Improving urban livelihoods: how can satellite data assist to reach this goal

Tomas Soukup, GISAT
Improving urban livelihoods: how can satellite data assist to reach this goal

Speaker

Tomas Soukup

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GISAT, Czech Republic
Outline of the Presentation

• Why does it matter?
• Definitions: Urban Green Areas, Public Spaces
• Definitions of Open & Green Areas (OGA) as a proxy
• EO4SD-Urban Urban Greenery products at glance
• Methodology of EO-based OGA products for WBG UrbanScapes
• Examples of derived analytical products
• Quality and Utility
In order to better understand multi-faceted characteristics of public spaces, a rule-based characterization methodology has been developed and applied in case cities.

PUBLIC SPACES MATTER

- benefit our health
- help to build a sense of community, civic identity and culture
- have the ability to drive economic growth
- can transform wasted space and became part of NBS
- if utilized and designed well can give a city character and enhance its diversity, livability, inclusiveness, safety and overall city attractivity
• Public urban spaces such as streets, open spaces, green areas, parks, and public buildings are a big part of cities that are still often overlooked.

• Inadequate, poorly designed, or privatized public spaces often generate exclusion and marginalization and degrades the livability of the city.

• Importance of green areas and open public spaces are now embedded within the Sustainable Development Goals (SDGs), particularly in Goal 11.7: “By 2030, provide universal access to safe, inclusive and accessible, green and public spaces.”
How far we can go remotely?

Service: Identification, quantification and characterization of potential public spaces (using EO)

Coherent with SDG 11.7 implementation (UN-HABITAT)

Urban Spaces:
- Open and Green Spaces
- Streets
- Building
Public (open / green) spaces definitions

- UN-HABITAT (2015):

  - "Public open space" is defined as the sum of the areas of the built-up areas of cities devoted to streets and boulevards (including walkways, sidewalks, and bicycle lanes) and the areas devoted to public parks, squares, recreational green areas, public playgrounds and open areas of public facilities.

  - Not included: areas devoted to public facilities—e.g. schools, stadiums, hospitals, airports, waterworks, or military bases - that are not open to the general public. It also does not include open spaces that are in private ownership or vacant lands in private ownership.
• For mapping of Urban Greenery in Europe (in frame of EU Copernicus Land Monitoring services) and in frame of EO4SD-Urban Urban Atlas (2012) nomenclature is used as de-facto standard for class specifications.
• It reflects interpretability of land use by means of remote sensing.
EU Urban Atlas (2012):

- **ARTIFICIAL NON-AGRICULTURAL VEGETATED AREAS**
  - Vegetation planted and regularly worked by humans; strongly human-influenced. Sporting facilities as functional units independent of being non-sealed, sealed or built-up.

- **GREEN URBAN AREAS (1.4.1)**
  - Public green areas for *predominantly recreational use* such as gardens, zoos, parks, castle parks and cemeteries. Suburban natural areas that have become and are managed as urban parks (Forests or green areas extending from the surroundings into urban areas are mapped as green urban areas when at least two sides are bordered by urban areas and structures, and *traces of recreational use are visible*.)
  - **Not included:** Private gardens within housing areas, buildings within parks (such as museums, governmental areas), patches of natural vegetation or agricultural enclosed by built-up areas without being managed as green urban areas.

- **SPORTS AND LEISURE FACILITIES (1.4.2)**
  - All *sports and leisure facilities* including associated land, *whether public or commercially managed*, public arenas for any kind of sports including associated green areas, parking places, etc.
Public (open / green) spaces from EO

Missing pieces in **Urban Atlas** with respect to UN-HABITAT definitions

- Urban Atlas **does not include** living streets, open spaces, squares
- Term ‘public’ is applied and required **in less strict meaning**

- Main caveats of application of remote sensing for OGA mapping:
  - Actual ground-use can be different from remote image interpretation
  - Public use / accessibility of the space cannot be interpreted (just guessed)
  - Polygons delineated by remote sensing shall be understood as **potential / candidate** spaces that need to be confirmed by ground truthing
  - Main function of the multi-use space can be difficult to determine
  - Classification rule-sets and signatures might need to be adapted across different cities
The importance of open and green spaces is embedded within the SDG Goal 11 Target 11.7: aiming at making green and public spaces accessible, safe and inclusive.

