From Local SDGs Profile to SDGs Knowledge Service: Deqing’s Case Study

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Challenges

- appropriate indicators for a given sub-national
- integrate geospatial and statistical data
- perform overall progress assessment
- Transfer to knowledge
From Local SDGs Profile to SDGs Knowledge Service

Methodology

1. Localization of Indicators
2. Spatio-temporal data processing
3. Computing indicators with geographical angle
4. Indicator and evidence-based analysis

Progress

SDGs Knowledge Service

- Constructive Modeling
- Knowledge Extraction
- Knowledge Connection
- Knowledge Representation
- Knowledge Service

Regional SDGs Assessment and Monitoring
Contents

Background

Deqing SDGs Profile

SDG Knowledge Modeling and Service

Summary
2.1 A data-driven and evidence-based approach

This approach has four elements

1. Localization of Indicators
2. Spatio-temporal data processing
3. Computing indicators with geographical angle
4. Indicator and evidence-based analysis

Progress report
A set of 102 indicators was selected for Deqing County

<table>
<thead>
<tr>
<th>SDG</th>
<th>UN</th>
<th>Deqing</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>5</td>
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<tr>
<td>2</td>
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<td>16</td>
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<td>6</td>
</tr>
<tr>
<td>17</td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>

All the 16 SDGs are covered that is essential for a comprehensive measurement
45 geospatial datasets, 385 statistical datasets, 66 thematic datasets, and 27 other datasets were collected and processed.

<table>
<thead>
<tr>
<th>镇名</th>
<th>人口</th>
</tr>
</thead>
<tbody>
<tr>
<td>武康街道</td>
<td>89944</td>
</tr>
<tr>
<td>阜溪街道</td>
<td>26008</td>
</tr>
<tr>
<td>下渚湖街道</td>
<td>23999</td>
</tr>
<tr>
<td>舞阳街道</td>
<td>52180</td>
</tr>
<tr>
<td>洛舍镇</td>
<td>20553</td>
</tr>
<tr>
<td>钟管镇</td>
<td>43856</td>
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<tr>
<td>莫干山镇</td>
<td>31643</td>
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<tr>
<td>乾元镇</td>
<td>49644</td>
</tr>
<tr>
<td>雷甸镇</td>
<td>37592</td>
</tr>
<tr>
<td>新安镇</td>
<td>31730</td>
</tr>
<tr>
<td>新市镇</td>
<td>72395</td>
</tr>
<tr>
<td>禹越镇</td>
<td>33297</td>
</tr>
</tbody>
</table>

30-m Population density with topographic information

Population were disaggregated at 30m spatial resolution using land cover/use data to facilitate integrated analysis of statistical and geographic data.
Three different ways to measure the 102 indicators

A Direct calculation with statistical data  85
   - using ratio (or proportion), rate of change, index or other calculations

B Direct derivation from geospatial data  10
   - using spatial density calculation, coverage classification and others

C Integrated utilization of statistical and geospatial information  7
   - based on quantitative measurement of spatial accessibility, coverage, spatial relations
### 17 Indicators Measured with Geospatial Data

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4.1</td>
<td>Population proportion living in households with access to basic services</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Proportion of agricultural area under productive/sustainable agriculture</td>
</tr>
<tr>
<td>3.8.1</td>
<td>Coverage of essential health services</td>
</tr>
<tr>
<td>6.6.1</td>
<td>Change in the extent of water-related ecosystems over time</td>
</tr>
<tr>
<td>9.1.1</td>
<td>Proportion of rural population living within 2 km of an all-season road</td>
</tr>
<tr>
<td>11.2.1</td>
<td>Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities</td>
</tr>
<tr>
<td>11.3.1</td>
<td>Ratio of land consumption rate to population growth rate</td>
</tr>
<tr>
<td>11.7.1</td>
<td>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</td>
</tr>
<tr>
<td>15.1.1</td>
<td>Forest area as a proportion of total land area</td>
</tr>
<tr>
<td>15.1.2</td>
<td>Proportion of important sites for terrestrial and freshwater biodiversity covered by protected areas, by ecosystem type</td>
</tr>
<tr>
<td>15.2.1</td>
<td>Proportion of forest change</td>
</tr>
<tr>
<td>15.2.1</td>
<td>Proportion of land that is degraded over total land area</td>
</tr>
<tr>
<td>15.4.1</td>
<td>Protected area coverage of important sites for mountain biodiversity</td>
</tr>
</tbody>
</table>
Hierarchical Assessment

A hierarchical assessment with three levels

- **Indicator Level**: 79/102 were Contracted and ranked
  - with SDGs Index and Dashboard, National Plan mandate requirements etc.

