

Increasing the spatial resolution of MERRA-2 reanalysis data for energy system modeling

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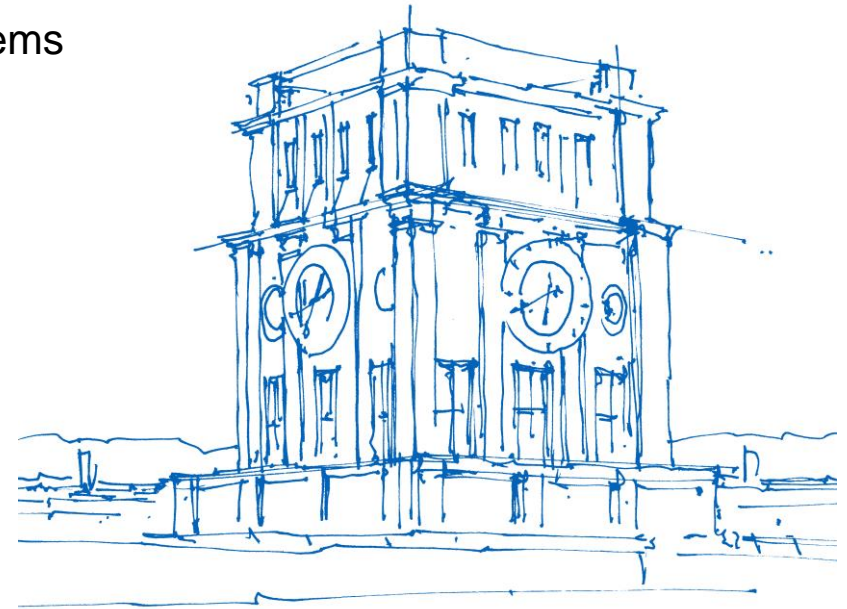
EGU General Assembly, Vienna, 12.04.2019

Supported by:



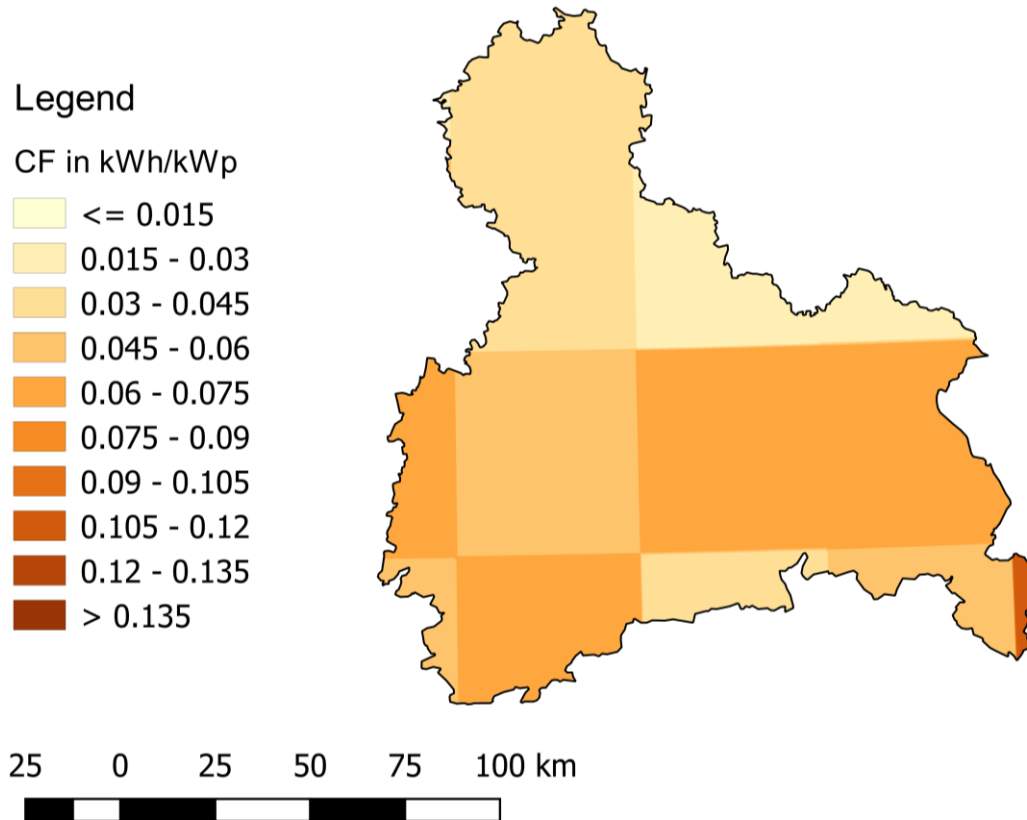
Federal Ministry
for Economic Affairs
and Energy

