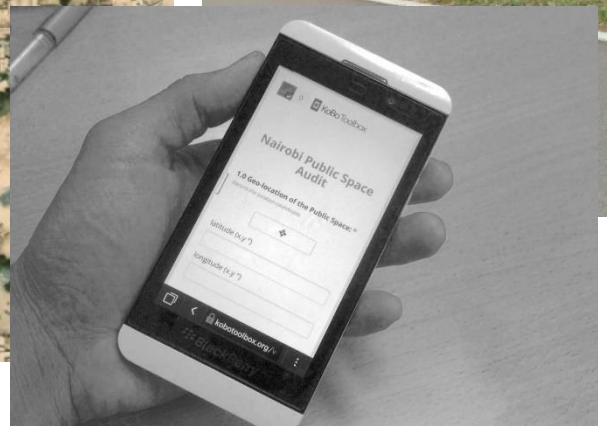
Example 2: Indicator 11.7.1 Computation Workflow

1 Identify potential open public spaces and extract information on streets from city land use plans, VHR satellite imagery/ base maps, open sources eg OSM



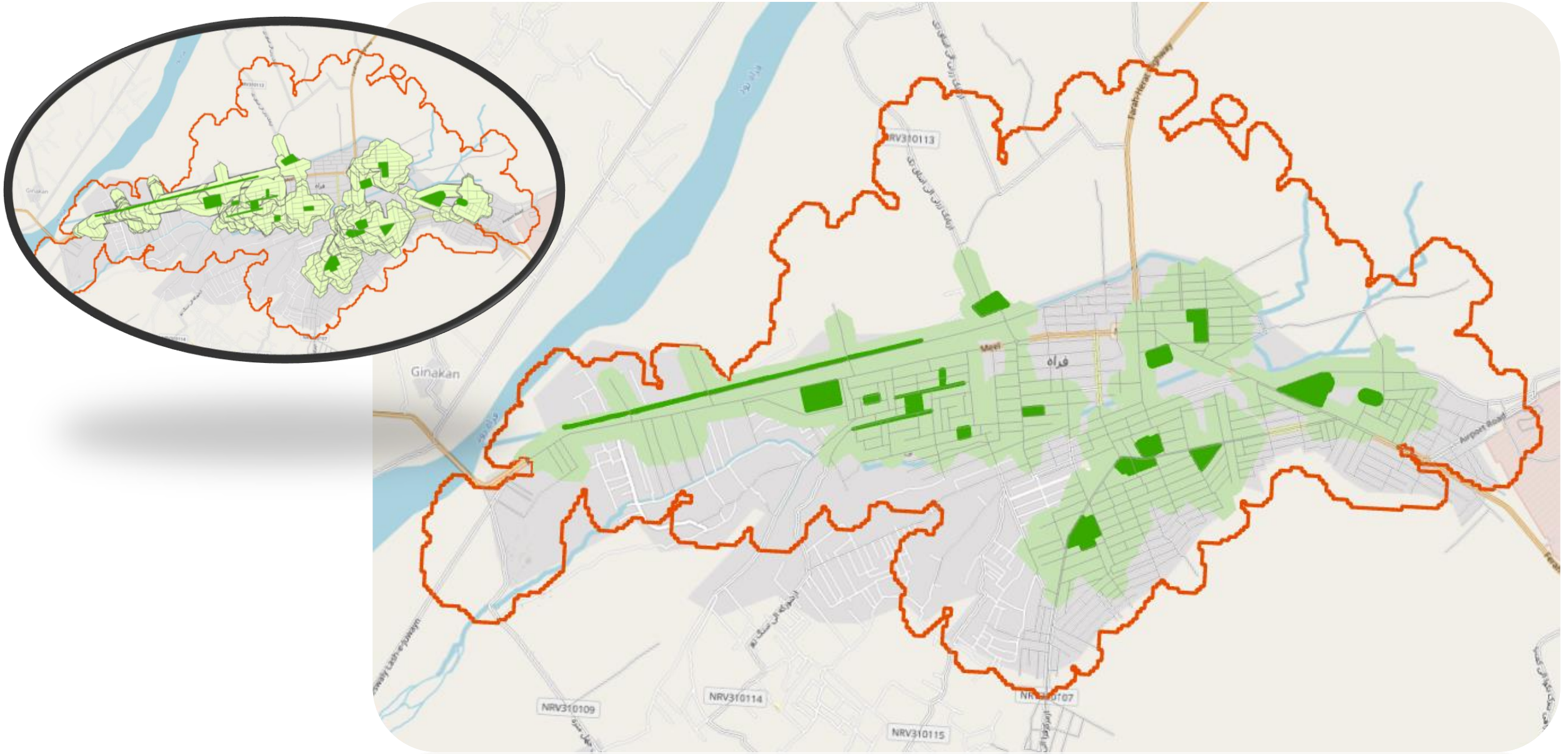


2 Undertake validation of identified/mapped potential open public spaces (eg through expert consultations, participatory desktop mapping, ground truthing, etc)