**Global/regional scale**

- **SDG Indicator 11.7.1**
  - Average share of the built-up areas of cities in open space in public ownership and use.

- **Additional city indicators** (e.g. WB’s Global City Indicators) and diagnostics
  - Green areas per 100,000 inhabitants, Citizens access to nearby green areas, …

**City-wide scale** improving city liveability

- Inadequate existent local inventories about locations and characteristics
- Prioritization of interventions
- Scaling up from pilot study to the city-wide level
Distribution of Green Areas
• Derived directly from LULC product
• Basic nomenclature based on Urban Atlas (classes 1.4.1, 1.4.2)

Distribution + structure of changes
• Green extension / uptake
• Gross / Net increase / decrease
• Structure of consumption and formation
Collaboration Steps
GISAT/WBG UrbanScapes collaboration on potential public space consists of

Step I. Identifying public spaces
- Definition of scope
- 6 criteria rule-based classification based on standard EO4SD Urban portfolio products
- Methodology, GIS layers

Step II. Spatial analysis on public space network
- Various indicator analyses at block, neighborhood and city levels
- Maps, Graphics and Stats

Step III. Quality & Reality check
- Cross check with other satellite imagery
- Ground truthing and local surveys
- Quality and Utility Check, Analytics,
- Report and Roll-out

Beyond Green Areas
Step I: Setting the scope

• Publicness:
  ▪ This project aims to identify potential public urban spaces that might contribute to enhancing livability and quality of life across a city

• 3 elements of Public Spaces:
  ▪ Open and Green spaces
  ▪ Streets
  ▪ Building
Step I: Methodology
Indentification of seed OGA elements

• Identification of potential GOA
  – Seed areas from standard LULC products
  – Object-based image segmentation and analysis
  – Machine Learning components
  – Open data mining (transport network -> street network, POIs & labels)

VHR EO imagery (HR EO imagery)

OSM
Step I: Methodology
OGA Characteristics

- For each candidate OGA object (polygon) several indicators are derived by OBIA and GIS
- Indicators build for 6 base OGA criteria to classify public spaces

Characteristics

<table>
<thead>
<tr>
<th>Indicator group</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance and accessibility</td>
<td>Distance to roads, amenities</td>
</tr>
<tr>
<td></td>
<td>Distance to water</td>
</tr>
<tr>
<td>Patterns</td>
<td>Shape linearity, size, compactness</td>
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<tr>
<td></td>
<td>Vegetation typology (high/low, bare)</td>
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<td></td>
<td>Park probability indicator</td>
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<td>U/LC patterns and proportions</td>
</tr>
<tr>
<td>Contextual</td>
<td>Built-up proportions and adjacency</td>
</tr>
<tr>
<td></td>
<td>U/LC adjacency</td>
</tr>
</tbody>
</table>

C1. Distance to nearest Road?

- Very accessible (<10m)
- Accessible (<100m)
- Inaccessible (>100m)

C2. Adjacent to Water

- Waterfront

C3. Compactness: Linear or not

- Linear
- General

C4. Patterns

- High vegetation
- High built up and open
- Horticultural management

C5. Location (Urban Mask)

- Urban
- Vs suburban
- Neighborhood (<2ha)

C6. Size

- Pocket (1ha)
- City
Rule-based OGA typology

In order to better understand multi-faceted characteristics of public spaces, a rule-based typology has been developed and applied in case cities.

* Additional “public” building stocks based on OSM and local knowledge introduced. Full list includes cinema, college, courthouse, department_store, hospital, library, memorial, monument, museum, park, picnic_site, playground, post_office, public_building, school, sports_centre, stadium, supermarket, swimming_pool, theatre, university, viewpoint, zoo, station, bus stop
**Step II: City-wide Assessment**

**Testing Analytics**

Spatial Analysis describing public space network

**Availability:** share of public spaces out of a unit area

**Accessibility:** distance from a public space to nearest roads

**Connectivity:** distance from a public space to neighboring public spaces

**Inclusivity:** share of population living within 400m catchment area

..and more
Step II: City-wide Assessment

Testing Analytics

Spatial Analysis describing public space network

- GOA Share (in %)
- GOA/Urban Fabric ratio (%)
- Euclidian Distance to GOA (m)
- GOA Mean Distance (m)
- Connectivity
- Proximity
- Walkability
- Slums
- Street Path Distance to GOA (m)
- Average Street Path Distance (m)
- Greenness Index change
- Cumulative Greenness Index Change
- Evolution Trends
- Inclusivity
- Flood risk
Step II: City-wide Assessment