on the basis of a decision
by the German Bundestag



Uhrenturm der TUM

MERRA-2 resolution

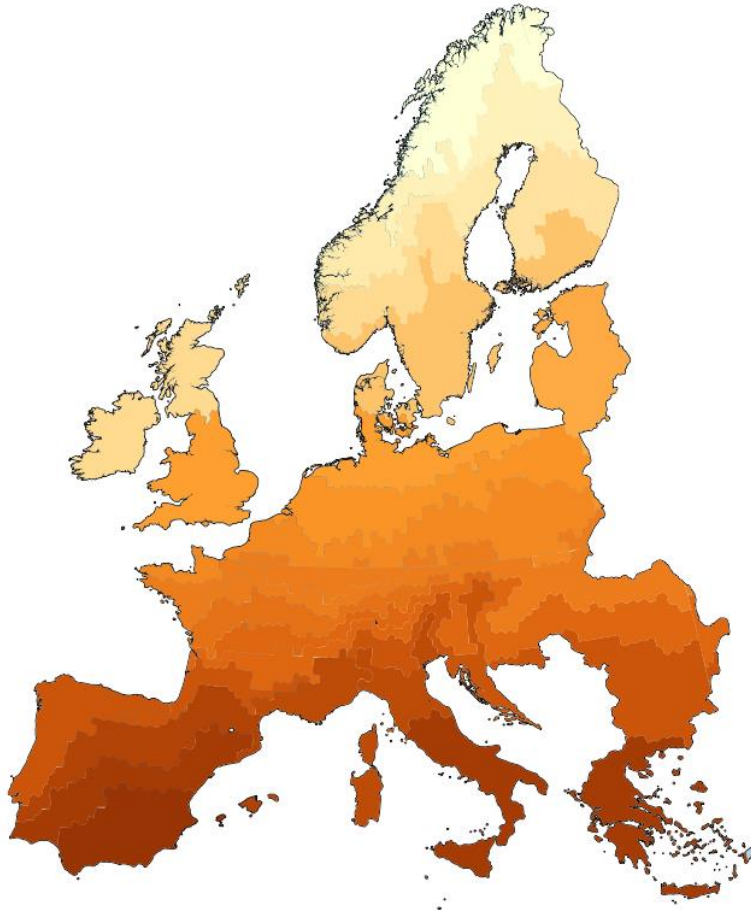


Solar PV potential for Upper Bavaria, using low-resolution MERRA-2 data

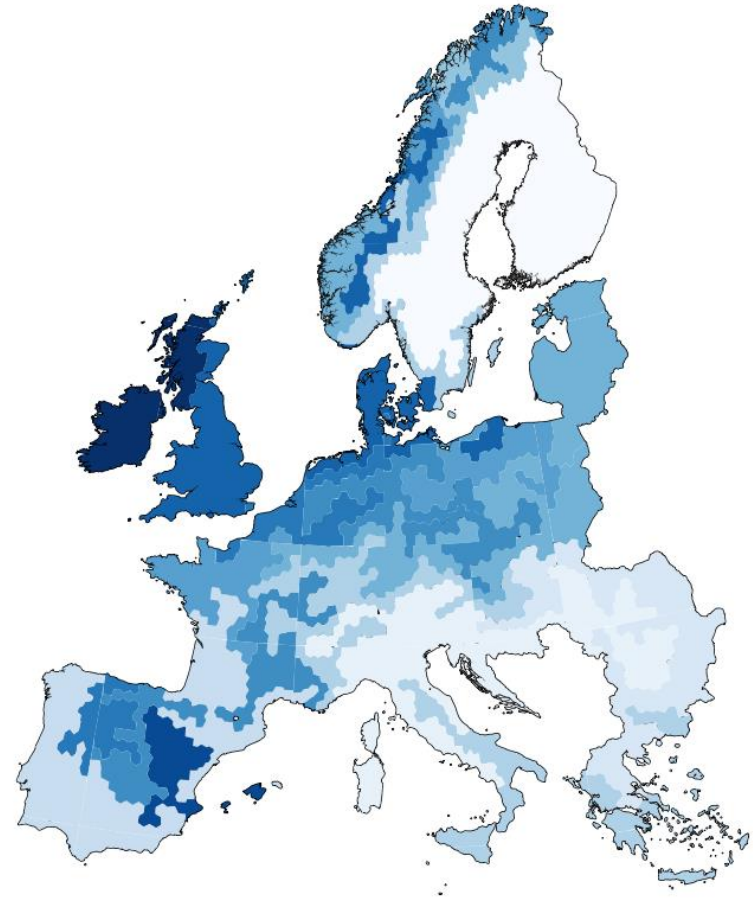
What existing models can do



What existing models cannot do

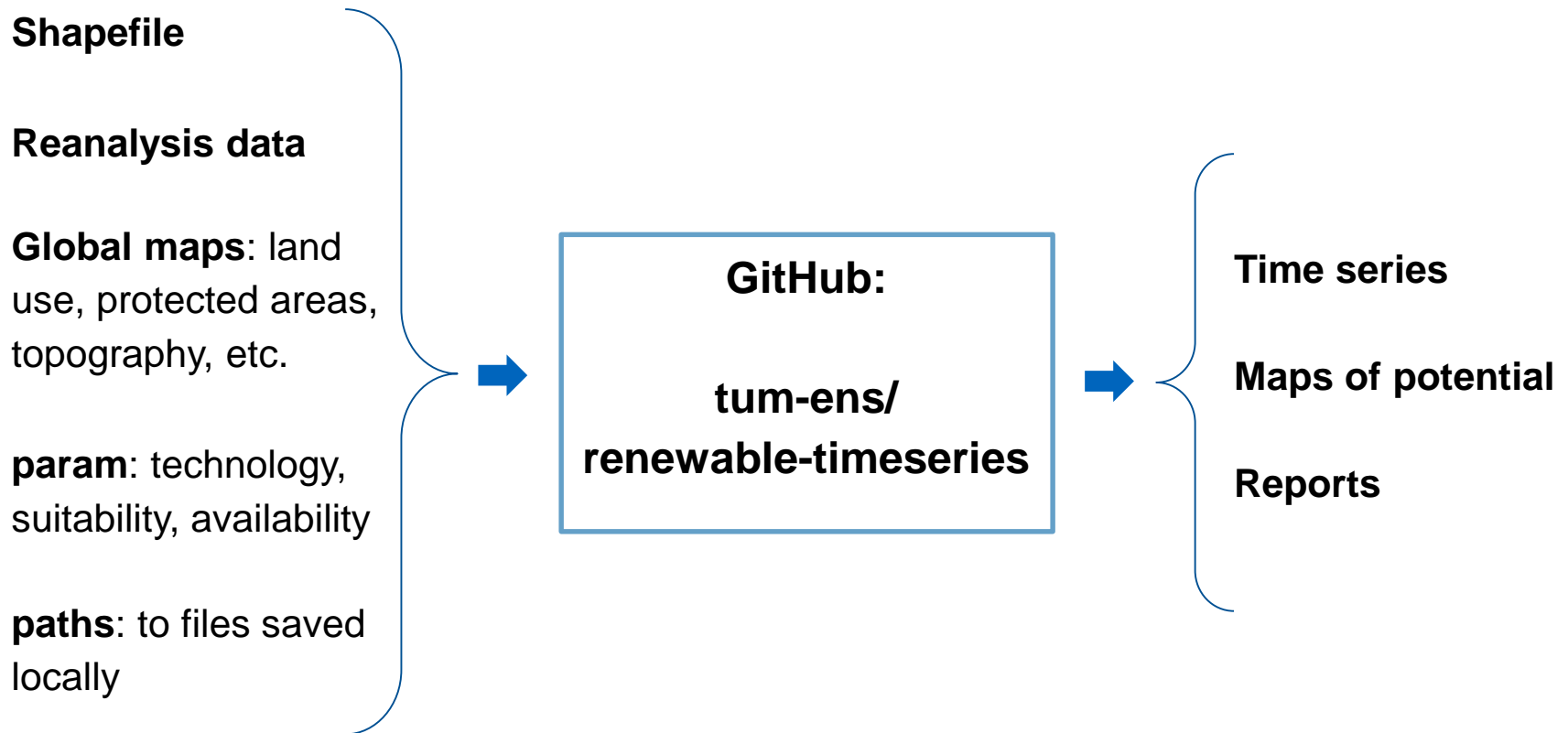


Regions with homogeneous solar PV potentials within Europe



Regions with homogeneous wind potentials within Europe

How the tool works



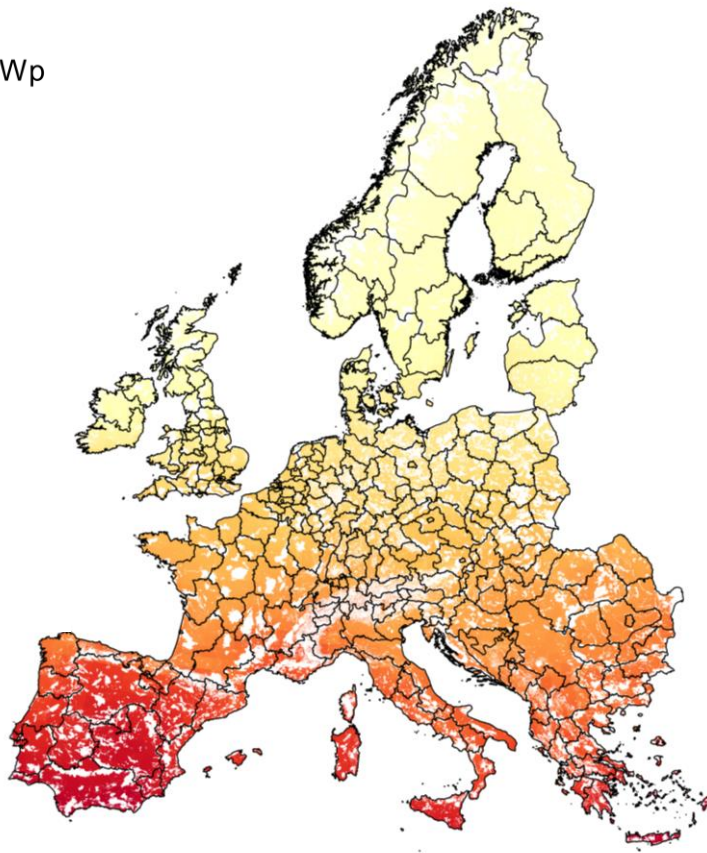
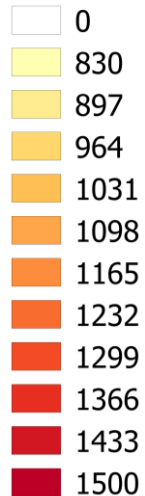
How the tool works

```
if __name__ == '__main__':
    paths, param = initialization()
