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UN HABITAT
FOR A BETTER URBAN FUTURE

Regional Workshop on Data Capturing Methods ad Reporting of Human Settlement Indicators in Arab Countries

Indicator 11.7.1: Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

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Target 11.7: By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

Indicator 11.7.1: Average share of the **built-up area of cities** that is **open space for public use** for all, by sex, age and persons with disabilities

Tier III indicator

Outline

- Rationale for monitoring indicator
- Indicator components
- Definition of concepts
- Computation
- Emerging challenges and opportunities

Why monitor

- Public space (including streets) affect urban functionality and urban prosperity - attracts investment, increases property value
- Contributes to value added to a city's cultural, historical and architectural endowment, thus its attractiveness
- Supports inclusion, equity and socio-cultural interaction
- Enhances safety - Well-designed and well-maintained streets and public spaces can help to reduce fear of crime and violence and contribute to improved safety.
- Improves public health - physical and mental
- Increases mobility, productivity
- Improves the environment – e.g Green and open public spaces
- Promoting inclusion – which is achieved through creation and/or improvement of spaces to be friendly to women, children, youth and the elderly

- **A city's provision for, or need to provide these spaces is thus important**

Definition of concepts

- **Built up area** – In this indicator, the built up area is used to **mean the same thing as urban extent** – particularly because it is the denominator unit of computation.
- **Urban extent –** means the operational entity that can collectively be termed as a city, and incorporates both developed land and open spaces
- **Public Space –** "all places **publicly owned or of public use**, accessible and enjoyable **by all for free and without a profit motive**" (The Charter of Public Space). Officially constitutes;
  - **Streets** - *avenues and boulevards, squares and plazas, pavements, passages and galleries, bicycle paths, sidewalks, traffic islands, tramways and roundabouts.*
  - **Public Open Spaces -** undeveloped land that is accessible to the public, and that provides recreational areas for residents and enhances environmental quality. *E.gs parks, gardens, playgrounds public beaches, riverbanks and waterfronts.*
  - **Public facilities** - high maintenance amenities that are publicly owned and maintained and are accessible to users without any charge, e.gs public libraries, civic/community centres, public sports facilities.
  - **Public commercial spaces** - areas in which the socio-economic dimension of the city is always expressed. *E.gs markets, accessible commercial fixed premises, public venues*

Definition of concepts

Land allocated to streets - Total area of urban surface consumed by all forms of streets – the thoroughfare, walkways, green areas, etc

https://nyc.streetsblog.org/2008/11/06/designing-nyc-streets-for-the-21st-century/

Some Data Sources

- **City open space and streets database** – The most important data source; map and name of streets, lengths, widths, condition, etc
- **Local knowledge** –
  - E.gs community and local leaders, NGOs working on the ground, etc
  - key source of data on public open spaces – locations, usability, conditions
- **Open source datasets**
  - **OpenStreetMap** – most important open source streets resource, downloadable data in GIS compatible formats
  - **Google Earth –**can be used as a baseline for initial identification and digitization of open public spaces, to estimate widths of streets as well as to check completeness of street data from openstreetmap
  - **Landsat and Sentinel imagery–** data usable for delimitation of city boundaries based on built up expanse
- **Analytical databases**
  - Atlas of urban – urban extent data, some streets data
  - Global Human Settlements Layer and Global Urban Footprint – built up area data

The Method

- **Component 1: Land allocated to streets**
  - Method 1: Where streets data exists
  - Method : Where no street data exists

- **Component 2: Public Open spaces**

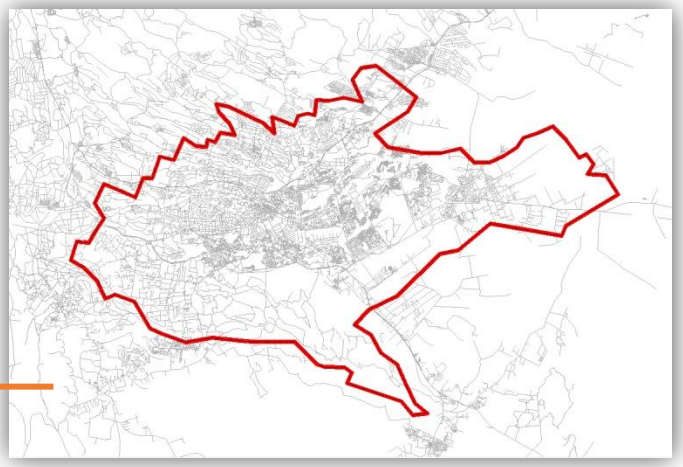
Delimitation of the functional city boundaries should always be the first step in the computation of this indicator, since it helps narrow down the scope of data collection.

