Mapping of urban villages in China

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► The case of Shenzhen, China
► Discussion and Conclusions
Urban Growth in China
## Urban growth in China

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban built-up area (sq.km) of China</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>10161</td>
</tr>
<tr>
<td>2002</td>
<td>25973</td>
</tr>
</tbody>
</table>

An increase of **151%** in 16 years

*(Source: China Statistics, 2003)*
Shenzhen
Urban Villages
From Villages to Urban Villages
# Features of three types of urban villages

<table>
<thead>
<tr>
<th>Types of urban village</th>
<th>Basic features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agri. Activity</td>
</tr>
<tr>
<td>Typical (built-up area &gt; 70%)</td>
<td>None</td>
</tr>
<tr>
<td>Transformed (built-up area 40%-70%)</td>
<td>Few</td>
</tr>
<tr>
<td>Urban-fringe (built-up area &lt; 30%)</td>
<td>Some</td>
</tr>
</tbody>
</table>
Factors for the formation of urban villages

► Urban growth too fast

► Residents:
  - Resistance of residents in villages
  - living a profitable life: house rent
  - Potential increase of land price

► Government:
  - Lack of money to relocate and rebuild
  - Lack of interest
  - Tough issue
Urban expansion 1986-2002
Urban villages in Wuhan, 2004
Spatial location of urban villages in Wuhan

- Inside Inner ring: 4%
- In between: 34%
- Outside Outer ring: 62%

Urban villages in Wuhan

![Image of urban village streets]
Features of urban villages

- Unplanned lots surrounded by planned streets
- Complex land use
- Bad living condition: houses
- Lack of public facilities
- Good sense of “home”
- Harmonious neighbors
- Cheap
- Profitable
Mapping of urban villages
- Nanchang, China
NC high-tech zone 2002, 5m
Planning with 5m image
Planning with 1m image
More detailed view of 1m image
Mapping of urban villages
- the story of Shenzhen, China
Distribution of urban villages in Shenzhen, 2005

(data source: Shenzhen Pl. Bureau)

SEZ: Special Economic Zone
Features of urban villages outside SEZ

SEZ: Special Economic Zone

(1) mixture of planned and unplanned
(2) large quantities
(3) occupies large area
Features of urban villages inside SEZ

(1) smaller buildings
(2) crowded construction
(3) spatially unplanned
Urban village inside Shenzhen Economic Zone (SEZ)
Futian: a district of central Shenzhen
Locations of urban villages in Futian District

Spot image, 2005

Legend
- boud_ft
- vil_ft
## Population structure of urban villages in different district of Shenzhen

<table>
<thead>
<tr>
<th>No.</th>
<th>District</th>
<th>Local residents</th>
<th>%</th>
<th>Leaseholders</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW</td>
<td>467</td>
<td>2.35</td>
<td>19400</td>
<td>97.64</td>
<td>19867</td>
</tr>
<tr>
<td>2</td>
<td>SZ</td>
<td>729</td>
<td>1.58</td>
<td>45271</td>
<td>98.41</td>
<td>46000</td>
</tr>
<tr>
<td>3</td>
<td>SS</td>
<td>1280</td>
<td>1.6</td>
<td>78720</td>
<td>98.4</td>
<td>80000</td>
</tr>
<tr>
<td>4</td>
<td>XS</td>
<td>1319</td>
<td>1.88</td>
<td>68500</td>
<td>98.11</td>
<td>69819</td>
</tr>
<tr>
<td>5</td>
<td>XZ</td>
<td>800</td>
<td>1.61</td>
<td>48750</td>
<td>98.38</td>
<td>49550</td>
</tr>
<tr>
<td>6</td>
<td>SB</td>
<td>2800</td>
<td>18.85</td>
<td>12050</td>
<td>81.14</td>
<td>14850</td>
</tr>
<tr>
<td>7</td>
<td>FT</td>
<td>1430</td>
<td>2.67</td>
<td>52020</td>
<td>97.32</td>
<td>53450</td>
</tr>
<tr>
<td>8</td>
<td>TM</td>
<td>250</td>
<td>0.21</td>
<td>117000</td>
<td>99.78</td>
<td>117250</td>
</tr>
<tr>
<td>9</td>
<td>GS</td>
<td>1000</td>
<td>1</td>
<td>98500</td>
<td>98.99</td>
<td>99500</td>
</tr>
<tr>
<td>10</td>
<td>SHW</td>
<td>601</td>
<td>2.14</td>
<td>27399</td>
<td>97.85</td>
<td>28000</td>
</tr>
<tr>
<td>11</td>
<td>SHS</td>
<td>550</td>
<td>0.91</td>
<td>59450</td>
<td>99.08</td>
<td>60000</td>
</tr>
<tr>
<td>12</td>
<td>SM</td>
<td>1100</td>
<td>1.83</td>
<td>58900</td>
<td>98.16</td>
<td>60000</td>
</tr>
<tr>
<td>13</td>
<td>XM</td>
<td>1376</td>
<td>1.16</td>
<td>116886</td>
<td>98.83</td>
<td>118262</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>13702</strong></td>
<td><strong>1.67</strong></td>
<td><strong>802846</strong></td>
<td><strong>98.32</strong></td>
<td><strong>816548</strong></td>
</tr>
</tbody>
</table>
## Condition of urban villages