Testing Analytics – Types proportions

Class proportion on total

Frequency

- Square-Neighbourhood
- Square-Pocket
- Square-suburban
- Other-open space
- Market (Open Sky)
- Waterfront
- Park-Neighbourhood
- Park-Pocket
- Green-Linear
- Green-Trees, Forest, Woodland
- Green-Other
- Cemetery
- Green-Sport & Leisure
- Inaccessible potential PS
**Step II: City-wide Assessment**

**Testing Analytics: Distribution - Diversity**

OGA typology profiles

...distance to CBD (m) by 1000

...directional distribution

...level of urbanity
• Total 224 points have been randomly selected for ground-truthing
• WBG Dhaka Task team visited 50 points in Feb, 2019, local university scale this up to all 244 points.
• In result, the accuracy rate was satisfiable at 85%.
• The main reason of the inaccurate parts was hidden figures (e.g. squatters, markets) under high vegetations in Dhaka
Step III: Operation
Utility testing

Dhaka city neighborhood upgrading project (DCNUP)

- Seeks to enhance public space and improve urban services in selected neighborhoods in Dhaka
- Bank Loan of $100 million, prepared in less than a year
- Focused on public rights of way; green/open spaces; public buildings, facilities and amenities owned by the city government
- Leverage on neighborhoods communities: discrete, bounded, built up area in Dhaka City covering an area of ~2 sqkm
Utility testing

EO as part of the Full Planning Cycle

Dhaka - Green and Open Areas (GOA)

GOAs Analysis and Indicators

GOAs Identification and Characterization

Criteria Settings

Neighbourhood Selection Process

Neighbourhood Citizen Consultation

Customized Design Schemes

In a data scarce environment, efficiently identified targeted neighborhoods and public spaces.
Step III: Operation
Positive Feedback

- EO4SD-Urban GOA service offers systematic and contextualized understanding of urban assets with respect to public spaces...
- ...and significantly contributes to the Bank operations...
- ...the public aspects has to be verified / complemented on-site.
Step III: Operation
Positive Feedback

1. Reduced costs and time for understanding data-scarce cities by site visits and manual works

2. Improved project design with evidence-based approaches for initial prioritization

3. Better communication with local partners
Reduced costs and time for the preparations

» TA: Transforming Karachi into a Livable and Competitive Megacity: A City Diagnostic and Transformation Strategy (KCD)

» KCD is the first phase of a long-term city transformation strategy
  › benefiting from remote sensing and spatial analysis, and contributed to improving efficiency of the preparations of KNIP
Based on the results of the EO4SD-U analytics, the task teams created a neighborhood selection criteria to address spatial and political inclusion:

- **Measure Demonstration & Deprivation factors across Dhaka:**
  - Proxy indicators: Road connectivity, Open green space, Slum proximity, Public amenity concentration

- **Wards according to deprivations**
  - Red = more deprived
  - Green = less deprived

### Neighborhood Information

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Key landmark</th>
<th># of road junctions/km²</th>
<th># of public facilities in NB</th>
<th>% of public facilities in open green space per</th>
<th>% of slum of total area</th>
<th>Well-connected road network</th>
<th>Accessibility to public facilities</th>
<th>Open green space</th>
<th>Slum domination</th>
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<td>1</td>
<td>Kotwali Ahsan Manzil</td>
<td>267.99</td>
<td>2.00</td>
<td>0.43</td>
<td>2.76</td>
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<td>Above</td>
<td>Below</td>
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<td>2</td>
<td>Phulbari New Market</td>
<td>291.69</td>
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<td>4.13</td>
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<td>3</td>
<td>Gadlgarh Bahadur Shah Park</td>
<td>267.99</td>
<td>2.00</td>
<td>0.43</td>
<td>2.76</td>
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<td>Above</td>
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<td>4</td>
<td>Quarmir Jurain Rail Station</td>
<td>149.38</td>
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<td>0.62</td>
<td>23.75</td>
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<td>5</td>
<td>Bangshal Old Central Jail</td>
<td>2294.98</td>
<td>1.00</td>
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<td>2.59</td>
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<td>6</td>
<td>Lalbagh Fort Museum</td>
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<td>0.00</td>
<td>46.05</td>
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<td>7</td>
<td>Farirkhan Shahid Baki Road</td>
<td>170.43</td>
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<td>0.31</td>
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<td>8</td>
<td>Farmgate</td>
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<td>8.00</td>
<td>5.74</td>
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<td>9</td>
<td>Mohammadpur Sahsabhat Road</td>
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<td>11</td>
<td>Dhanbad</td>
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<td>2.90</td>
<td>7.05</td>
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<td>Dhaka Average</td>
<td>326.13</td>
<td>1.45</td>
<td>2.52</td>
<td>8.53</td>
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</table>
Step III: Operation
Positive Feedback