Component 1: Land Allocated to Streets

Method 1: Estimation of the land allocated to streets (LAS) where street length, width exist

Delimit city boundaries

Clip streets to functional city boundary



Compute land area occupied by each street section in Ms Excel or GIS

Street	Length	width	Area
a	x1	y	x1y
b	x2	y	x2y
c	x3	y	x3y
d	x4	y	x4y
e	x5	y1	x5y
f	x6	y1	x6y1
g	x7	y1	x7y1
h	x8	y1	x8y2
i	x9	y1	x9y1
j	x10	y2	x10y2
			Total street area

Add sum of all streets areas

$$Share\ of\ LAS = 100\left[\frac{Total\ surface\ of\ urban\ streets}{Total\ surface\ of\ urban\ area}\right]$$

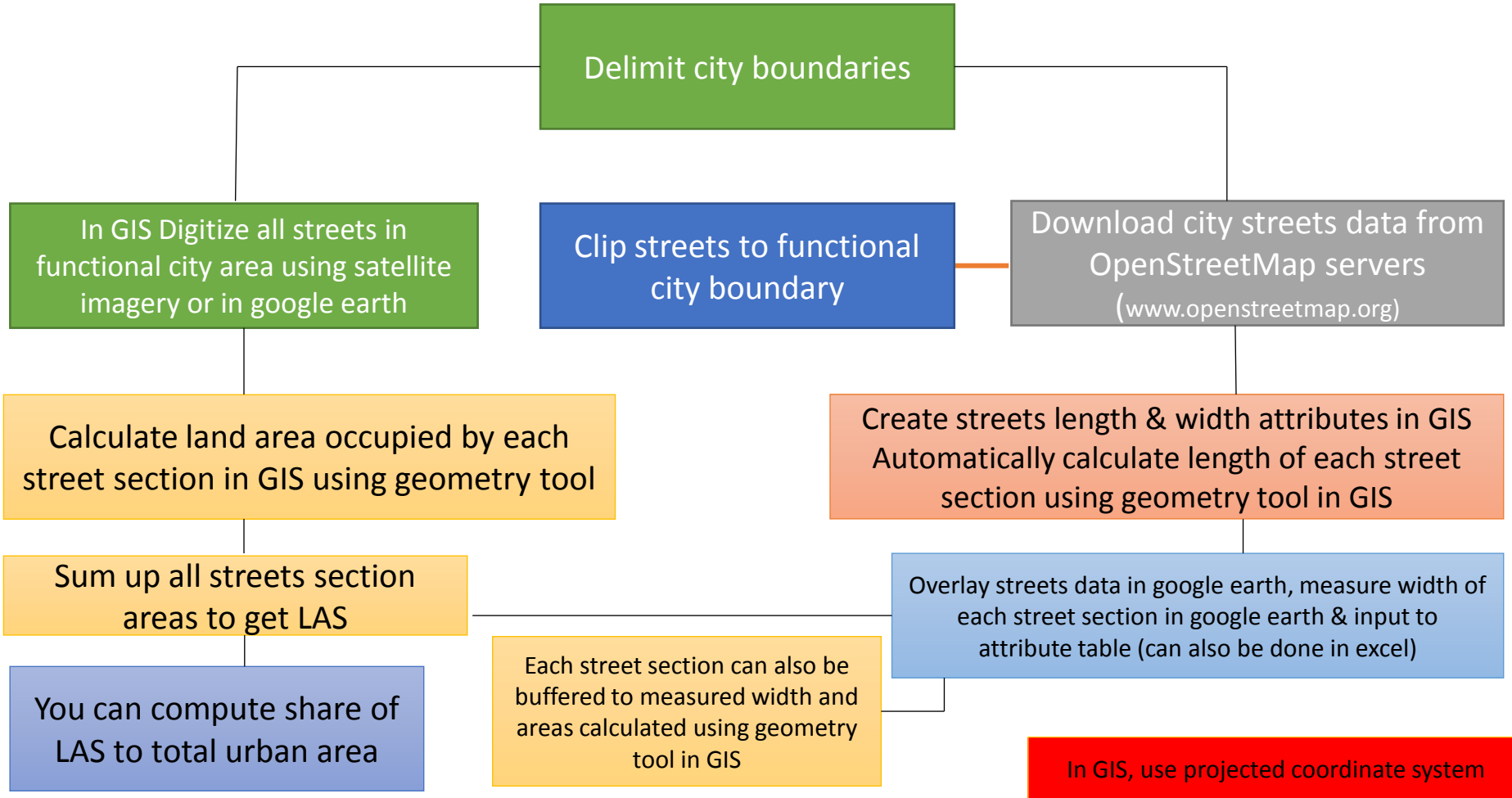
You can compute share of LAS to total urban area

