ENERGY LANDSCAPES – THE ENERGY TURNAROUND OF LOWER AUSTRIA

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Project lead: Thomas Knoll, Ursula Aichhorn
Commissioned by: The Provincial Government of Lower Austria
Area: 19.186 km2
Planning and design: 2013 - 2014/2016
Implementation: 2014 - ongoing

Knollconsult
Landschaftsarchitektur . Wien AUSTRIA

Energy turnaround: the role of landscape architecture

Some of our time's major challenges are caused by the anthropogenic climate change and its effects on the world system. A main contributory cause of climate change is the worldwide energy consumption, based on fossil fuels. Therefore the transition to sustainable systems is considered as one of the substantial measures to mitigate climate change and to reach long-term climate objectives. Compared to the environmental impacts of fossil fuels, the negative effects of sustainable energy methods are relatively minor. Nevertheless, even those environmentally compatible methods influence natural habitats and the human living space. The planning of energy landscapes requires the integrative working in and with social and landscape systems. Hence, landscape related design professions play a significant role within the energy turnaround. Particularly landscape architecture can offer sustainability based planning solutions and design strategies, including technical, infrastructural, ecological, spatial, socio-cultural, aesthetical and political approaches.

Sustainable systems replace pollutive methods, wind facilities near Spannberg

Long tradition – new chances

Austria has a long tradition in generating renewable energies. In 1978 a referendum voted against the national production of nuclear energy. Since then, hydro- and biomass power covers a significant part of the energy requirements. Due to the hydropower's drastic ecological disadvantages, civic protests and the environmental movement stopped any further developments during the 1990ies and caused a nationwide stagnation in sustainable energy production. Since then, an enormous technical progress was made within wind power production. This development offered new chances to continue the Austrian

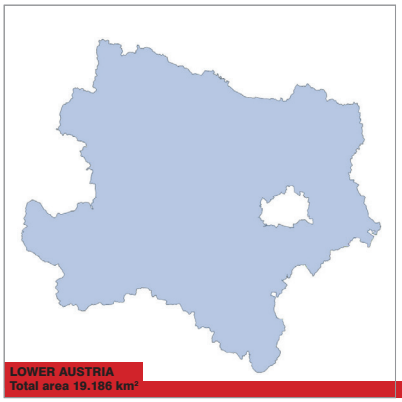
sustainable energy strategy and to increase the use of renewable energies. But the implementation of wind turbines was and still is controversial. Besides the outstanding advantages of wind power utilization, there are disadvantageous factors conflicting with the expansion of wind energy. Wind turbines affect landscape aesthetics and therefore often provoke negative public responses. The increase of bird and bat mortality, noise pollution or shadow impact, side effects of energy producing facilities, are seen controversial, too.

Austria's most suitable wind-conditioned area is Lower Austria, the largest federal state. Concurrently it is also the most densely populated part of the country, with ongoing settlement development. Limited available space and deficient public acceptance make any spatial interventions difficult. Nevertheless, the country set the goal of power self-supply, knowing that this process had to be planned environmentally compatible and social acceptable. Adhering to this common plan, Knollconsult, an office for environmental planning and landscape architecture, was commissioned to find ways, how Lower Austria's energy turnaround transformation process could be planned, including the diverse demands.

A new method: zones of non-suitability

The major task was to work within the capacity of ecosystems, securing the balance of different uses and landscape demands and representing various public interests. For gaining ecological and spatial compatibility, efficiency and social acceptance for wind energy facilities, an entirely new method was developed. Knollconsult reversed the usual analytic procedure of finding "zones of suitability" by determination of specific site criteria. Conversely, the total area of Lower Austria – 19.186 km^2 – was surveyed and "zones of non-suitability" were defined. These zones were step by step excluded from the zoning plan. After this landscape architectural analysis work, a participation process was carried out, reducing the survey area even further. The consequential rest-areas remaining were recommended as possible positions for wind energy facilities. Working with such a large survey area seems more complex than the traditional method of selective area analyses. But the results are objective and transparent and therefore reduce conflicts over distribution and controversies that come within the decision making and implementation process.

