



# **Impacts of Climate Change on Transport - PESETA III**

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**UNECE**

**Aris Christodoulou, JRC – European Commission**

**Panos Christidis, JRC – European Commission**

**Hande Demirel, Istanbul Technical University**



# PESETA project

*Climate resilient Europe*

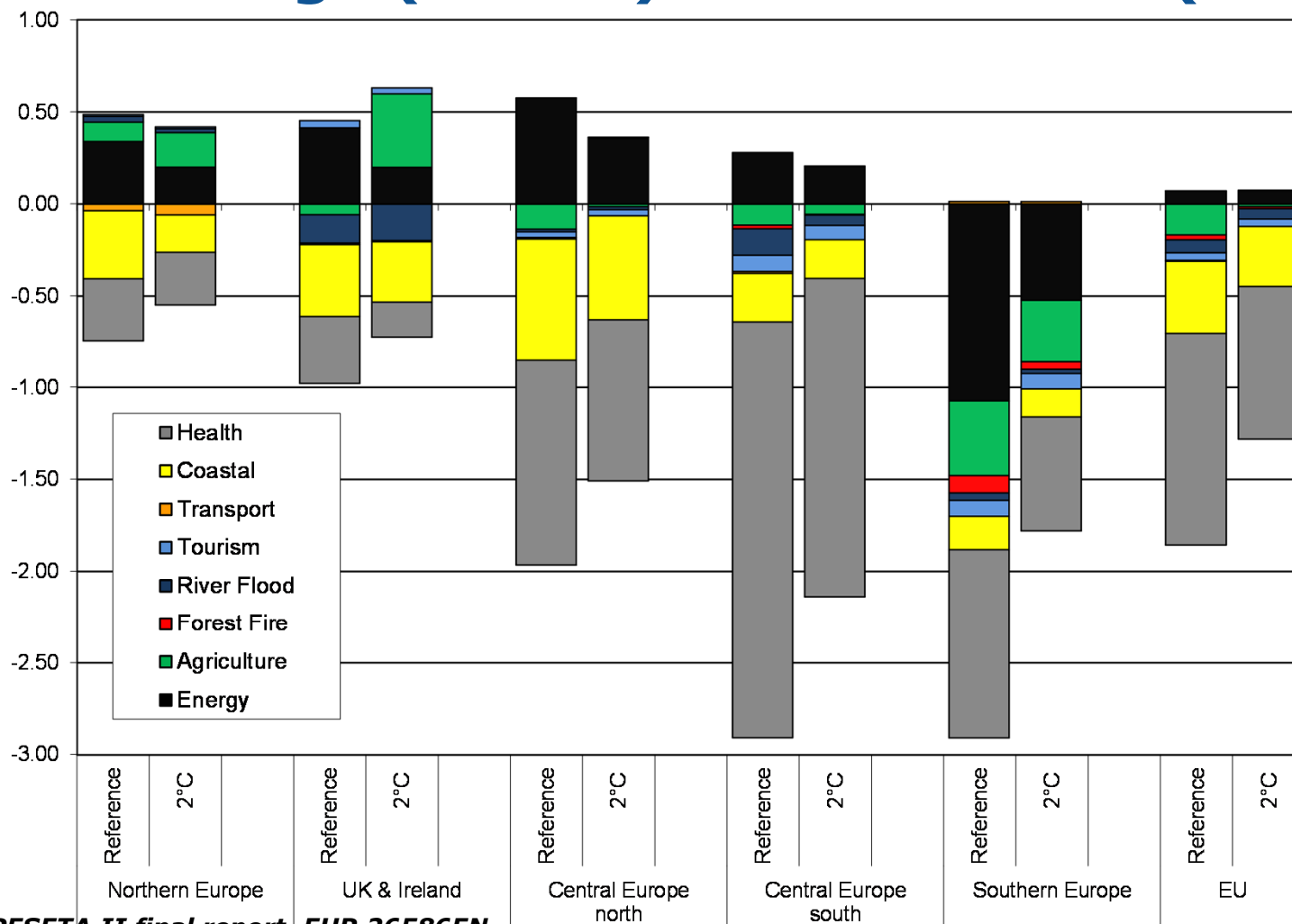
*Better informed decision making*

*Comprehensive approach*

*PESETAII: agriculture, energy, transport  
infrastructure, forest fires, river floods, coastal  
areas, health, droughts and habitat suitability*