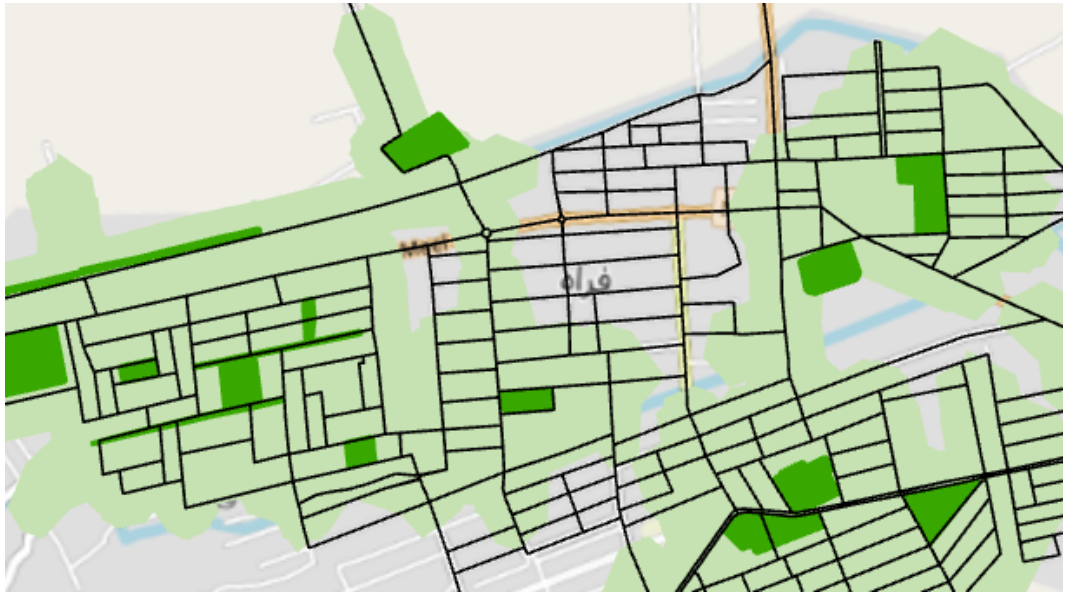


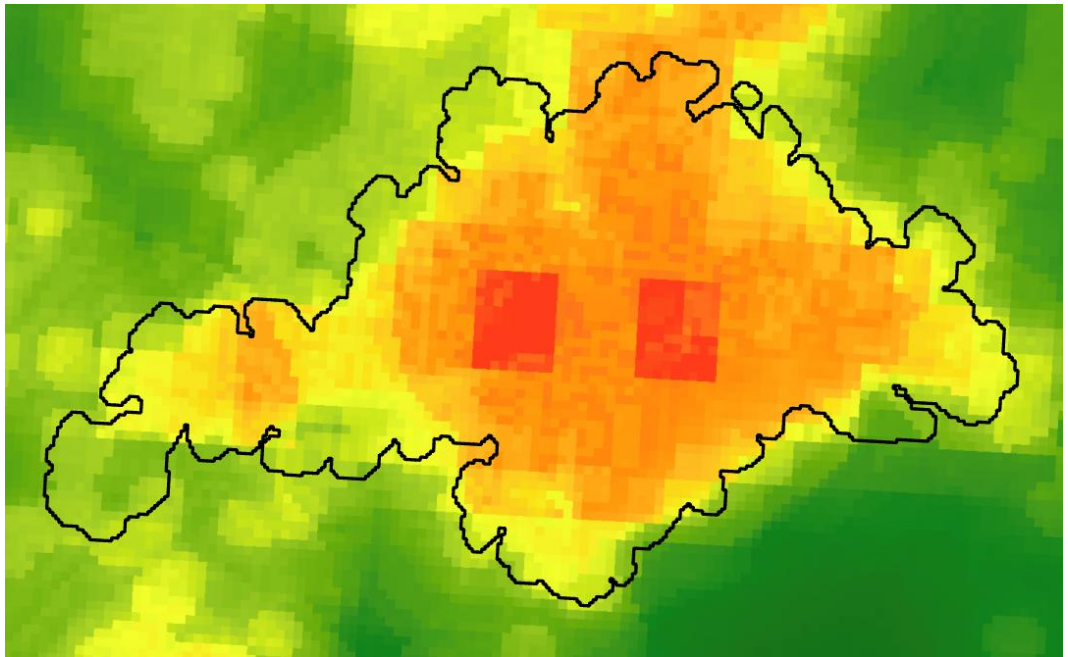
3 Compute total amount of land occupied by validated open public spaces and streets

