EEA project
Wind-Energy potential in Europe
2020-2030

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Background

- 2006, EEA published a report on How much bioenergy can Europe produce without harming the environment (work started in 2005)
- Follow-up with similar work on wind energy potential within the EEA Renewable Energy project 2.4.2 (Assess how much renewable energy can be utilised without increasing pressures on the environment)
- Dec 2006, EEA/ ETC ACC technical paper analyzed the results of a questionnaire sent earlier to NFPs and other stakeholders regarding land cover type criteria.

Background (problems)

- Paper could not build consensus on common environmental criteria in the form of maximum fractions of land cover types (CORINE land classification).
- Publication of Commission guidelines on Wind Energy and Nature Conservation delayed on similar consensus type obstacles.
- Problems with getting data of actual output of existing wind farms in wind-energy advanced countries approaching on-shore “saturation” (e.g. Germany, Spain) to calibrate models.

Background (some value)

- Work in 2007 resulted in some value offering significant insights:
  - Draft technical paper exhibiting the results to be send to experts by mid December 2007
  - Expert meeting by second half of January 2008
  - Final technical paper by mid February 2008

Current Objectives:

1. Estimate and map the distribution of the wind energy potential in Europe per country and CORINE land cover type, including offshore.
2. Provide an estimate of the wind energy potential in designated natural areas and NATURA 2000 areas.
3. Identify best practices of how the wind energy potential can be realized without causing (undue) pressures on the environment.

Objectives (continued)

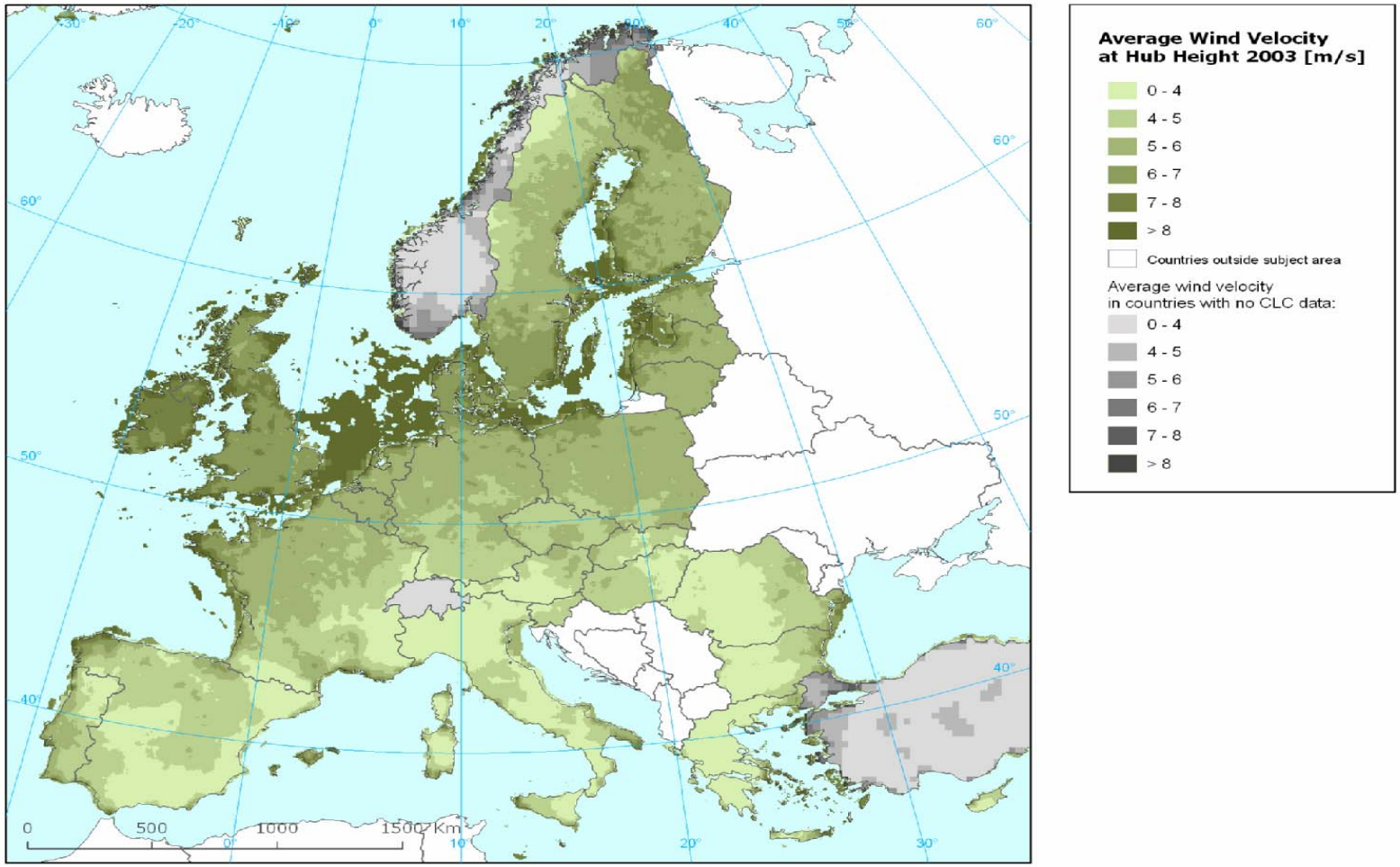
4. Identify any knowledge/ information gaps for further work, which could significantly support climate change and wind-energy / renewables policy making.

