Urban Development for Smart Cities: Looking at Cities through the Lens of Geospatial Data Analytics

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1. Urban Expansion
2. Pursuit for Resilience
3. Geospatial Big Data to Smart Data
4. City Projects
Growing World Population & Urbanization

<table>
<thead>
<tr>
<th>World Population Reached</th>
<th>Year</th>
<th>Time to Add a Billion</th>
<th>Urban Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Billion</td>
<td>1804</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2 Billion</td>
<td>1927</td>
<td>123 years</td>
<td>-</td>
</tr>
<tr>
<td>3 Billion</td>
<td>1960</td>
<td>33 years</td>
<td>33%</td>
</tr>
<tr>
<td>4 Billion</td>
<td>1974</td>
<td>14 years</td>
<td>38%</td>
</tr>
<tr>
<td>5 Billion</td>
<td>1987</td>
<td>13 years</td>
<td>40%</td>
</tr>
<tr>
<td>6 Billion</td>
<td>1999</td>
<td>12 years</td>
<td>48%</td>
</tr>
<tr>
<td>7 Billion</td>
<td>2011</td>
<td>12 years</td>
<td>51%</td>
</tr>
<tr>
<td>8 Billion</td>
<td>2024</td>
<td>13 years</td>
<td>59%</td>
</tr>
<tr>
<td>9 Billion</td>
<td>2040</td>
<td>16 years</td>
<td>63%</td>
</tr>
</tbody>
</table>

Source: United Nations / worldometers.info

Cities Under Pressure

- Climate Change
- Urbanization
- Aging Infrastructure
- Environmental Issues
1. Urban Expansion
2. Pursuit for Resilience
3. Geospatial Big Data to Smart Data
4. City Projects
What is Resilience?

- Returning to an original or improved quality of life

Shocks

- Severe, sudden events
- Threaten a city

Stresses

- Temperate, day-to-day events
- Weaken a city

Credit: NY Post
Credit: Marius Vieth
100 Resilient Cities Program

Mission Statement:

“Helping cities around the world become more resilient to the **physical**, **social**, and **economic** challenges that are a growing part of the 21\textsuperscript{st} century”

www.100resilientcities.org
Trimble as a Platform Partner

- Focused on “physical” challenges
- Geospatial imagery analytics
- eCognition software

Turning Data into Information
1. Urban Expansion
2. Pursuit for Resilience
3. Geospatial Big Data to Smart data
4. City Projects
Geospatial Technology Disruption

- Increased data accessibility
- Innovative imagery analysis software
- Cloud-computing infrastructure

Massive Data Analytics Possibilities
1. Urban Expansion
2. Pursuit for Resilience
3. Geospatial Big Data to Smart Data
4. City Projects
Engaged Cities

Boulder, Colorado

Los Angeles, California

Melbourne, Australia

New Orleans, Louisiana
Analysis Applications

- Common to resilience challenges around the world
  - Urban environment
  - City climate
  - Water management

- Direct involvement with city councils
Project #1 – Urban Tree Canopy

Why trees?
- Micro climate
- Air quality
- Shade
- Runoff
- Property Value
- Quality of living

Objective
- Establish a baseline
- Monitor
Solution

Tree Canopy: 2,639 acres  16%
Buildings: 1,766 acres  11%
Unclassified: 12,027 acres  73%
Project #2 – Heat Island Analysis

Why?

- Quality of life
- Health effects [pos. / neg.]

Objective

- Better understanding of dynamics
- Monitor
Solution

Temperature derived from Landsat 8, Band 11, Units: °F
Project #3 – Impervious Surface Analysis

Why?

- Runoff modeling
- Flood prevention
- Taxation

Objective

- Impervious surface at parcel level
Solution – New Orleans
Solution - Boulder

4-band Imagery

1. (01) Impervious >90%
2. (02) Impervious >80%
3. (03) Impervious >70%
4. (04) Impervious >60%
5. (05) Impervious >50%
6. (06) Impervious >40%
7. (07) Impervious >30%
8. (08) Impervious >20%
9. (09) Impervious >10%
10. (10) Impervious <10%
Discussion

- Population growth and urbanization makes resiliency an essential part of urban planning in the future
- Geospatial big data needs to become smart data
- Focus on end user is key to deploy suitable geospatial technologies
  - Technology adoption
  - Workflow integration