The energy transition

Visualizing sustainable energy landscapes

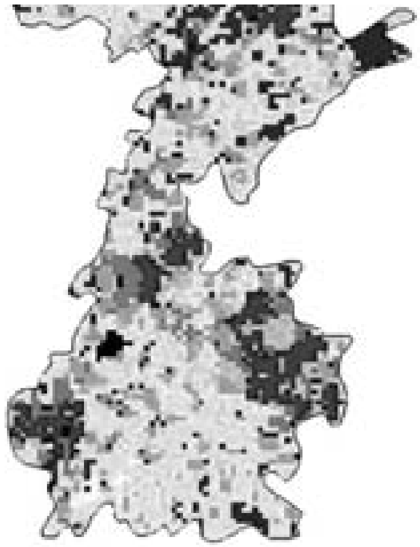
Today we are at the edge of a new era: an era no longer dominated by oil, but by new energy resources. We are at the take off stage of an energy transition towards renewable energy sources. But how does the energy transition manifest itself in the landscape? As landscape architects, we searched for the consequences of this energy transition for the landscape, and what the value of the landscape can be for hosting renewable energy sources. We built on to our work of the Regional design atelier "Re-Energize South Limburg" (Stremke, 2007) and worked along with the SREX research project.

Arjan Boekel
Boekel Tuin&Landschap
arjan@boekel.nu

Kees Neven
onderzoeker Sociaal-Ruimtelijke Analyse, WUR
kees.neven@wur.nl

Landscape and sustainable energy
The Dutch national government has set ambitious goals on renewable energy and CO2 emission reduction. By 2020, 20% of energy use should consist of renewable energy sources (VROM, 2007), like wind energy, solar energy, hydropower or biomass. Knowing that, in 2005, an amount of only 2,4% of the total energy demand was covered by renewable sources (CBS, 2006), a lot has to be done to reach the 2020 targets. To get there, a major shift towards a solid base of renewable energy production is needed. However, this 'energy transition' is still a rather abstract concept, a policy consisting of text, numbers and figures. The pathway towards a more renewable energy based system is unclear. We think this transition can manifest itself in many different ways. On the one hand implementation varying in big versus small scale and on the other hand in using more technical solutions versus using more natural 'logics'. In order to critically evaluate the effect of the transition to the landscape, we need to visualize these different pathways towards sustainability in energy provision. In order to do so, we worked out four designs for the municipality of Margraten, South-Limburg.

The energy transition: where we are right now
A striking saying about the future is: "Predicting is hard, especially when it concerns the future". But still, predicting is what we want to do, to be able to visualize changes in the landscape. To give some direction to this prediction, we used the most recent scenario study



The current state of visualizing the future is not gaining much insight on the future of the landscape
(MNP, 2004 in Engelen et al, 2006)

from the Provincial Board of Limburg (Engelen et al, 2006). In order to use the scenario's as the 'base map' for the four designs, we translated and interpreted these scenarios to our case-study region of Margraten. If you take a look at the 'spatial map' of the scenario's by the Provincial Board, you probably agree that some more visualization should be done to clarify the consequences for the landscape.

Meanwhile, a clear overview of renewable energy sources, techniques and energy design principles from landscape architecture, architecture and urban planning was lacking. In order to fill this knowledge gap, we put an 'inspirational handbook' together, which could be used later as a checklist for designing