- **Single SDG level**: 16 were assessed
  - through grouped focused analysis with quantified indicators and evidences

- **SDGs cluster Level**: 3, economy, society and environment
  - coherency analysis with degree of coordination, coefficient of variation
2.2 Deqing's SDGs Progress Report-2017

Approach briefing

Assessment of each Single SDG

SDGs Cluster analysis

Chinese version- around 70 pages

English version- around 80 pages

1) How to measure progress towards 2030 SDGs ?

2) How far is Deqing from 2030 SDGs ?

3) What are next steps ?
## Indicator and Single SDG Assessment - SDG 6 as an Example

### Content

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Quantitative result</th>
<th>Evaluation reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clean Water</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1.1 Proportion of population using safely managed drinking water services</td>
<td>Urban: 100% Rural: 99.6%</td>
<td>Green≥98%</td>
</tr>
<tr>
<td>6.2.1.a Penetration rate of sanitary toilets in rural areas</td>
<td>98%</td>
<td>Green≥95%</td>
</tr>
<tr>
<td>6.2.1.b Service convenience of urban public toilets</td>
<td>From all parts of town, the nearest public toilet can be reached within 16 minutes</td>
<td></td>
</tr>
<tr>
<td><strong>Volume, quality and efficiency of water resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3.1 Proportion of wastewater safely treated</td>
<td>Urban domestic sewage: 91.06% Rural domestic sewage: 80.68%; trade effluent: N/A;</td>
<td>Green≥95%</td>
</tr>
<tr>
<td>6.3.2 Proportion of bodies of water with good ambient water quality</td>
<td>68.75%, 100%**</td>
<td>76.9%</td>
</tr>
<tr>
<td><strong>Sustainability of water-related ecosystems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6.1 Change in the extent of water-related ecosystems over time</td>
<td>6.47%; High sustainable</td>
<td>Green≥25% Yellow: 25%&lt;x≤75%</td>
</tr>
<tr>
<td>6.6.1.a Rate of change in the spatial extent of water-related ecosystems</td>
<td>11.14%</td>
<td>0-20%;High sustainable; 21-40%;Local sustainable but threatens global stability; 41-60%;Border-line sustainability; Corrective actions are strongly recommended; 61-100%;Unsustainable. Urgent renewal is required.</td>
</tr>
<tr>
<td>6.6.1.b Rate of change in the water quantity characteristic of water-relate ecosystems</td>
<td>8.26%</td>
<td></td>
</tr>
<tr>
<td>6.6.1.c Rate of change in the water quality of water-relate ecosystems</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>6.6.1.d Health state of the typical wetland ecosystems</td>
<td>Xiazhuhu wetland: well</td>
<td></td>
</tr>
</tbody>
</table>

### Grouping targets into sub-groups for focused analysis
- Safe drinking water and sanitation 6.1, 6.2
- Water resource utilization 6.3 6.4 6.5 6.6.a 6.6.b
- Protection of water-related ecosystems 6.6

### Metrics Used for Comparing/ ranking

- I -- SDGs Dashboard
- II -- National plan
- III -- Multiple evaluation
- IV -- others
SDGs Clusters Analysis

Economy growth
- Growth condition
- Growth trend
- Growth development

Natural Beauty
- resources utilizing
- environment protection
- response to global change

Social harmony
- survival needs
- security needs
- development needs

Lower Coefficient of Variation means a better coordination
Contents

Background

Deqing SDGs Profile

SDG Knowledge Modeling and Service

Summary
Based on the characters of SDG, the constructive model has been built, then extract knowledge from the report with the process of knowledge connection to form the knowledge graph.
Constructive Modeling