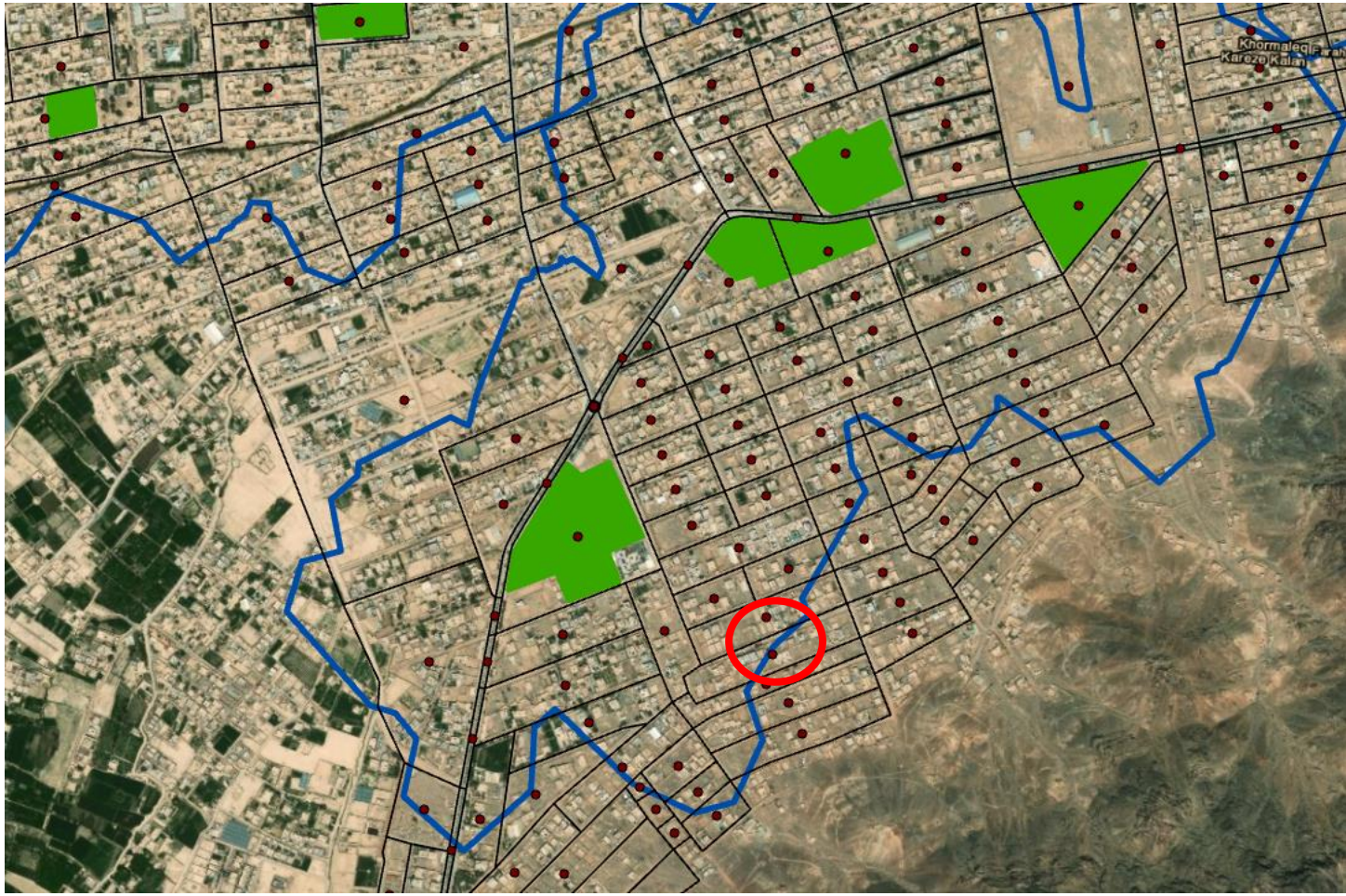
4 In GIS, create service area for each open public space, measured as 400m walking distance along street networks



