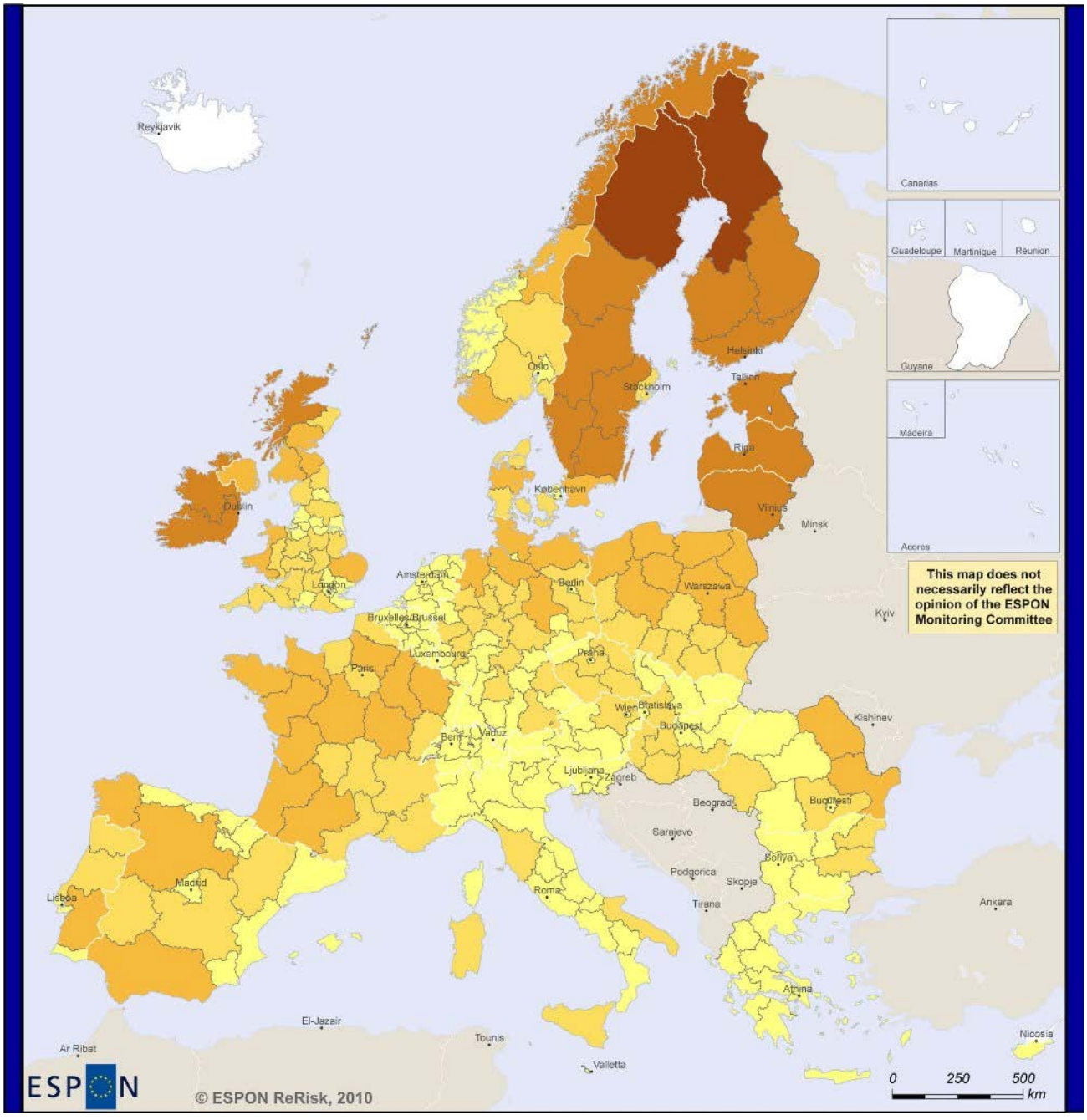
Wind Power and Photovoltaic Potential



An increasing share of renewable energy from some 10% in 2008 to 20% by 2020 forms a key energy and climate change objective of the European Council. At the same time have energy prices recently been rising again and the dependency on fossil fuels is increasing. In order to make an improvement in energy efficiency and to reach the above mentioned objective, energy supply and demand will have to turn more towards renewable energy sources in the future.

Especially for regions and cities that are at risk of energy poverty, due to climate conditions, the economic and transport structure or the social situation, the potential for generating energy from renewable resources as wind power or solar energy can be one important factor for consideration. In this respect particular renewable energy from e.g. solar-thermal, small wind, or photovoltaic plants, which can deliver energy for direct consumption without being fed into the general electricity grid might be of specific interest.