    generate_weather_files(paths)
    generate_landsea(paths, param) # Land and Sea
    generate_landuse(paths, param) # Landuse
    generate_bathymetry(paths, param) # Bathymetry
    generate_topography(paths, param) # Topography
    generate_slope(paths, param) # Slope
    generate_population(paths, param) # Population
    generate_protected_areas(paths, param) # Protected areas
    generate_buffered_population(paths, param) # Buffered Population
    generate_wind_correction(paths, param) # Correction factors for wind speeds
    for tech in param["technology"]:
        calculate_FLH(paths, param, tech)
        masking(paths, param, tech)
        weighting(paths, param, tech)
        reporting(paths, param, tech)
        find_locations_quantiles(paths, param, tech)
        generate_time_series(paths, param, tech)
```

How the results look like

Legend

FLH in kWh/kWp



PV potential of Europe

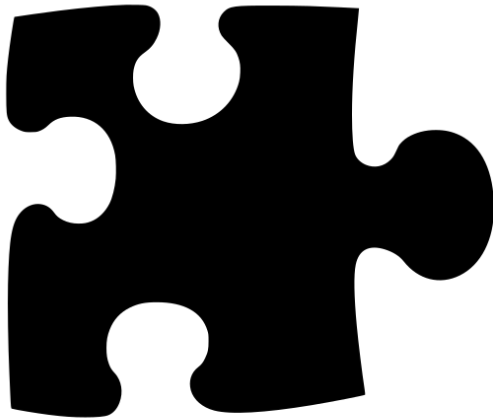
Parameter

Value

Available_Area_km2	15431
FLH_Mean_MW	1756
FLH_Median_MW	1818
FLH_Max_MW	4260
FLH_Min_MW	41
FLH_Mean_Masked_MW	1831
FLH_Median_Masked_MW	1856
FLH_Max_Masked_MW	4260
FLH_Min_Masked_MW	120
FLH_Std_Masked_MW	378
Power_Potential_GW	2686
Energy_Potential_TWh	4716
Energy_Potential_Weighted_TWh	210
Energy_Potential_Weighted_Masked_TWh	197