6 Estimate population living within the service areas from VHR census data or population grids







High resolution population data is needed for 11.7.1

Strong cooperation between NSOs and SDG monitoring/ mapping agencies is required

7 Compute the indicator components

Share of the built – up area of the city that is open space in public use (%)

$$= \left\lfloor \frac{Total\ area\ of\ Open\ public\ space + Total\ land\ allocated\ to\ streets}{Total\ urban\ area} \right\rfloor$$

Share of population with access to open public space (%)

$$= \left\lfloor \frac{Total\ population\ within\ 400m\ walking\ distance\ to\ OPSs}{Total\ urban\ population} \right\rfloor$$

Disaggregate by:

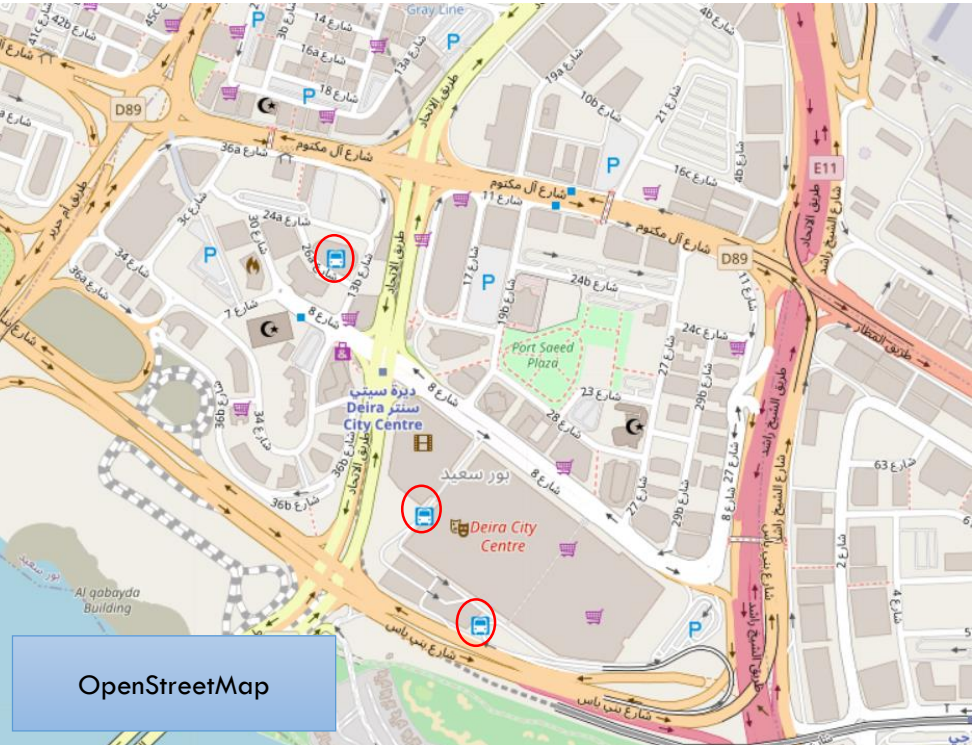
- Age
- Gender
- Persons with disabilities

