



Impacts of climate change on maritime transport: results from the PESETA III and HELIX projects

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The Joint Research Centre of the EC

Providing scientific and technical support to the European Commission for the development, implementation and assessment of EU policies.

Our group

- **Directorate C: Energy, Transport and Climate**
- **Unit C6: Economics of Climate Change, Energy and Transport**
- **Transport group**





The transport group of C6

Covering a wide range topics at EU level including transport modelling, accessibility analysis, congestion, external costs, impact assessment and

impacts of climate change on transport

- **PESETA**

Over the different versions have covered most modes

- **HELIX**

Covering different global warming levels





Maritime transport

80% of world freight is transported by ship

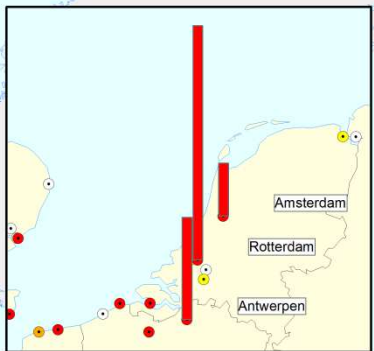
74% of extra-EU trade through ports

37% of the intra-EU freight traffic through ports

385 million passengers in the EU pass by ports

50% growth of cargo handled in EU ports is predicted by 2030





Top 20 cargo ports and other main cargo ports in 2015 on the basis of gross weight of goods handled



Top 20 ports are named and their handling activity shown as bars.



Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat
Cartography: Eurostat — GISCO, 01/2017



Climate change impacts and relevant risks for seaports

Increased intensity of storms:

- **Port closure.**

High precipitation:

- **Flooding and inundated areas.**
- **Damage to storage buildings.**





Climate change impacts and relevant risks for seaports

Increased temperature, heat waves:

- **Adverse impacts on modes linking ports to the hinterland (roads, railways).**

High speed winds:

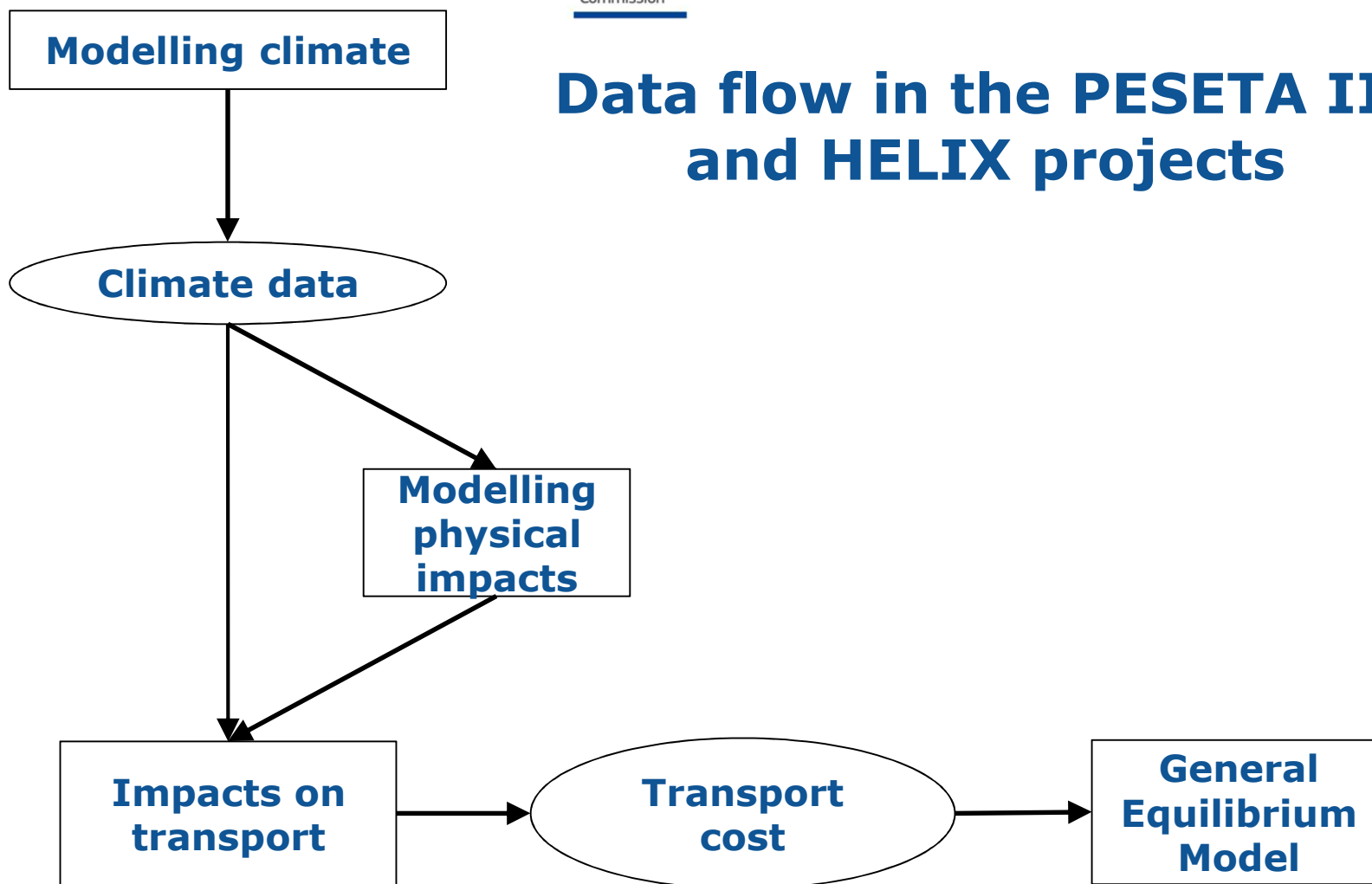
- **Delays to unloading/loading vessels.**

