

## **Expansion of renewable Energies and GIS as Planning Tool**

I'm architect and urban planner and I started 1990 with two other partners the ASTOC Architects and Planners office with nowadays 45 employees in Cologne. We work on different scales and with the Emscher masterplan in 2003, which is a very big urban plan over 10 cities in the Ruhrgebiet along 85km of the river Emscher, we began to use Geoinformatic Tools like ArcGIS. This is not common for architects but for us it was simply necessary to organise the masses of data informations. For us Geoinformatic systems visualize knowledge about space and it helps to organise and argue planning processes.

Since 2003 I'm teaching urban planning at the Department of architecture at University Ostwestfalen Lippe. In education and Research projects we include GIS tools as an essential skill. We also take part in the ESRI campus-license together with the faculties for landscape architecture and civil engineers.

## **Nuclear Phase out till 2022 - new Energie infrastructure**

The Federal Environment Ministry strongly supports the increased use of renewable energies and thus a structural change in energy supply. We have the unbreakable decision to end up with energy production from nuclear power plants after 2022. For this purpose, the use of renewable energies will be expanded rigorously. This decision is singlestanding in Europe. but it produces also new problems. For example Mega windfarms in the North Sea afford mega high voltage lines to bring the power to the industrial area in the south .

The aim for future energie supply is a decentralized system. Lots of plants produce renewable energy, and they are connected to a so called smart grid. This means also to equalizes the differences between a sunny and windy day with big energy production and a cloudy day without wind, therefore batteries have to be integrated in the system as well as Buildings. They become so called "Prosumers" which means Energy Production and Consuming at the same place. E-cars will be part of the smart grid too as batteries which can be loaded or unloaded by need. But the smart grid network will not spread consistent over Germany, as the following shows.

## **Metropolregions and little Towns**

The urban landscape in Germany has two extremes:

On the one hand we have 8 Metropolregions and 83 cities with more than 100.000 inhabitants. Although we realize a growing tendenz of big cities the sum of inhabitants is still only 33% of Germany's population. On the other hand we have round about 12.000 little Towns with more or less rural surroundings which is in sum 67% of the population, therefore still the majority, although shrinking tendence.

Actually the discussion about the future European city and all aspects of zero carbon cities and energy supply focus on the growing metropolregions, but the relevance of this discussion is only for 10% of Germany's space. Looking to the space outside the big cities we need now a discussion and planning tools facing the massive expansion of renewable energies which is threatening 90% of Germany's space.

Energy consuming Cities have little potential to produce their own renewable energy, only Photovoltaik on roofs, or heat recovering of drain water. The biggest potential in Production of Renewable Energies are in rural regions as the list on the right shows: wind- and waterpower, Biomass and Photovoltaik on fields. What you see is the result of the change to renewable energies in rural regions, which is necessary, indeed, but this development is not a conclusion of a planning process like urban planning but a result of engineering only. In the end we manage the energy turnaround but we earn an Injured landscape. We have to realize that Resource saving and environmental friendliness is the task of today's planning professions.

### **GIS based Masterplan for renewable energies**

I talk about the complexity of different networks, dealing with renewable energy, which makes a planning tool necessary. The aim in our research studies is to view the Problem in its entirety, not only in behalf of protecting distance, infrastructure, network and smart grid technology but also in terms of spatial compatibility in an increasing injured landscape.

First step is collecting all geo- informations of different energie layers like Wind and solar energy, hydropower, geothermal energy, bioenergy and power lines in one data base like an atlas. We have already Data bases like the „Energieatlas.NRW“ so this is not innovative, but in our research studies we do this as a georeferenced Database on ArcGIS with 3D informations.

For example windpower is considered a key technology but as the picture shows, it is part of a wild development in rural regions and the location of new wind mills is dependent of wind conditions plans as on the right. The wild development of windmills is the result of a negative planning method. What you see is an example of Kreis Höxter. by exclusion of protecting distances you get Potential space for windpower which are the blue fields. There is no further control on the position of windmills in the blue fields.

In our research studies with ArcGIS we analyse wind power in a positive planning method. We test, for example the suitability of Highways and industrial areas for a double-use with renewable energy plants. The benefit is to avoid injuring new landscape areas.

Another benefit is the 3D tool of ArcGIS to elaborate and test scenarios, like an Allee of windmills along a highway which can be used for participation and help to argue certain positions of the energie plants. Another 3D-theme is to show the visibility of windmills in the topographic .

In our research studies with ArcGIS we analyse the Potentials of Photovoltaic Energie production. PV sheds covering agriculture fields are not a sustainable solution. But with GIS as planning tool we can identify existing Sealed surfaces for double use like disposal sites, Dumps, gravel quarries, Industrial areas with Flat roofs, and even streets may be identified and used as solarroads, if this invention will become an economical solution.

## **GIS as planning tool in urban planning and landscape architecture**

- nowadays digital informations about space exist in lots of sources and in a comprehensive way
- most architects and planners are not aware about existence, usability and work with Geoinformatic tools
- usually, a simple Basis-Set of Datas are enough to do planning tasks
- There is no need to do extra Data survey or to buy Datas because they exist already, most planners don't even know about the open sources.
- Our aim at the faculty for architecture and urban planning is to teach understanding, knowledge and structure of Geoinformations. Therefore we are right now starting a professorship for digital design and GIS.

And last but not least:

Expanding Renewable energies for the "Post Oil City" is not a job for engineers alone, but for a team with urban planners, landscape architects, economical and social experts. The basis for understanding between the disciplines are Geoinformatic tools.

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Prof. Dipl. Ing. Oliver Hall

Architekt und Stadtplaner AKNW, BDA, SRL

Gesellschafter ASTOC GmbH & Co. KG, ARCHITECTS + PLANNERS

Maria-Hilf Str. 15, D- 50677 Koeln

Tel. (+49) 221/ 271 806- 0, mail: o.hall@astoc.de

And:

Hochschule Ostwestfalen-Lippe, University of Applied Sciences

Detmolder Schule für Architektur und Innenarchitektur

Lehrgebiet Stadtplanung und Städtebauliches Entwerfen

Emilienstraße 45, D- 32756 Detmold, Fon: +49- 5231- 769- 666

mail: oliver.hall@hs-owl.de

web: [www.hs-owl.de/fb1](http://www.hs-owl.de/fb1)