Some preliminary results:

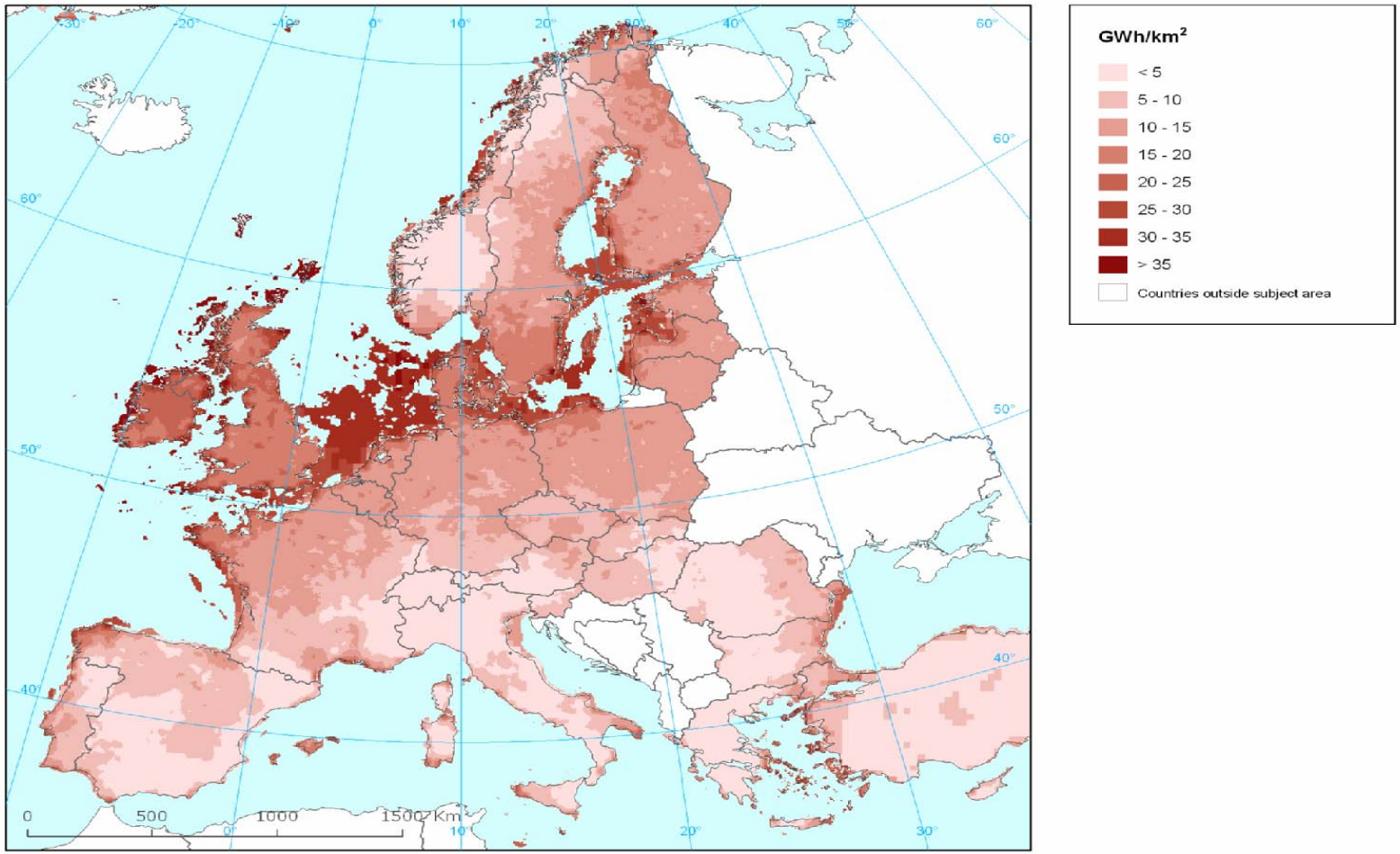
- Theoretical wind potential per country (using wind data from the European Centre of Medium-range Weather Forecasts)
- Map average wind speed at hub height (80m onshore, 100m offshore)
- Map wind energy density (GW-h/ km^2)
- Map load hours
- Map cost per KW-h