Wind potential of Germany

GitHub:
**tum-ens/
renewable-timeseries**



Modeling:

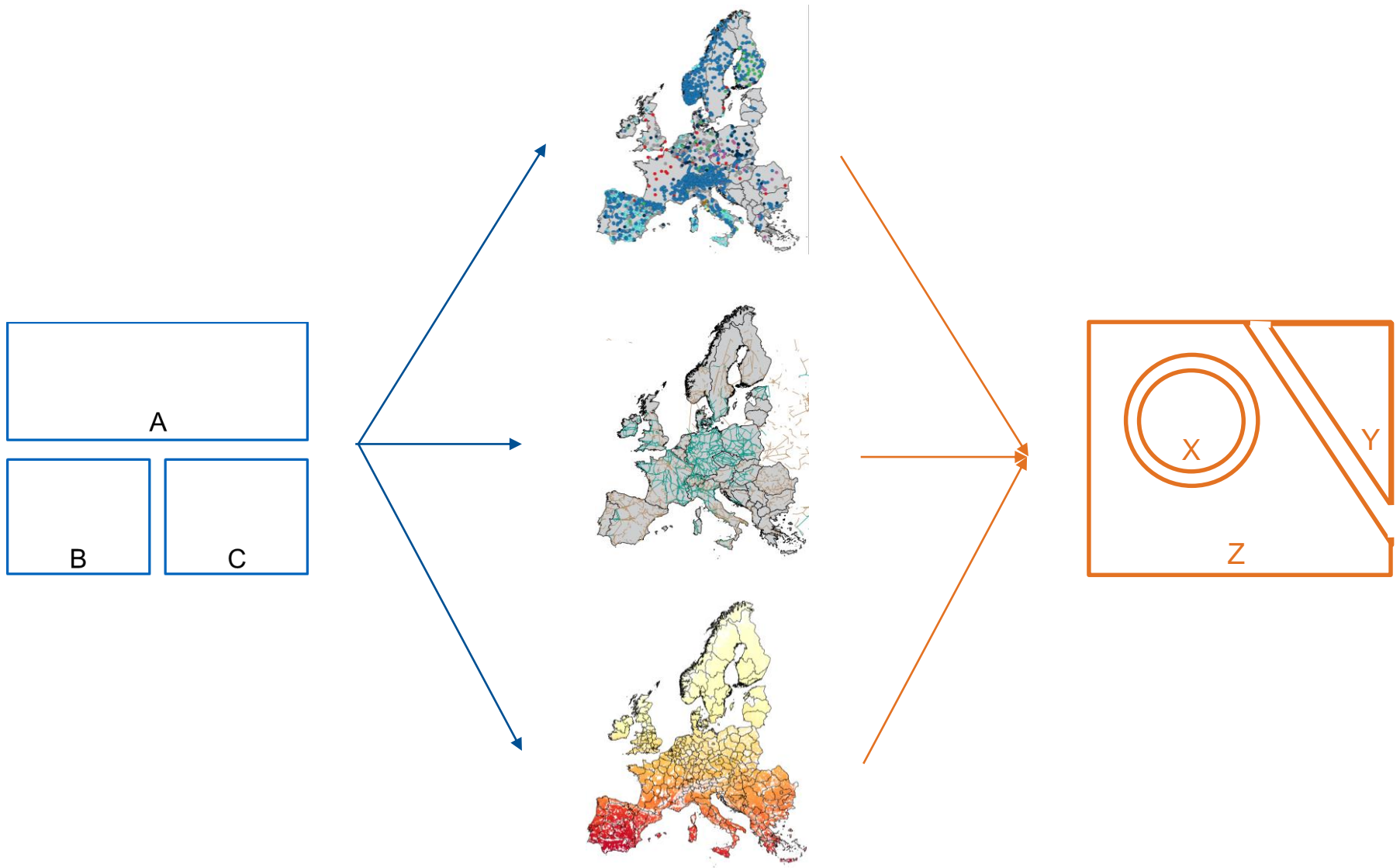
- Generation of time series and potential limits for small regions (cities)
- Generation of time series and potentials for any user-defined regions