There is a challenge of disaggregating the indicator by different groups where high resolution population data is lacking

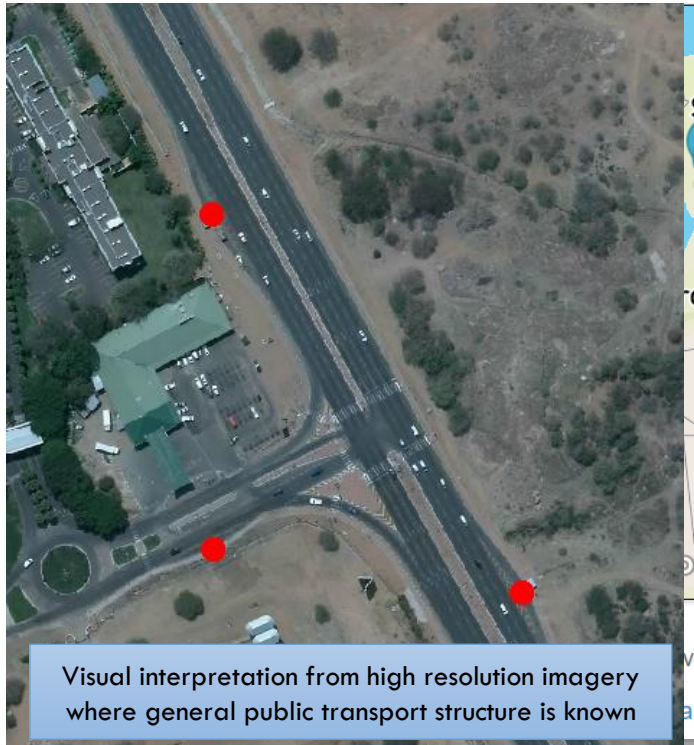
Example 3: Indicator 11.2.1 Computation Workflow

1 Collect point data on locations of public transport stops (or routes in cases of informal transport)

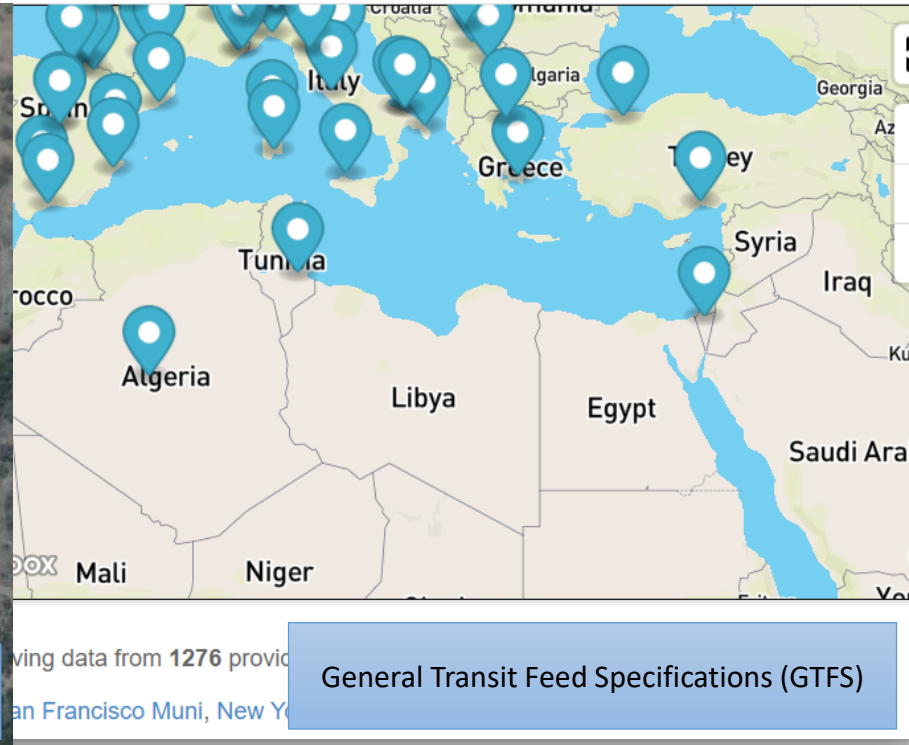
- From city authorities, ministries in charge of transport, etc
- Open source platforms – e.g OSM, GTFS
- Extraction from satellite imagery
- **Detail of data available from open sources varies greatly across cities**