Other:

- **Rise in insurance premiums.**



Data flow in the PESETA III and HELIX projects





PESETA III

Climate resilient Europe

Better informed decision making

Comprehensive approach

- **Sea level rise and extreme weather events affecting seaports**
- **Sea level rise and extreme weather events affecting airports**
- **Floods and droughts affecting inland waterways**

Report on transport: Christodoulou A. and Demirel H. 2017. Impacts of Climate Change on Transport - A focus on airports, seaports and inland waterways. JRC Technical Reports, European Commission.



Seaports in PESETA III

Coastal inundation maps

- **RCP8.5, 2060 & 2100, 100year return period**

Flood hazard maps

- **RCP85, return periods: 10, 20, 50, 100 years**

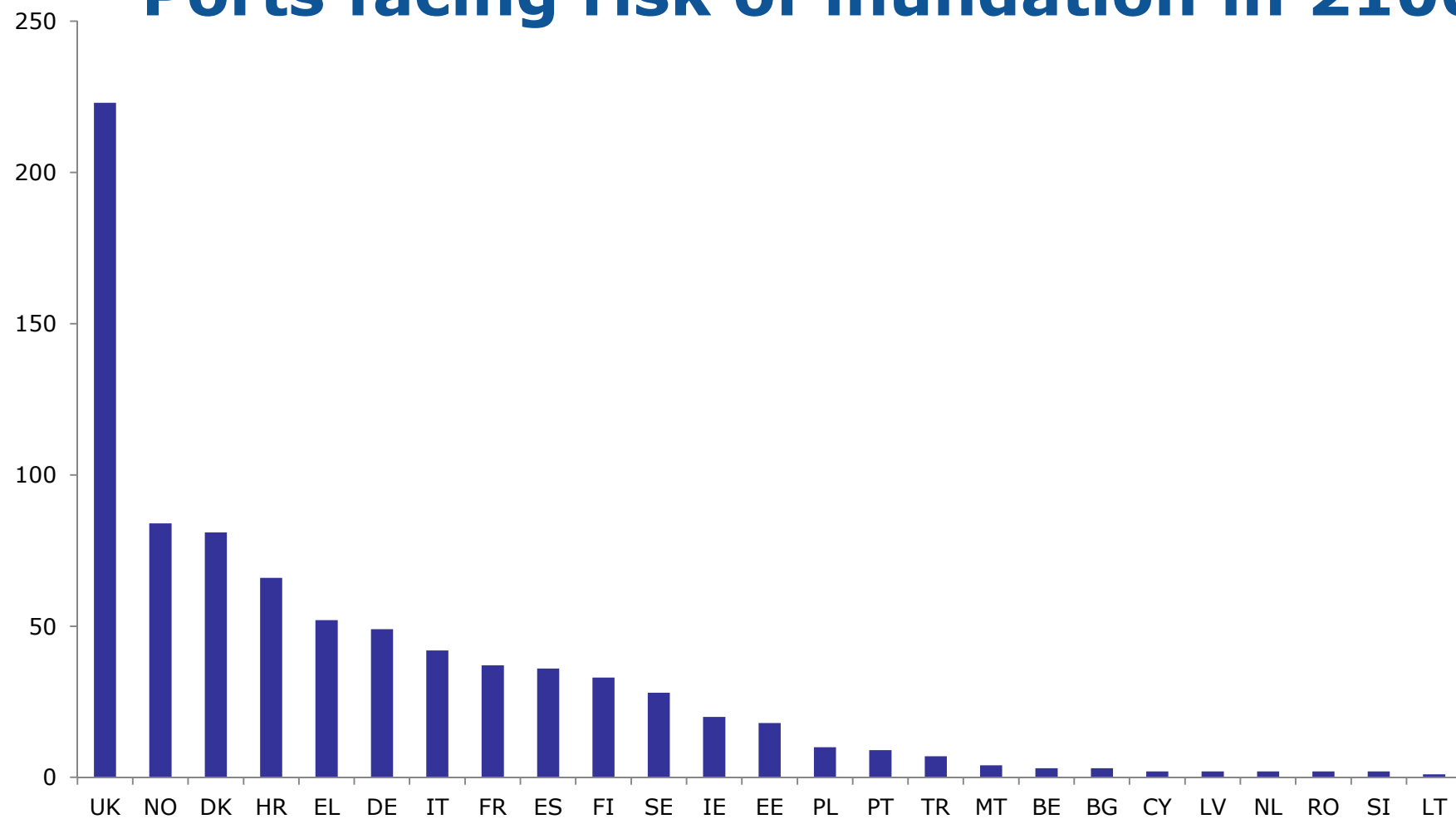
Wind data

- **RCP8.5, 4 regional model runs, wind gusts, up to 2100**

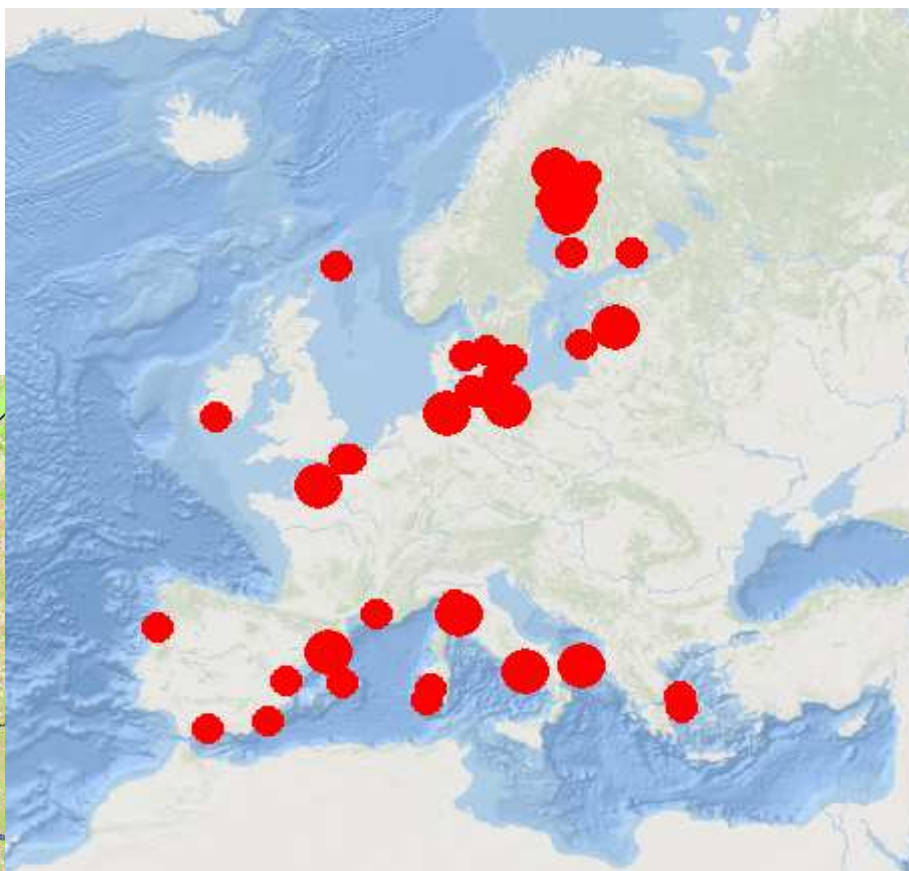
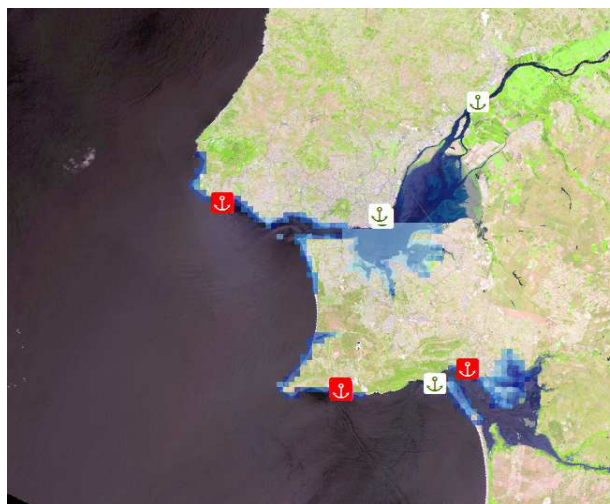