		TWh		Onshore		Offshore		Combined Onshore (> 2000 hrs), Offshore 10-50km	25% electricity, % suitable area required	
	Electricity consumption			% electricity windpower		< 50 m depth, >2500 hrs				
	2000	2020	2030	>150 hrs	>2000 hrs	10-50km	economic zone		Combined scenario	max available
Latvia	4	8	10	2552%	1112%	15002%	23361%	16114%	0.2%	0.1%
Estonia	9	12	12	1774%	1149%	11913%	22548%	13062%	0.2%	0.1%
Ireland	24	38	40	4389%	4389%	8459%	15712%	12848%	0.2%	0.1%
Denmark	36	44	50	1846%	1457%	9387%	32163%	10844%	0.2%	0.1%
Finland	70	91	96	435%	238%	4242%	7015%	4480%	0.6%	0.3%
Sweden	146	171	178	542%	323%	2329%	4294%	2652%	0.9%	0.5%
United Kingdom	372	517	591	903%	709%	1674%	3660%	2383%	1.0%	0.5%
Netherlands	90	140	157	187%	96%	1824%	3399%	1920%	1.3%	0.7%
Lithuania	11	16	20	182%	88%	1553%	2135%	1640%	2%	1.1%
Norway	142	163	171	0%	0%	1007%	6041%	1007%	2%	0.4%
Poland	143	240	270	110%	50%	648%	838%	698%	4%	2.6%
Greece	53	87	100	369%	296%	371%	1202%	668%	4%	1.6%
Germany	569	644	685	87%	40%	495%	852%	535%	5%	2.7%
France	536	702	751	157%	74%	289%	669%	363%	7%	3.0%
Malta	2	3	4	179%	179%	0%	0%	179%	14%	14%
Cyprus	3	5	7	386%	178%	0%	0%	178%	14%	6%
Spain	223	360	391	103%	63%	77%	181%	140%	18%	9%
Portugal	43	71	85	105%	94%	0%	169%	94%	26%	9%
Belgium	83	103	110	26%	5%	71%	226%	76%	33%	10%
Bulgaria	41	50	56	104%	67%	0%	0%	67%	37%	24%
Romania	52	87	108	68%	47%	0%	194%	47%	53%	10%
Italy	270	363	412	67%	45%	0%	17%	45%	55%	30%
Turkey	125	272	429	0%	0%	1%	32%	1%	2597%	78%
Austria	60	81	90	0%	0%	0%	0%	0%	-	-
Czech Republic	73	92	97	0%	0%	0%	0%	0%	-	-
Hungary	35	53	58	0%	0%	0%	0%	0%	-	-
Luxembourg	0	4	6	0%	0%	0%	0%	0%	-	-
Slovakia	30	46	47	0%	0%	0%	0%	0%	-	-
Slovenia	14	19	18	0%	0%	0%	0%	0%	-	-
Switzerland	66	91	97	0%	0%	0%	0%	0%	-	-
total EU15	**2574**	**3418**	**3740**	**338%**	**248%**	**946%**	**2057%**	**1194%**	**2%**	**1.0%**
EU10	**324**	**495**	**542**	**152%**	**77%**	**912%**	**1413%**	**989%**	**3%**	**1.6%**
EU2	**93**	**137**	**164**	**80%**	**54%**	**0%**	**128%**	**54%**	**46%**	**12%**
EU27	**2990**	**4049**	**4446**	**265%**	**220%**	**907%**	**1908%**	**1127%**	**2%**	**1.1%**
NO,SW,TU	**333**	**525**	**696**	**0%**	**0%**	**247%**	**1500%**	**247%**	**10%**	**1.7%**
All	**3324**	**4575**	**5142**	**306%**	**190%**	**817%**	**1852%**	**1008%**	**2%**	**1.2%**