<table>
<thead>
<tr>
<th>Items</th>
<th>Urban village in Futian</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Xiasha (XS)</td>
</tr>
<tr>
<td>Sanitation</td>
<td>G</td>
</tr>
<tr>
<td>Building quality</td>
<td>VG</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>G</td>
</tr>
<tr>
<td>Public amenity</td>
<td>VG</td>
</tr>
</tbody>
</table>

**VG** - Very Good;  **G** – Good;  **B** - Bad

(Source: Survey of the internal environment of urban villages in Shenzhen, UPDIS & SUPLAB, 2005)
## Development strategies based on MCE

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Strategies for redevelopment</th>
<th>Potential leader for first stage</th>
<th>Redevelopment priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FT</td>
<td>Conversation, Rebuild/Rebuild</td>
<td>Government/Residents</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>GS</td>
<td>Rebuild</td>
<td>Developer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>SHS</td>
<td>Rehabilitation, Rebuild/Rebuild</td>
<td>Government</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>SZ</td>
<td>Rehabilitation/Conservation, Rehabilitation/Rebuild</td>
<td>Government/Resident</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>TM</td>
<td>Conservation, Rebuild</td>
<td>Government</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>XS</td>
<td>Rehabilitation, Rehabilitation</td>
<td>Government/Resident</td>
<td>3</td>
</tr>
</tbody>
</table>

*(Zhou, 2007)*
Urban village redevelopment strategic plan

Urban village redevelopment plan in key areas

Legend
- Boundary of administrative regions
- Key area
- Boundary of SEZ
- Water resource protection zone
- Function axes

(Source from: Urban village redevelopment planning during the 15th five year period, 2005)
Urban village redevelopment plan within five years (2005-2010)

The plan of urban village redevelopment within five years

Legend
- to be accelerated
- to be launched
- to be conserved
- to be finalized
- to be researched

(Source from: Urban village redevelopment planning during the 15th five year period, 2005)
The application of Laser scanning
Advantages of laser scanning

► Scanners focus laser beam along the X and Y axis
► Scanner records range, intensity and scan angle of each measurement
► Location of each measurement calculated very accurately (in local reference frame)
► Creates an extremely dense, accurate model of the scanned surface
► Each point in the cloud has X, Y, Z and I (intensity)
► A low power laser beam is used to measure the position of points on an object in 3-dimensions.
► The scanner is moved around the object to measure points from many different angles
Leica HDS 3000

Medium range scanner
Measuring the scanned image
Applications of laser scanned data
A PhD dissertation

A Hierarchical Object-Based Approach for Urban Land-Use Classification from Remote Sensing Data

Zhan, Qingming
Houses are classified and clustered
Landuse grouping
The Hi-Tec Research and Development Project (863 project), China

- Research on the protection of historical buildings based on laser scanning
- 2007-2009
- School of Urban Design, Wuhan Univ
- Research Center for Digital Cities, Wuhan Univ
A historical district in central Fuzhou, Fujian province, China
Point cloud data from laser scanner
Building 3D model from laser scanned data
Scan inside building
Findings

- Urban villages in Chinese cities take on complex spatial, socio-economic and environmental features.
- Urban villages have to be planned along with the planning of the cities.
- Fast and reliable monitoring techniques required.
- High resolution images provide better spatial mapping data source.
- Laser scanning provides more measurable data, but also with more complicated data pre-processing.
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