Street width and no length? Calculate using geometry tool in GIS software

Component 1: Land Allocated to Streets

Method 2: Estimation of the land allocated to streets (LAS) where street data not existing

OPTION 1a **OPTION 1b**

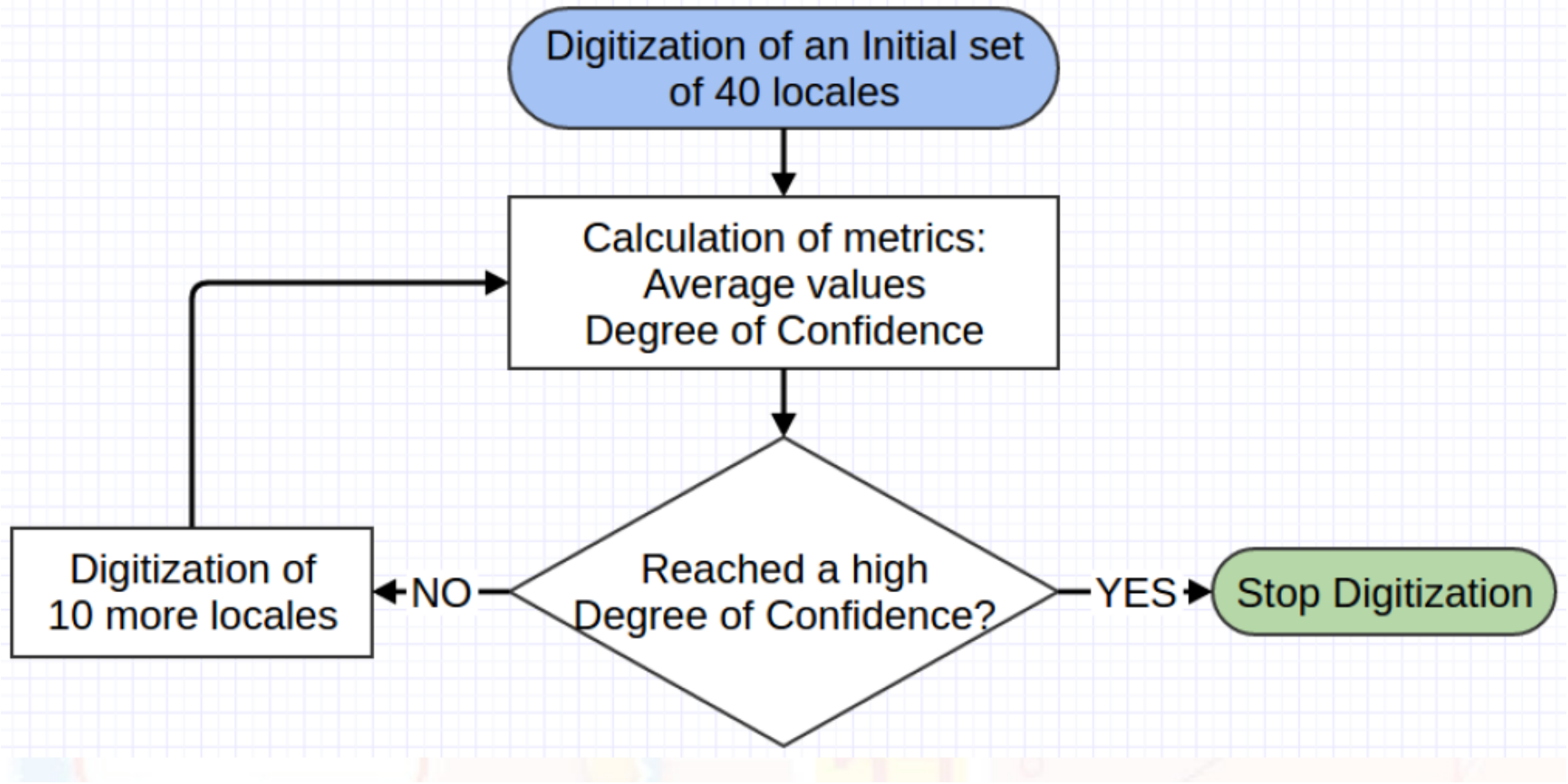


Component 1: Land Allocated to Streets

Method 3: Estimation of LAS where street data not existing: Spatial Sampling

- Using functional city size, create a sampling frame in GIS software.
  - Halton Sequence of Points is proposed sampling method because it generates better spatial distribution and can generate the same points for the same area when applied repeatedly using same input values
- Sampling method can create a good balance between data accuracy and efficient resource use.
- Sampled points to be proportional to the city size and high accuracy
- Use of **variance calculator** proposed to determine when sample is representative of city metrics
  - NYU urban expansion allocated each city at least 80 sampling points, with confidence level measured after data production for 40 random points
  - From experiments by NYU, initial sample of 40 sampling points can be used to collect data
  - Average values are then fed to a variance calculator at specified degree of confidence which helps to determine whether to sample more points or not
  - If confidence not attained, additional 10 sampling points per set recommended until confidence level is attained