2. Improved project design with evidence-based approaches

In a data scarce environment, efficiently identified targeted neighborhoods and public spaces.
Step III: Operation
Positive Feedback

2 Improved project design with evidence-based approaches

- Reflecting local needs identified from the analytics to Concept Designs for neighborhoods

Proposed improvement

Current situation
Step III: Operation
Positive Feedback

Better communication with local partners

- Initial prioritization combined with local knowledge, developing a comprehensive inventory of public urban assets and plan for improvement activities

<table>
<thead>
<tr>
<th>NR</th>
<th>NAME</th>
<th>TYPE</th>
<th>OWNER</th>
<th>DIMENSION</th>
<th>COST (USD)</th>
<th>YEAR</th>
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<tbody>
<tr>
<td>D01</td>
<td>Streets around Shajahanpur Jheel</td>
<td>STREET 1</td>
<td>DSCC</td>
<td>978 m long</td>
<td>1,526,700</td>
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<tr>
<td>D02</td>
<td>Shajahanpur Jheel</td>
<td>O. SPACE</td>
<td>WASA</td>
<td>21,290 sqm</td>
<td>1,472,400</td>
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<td>D03</td>
<td>Fields around Shajahanpur Jheel</td>
<td>O. SPACE</td>
<td>PWD, WASA</td>
<td>9,070 sqm</td>
<td>1,485,100</td>
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<td>D04</td>
<td>Atish Deenapcak Crossings</td>
<td>STREET</td>
<td>RAIL, DSCC</td>
<td>5,000 sqm</td>
<td>276,600</td>
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<td>D05</td>
<td>Amtole Mojitar Gol Road</td>
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<td>DSCC</td>
<td>380 m long</td>
<td>135,500</td>
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<td>D06</td>
<td>Shahid Baki Road</td>
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<td>DSCC</td>
<td>1.8 km long</td>
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<td>D07</td>
<td>Khilgaon Talota Community Center</td>
<td>BUILDING</td>
<td>DSCC</td>
<td>2,820 sqm</td>
<td>1,192,300</td>
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<td>D08</td>
<td>Road in front of Khilgaon Talota Cemetery</td>
<td>STREET</td>
<td>PWD</td>
<td>225 m long</td>
<td>730,900</td>
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<td>D09</td>
<td>Road in Bhuyan Math area</td>
<td>STREET</td>
<td>DSCC</td>
<td>945 m long</td>
<td>1,190,200</td>
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<td>D10</td>
<td>DSBC office and Community Center</td>
<td>BUILDING</td>
<td>DSCC</td>
<td>1,160 sqm</td>
<td>2,762,500</td>
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<td>D11</td>
<td>Bhuyan Math Playground</td>
<td>O. SPACE</td>
<td>DSCC</td>
<td>5,810 sqm</td>
<td>1,313,100</td>
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<td>D12</td>
<td>Goran Road</td>
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<td>DSCC</td>
<td>304 m long</td>
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<td>Shanipur Road</td>
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<td>D14</td>
<td>Green spaces around Bashabo Community Center</td>
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<td>DSCC</td>
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<td>346,200</td>
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<td>D16</td>
<td>Bashabo Balur Math and Road</td>
<td>O. SPACE</td>
<td>DSCC</td>
<td>2,280 sqm</td>
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<td>D17</td>
<td>Roads around Bashabo Balur Math</td>
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<td>DSCC</td>
<td>750 m long</td>
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<td>Shabujbag Thana Muktijoddha Community Center</td>
<td>BUILDING</td>
<td>DSCC</td>
<td>200 sqm</td>
<td>345,100</td>
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<td>D19</td>
<td>Shabujbag middle Bashabo Children park</td>
<td>O. SPACE</td>
<td>DSCC</td>
<td>-</td>
<td>-</td>
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<td>D20</td>
<td>Street Around Bashabo Thana area</td>
<td>STREET</td>
<td>DSCC</td>
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<td>D21</td>
<td>Atish Deenapcak Community Center</td>
<td>BUILDING</td>
<td>DSCC</td>
<td>1,030 sqm</td>
<td>2,213,600</td>
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</tbody>
</table>

EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT
Urban development
Global Analysis

Service Roll-out

Bamako, Mali, SSA
>> ASA on Engine of Growth and Service Delivery & preparation of a new operation

Lima, Peru, LAC
>> National Urban Cadaster and Municipal Support

Fallujah & Ramadi, Iraq, MENA
>> Emergency Operation Development Project

Dhaka, Bangladesh, SAR
>> Dhaka City Neighborhood Improvement Project

Karachi, Pakistan, SAR
>> Karachi Neighborhood Improvement Project

EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT
Urban development
Global Analysis
Roll-out to additional cities

- Bamako 2018
- Karachi 2015
- Dhaka 2017
- Fallujah 2017
- Ramadi 2017
- Lima 2018
Global Analysis
Roll-out to additional cities

- Bamako 2018
- Karachi 2015
- Dhaka 2017
- Fallujah 2017
- Ramadi 2017
- Lima 2018
Accessibility to potential public spaces [average (Euclidean) distance from road]

- Bamako 2018
- Karachi 2015
- Dhaka 2017
- Fallujah 2017
- Ramadi 2017
- Lima 2018

Global Analysis
Roll-out to additional cities

EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT
Urban development
Global Analysis
Roll-out to additional cities

Proportion of public spaces (% of built-up land)

<table>
<thead>
<tr>
<th>Location</th>
<th>Proportion of Public Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhaka, Bangladesh</td>
<td>17.9%</td>
</tr>
<tr>
<td>Karachi, Pakistan</td>
<td>13.7%</td>
</tr>
<tr>
<td>Lima, Peru</td>
<td>26.5%</td>
</tr>
<tr>
<td>Bamako, Mali</td>
<td>19.0%</td>
</tr>
<tr>
<td>Fallujah, Iraq</td>
<td>10.4%</td>
</tr>
<tr>
<td>Ramadi, Iraq</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Other potential spaces include:
- Cemetery
- Sport and leisure facilities
- Pocket square
- Neighbourhood square
- Suburban square
- Pocket park
- Neighborhood park
- Neighborhood park
- Waterfront
- Market (open)
- Linear park
- Street area

Source: World Bank, based on EO4SD-Urban data http://www.eo4sd-urban.info/
Note: “Other potential spaces” include vacant areas, residual green areas, forest and dense trees, and inaccessible areas. This list of public-space types is not exhaustive. For detailed definitions of each category, see appendix B. EO4SD = Earth Observation for Sustainable Development, a joint project between the World Bank and the European Space Agency.
Global Analysis
Roll-out to additional cities

Inclusivity

Note: “Near” refers to a distance of 400 meters or less. The definition and locations of city centers are explained in each case study later this chapter; and the public spaces included in this analysis are parks, waterfronts, squares, and markets, excluding streets. EO4SD = Earth Observation for Sustainable Development, a project of the European Space Agency. Due to data availability, Lima and Bamako refers to data in 2018.
Walkability

- 100 intersections per km² as a reference of an ideally walkable and prosperous city (UN-Habitat)

Note: The total area is defined by administrative boundaries of the cities. EO4SD = Earth Observation for Sustainable Development, a project of the European Space Agency
UTEP Implementation + Publication

Selected results shared
Thank you for your attention!
Transport network patterns

- Transport network density (Dhaka) from analysis and augmentation of OpenStreetMap layers

Dhaka 2017

Transport network across cities

100 intersections per km² as a reference of an ideally walkable and prosperous city (UN-Habitat)