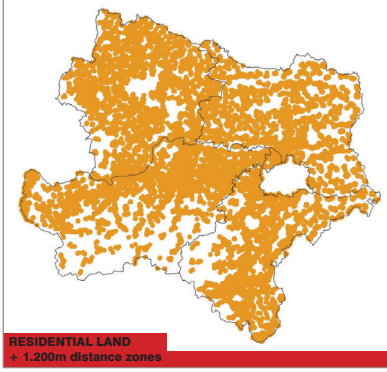
The complex zoning instrument is based on detailed, multi-layered GIS data, covering the entire territory of Lower Austria. Indisputable restriction zones, such as existing and ongoing settlement developments and their near surroundings, nature conservation zones and protected natural environments or national parks were excluded in a first step. The instrument also integrates more detailed subjects of protection, such as high level of naturalness, importance and diversity of ecosystems, landscape scenery and individuality in character, rarity and cultural or historic value of the landscape, visual axes, importance for tourism and recreation, prior anthropogenic interferences, technical preloads and regional balance. This specification and the intersection of objective criteria with GIS data allowed the classification of sensitivity levels. Areas with high levels of sensitivity were excluded. A supplementary involvement of experts and NGOs, such as "Birdlife" or "The Environmental Association Austria" provided more detailed expert knowledge, defining nature conservation and ornithologic restriction zones.



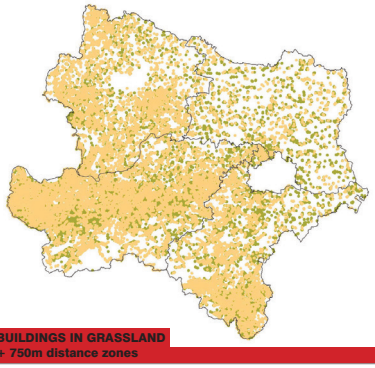
LOWER AUSTRIA
Total area 19.186 km²

⇒100% state area

AREA REDUCTION



RESIDENTIAL LAND
+ 1.200m distance zones

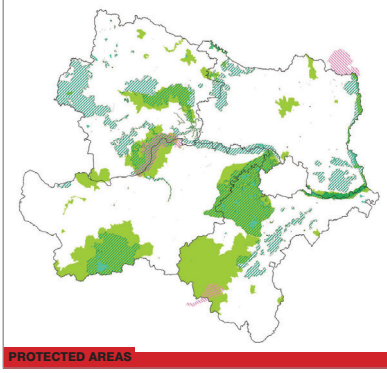


BUILDINGS IN GRASSLAND
+ 750m distance zones

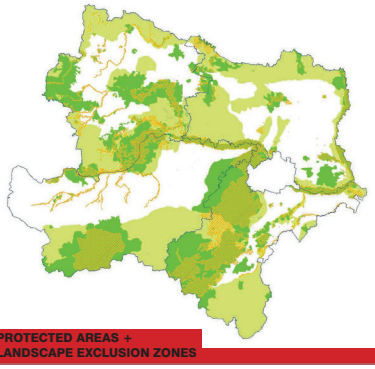
⇒83% of the state area

17%
possible area
remaining

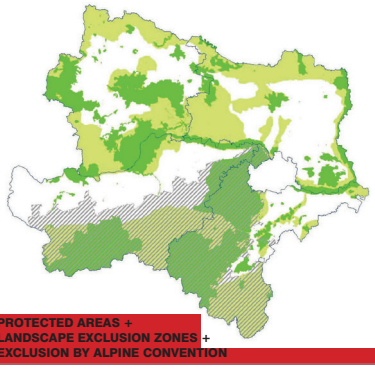
AREA REDUCTION



PROTECTED AREAS



PROTECTED AREAS +
LANDSCAPE EXCLUSION ZONES

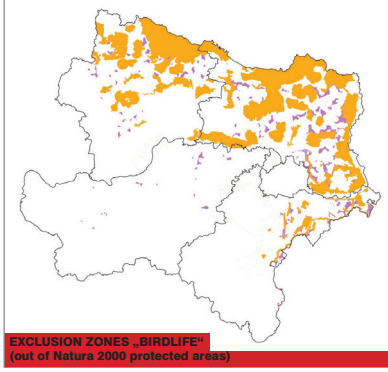


PROTECTED AREAS +
LANDSCAPE EXCLUSION ZONES +
EXCLUSION BY ALPINE CONVENTION

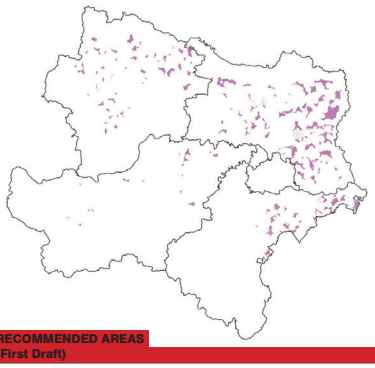
⇒91% of the state area

9%
possible area
remaining

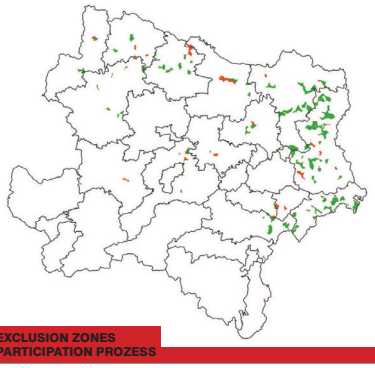
AREA REDUCTION



EXCLUSION ZONES „BIRDLIFE"
(out of Natura 2000 protected areas)