Component 1: Data confidence in spatial sampling



Component 1: Spatial Sampling application

- Randomly generate sampling points using Halton sequence
- Buffer each sampling point to a radius of 178.4 meters, so as to attain an area of 10 hectares (0.1Km2) for each point/locale.
- Collect data within each locale
- Calculate LAS within each locale, get average for all locales = total city LAS
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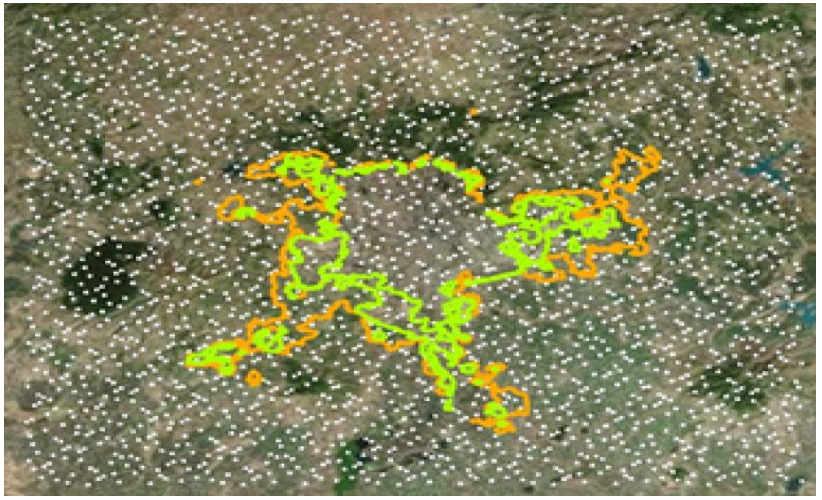
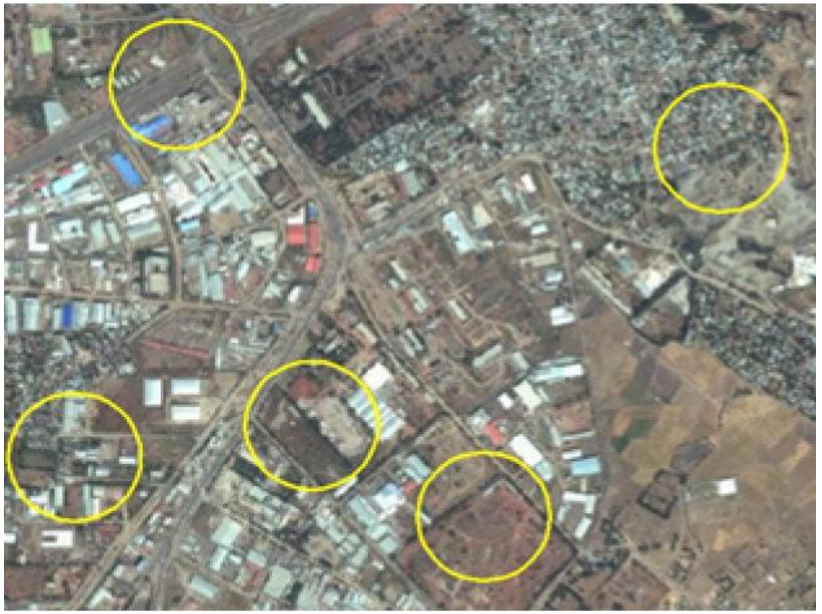
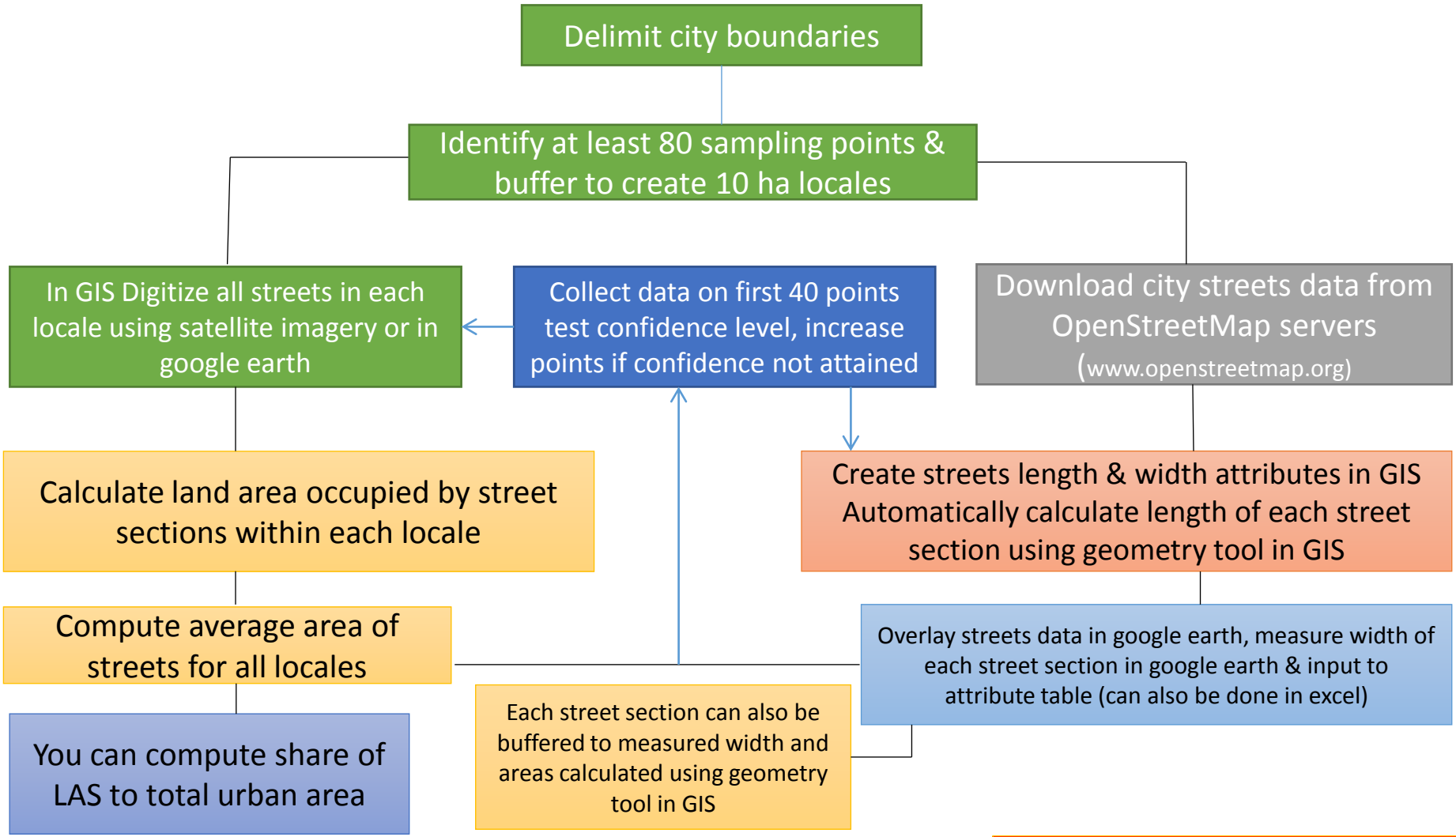
$$Average\ city\ LAS = \left[\frac{Total\ area\ covered\ by\ streets\ in\ all\ locales}{Total\ area\ of\ all\ locales}\right]$$