<table>
<thead>
<tr>
<th></th>
<th>Intersections (total in AOI)</th>
<th>Intersections (per km² in urban artificial area)</th>
<th>Road length (total km in AOI)</th>
<th>Road length (km per km² in urban artificial area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhaka</td>
<td>14 857</td>
<td>69</td>
<td>2 718</td>
<td>13</td>
</tr>
<tr>
<td>Karachi</td>
<td>20 277</td>
<td>72</td>
<td>3 743</td>
<td>13</td>
</tr>
<tr>
<td>Ramadi</td>
<td>5 522</td>
<td>74</td>
<td>1 357</td>
<td>18</td>
</tr>
<tr>
<td>Fallujah</td>
<td>4 403</td>
<td>122</td>
<td>768</td>
<td>21</td>
</tr>
<tr>
<td>Bamako*</td>
<td>30 420</td>
<td>170</td>
<td>4 251</td>
<td>24</td>
</tr>
<tr>
<td>Lima*</td>
<td>26 811</td>
<td>154</td>
<td>4 197</td>
<td>24</td>
</tr>
</tbody>
</table>

* part of the city

Mean road length (km/km²)

Intersections per 1 km² grid

Based on Open Street Map (© Contributors OpenStreetMap)
Land use status and growth patterns

Dhaka 2006-2017

**Urban extent growth** (land consumption)
- 23.6% increase of urban form extent
- 1.9% avg. annual growth rate

**Densification** (infilling, vertical growth)

From VHR imagery
**Land use status and growth patterns**

**Dhaka 2006-2017**

**Urban extent growth (land consumption)**
- 23.6% increase of urban form extent
- 1.9% avg. annual growth rate

**Densification (infilling, vertical growth)**

**Green areas, sport & leisure fac.**
(LULC – according to UA2012)
- Number: 462 → 484 (+4.8%)
- Extent: 12.5 → 13.6 km² (+9.2%, 0.8% avg. annual growth rate)

**Gross/Net change (balance):**
- + 1.8 km²
- - 0.66 km²

Decrease of share of “greenness” in urban fabric blocks:
- Increase in 21% blocks
- Decrease in 48% blocks

*from VHR imagery*
Informal settlements and distribution of flood vulnerability

- 1650 informal settlement patches detected
  - Distinct pattern of spatial distribution
  - Various characteristics derived
- Flooding risk
  - From archived satellite imagery
  - Higher risks at urban fringe
Indicators of sustainable public space network

- **Share of public spaces** out of total (urban fabric) area:
  - 7.9%

Dhaka 2017

A: East Dhaka
B: Central Dhaka
C: Northern Dhaka

Share of OGA spaces on urban fabric (%)

Core City

0 50 %
0 5 km
Indicators of sustainable public space network

- **Share of public spaces** out of total (urban fabric) area:
  - 7.9%

- **Accessibility**: mean distance from a public space to the nearest roads
  - Median: 1 m; Mean: 90 m

![Map of Dhaka 2017 with districts A, B, and C labeled: A: East Dhaka, B: Central Dhaka, C: Northern Dhaka. The map also shows street path distance to the nearest Open Green Space (m).]
**Indicators of sustainable public space network**

- **Share of public spaces** out of total (urban fabric) area:
  - 7.9%

- **Accessibility**: mean distance from a public space to nearest roads
  - Median: 1 m; Mean: 90 m

- **Connectivity**: mean distance from a public space to neighbouring public spaces
  - Median: 83m; Mean: 156 m

**Distance from park to the nearest neighbouring park (m)**

**Graph:**
- **Strongly connected**
- **Connected**
- **Less connected**
- **Isolated**

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**Legend:**
- Pocket scale
- Neighborhood scale
- City scale
Indicators of sustainable public space network

• **Share of public spaces** out of total (urban fabric) area:
  - 7.9%

• **Accessibility**: mean distance from a public space to nearest roads
  - Median: 1 m; Mean: 90 m

• **Connectivity**: mean distance from a public space to neighbouring public spaces
  - Median: 83m; Mean: 156 m

• **Inclusivity**: share of population living within 400m catchment area
  - 74% of population *(aggregated for AOI, from GPWv4 population grid)*