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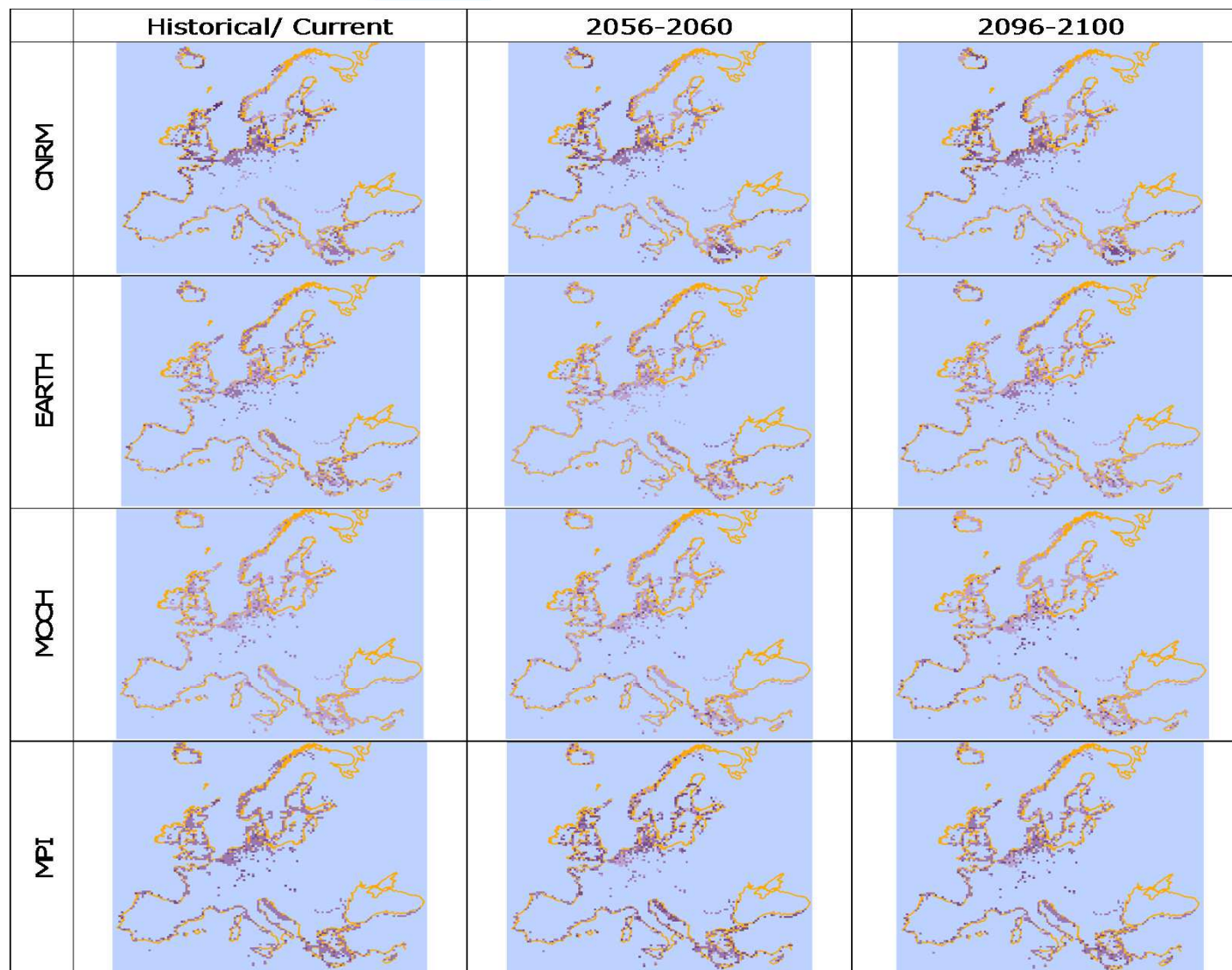
Ports facing risk of inundation in 2100