Component 1: Land Allocated to Streets using spatial sampling



Component 2: Estimation of the share of city land allocated to open public spaces (OPS)

- Sub-component relies heavily on good city level databases and participatory primary data collection

Input data

- Functional city boundaries file
- City public spaces database, land use plans, cadastral maps or any other official documents
- Primary data from surveys
- High resolution imagery covering the same area as the city boundary e.g google earth, GIS software basemaps (e.g Openlayer in QGIS)
- Google earth street view allows for some level of ground verification

Component 2: Estimation of the share of city land allocated to open public spaces

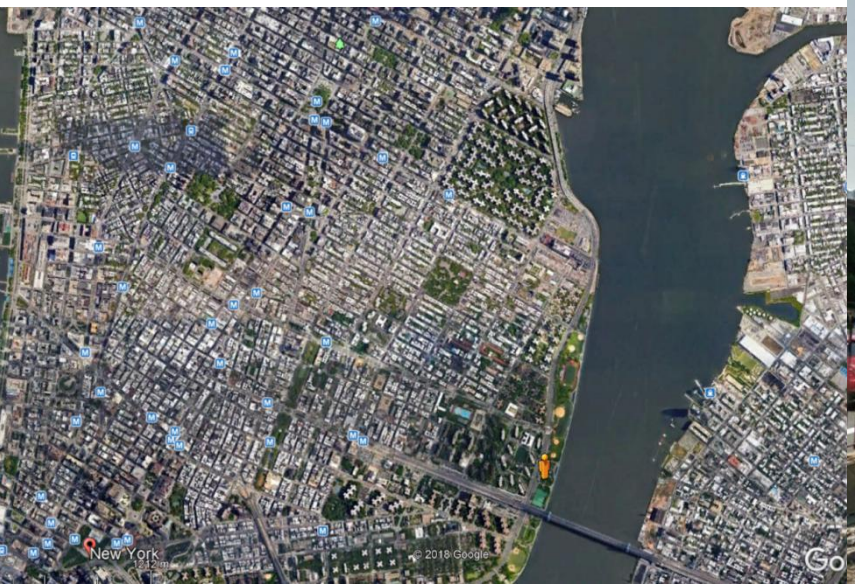
Option 1: where city has up to date open public spaces database

- use the information to plot such spaces in GIS software and compute their areas.
- Where necessary, clean data to remove components which are not applicable in the computation of this sub-indicator (e.g market spaces)
- Validate data and collect data on usability, quality

Component 2: Calculating OPS where city has no up to date open public spaces database