Policy/Society:

- Impact of constraints and policy choices on potentials

Back up

The big picture

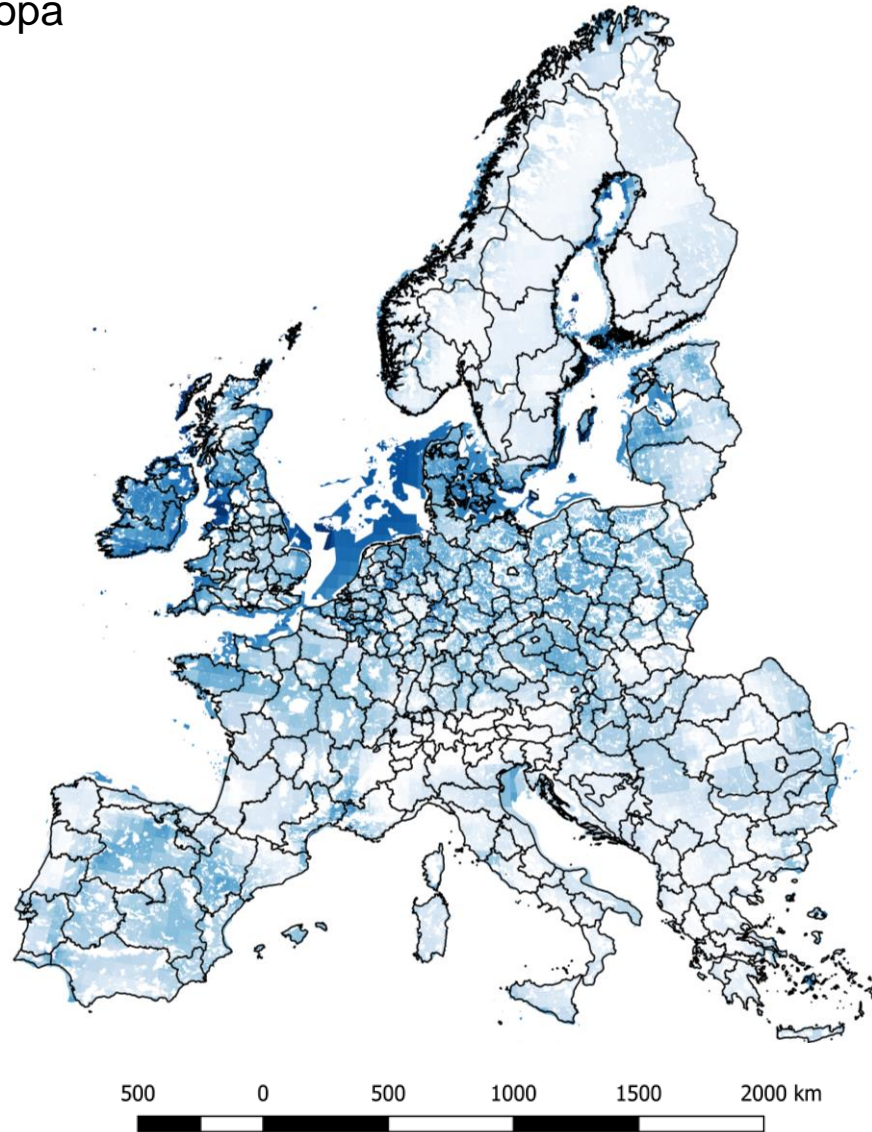
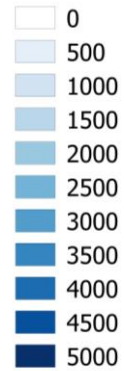


Wetterdaten

Windpotenzial für Europa

Legend

FLH in kWh/kWp



Landnutzungskarte

Legend

Land use types

- Water
- Forest
- Shrubland
- Savanna
- Grassland
- Permanent wetland
- Cropland
- Urban
- Cropland/Natural vegetation
- Snow/Ice
- Barren/Sparsely vegetated