OpenStreetMap

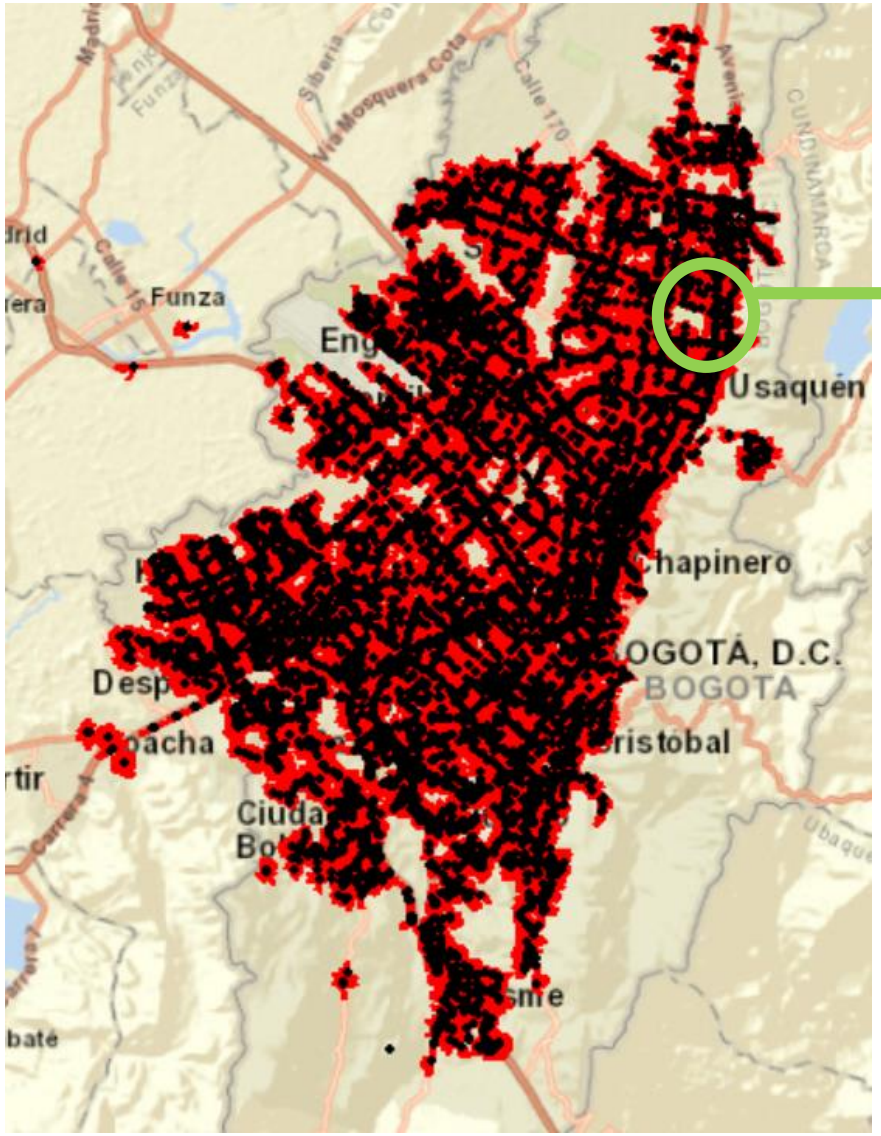


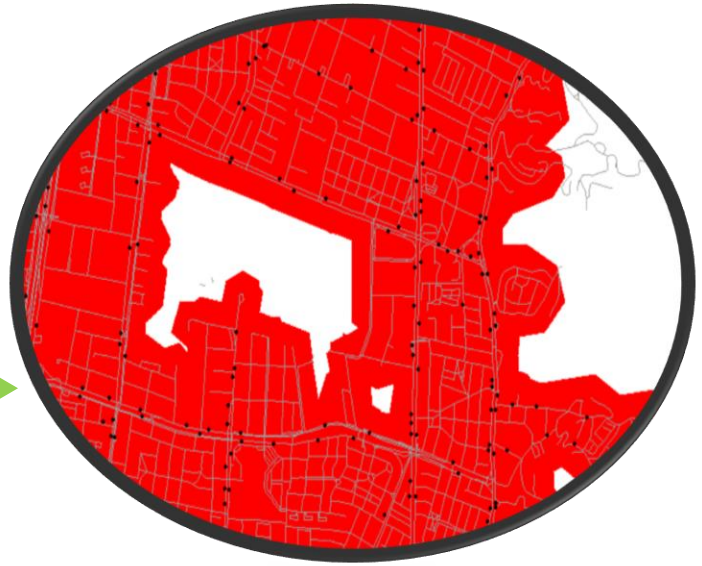
Visual interpretation from high resolution imagery where general public transport structure is known



General Transit Feed Specifications (GTFS)

2 In GIS create service area for each public transport stop / route per carrier type threshold





- Access to public transport is measured by delimiting areas within 500 meters walking distance along street network to bus stops, 1000m to high capacity modes
- Include barriers to walking in network service area model
- Service areas for all spaces merged to avoid double counting (GIS network analyst tools)
- Identify barriers to accessing stops – egs where streets are not walkable, where pedestrian crossings/ bridges are missing on major highways

3 Estimate population living within the service areas from VHR census data or population grids

Share of population with convenient access to public transport (%)

$$= \left(\frac{\text{Total population within service } areas}{\text{Total urban population}} \right)$$

Some emerging challenges and opportunities

Challenges

- Varied capacities – technical, infrastructural etc to deal with multiple data needs (city to national level activities)
- Fast rate of geospatial technology change, slow pace of incremental uptake at local level
- Data resolution challenges
  - Resolution of required geospatial data
  - Variations between geospatial and statistical data
- Acceptability & rate of adoption of non-conventional data into mainstream data structures
- Partnerships arrangements and collaborations – duplication of efforts

Opportunities

- Reduced costs in production of geospatial data – replicability & repeatability at scale, large coverage with fewer resources
- Ability to collect data in hard-to-reach areas
- Important baseline layers in places with no data – incl improving data resolution
- Active geospatial community (despite competing interests)
- Reporting requirements within SDGs monitoring framework

More information & step by step training modules

Indicator 11.2.1

https://unhabitat.org/sites/default/files/2020/06/indicator_11.2.1_training_module_public_transport_system.pdf

Indicator 11.3.1

https://unhabitat.org/sites/default/files/2020/07/indicator_11.3.1_training_module_land_use_efficiency_french.pdf

Indicator 11.7.1

unhabitat.org/sites/default/files/2020/07/indicator_11.7.1_training_module_public_space.pdf

Other related indicators, tools & datasets

https://unhabitat.org/knowledge/data-and-analytics
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