- undertake rigorous literature review, rapid key informant surveys with city authorities to identify the diversity of open spaces that are used by the public, free of charge and for recreational activities.
    - *Broad categories include parks, gardens, playgrounds, public beaches, riverbanks and waterfronts.*
- Identify potential spaces from high resolution imagery and digitize them – e.g google earth street view
- Organize stakeholder workshop with key city stakeholders to undertake the first layer of data validation.
    - *E.gs city government representatives, open spaces management entities, community leaders, relevant NGO representatives, women, youth and children representatives, among others*
- Update base map from workshop - open spaces which are not publicly and freely accessible, add previously omitted spaces (too much information is good information at this stage).
- Undertake primary data collection on each of the spaces and collect relevant data, including plotting actual extents of the spaces.
- Validate findings in larger stakeholder foru and update database
- Compute land allocated to public open spaces from the final validated data.

Mapping potential open public spaces in google earth



- Google earth open street view allows for on-the-fly identification and pre-validation of Open Public Spaces
- Based on 360 degrees 3D view of a potential space to validate based on given criteria – e.g presence of resting benches, etc

Final computation of the indicator

$$POPS = 100 \left[\frac{Total\ surface\ of\ Open\ public\ space + Total\ surafce\ of\ land\ alloacted\ to\ streets}{Total\ surface\ of\ built\ area} \right]$$

- Proportions of LAS and OPS (sub-indicators) can be computed separately and used to make decisions individually for city

Interpretation of the Indicator Metrics

- To achieve sustainable neighbourhood planning and productive urban system, UN-Habitat recommends that
  - At least 30% of Land Allocated to Streets
  - At least 18Km/Km2 (Street Density)
  - 100-140 int/Km2 (Intersections Density)
  - These reduce traffic congestion (and related losses), promote walkability, urban greenery, healthy living, prosperity
  - *(based on 2013 study on 60 cities – streets as public spaces and drivers of urban prosperity)*

- Currently collecting data on all standards applicable to sub-components of the indicator
  - Minimum recommended green area for healthy population
  - Country level thresholds for open space requirements and justification e.g share of land proposed for different land uses & justification
  - Studies on land allocated to streets and mobility – deduction of some key indicators
  - Proposed studies in countries with very high and very low shares of open spaces with regards to happiness, health, etc
  - Based on data, modelling to be done for average amount of open space that cities should provide to be sustainable

Disaggregation of the indicator

Potential Disaggregation:

- Challenges of disaggregating indicator by functional elements of use for all (by sex, age and persons with disabilities)
- Proposed approach is to use design aspects - provisions for inclusion e.g facilities for gender, age, persons with disabilities

Some disaggregation elements

- By type of open public space – green public spaces versus other types of public spaces (achievable through image interpretation and derivations from primary data)
- Design elements –
  - distribution of the spaces in relation to other facilities
  - Location of facilities
  - nature of their design – spaces for different groups, friendless,
  - Accessibility – connectivity to other functional spaces, presence of streets, walkways, etc

- **Methodology testing in Johannesburg (April) and Dakar (May) 2018 through parallel processes with Global Public Space Programme UN-Habitat**

Emerging challenges

- LAS easy to measure from non-primary data, data limitations for Open Public space requiring difficult to implement and expensive primary collection options – what is the motivation for countries?
- How to interpret data where organic and functional cities are prevalent – does it mean they are doing badly?
- Indicator quantifies the amount of open space in public use in cities, but does not capture the quality of the space that may impede its proper use.
- Who will follow up to promote improved quality of spaces?
- Definition of open public space using concepts of **public management** and **free access** may result in un-representative numbers – more research and country engagement needed
  - UNH currently undertaking study to establish how countries define OPSs and how they are managed
- Use of imagery analysis techniques without verification will create false statistics

Emerging Opportunities

- Presence of dedicated team at UN-Habitat working on indicator, with a GC mandate
- Interlinkage between open public spaces and city functionality, making it an important component to understand, adopt measurement
- Data from many sources currently being computed
- Global public space movements likely to contribute to open source and big data on component

THANK YOU

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