GIS-based landscape assessment for the Salzburg FUA

Günter Gruber, Johanna Schmitt
RSA FG maintains 6 research studios in Austria with focus on:
data science, pervasive computing, smart agent technologies, mobile learning and 4D environments

- Multi-level project chains
- Knowledge transfer and incubator role
- Capitalizing scientific knowledge in the market

Studio iSPACE is specialized on georeferenced solutions:

- Up-to-date GIS methods and technology-driven expertise in
  - data management & processing
  - spatial analysis & simulation
  - indicator systems
  - cartography & geo-visualisation

- Applied planning and decision-support for an integrative smart settlement development
Goal: Development and pilot testing of innovative methods and tools for smart management of green spaces in functional urban areas

- 10 project partners from 7 central European countries
- Development of Smart Models in 3 thematic working groups:
  1. GIS-based solutions (iSPACE as knowledge provider)
  2. Community involvement
  3. Multi-stakeholder governance
- Design of local roadmaps and a joint Smart Governance Manual on integrated urban green space management as a guideline for local authorities
CONCEPTS OF THE GIS MODEL

- **Analytic vision**
  - Identify local assets and demands
  - Define specific objectives with respect to local development strategies and stakeholder interests

- **Appropriate indicators**
  - Crack up complex real-world phenomena and make them measurable

- **GIS workflow**
  - Data acquisition and management for *transferability*
  - Analytic methods and processing routines for *replicability*
  - Visualisation techniques for *communication* purposes
## Analytic Pillars and Indices

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Maintenance</th>
<th>Sustainability</th>
<th>Attractiveness</th>
<th>Profitability</th>
<th>Fair Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory of various green space types and deduction of effort and costs for conservation</td>
<td>Support of a well-balanced supply of natural green space functions</td>
<td>Configuration and satisfaction of users as contribution to liveability</td>
<td>Economic potential in terms of agriculture &amp; forestry and tourism</td>
<td>Balanced fulfillment of the demand for green space services</td>
<td></td>
</tr>
</tbody>
</table>

| Targets | Monitoring and management support for public authorities | Analysis of natural functions for authorities and ecologists | Acceptance studies for planners and socio-psychologists | Capitalization options for developers and business people | Demand and competition analyses for regional planners and developers |

<table>
<thead>
<tr>
<th>Implementations in Salzburg</th>
<th>Landscape Index</th>
<th>Recreational Index</th>
<th>Near-distance supply of high quality green with residents</th>
<th>Matrix to identify priority and potential conflict zones</th>
</tr>
</thead>
</table>
| Data on green space inventory only used as input for other analytical steps | - relief diversity  
- existence of water  
- tree cover density  
- land cover status  
- share of protected areas  
- biotopes  
- noise zones  
- wildlife corridors  
- attractive forests | - path density  
- number and variety of infrastructural elements like  
- playgrounds  
- sports fields  
- picnic sites  
To be complemented by users’ perceptions | Identification of high quality soils and productive forests for cultivation | |
STUDY AREA

The Upper Salzach Valley:

- Part of the Salzburg FUA
- Dominated by river Salzach and alpine topography → small area of permanent settlement
- Urban core and rural surroundings
- Population: 218,000
- High population pressure in the Salzburg Basin
- 77% covered with green, mainly forests and agricultural land
Objective 1: Monitoring of green space quality

- ✓ Action 1.1: Assessment of green space quality in terms of recreational value
- ✓ Action 1.2: Assessment of green space quality in terms of landscape value
- ★ Action 1.3: Green space surveys

Objective 2: Improvement of green space supply

- ✓ Action 2.1: Determination of green space supply in short walking distance
- ★ Action 2.2: Remodeling of green spaces to raise the supply with high quality green

Objective 3: Well-balanced distribution of green

- ✓ Action 3.1: Identification of development and conflict zones
- ★ ✓ Action 3.2: Prioritization of areas and conflict handling