RECOMMENDED AREAS
(First Draft)

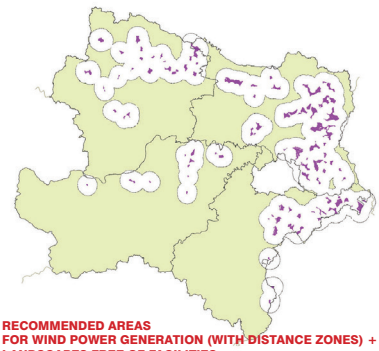


EXCLUSION ZONES
PARTICIPATION PROZESS

⇒98% of the state area

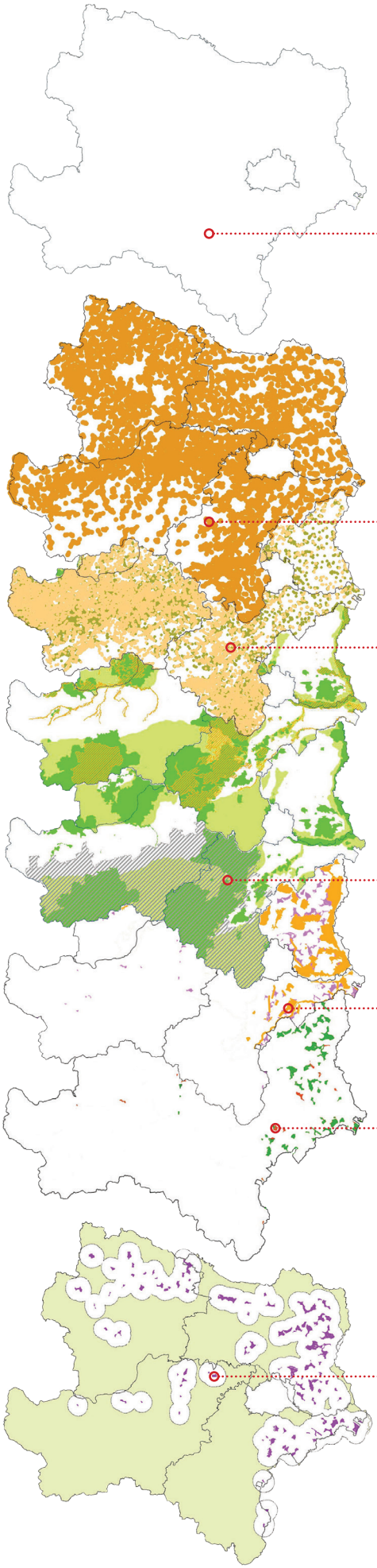
2%
state area
remaining

ENERGY LANDSCAPES



RECOMMENDED AREAS
FOR WIND POWER GENERATION (WITH DISTANCE ZONES) +
LANDSCAPES FREE OF FACILITIES

Area reduction method, based on GIS data and objective criteria (landscape analysis) and participation



START

100% state area
LOWER AUSTRIA
Total area 19.186 km²

reduction of
RESIDENTIAL LAND
+ 1.200m distance zones

reduction of
BUILDINGS IN GRASSLAND
+ 750m distance zones
17% possible area remaining

reduction of
PROTECTED AREAS +
LANDSCAPE EXCLUSION ZONES +
EXCLUSION BY ALPINE CONVENTION
9% possible area remaining

reduction of
EXCLUSION ZONES „BIRDLIFE“
(out of Natura 2000 protected areas)
3% possible area remaining

reduction of
EXCLUSION ZONES
PARTICIPATION PROZESS

2% of state area remaining
RECOMMENDED AREAS
FOR WIND POWER GENERATION
white: distance zones
green: area free of wind facility influences

