

## POLICY PAPER

### Energy Planning in a Spatial Context

#### The Use and Benefit of a Spatial Approach in Energy Planning

Workshop “Energy Planning in a Spatial Context”

14<sup>th</sup> – 15<sup>th</sup> March 2012 – Jade Hochschule, Oldenburg (Germany)

#### Motivation

Energy costs have soared in the last few years. Even though fossil fuel costs have not continued to rise they will, in the long term, remain at current high levels. In response to this trend, hard questions must be asked about energy consumption and the currently available potential for energy saving must be exploited. Rising energy costs put public finances under increasing pressure. Moreover, many small towns and rural municipalities are suffering population loss. This leads to a vicious circle: The municipalities have to provide public services at ever-increasing expense while they see their revenues shrink in size. Although the problem has long been recognized by political decision makers, to date there have been no attempts to apply energy policies at the local or regional level or to implement appropriate measures.

This is where the project **North Sea Sustainable Energy Planning** („North Sea-SEP“, <http://www.northseasep.eu>) takes its lead. The project focuses on the specific challenges faced by local municipalities in the area of renewable energy and energy efficiency. The project was initiated by a wide range of organizations and groups: representatives of “green industries”, regional planners, regional and local development bodies as well as scientific organisations.

The objective of the project is to develop models for regional planning under special consideration of renewable energy and procedures for a better energy saving under perspective of regional aspects.

Energy Planning takes place in a spatial context on a very concrete local and regional level. Geo-Information Systems (GIS) are appropriate tools to analyze spatial data under the perspective of Energy Planning. But Energy Planning is a real challenge for local authorities. The daily work, the lack of knowledge and the lack of easy-to-use technologies are obstacles to work on the subject in a proper way with sound results.

Within the North Sea Sustainable Energy Planning project a couple of case studies were elaborated and the results were discussed in different contexts (participation, potential studies, etc). Local

authorities can use these studies to work on their own tasks and challenges. But what if the orientation of the tasks differs from the case studies? What are the key-factors of a successful GIS-project in the case of regional energy planning?

These questions were discussed on the GIS-Workshop, which took place from 14<sup>th</sup> to the 15<sup>th</sup> of March, 2012 in Oldenburg (GER).

The objectives of the workshop were

- to pinpoint the added values but also the obstacles of using GIS for energy planning
- to light up the conditions to use GIS efficiently for energy planning
- to find out the factors, how to use a GIS as a common decision support system for energy planning

The presentations and results are placed here on the project site:

<http://www.northseasep.eu/index.php?id=104#c506>

## Geo-Information

The use of geographical information systems (GIS) is today commonplace for all forms of planning work. It is universally used to graphically depict planned future land-use at a local and regional level and to assess environmental impact. Furthermore, GIS is used in helping to identify suitable locations for wind turbines, biogas plants and other technical facilities which either use or generate energy from sustainable sources. To this end, standard GIS tools for spatial analysis are generally used, such as the intersection and buffer functions. The aim of such an investigation is, on the whole, to find a location where there is no direct competition in terms of land-use.

This approach in using GIS is limited, in the sense that it is based on one single perspective provided by specific technology and the rules, directives and laws associated with it. Planning processes using GIS must, therefore, be understood as being from the 'viewpoint' of the technology in question. The emphasis is on finding the optimum use of available space. This results in a typical planning-focused decision situation and a functional, conventional approach to solution-finding (Nyerges & Janowski, 2010). The environmental impact can be clarified in each specific case using a variety of procedures: 3D visualization, shadow-analysis, noise assessment etc. With this approach, however, a holistic view of the impact of extended energy planning is not possible.

Alongside the location analysis mentioned above, the analysis of the potential for renewable energies and energy saving, has become more common in the past few years. Specifically, this means a comprehensive survey of the energy-generating potential and energy requirements within one planning area (municipality, district, region etc.).

## Deficits in work with spatial data and services in the case of energy planning

The participants pinpoint following deficits and obstacles in the work with spatial information:

1.) **Hidden Treasures:**

Within a local authority a huge amount of data is produced by different departments. Most of the data have a spatial reference. **The integration of different data and subjects under an energy perspective is not performed.**

2.) **GIS is a miracle:**

**GIS is mostly used by experts only.** A couple of GIS experts are organizing and analyzing the data.

3.) **Lack of knowledge about the possibilities:**

The origin of energy planning is lightly related to spatial information. **A lack of knowledge about spatial correlation and methods of analysis exists.**

4.) **Lack of knowledge about the subject:**

**GIS experts are no energy experts.** GIS experts have to work together with energy and planning experts to create comprehensive tools and models.

5.) **Accessibility of geo-data:**

There are **heterogeneous sources of data supply** which unnecessarily complicate the simple access to energy-relevant spatial information. There are also **heterogeneous - and in some cases very expensive - licensing models**, which complicate the harmonization and the use of data. This impedes the implementation of transparency-creating **geo-services** and of information platforms.

## Processes

In the workshop, individual processes were identified in which GIS plays a role or may play an increasing role. The base of the processes is a common language between GIS experts, energy experts, decision makers and citizens, to implement the processes successfully.