Inundation in 2100 and increase of storm surge height from 2060 to 2100



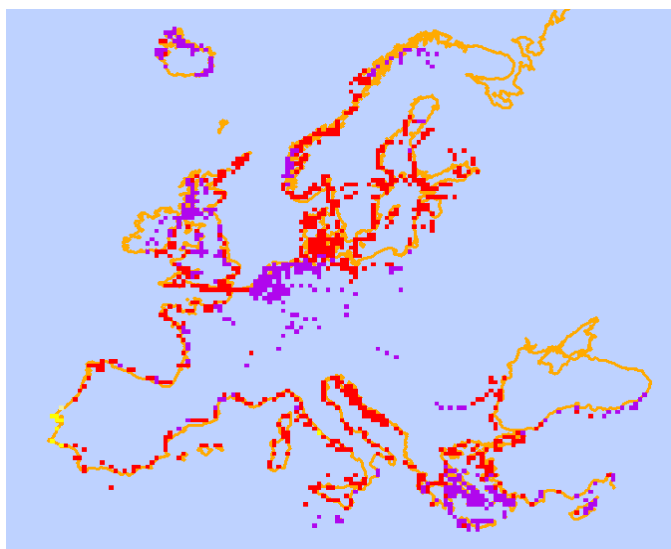
Wind gusts





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Wind gusts



		0-5 m/s	5-10 m/s	10-15 m/s	15-20 m/s	20-25 m/s	25-30 m/s	> 30 m/s
DEWYK	1981	25	368	713	490	184	41	5
	2056	25	372	653	529	199	46	3
	2100	36	375	690	516	162	37	10
DKEBJ	1981	31	355	735	473	183	41	8
	2056	23	376	682	508	183	49	6
	2100	31	379	696	495	169	47	9
EEPRN	1981	43	543	760	363	105	10	2
	2056	39	505	769	388	107	13	6
	2100	56	510	766	390	91	11	2
FRLRH	1981	27	728	704	271	76	13	7
	2056	31	697	670	290	115	21	3
	2100	36	715	647	298	110	16	4
GRJNX	1981	95	593	684	358	80	16	-
	2056	65	571	723	389	72	6	1
	2100	76	577	713	381	73	6	-
LVLPX	1981	31	431	734	420	175	28	7
	2056	15	384	715	471	194	43	5
	2100	37	398	714	472	165	32	8
PTAVE	1981	52	526	665	430	129	16	8
	2056	53	486	704	408	134	36	6
	2100	80	506	655	424	132	27	2
SEMMA	1981	42	495	694	432	143	18	2
	2056	45	462	724	442	128	24	2
	2100	55	496	732	406	110	24	3
SEGOT	1981	36	414	758	445	136	31	6
	2056	40	412	694	449	194	37	1
	2100	46	450	672	467	156	31	4
GBNHV	1981	42	410	718	422	182	46	6
	2056	25	356	709	451	229	46	11
	2100	43	404	645	487	183	52	12



HELIX

Develop scenarios of the world at 4°C global warming, including reaching this level early (2060s) or later (after 2100) and with and without pro-active adaptation planning by society.

Develop 2 scenarios of the world at 6°C by 2100, again with and without pro-active adaptation, and a further two scenarios at 2°C for comparison.



HELIX

Provide additional detail for focus regions of Europe, northern sub-Saharan Africa and South Asia.

Provide reliable assessment of confidence in the different components of these scenarios, based on a comprehensive assessment of uncertainties.

Address the needs of decision-makers, through both its implementation and communication.



Seaports in HELIX

Coastal inundation maps

- **RCP4.5, RCP8.5**
- **Extreme Sea Level**
- **100year return period**
- **2060, 2100**