ENERGY LANDSCAPES

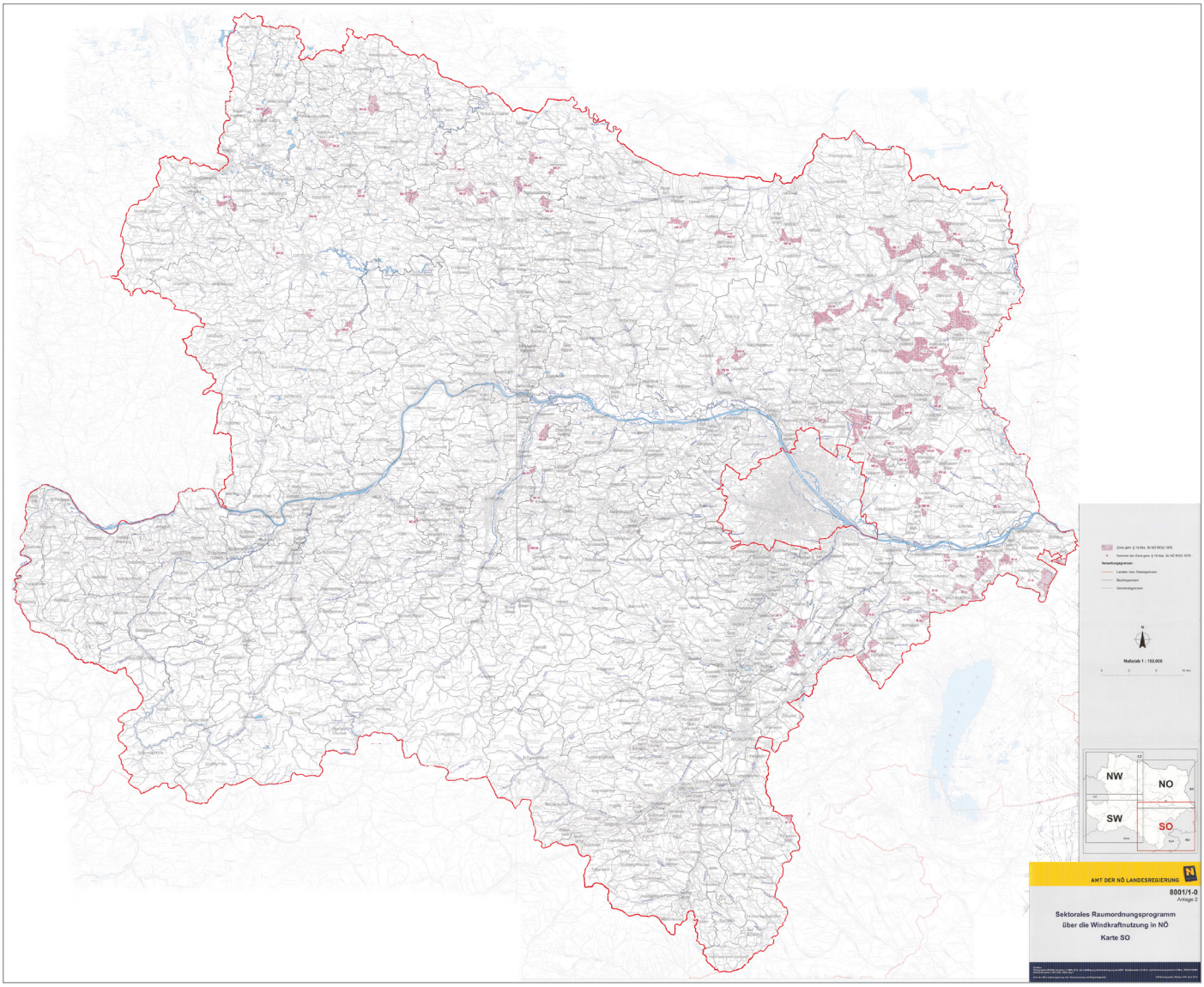
Methodology, reduction layers

Acceptance through objective criteria and participation

To raise the acceptance and generate a realistic result, the remaining areas were carried on to a participation process with local communities and politicians, residents, NGOs and other stakeholders. The professional basis, whether areas were included or excluded from the zoning plan, was presented and discussed. This participation process caused another reduction of the presented suitability zones: Regions where communities decided against wind energy, for example by public referendum, were excluded. Therefore a broad support and a high degree of acceptance could be established.

The results: legal basis for development

The resulting land use plan marks zones, recommended for the implementation of wind energy facilities. These zones cover about 2% of the state's area. The final plan built the basis for the political decision-making process and was transfered to the federal directive plan, the legally binding specification instrument for all following wind power developments. Actually an evaluation of the zoning plan is carried out, reviewing the protected zones by considering the four ecosystem functions: habitat, production, regularization and recreation.



Regulation plan with defined areas for wind power facilities

The next step: water power supply

Due to the success of this strategic planning process the Lower Austrian's government decided to extend the turnaround process. The effective method and zoning instrument developed by Knollconsult also built the basis for the developments regarding hydro power implementation carried out in 2016. This zoning plan followed the same procedure as carried out during the wind power development. It protects substantial river sections and marks recommended areas for implementation of hydro power plants.

Landscape architecture creates energy landscapes

Today, the Lower Austrian demand for electricity is fully covered by renewable energies, produced in Lower Austria. This energy turnaround was achieved through the substantial contribution of landscape architecture. The method, developed and executed by Knollconsult, became one of the essential instruments used in further regional developments.

Energy landscape: landscape integrative located wind turbines (eastern part of Lower Austria, near City of Vienna)