Objective 4: Awareness raising

- ★ Action 4.1: Organization of green events with result communication
GREEN SPACE QUALITY AND SUPPLY

Example: Recreational Index

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Classification and normalization</th>
<th>Indicator weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path density [m/ha] (I₁)</td>
<td>0 (1 point) &gt;0-200 &gt;200-400 &gt;400-800 &gt;800 (5 points)</td>
<td>0.4</td>
</tr>
<tr>
<td>Number of different categories of infrastructural elements [n] (I₂)</td>
<td>0 (1 point) 1-3 4-6 7-9 &gt;9 (5 points)</td>
<td>0.3</td>
</tr>
<tr>
<td>Presence of sports fields, playgrounds, picnic sites [yes/no] (I₃)</td>
<td>Not present (1 point) Present (5 Points)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Recreational Index = (0.4 * \(I₁\)) + (0.3 * \(I₂\)) + (0.3 * \(I₃\))

- Complementing study of recreational and landscape value to include urban, suburban, and rural green spaces
- Normalization of indicator values to assessment scales (point system) for weighted overlay
- Flexible approach:
  - Adaptation of parameters and weighting factors
  - Additional indicators
High quality areas as a result from the index calculations

Supply studies follow the service area concept, but
- No network analysis at this scale
- Recreational value dominates landscape value

Planning and decision support basis for upgrade demand:
- Good supply in the cities of Salzburg and Hallein, poor supply even in some densified regions
- Landscape value is important for the countryside
- Quality areas along/around water
- **Priority zones** based on certain criteria for a well-balanced green space use and distribution of crucial functions

- **Solutions for overlapping functions** needed: prioritisation by predefined order of importance AND/OR local specifications

<table>
<thead>
<tr>
<th>Priority zones</th>
<th>Criteria</th>
<th>Service area</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recreation</td>
<td>Landscape</td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td>High</td>
<td>Neutral</td>
<td>400m</td>
</tr>
<tr>
<td>Recreation</td>
<td>Medium</td>
<td>Neutral</td>
<td>400m</td>
</tr>
<tr>
<td>Recreation</td>
<td>Medium</td>
<td>Neutral</td>
<td>400m</td>
</tr>
<tr>
<td>Close-to-nature recreation</td>
<td>Medium</td>
<td>High</td>
<td>400m</td>
</tr>
<tr>
<td>Close-to-nature recreation</td>
<td>Present</td>
<td>Medium</td>
<td>400m</td>
</tr>
<tr>
<td>Close-to-nature recreation</td>
<td>Present</td>
<td>Medium</td>
<td>400m</td>
</tr>
<tr>
<td>Habitat</td>
<td>Not present</td>
<td>High</td>
<td>1000m</td>
</tr>
<tr>
<td>Risk prevention</td>
<td>Hazard zones and forest with protective function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture &amp; forestry</td>
<td>High soil quality and forest with economic function</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Priority zones of green space use considering functionality indices

Combination with supply studies
- Populated cells are assigned with accessibility to high quality green

Highly flexible planning and scenario building tool in terms of:
- Indicator choice, parameters and weighting factors for index building
- Prioritisation criteria based on local development strategies
- Cycle process with supply studies → e.g. growing settlement cores for derivation of development zones
SUMMARY AND DISCUSSION

- Innovative approach to combine recreational with landscape value on FUA level
- Explore potentials of “special landscapes” with adapted indicator systems
- Assessment of existing UGS & planned UGS
- Joint investigation of settlement development (built-up areas and green supply)
  → Lacks and needs of a well-balanced supply
- Include results in zoning and construction plans, combine with housing subsidies

- Potentials of further development:
  - Interactive web-map for flexible prioritisation and live simulation
  - Enlargement of the data foundations and analytic scope:
    - Qualitative data through community involvement
    - Multi-stakeholder governance for conflict handling
  - Transfer to wider area and other regions
Thank you for your attention!

Günter Gruber, Johanna Schmitt