Potential and design of district heating networks using Geographic Information Systems (GIS)

or

Fighting Climate Change with GIS-technology

Jigeeshu Joshi & Hinnerk Willenbrink
Research Associates

Stegerwaldstraße 39  fon +49 (0)2551.962548  joshi@fh-muenster.de, willenbrink@fh-muenster.de
D-48565 Steinfurt  fax +49 (0)2551.962717  www.fh-muenster.de/egu, www.wiefm.eu
About us

Hochschulen

Projektpartner

“Münsterland”
A need for more energy planning

There was no freely accessible basis for integrated energy planning with the focus on heat (at least in our region)

- No open geodata (until 2017/01/01)
- No open energy demand information
- No spatial context
Approaching the problem

Hotspot Analysis

Network planning

Heat source design

Report
Heatmap
hotspot-analysis
HotSpot - Analysis

1. Buildings:
   - Type, area, age

2. Buildings:
   - Specific heat demand

3. City block:
   - Aggregated heat demand

4. City block:
   - Landuse

5. Hotspot:
   - Results
HotSpot - Analysis

1. Buildings:
   - Type, area, age

2. Buildings:
   - Specific heat demand

3. City block:
   - Aggregated heat demand

4. City block:
   - Landuse

5. Hotspot:
   - Results
Facts & Figures
HotSpot Analysis

• 10 % of the project area is settlement area

• 1 % of the project area is covered by hotspots

• 30 % of the total heat demand (heating and warm water) within the hotspots
Network Planning
Example

Havixbeck
Area: 53 km²
Inhabitants: 11,800
Example - Selecting Buildings

Schematic representation
Example – Preparing (Road) Network
Example – Locating of Heat Source
Example – Network Analysis

Schematic representation

Supply Temperature: 80° C
Return Temperature: 60° C
Example

Supply Temperature: 80° C
Return Temperature: 60° C
Example

Supply Temperature: 80° C
Return Temperature: 60° C
Example – Network Design

Schematic representation

Supply Temperature: 80° C
Return Temperature: 60° C
Example – Network Figures

- **5.2 km Primary lines**
- **2.6 km Secondary lines**
- **7.8 km Pipe system total**
- **1,015 kWh/m·a**
- **2.25 Mio € Investment**
- **229 € / m**

**Load-profile**

<table>
<thead>
<tr>
<th>Category</th>
<th>Heat demand [kWh/a]</th>
<th>Count [n]</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFH &amp; MFH</td>
<td>3,457,752</td>
<td>107</td>
</tr>
<tr>
<td>GH</td>
<td>209,201</td>
<td>3</td>
</tr>
<tr>
<td>GKO</td>
<td>1,862,659</td>
<td>12</td>
</tr>
<tr>
<td>GMK</td>
<td>1,518,330</td>
<td>37</td>
</tr>
<tr>
<td>Sum</td>
<td>7,047,942</td>
<td>-</td>
</tr>
<tr>
<td>Losses</td>
<td>830,651</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7,878,593</td>
<td>159</td>
</tr>
</tbody>
</table>

**Losses** 12%
Example - Project Report
Conclusion
We showed that energy planning is possible with open GIS data and how.

Our tools enable quick and easy implementation of DH.

Our results are published and presented in form of web maps (wiefm.eu)
Please contact us:

M.Sc. Jigeeshu Joshi
Dipl.-Geogr. Hinnerk Willenbrink

FH Münster - University of Applied Sciences
Fachbereich Energy · Building Services · Environmental Engineering

Stegerwaldstraße 39
D-48565 Steinfurt
Tel: +49 (0) 2551 9-62548
Fax: +49 (0) 2551 9-62717
Mail: willenbrink@fh-muenster.de
Web: www.fh-muenster.de/egu
Web: www.wiefm.eu

Forschungsteam
Prof. Dr.-Ing. Christof Wetter

joshi@fh-muenster.de, willenbrink@fh-muenster.de
Wärmehotspots im Münsterland
Wärmehotspots im Münsterland
Wärmehotspots im Münsterland
Wärmehotspots im Münsterland

Sichtergebnisse anzeigen für Havia...