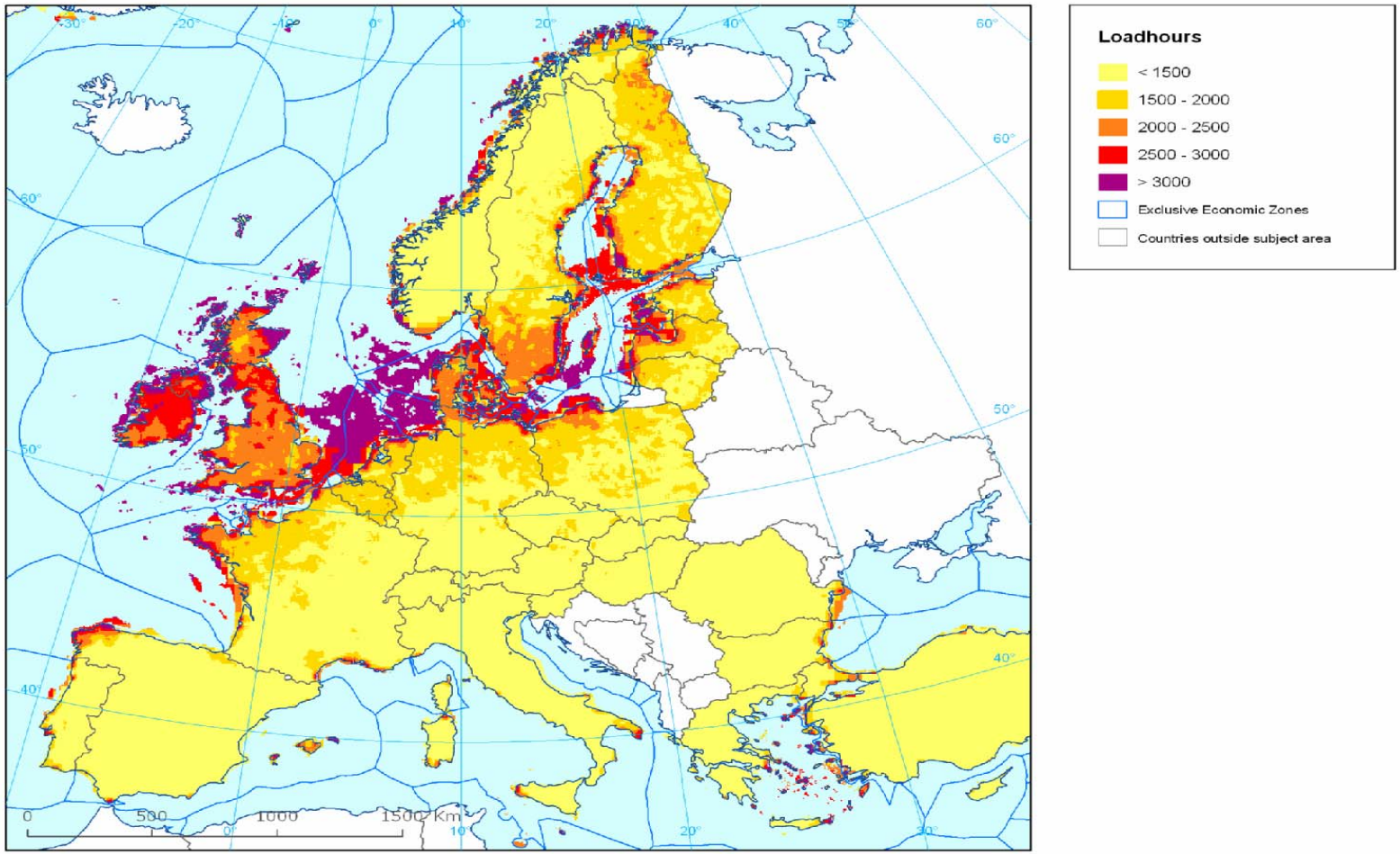
Average wind speed at hub height (m/s)