Ports affected

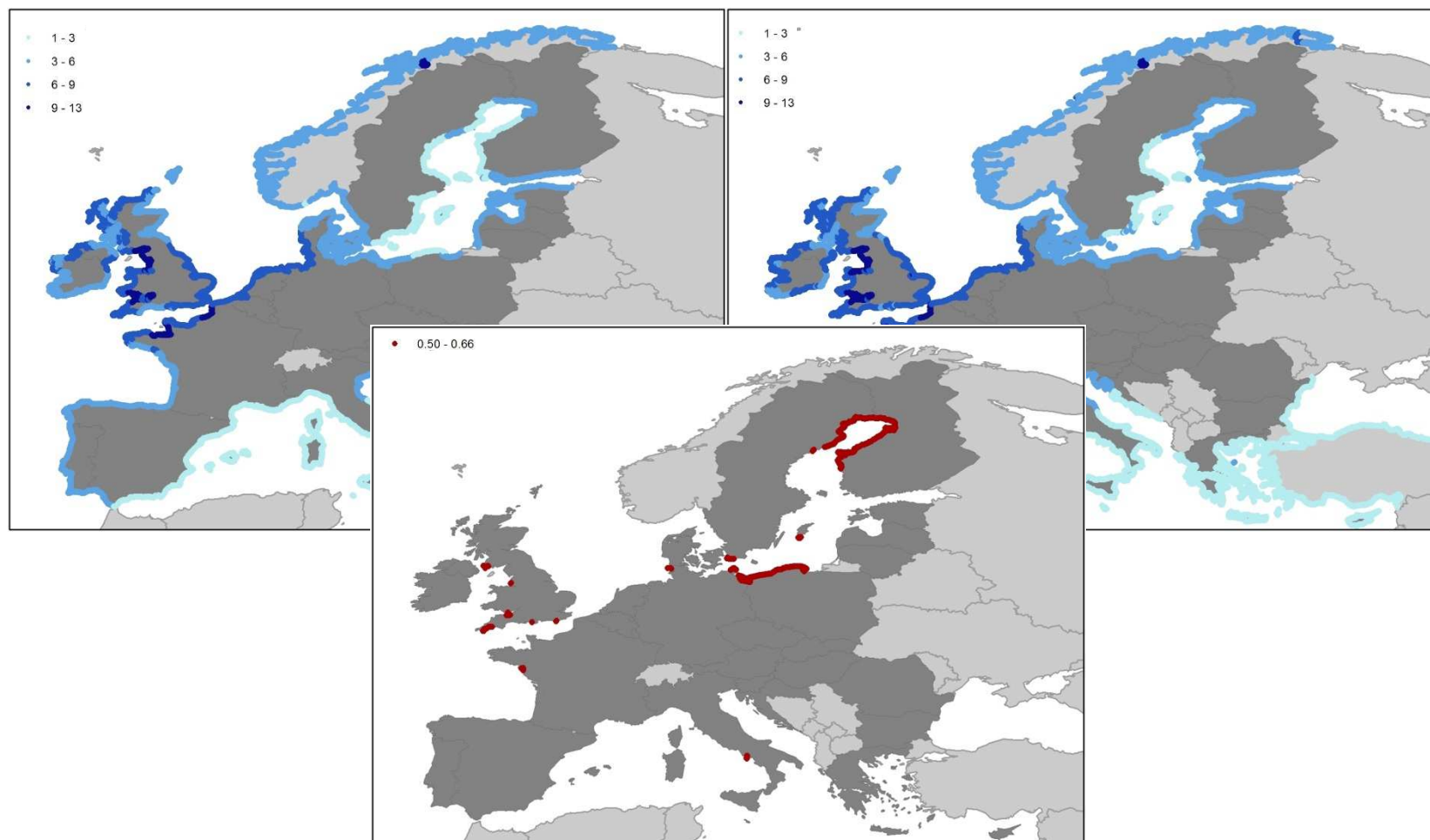
Impacts on hinterland

Impacts on global trade

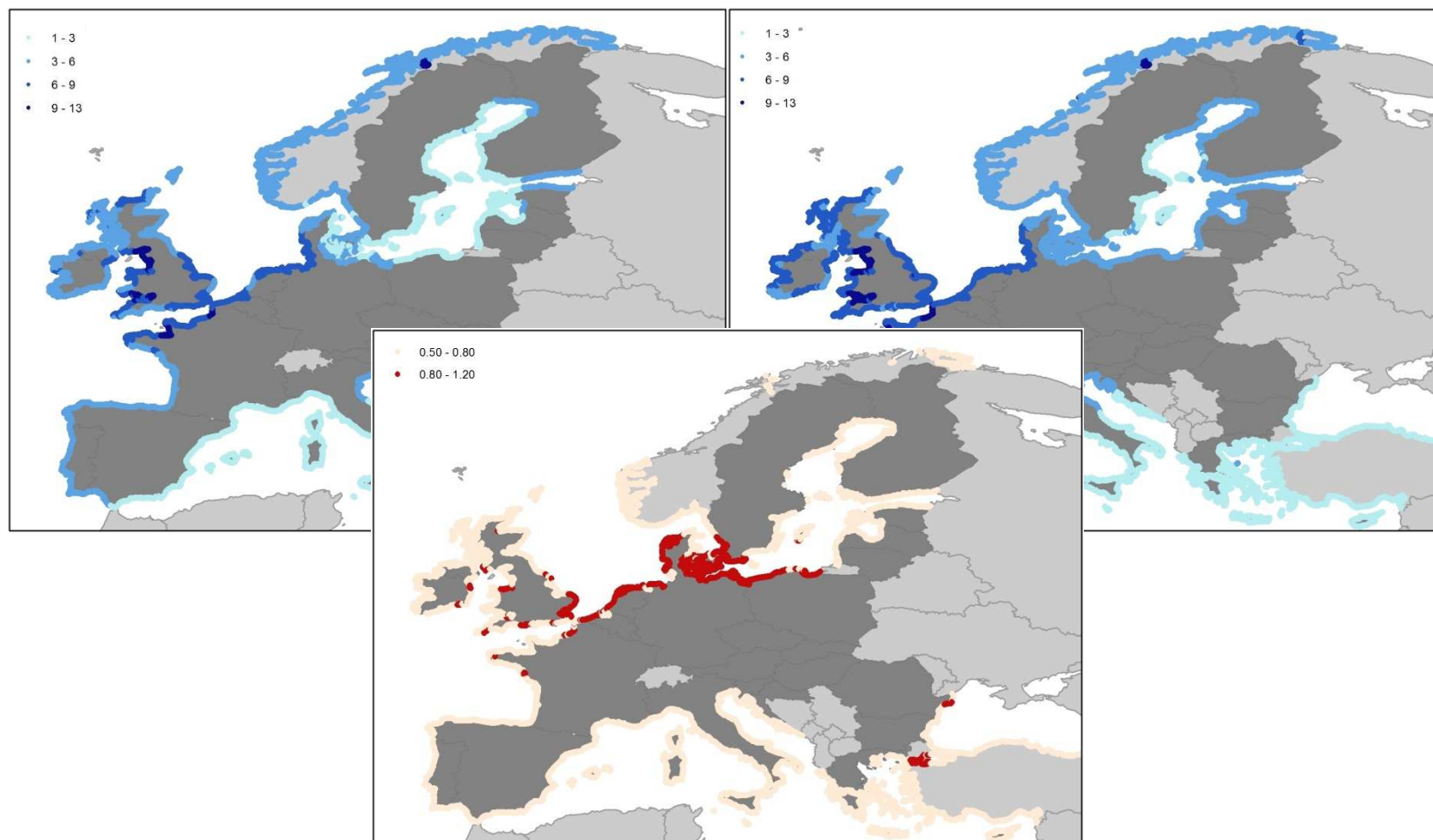
Report on transport: in preparation