### Renewable Energy

- **Potential analysis** is focusing on the local and regional potential of energy (sources) in space and time.
- **Site Planning** of renewable energy plants under the perspective of spatial constraints and potentials.
- **Environmental compatibility and impact analysis** is a very important approach to analyze and also to assess the consequences of renewable energy plants on other issues e.g. nature and landscape protection, recreation and food production.

### Saving Energy

- By the help of a spatial integration of different uses and demands of **energy, synergies** can be worked out. Taking into account rates of renovation of buildings, the energy demand can be analyzed both spatially and temporally. The results can be used as a basis for the discussions e.g. about district heating systems.

- The spatial analysis can be used for the location of **'hot spots of measures'** (public relations, renovation programs etc).

### Integration of Heat and Power

- The spatially integrating look on energy enables new energy concepts. The **combined use and production of power and heat** is a very big opportunity to use renewable energy sources sensible and efficiently.

### Integration of other Spatial Affairs and Planning into Energy Planning and vice versa

- Most of the other affairs and issues have a spatial reference. By combining such affairs with an energy issue **new fields of collaboration and applications** can be enabled. For example the county works on a new plan for the need of kindergarten and nursing homes. From the energy point of view a kindergarten or a nursing home are very important energy users with a high demand of heat. This planning information could be a starting point of new energy concepts for each planned kindergarten (heat supply by a heat exchanger in the sewage or district heating or CHP-plant etc). The spatial integration improved the awareness of other developments in the same area.

### Participation Processes

Participation can be distinguished by the degree of participation effect:

- Inform
- Query
- Consult
- Joint Planning
- Equitable Planning
- Control by the Citizens

For each degree of participation different legal frameworks but also different technical solutions (software, devices and services) are necessary. **Each degree of participation addresses specific spatial data and technologies** to enable the communication between the relevant participants.

## Vision

**Our vision is the overall integration of geo-services into the Decision Making Processes of Energy Planning – from the very first sketch to final projects and their monitoring. The contributors and planning parties are using geo-services as tools for an open, multidirectional communication without media break on appropriate devices. Expert analysis systems and dissemination systems are collaborating and for the daily work the tools are easy to use also for non-experts. The necessary geo-data are available under the perspective of standards, easy access, mostly free license agreements and also the protection of privacy. The interaction of geo-services provokes, is an interdisciplinary and long-term perspective on energy planning.**

## Recommendations for Action

### Recommendation A

More transparency for the Energy Planning participants (authorities, companies and citizens)

GIS should provide helpful services and tools to foster the bidirectional communication. Besides the expert systems also mobile and easy to use devices and services should be used for a transparent discussion about Energy Planning. The use of crowd sourcing systems on smart phones, tablets etc. are helpful to set up a high current data base with simultaneous involvement of citizens. The participants have to define a common language (geo-services, energy focus, public affairs) to utilize the synergies.

### Recommendation B

Optimization of data access and data use

A major obstacle is cost. Cost for geo-data, data quality and management as well as for software licenses. Therefore the shared use of geo-data and services within an authority or even between different authorities is a good opportunity to save money. Data sharing shall be performed under the principles of the INSPIRE directive and standardized geo-services:

- Data should be collected only once and kept where it can be maintained most effectively.
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications.
- It should be possible for information collected at one level/scale to be shared with all levels/scales; detailed for thorough investigations, general for strategic purposes.
- Geographic information needed for good governance at all levels should be readily and transparently available.
- Easy to find what geographic information is available, how it can be used to meet a particular need, and under which conditions it can be acquired and used.

For further information see <http://inspire.jrc.ec.europa.eu/>

Another source to optimize data access are the ambitions of the Open Geospatial Consortium, Inc (OGC), which is currently developing interoperability standards to ensure trouble-free data transfer and geo-services.

For further information see <http://www.opengeospatial.org/>

Both, INSPIRE and OGC-Standards, foster the use of geo-data and services. A prerequisite is that data are prepared in accordance with the requirements at the beginning of a project.

Under this perspective geo-data, which are produced in a project, become a fundament in another, following project!

### **Recommendation C**

#### Implementation of Geo-Services into the Decision Making Processes

Geo-data is a memory of planning activities and public affairs. It is also a starting point for new activities. With a long term strategy an authority can build up a data system with an integrated view on different issues and affairs taking into account data protection and privacy.

Geo-services are using the data and support decisions processes in a smart and easy to use way. Step by step the participants get used to spatial analysis support, not only in local authorities but also among citizens. The use of target group oriented technologies and a transparent culture of participation creates confidence in the new geo-services.

### **Recommendation D**

#### Using adjusted Tools under the perspective of Scale and Objective

GIS provides a wide range of applications: expert system, dissemination tool, quick scan tool on spatial data, interactive communication even up gaming for pupils.

Under the perspective of scale and objective it could be better to use generalized data for a first overview. It is necessary to balance between data quality, model and expected quality of results and statements. A pragmatic and goal-oriented approach should be agreed in advance to assess the validity of the results. This includes the original data, the scale and the spatial and thematic resolution. It should be prevented that micro data is created with great effort but uses only for "rough studies".

## **Final remarks**

It is desirable, that the Policy Paper is used as a basis for discussion and for further strategy development within municipalities, authorities and further institutions.

The explicit thanks go to the participants that have made the workshop so fruitful with their commitment and constructive contributions.

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