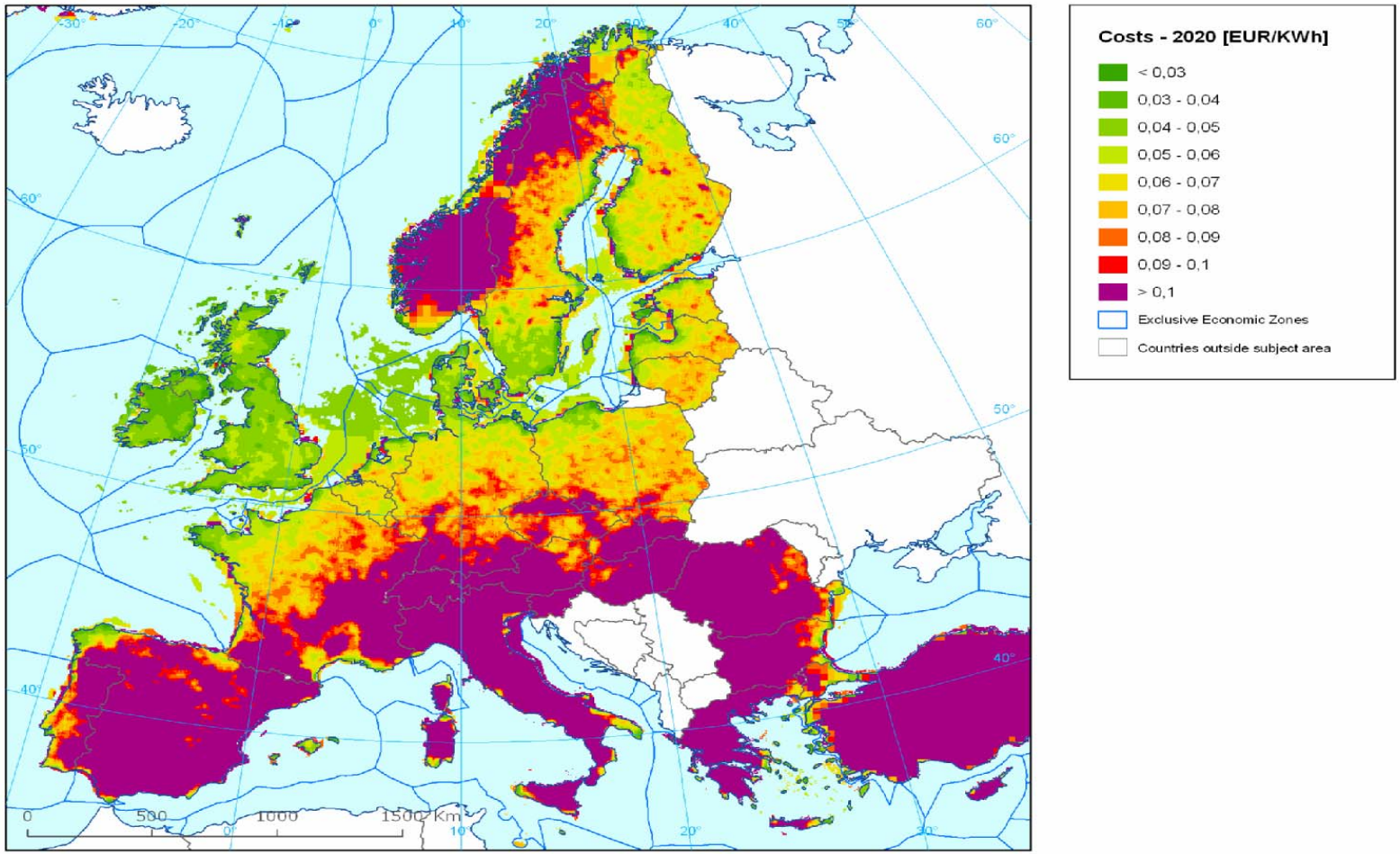
Wind energy density (GW-h/ km^2)



Load hours across Europe (max 365*24=8760 hr)