However, there are also obstacles to overcome when using renewable energy sources as for example potential conflicts with nature protection designations. Also, transmission cost for the energy transfer is a factor that needs to be considered in order to fully realize the wind power potential of peripheral regions. In addition, one significant problem is the variability of wind which means that wind-generated energy is best seen as part of an overall energy portfolio where connected networks can shift between sources in response to supply and demand.

Concept / method / measurement

The values on the wind power potential are primarily based on wind speed data, but are also taking into account environmental and other restraints. To calculate 'constrained potential', Natura 2000 and other protected areas are excluded from the calculations of wind energy potential. Although it is not illegal to build wind farms on Natura 2000 sites, they were considered to provide a useful proxy for the restrictions implied by biodiversity protection.

The wind power potential is measured in meters/second (m/s), considering also the area size of the regions (km2).The original data on wind intensity in the regions was prepared in GIS format by the European Topic Centre on Air and Climate Change (ETC/ACC), led by PBL the Netherlands Environmental Assessment Agency, on request of the European Environmental Agency (EEA, 2009). The data were converted to NUTS 2 level by the NTUA researchers.

Data on the photovoltaic potential in the regions was provided by the Joint Research Centre’s Sunbird data base. The data refers to the yearly total of estimated solar electricity generation (for horizontal, vertical, optimally-inclined planes) in kilowatt hour (kWh) within the built environment. These types of installations will be the first to become competitive at end-use level with electricity obtained from the central grid, with estimates from the International Energy Agency (IEA 2010) pointing to 2020 as break-even point in the regions with the highest potential.

Observations

Looking at the map of Europe a large proportion of regions have a high potential for creating renewable energy sources, either by wind or solar power.

The map on the wind power identifies those regions in Europe, which have the highest potential for producing electricity from on-shore wind power. These regions are located in Sweden, Finland, Ireland, Estonia, Latvia and Lithuania as well as the north of Norway and Scotland. Most of these areas are however very distant from major urban markets where the demand for electricity is concentrated.

The map of solar energy potential shows the regional potential for electricity production from solar panels. The difference is that the regions with greatest potential are now in the south and east of Europe. The core area of Europe is scoring low, while the main potential lies on the periphery.

Conclusions

Europe is entering a new energy landscape with rising energy prices, creating opportunities for the development of renewable energy resources, creating employment and new sources of income. This far-reaching transition process of the energy sector creates a need for informed policy and investment actions, as policy decisions taken today will be an important element in future competitiveness of regions, cities and different parts of the European territory, in which the prospects differ significantly.

- Neighbouring regions with different types of potential for renewable energy could cooperate to improve the reliability of energy supply from these sources in order to gain added value.
- Power plants which can deliver energy for direct consumption, without feeding the product into the general electricity grid, show potential to avoid energy poverty especially for islands, mountainous and peripheral regions of Europe. The reason for this is that grid access has costs associated, such as transport and distribution costs as well as taxes. If the production stays off the grid and is consumed directly, these additional costs are avoided by the consumer. As a result, the higher the total price of electricity sourced from the grid, the more competitive installations of renewables for end-use become.
- In order to accelerate the deployment of renewable energy sources territorial strategies and policies can support the incorporation of wind and solar applications in the built environment of densely populated urban areas.
- Spatial planning towards a more sustainable territorial management can consider the establishment of solar energy planning tools. Especially for regions and cities with low disposable income but considerable PV potential, these planning tools may provide the information necessary to achieve the greatest deployment of these technologies at the lowest cost possible.
- The future impact of climate change might be severe for some southern regions belonging to Spain, Greece, Portugal and France in terms of energy production and demand but also for the potential of renewable energy sources. However, the latter might be considered in respect of adaption measures. In these regions, summers are going to be relatively more complicated for energy companies, due to diminishing water reserves, higher average temperatures and heat waves, and consequently, forest fires. The supply problems will coincide in time with higher peaks of electricity demand, derived from a more extended use of air-conditioning. Solar cooling technologies play a decisive role for energy demand development in these regions [Holmes et al 2007].

The ReRisk project has developed indicators offering new information on the regional impact of increasing energy prices on industry, transport and private households, revealing not only regions' potential for the development of wind and solar power but also their socio-economic vulnerability. In addition the project presents several case studies of regions which are especially active in the field of renewable energies. The Final Report of the ReRisk (Regions at Risk of Energy Poverty) project is available at the ESPON Website.[1]

[1] The source: http://www.espon.eu/