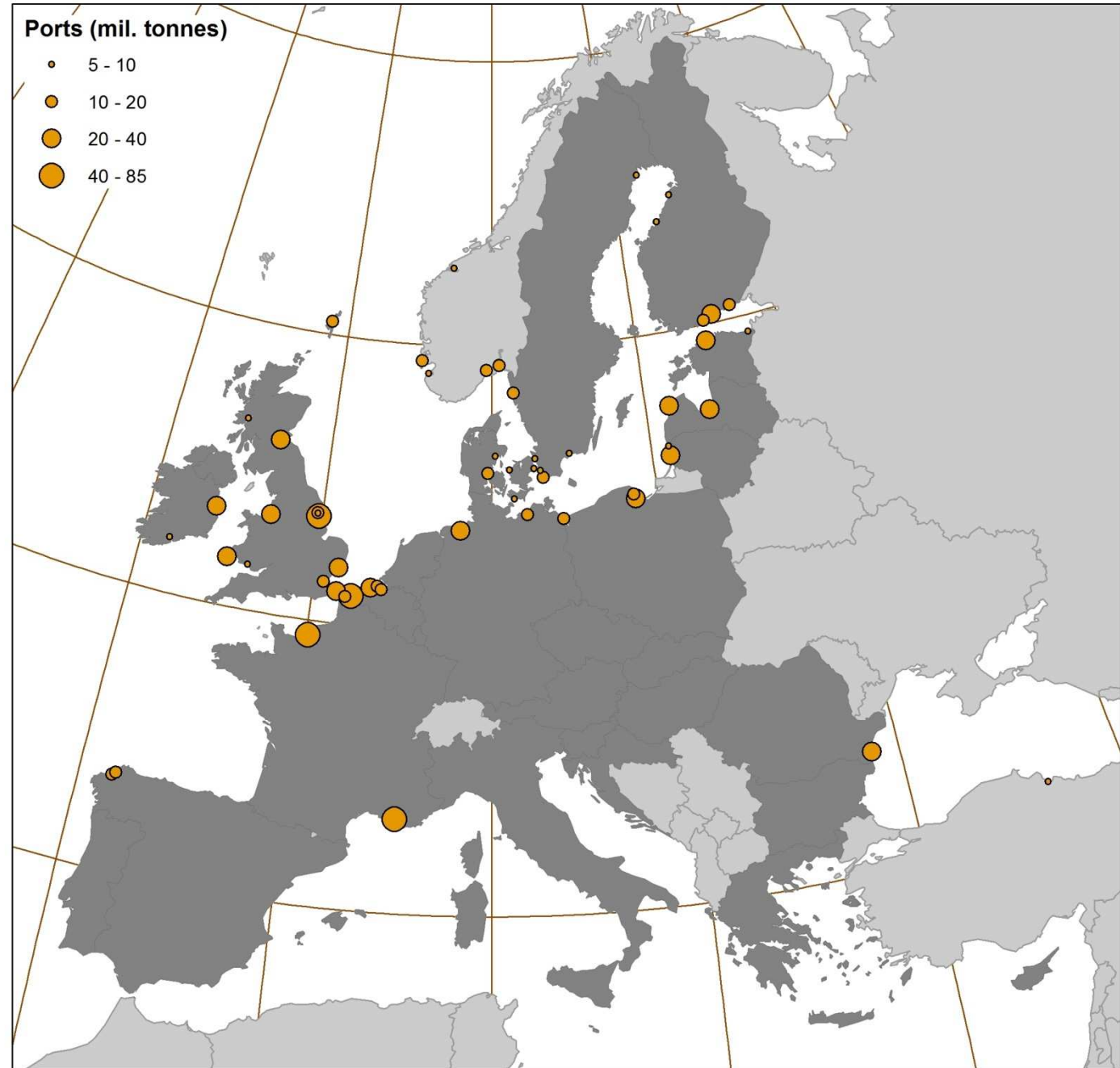
ESL for RCP4.5 & RCP8.5 in 2100



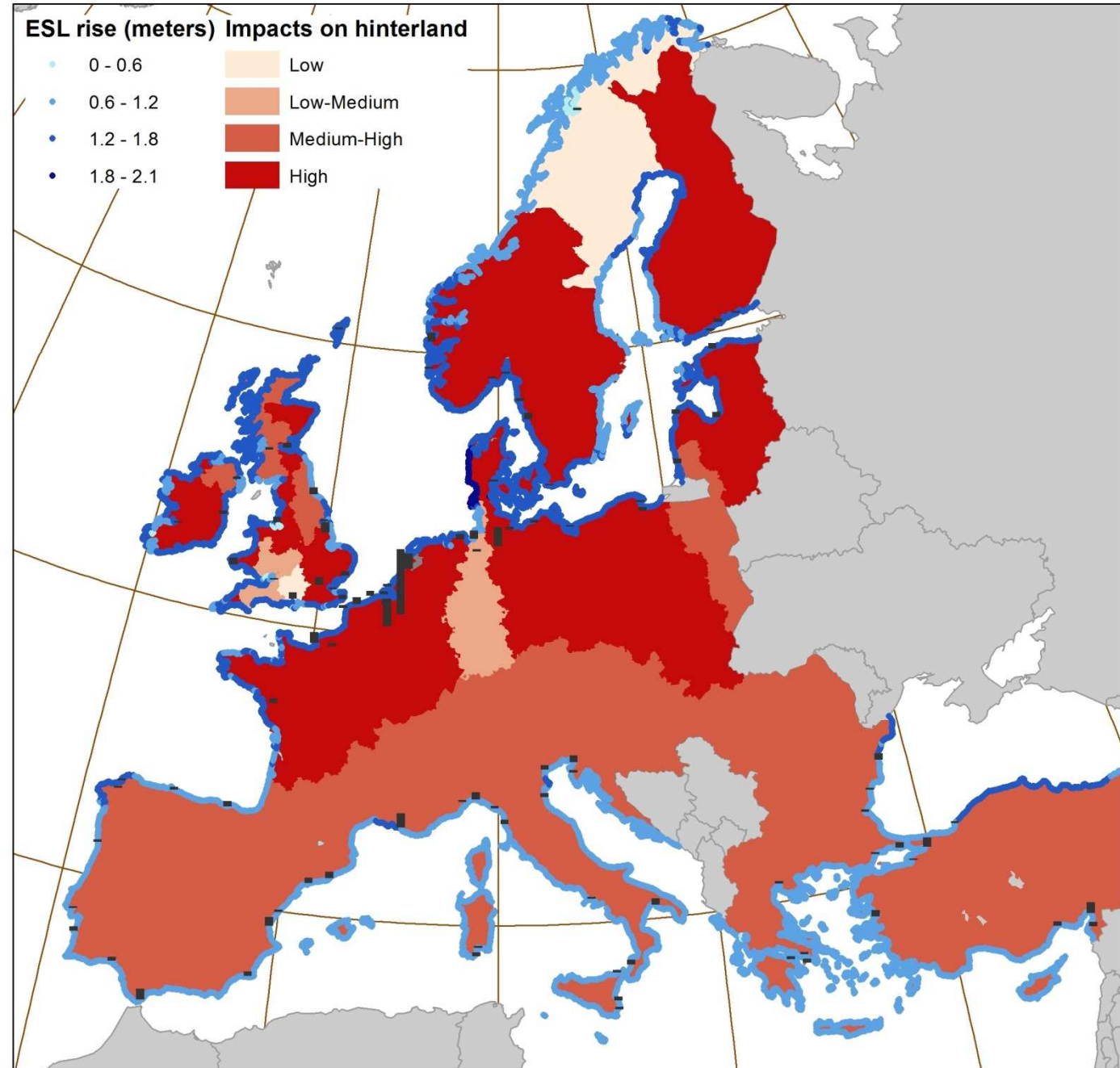
ESL for RCP8.5 in 2060 & 2100



Large ports projected to be exposed to ESL rise larger than 1.2m until 2100



A first indication of projected impacts of ESL rise on hinterland in 2100





Thank you

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