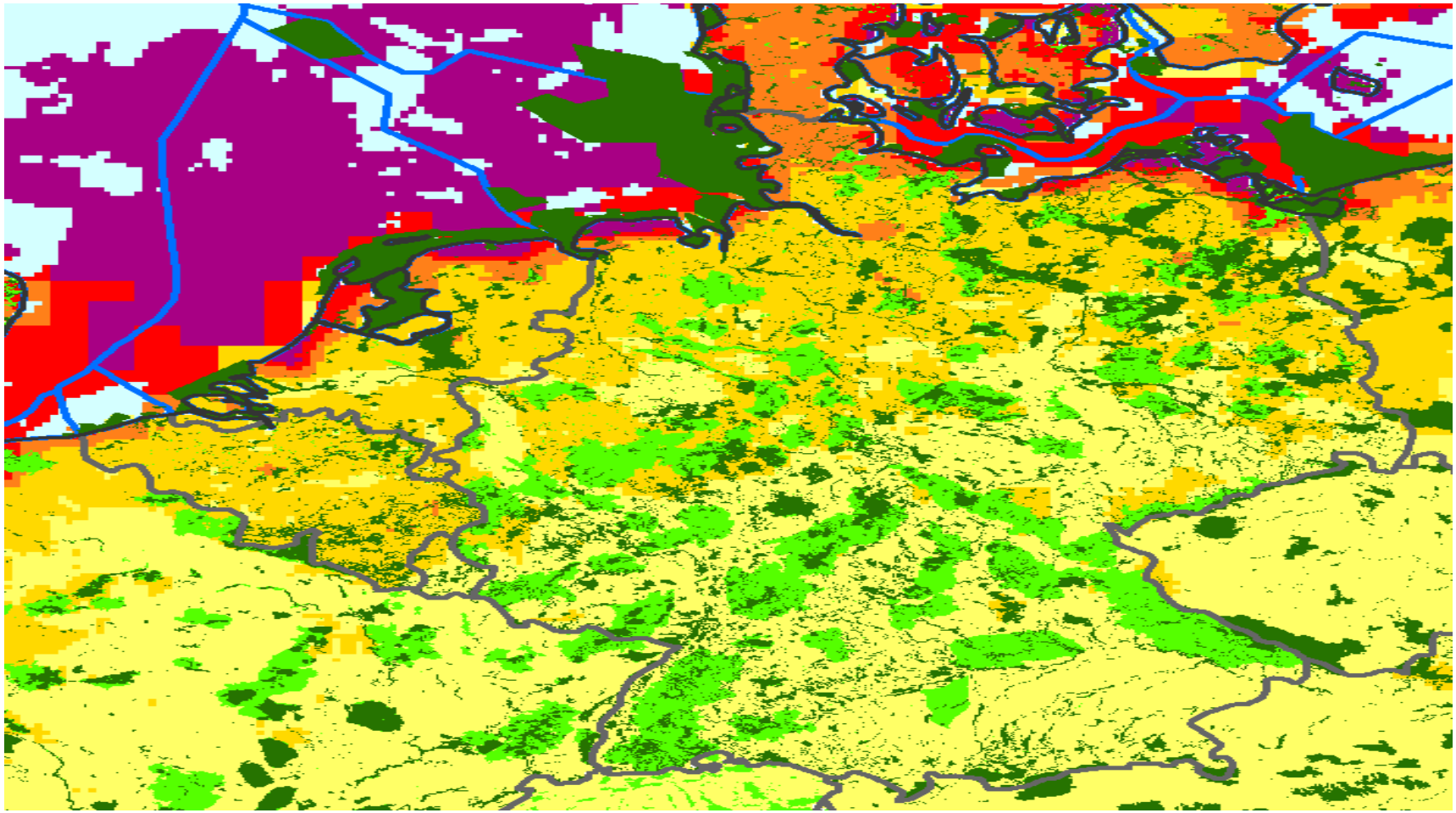
Cost -2020 (€/ KW-h)



Planned additional results:

- Biodiversity constraints
- Social constraints
- Applying implied CORINE land cover saturation constraints from Denmark to Holland.

Overlapping designated natural areas, DE and BENELUX (D.Gr NATURA 2000, L.Gr CDDA)



Conclusions

- Technical paper on wind energy potential will provide significant but not conclusive insight regarding the wind energy potential in the EU.
- The magnitude, cost effectiveness, and distribution of the wind energy potential across member states, justify further work on supporting EU policy towards realizing this potential.

Questions for reflection

- What do you think are the major barriers to the faster deployment of wind energy in your country?
- How do you think the EEA can contribute to the removal or those barriers?
- Which technology do you think will make the greatest contribution to reduce your country's GHG emissions by 2010, 2020, 2030?