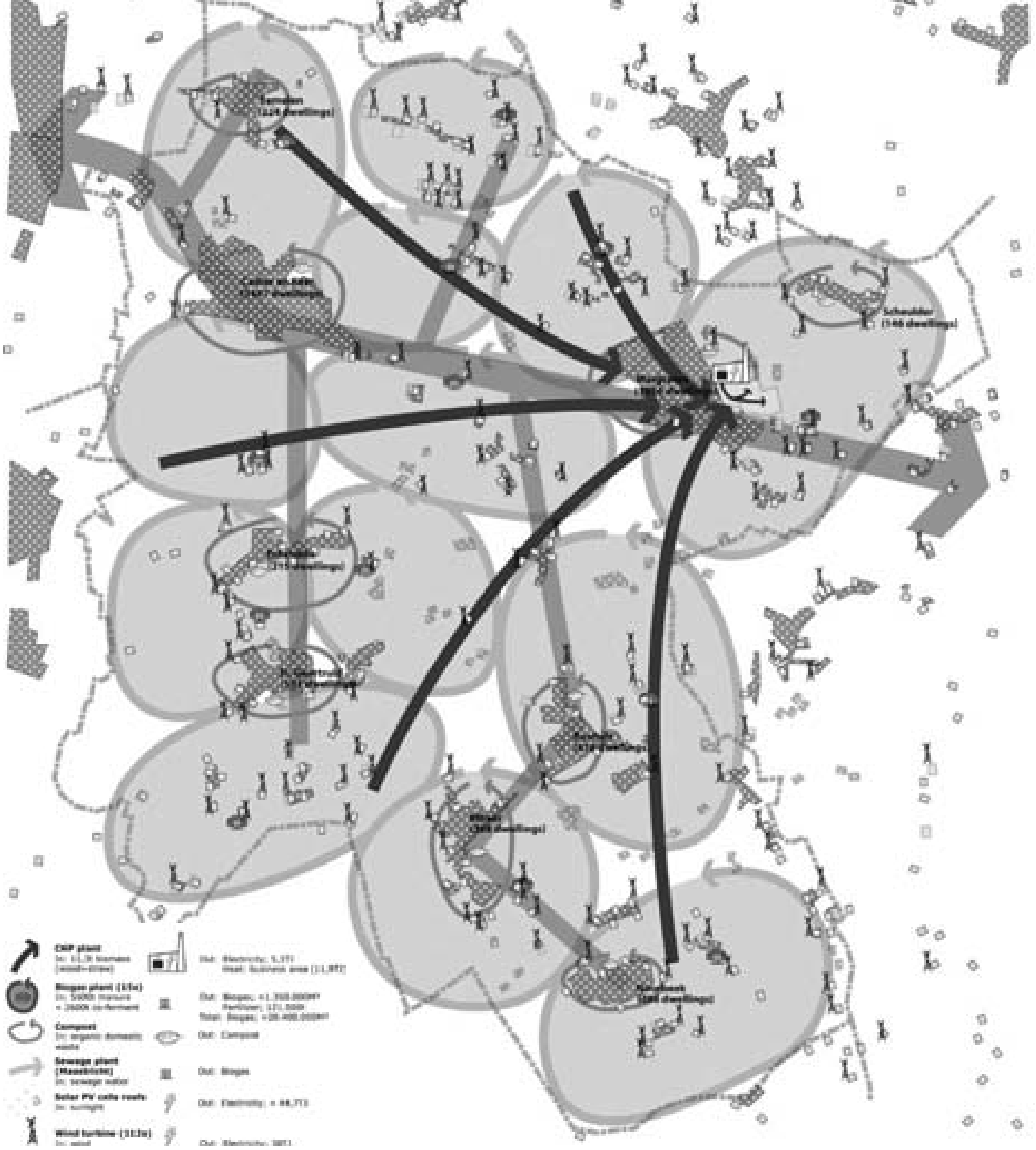
Example of a small scaled energy plant in Güssing, Austria

Map 'B2 final map'
Small is beautiful; try to create closed cycles at the smallest scale possible, without overlooking efficiency. Small scaled landscape with extra amount of landscape elements to create an attractive as well as productive landscape for food and energy. The region becomes a net producer of energy, being more then self-sufficient. The energy system is more balanced and robust than nowadays, and less vulnerable for malfunction. Thereby not only generating prosperity for the inhabitants, but also creating a more attractive landscape, community involvement, sustainable food production, and animal welfare.

sustainable energy landscapes. The handbook is meant for all spatial designers or planners who are interested in implementing the theme of sustainable energy. We clustered the principles in themes which connect to spatial planning: energy and the built environment, energy and industry, energy and transport, energy and the rural environment, energy and agriculture, energy and water, energy and nature. We derived the principles from (interdisciplinary) literature, field study and the internet. Very often, designing is not re-inventing the wheel over and over ; It is looking at other wheels and trying to combine their best characteristics into a new wheel. In our case, it meant (among others) visiting the sustainable neighborhood of EVA Lanxmeer, Culemborg and the region of Güssing, Austria. The Güssing-region is largely energy independent by using renewable energy sources, mainly biomass. How did they do it? And even more interesting for the visually educated landscape architects: how does it look?

Designing a sustainable energy landscape: small is beautiful
The scenario studies and the inspirational handbook, together with site visits resulted in a firm backpack for designing four possible pathways towards a sustainable energy landscape. We will take a look at one of them in order to give a clear overview of the results of the project.
The energy system map shows an

Village edge of Margraten, South Limburg.
The village edge of Margraten becomes a sustainable edge with integrated energy production, food production, hydrological sustainability, microclimate, and sustainable housing. The production of energy is visually present by not hiding the biomass power plant.
'Energy revealing design'.



