Use of Geospatial Information in measuring SDG11 and Urban Indicators

Case of Tunisia

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Use of Geospatial Information data for measuring SDG 11 indicators

- New form of data collection
- New form of analysis

SDG 11’s Indicators with a direct spatial component

11.2.1  Transport
11.3.1  Land Consumption
11.7.1  Public Space

Spatial Analysis

- New form of data collection
- New form of analysis
Use of Geospatial Information data for measuring SDG 11 indicators

**Indicator 11.3.1:**
Ratio of land consumption rate to population growth rate

**Indicator 11.2.1:**
Proportion of population that has access to public transport

**Indicator 11.7.1:**
Average share of the built-up area of cities that is open space for public use

Test for two Cities: Monastir and Tozeur
We Don’t have a national definition and identification of Cities boundaries YET

• Before, we utilized administrative definition
• Now, Tunisian territory is all communal classified and distinction between urban and rural areas is not feasible according to a well-established definition
Tunisian City boundaries

- Urban SDG indicators are very sensitive to boundaries

  Adapt the “City” definition of EU to the Tunisian case

  Partnership with UN-Habitat and European Union
Tunisian Cities Boundaries

Data
• Google Earth/Landsat Imagery (Censuses periodicity)

Method
Spatial Analysis with GIS tools to define built up areas
Built Up Area

Extract built up areas for each census year

Example of Tozeur City
Functional City Boundaries

Built up areas and city boundaries for each census year
Tunisian Cities Boundaries

Urban Extent Area

مساحة المناطق الحضرية

Year

1994, 10.9953
2004, 14.0499
2014, 14.9832

Tozeur

1994, 5.6979
2004, 7.2117
2014, 8.712

Monastir
Defining the population of urban agglomerations or cities:

• Relying on census data at the level of enumeration areas
• **Link** censuses data with spatial data
• Spatial analyzes to produce the **Gridded Population**
Gridded Population

Data
- **Built up** area at Censuses dates
- **Population at Enumeration Area level** (Censuses)

Result: Population density at each grid cell (1 km²)

Method
- **Distribute** population to habitable land use within each EA
- **Aggregate** population to a grid cell
Indicator 11.2.1:
Proportion of population that has convenient access to public transport, by sex, age and persons with disability

المؤشر 11.2.1: نسبة السكان الذين تتوافر لهم وسائل النقل العام المناسبة للجميع، بحسب العمر والجنس والأشخاص ذوي الإعاقة
11.2.1 Data and Method

Data and Method

- **Google Earth/LandSat Imagery**
- Open source/Data collected and **georeferenced** by INS
- Population data at Enumeration Area level (*Census*)
- Method based on **buffering** distance to create service area of public transport stops

**منطقة خدمة ووسائل النقل العام**
11.2.1 Data and Method

Processing: Use of GIS software

- **Delimitation** of urban agglomeration or city
- Identification of transport stops
- Computation of service areas: **Buffering** each of the stops at a distance field of 500 meter
- **Overlay** (تغطية) service area with population (**Gridded Population**)
- **Calculation** of the population within service areas

\[
\text{Population with access to public transport} = 100 \times \frac{\text{Population}}{\text{City population}}
\]
<table>
<thead>
<tr>
<th>Urban Area 2014 (sqkm)</th>
<th>Population 2014</th>
<th>Pop within 500m to bus stop</th>
<th>Total pop with access to public transport</th>
<th>% pop with access to public transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tozeur</td>
<td>8.712</td>
<td>39996</td>
<td>35628</td>
<td>35628</td>
</tr>
</tbody>
</table>
Disadvantages of the methodology

• Methodology does not take barriers into account like crossing closed roads, rivers, railways, etc.

• Street network detained by authorities is not complete, can’t use network to calculate service area using network methodology.

• Lack of transportation data in most cities.
Use of GIS to calculate Indicator 11.7.1

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

المؤشر 11.7.1: متوسط حصة المنطقة السكنية بالمدن التي تمثل فضاءا مفتوحا للاستخدام العام للجميع، بحسب العمر والجنس والأشخاص ذوي الإعاقة
11.7.1 Data and Method

Data

• Landsat imagery for city boundary
• OpenStreetMap to download streets data in GIS formats
• Google Earth and/or urban plans as a baseline for identification of open public spaces
11.7.1 Data and Method

**Urban Extent**
- Delimit the built-up area of the urban agglomeration

**Land allocated to streets**
- Download Streets from OpenStreetMap
- Computation of total Land allocated to streets

**Public Open spaces**
- Selection of open public space from urban plan and Google Earth
- Computation of total area of open public space

Estimation of share of population with access to open public spaces
## Service area of Public Open Space

<table>
<thead>
<tr>
<th></th>
<th>Urban area 2014 (sqkm)</th>
<th>Land allocated to Streets (sqkm)</th>
<th>Land allocated to OPS (SqKm)</th>
<th>Total land in OPS (sqkm)</th>
<th>Share of Land allocated to open space (%)</th>
<th>Pop within 400m of OPS</th>
<th>% of population with access to OPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tozeur</td>
<td>8.712</td>
<td>1.9547</td>
<td>1.3043</td>
<td>3.25894</td>
<td>37.4</td>
<td>31566</td>
<td>78.92</td>
</tr>
</tbody>
</table>
Problems encountered in the use of Spatial information for SDG 11 Indicators

Problems
- Gap in specialized human resources for the exploitation of Earth Observation data
- Quality of free satellite imagery
- High cost of good satellite imagery
- Ambiguities in the definition of Tunisian city boundaries
- Gap in GIS data for administrative sources

Proposing solutions
- Enhance the statistical capacities in spatial analysis and use of Earth Observation data
- Use different sources of earth observation data and plan to take advantage of the next census to acquire adequate satellite imagery
- Adopt The EU definition for Tunisian cities
- Use of Free data
Potential in the use of Spatial information for SDG 11 indicators

• A **robust support** for the monitoring and reporting of the SDG 11:
  ✓ Delimitation of Cities boundaries
  ✓ The urban expansion

• Important data for computing the SDG 11 indicators: a source of data always **available** even if the quality differs from one region to another

• **New methods** and **technologies** integrated in the statistical work: Spatial analysis, disaggregation, Small Area Estimation methodologies

• Use of **Non-traditional** sources (imagery, remote sensing, ...) for computing indicators
Recommendations for applying Spatial information for SDG 11

• **Study closely** the experiments carried out by UN-Habitat and pilot countries in measuring SDG 11 indicators by using Earth observations

• **Test and adapt** before using the tools developed for these purpose

• **Adopt** the methodologies developed by UN institutions and all stakeholders for unifying the definitions and concepts necessary in the measurement of SDG 11 indicators; like the “City”, “Functional Urban Area”,...

• **Data partnership** involving intergovernmental organizations, NGOs, universities, ... etc.
Thank you for your Attention

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