Expand a five Hierarchical model from the concept of UN GIF

Goal

Goal 6

- 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Targets

- 6.1.1 Proportion of population using safely managed drinking water services
- 6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
- 6.3.1 Degree of integrated water resource management implementation (0-100)
- 6.4.1 Change in the extent of water-related ecosystems over time

Indicators

- 6.1.2 Proportion of population using safely managed drinking water services
- 6.2.2 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

Domain (Cluster)

- Environment
- Economic
- Sociology

Goal 6 Clean Water and Sanitation

- Water Resources Utilization
- Safe Drinking Water and Sanitation
- Protection of Water-related Ecosystems

Connotation (multiple targets with local characteristics)

- Improvement Needed for Water Utilization (6.1.1 - 6.4.2)
- Significant Betterment in Water Quality (6.3.1 - 6.4.2)
- Safe Drinking Water (6.6.1)
- Convenient Public Health Services (6.2.1)
- High Sustainability of Water-related Ecosystem (6.6.1)
- Excellent Ecological Conditions in Xiazhu Lake (6.6.1)

Knowledge Points

- 6.3.1
- 6.4.2
- 6.1.1
- 6.2.1
- 6.6.1

Data Facts

Map service
Chart
Picture
Video
Website
Constructive Modeling

Define the entity-relation for each level to describe each level
Knowledge Extraction

According to the domains and goals, integrate the quantitative assessment with facts to form the knowledge point:

- Domain → Goal

  - Domain Theme: assessment
  - Data and Facts: assessment

  - Goal Theme: Description Knowledge
  - Diagnosis Knowledge
  - Forecast Knowledge

Over 130 knowledge points have been extracted from the progress report, covered all domains and goals.
Knowledge Extraction

Description: assessment, practices, actions......

Diagnosis: indicator judgment, variation, spatio-temporal effects......

Diagnosis: spatio-temporal effects
description: indicator result

Diagnosis: Variation
description: Practice
Knowledge Connection

Using spatial connection to process the knowledge with spatial info. All knowledge is logically connected with related info. elements such as pictures, videos...

Spatial connection includes geocoding, semantic transformation and spatial situation simulation.

Over 100 spatial related facts have been processed
According to the established SDGs hierarchical model, the knowledge nodes are connected hierarchically to form a knowledge network and construct a knowledge graph with hierarchy structure.

5 Levels of knowledge network, 3 field nodes, 16 target nodes, 44 connotation nodes, 68 knowledge points, over 700 data facts.
According to the idea of centralized management, customization and knowledge service, data and information resources are integrated and managed to realize customization of knowledge service and build knowledge service hub.
Using component model to customize knowledge service page, what you see is what you get.

The knowledge content editing window on the left provides rich styles and multiple interactive response modes. The data fact element window on the right provides multiple data visualization functions such as chart, geographic information configuration, etc.
Website Map of the Hub

All pages of the website are customized by the customization tool
Hub Function

Seven Functional Modules

1. Menu
2. Language Switch
3. SDG Turntable
4. Domain Button
5. Introduction
6. Search Box
7. Story map Button

Multi-entrance and interactive
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Summary
Summary

- This pilot project realizes a practice to realize a comprehensive measurement of an entire administrative region’s progress towards SDGs by combining geospatial and statistical information.
- Four different methods were utilized to measure and analyze SDGs with geospatial information:
  - geospatial disaggregation of statistical data
  - derivation of indicators with geospatial parameters (such as spatial density, accessibility, coverage and relations)
  - provision of spatial-temporal evidences
  - location-based visualization and knowledge representation
Monitor-Knowledge-Decision-Implementation

SDGs Knowledge Service
- Constructive Modeling
- Knowledge Extraction
- Knowledge Connection
- Knowledge Representation
- Knowledge Service

Regional SDGs Assessment and Monitoring
- Localization of Indicators
- Spatio-temporal data processing
- Computing indicators with geographical angle
- Indicator and evidence-based analysis

Infrastructure, Data, Tools, Standards

Decision-Making oriented Application

Partnership