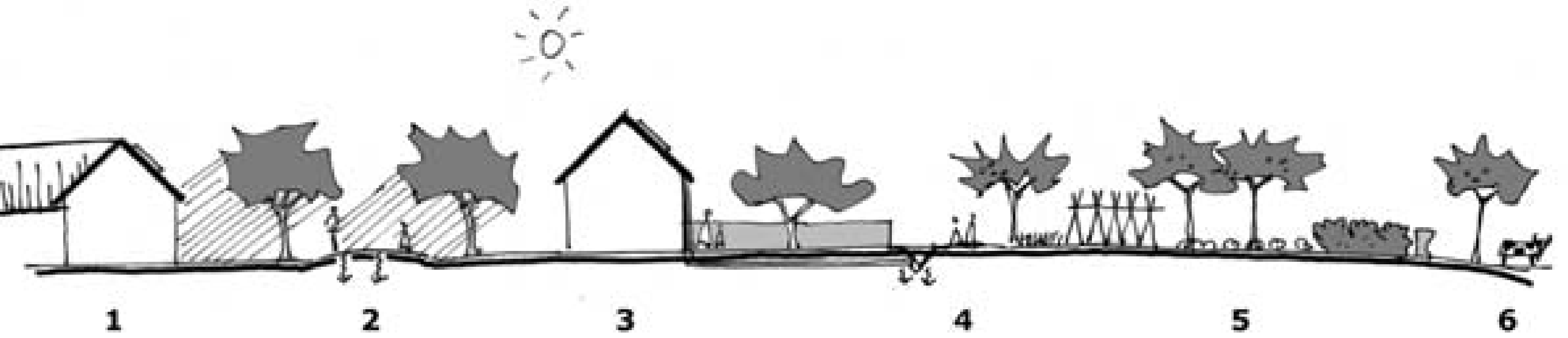
Map energy system
The energy system addresses waste cycles and the spread of energy production sites and locations.

example of an energy strategy we developed, and how it looks in the landscape. This strategy is called “Small is beautiful”; it tries to create closed cycles at the smallest scale possible, without overlooking efficiency. It addresses waste cycles such as organic domestic waste, sewage water, crop residues, manure and biomass from landscape maintenance to turn them into electricity and biogas.

Organic waste is a source with great potential for energy production. For example manure, which can be fermented into biogas. The biogas can be treated and used as natural gas for domestic purposes, or used as transport fuel. The residues after fermenting manure can be used as ‘clean’ fertilizer on agricultural land, without the environmentally negative side-effects of using un-fermented manure. Base principle is to keep the transport distance of manure and residues limited, to prevent energy loss when producing energy. This is in great contrast to current renewable energy production in large plants. These plants are running on large amounts of imported woodchips, which need (fossil!) fuel consuming transportation.

A small scaled landscape is created with an extra amount of green landscape elements. This results in an attractive, varied landscape with extra biomass harvesting potential. Also a more varied, local food producing system appears, among others by implementing allotment gardens around the villages. Considering the fact that an average meal travels thousands of kilometers before being eaten, local food supply saves a lot of energy. Altogether the landscape addresses local food and energy demand and efficient ‘close to source’ treatment of waste cycles..

The current total energy demand of households in this area is ca. 9,4 million cubic meters of gas and 65,5 TerraJoule



Design principles village.
Legenda: 1. carré-farm transformed to office, reducing need for transport by commuter traffic. 2. green streets with trees for shade in summer and permeable pavement for water infiltration. 3. House with solar boiler on south facing roof, sharply reducing demand for gas. 4. Public footpath combined with water infiltration ditch. 5. Allotment gardens for local food supply. 6. Partly shaded grassland for cattle and fruit production.

of electricity (own extrapolations of CBS data). This plan provides a total of 20,4 million cubic meters of biogas and 74,3 TJ of electricity by renewable resources. The region produces more energy than consumed by domestic use. The surplus can be transformed into fuel to cover transportation and industrial energy demand. The energy system is more balanced and robust than nowadays, and less vulnerable for malfunction. Thereby not only generating prosperity for the inhabitants, but also creating a more attractive landscape, community involvement, sustainable food production, and animal welfare.

Conclusion:
Landscape architecture and the energy transition
Landscape architects can significantly contribute to the energy transition. Thinking in regional systems, interdisciplinary thinking and connecting social, ecological and economical functions are part of the landscape approach. This is a huge lead compared to technical or economical scientists who work on this topic. The power of image is a strong tool which landscape architects should be aware of, not getting lost in technical specifications or political regulations, but stretching the imagination!

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Zooming in to Eckelrade.
Legenda: 1. fruit trees in grassland, shading cattle and creating vertical layering of food production. 2. Small wind turbines on farm plots, compatible with scale of village, plot size and building size. 3. Allotment gardens for local food supply. 4. Historical farm transformed into office. 5. Farm as distribution centre and shop with local products. 6. Campground for recreational attractiveness of region. 7. Woodbank as short rotation coppice, for biomass production and shading grassland, without shading crop fields. 8. linear water retention zone combined with public footpath, densifying the already existing rain water buffering system. 9. Organic domestic waste deposit, reducing transport need of waste trucks and producing compost for use in allotment gardens. 10. (Fruit) trees along road for microclimate, and food production. 11. Biogas fermentation plant for biogas production out of manure and organic waste.