## Welfare change (%GDP) – Ref. and 2°C (PESETA II)



Source: PESETA II final report, EUR 26586EN  
(Ciscar et al, 2014)



# Transport in PESETA II

JRC SCIENTIFIC AND POLICY REPORTS

Impacts of Climate Change on Transport:  
A focus on road and rail transport  
infrastructures

Impacts of Climate Change:  
A focus on road and rail  
transport infrastructures

Françoise Nemry, Hande Demirel

2012



Joint  
Research  
Centre

Transportation Research Part A 81 (2015) 62–76



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Contents lists available at [ScienceDirect](http://ScienceDirect)

## Transportation Research Part A

journal homepage: [www.elsevier.com/locate/tra](http://www.elsevier.com/locate/tra)



### A framework to analyze the vulnerability of European road networks due to Sea-Level Rise (SLR) and sea storm surges



Hande Demirel<sup>a,c,\*</sup>, Mert Kompil<sup>b,c</sup>, Françoise Nemry<sup>c</sup>

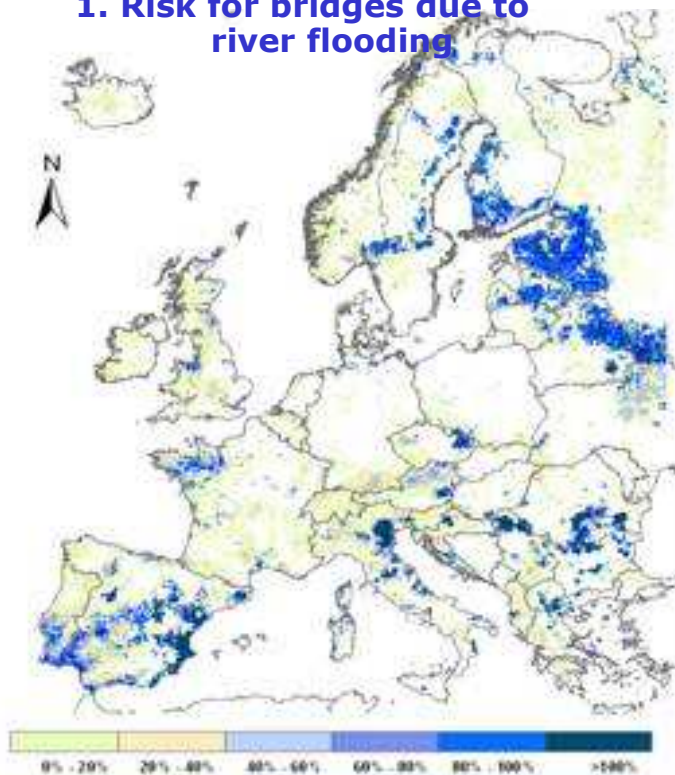
<sup>a</sup> Istanbul Technical University, Faculty of Civil Engineering, Department of Geomatics Engineering, Istanbul, Turkey

<sup>b</sup> European Commission, Joint Research Centre (JRC), Institute for Environment and Sustainability (IES), Ispra, Italy

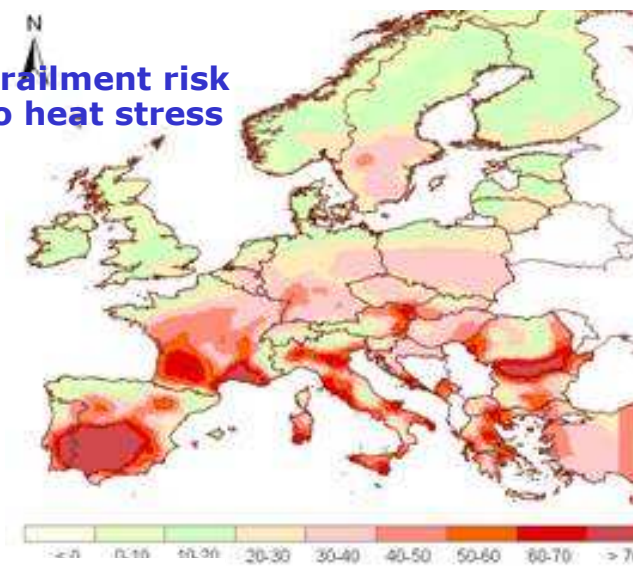
<sup>c</sup> European Commission, Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS), Seville, Spain<sup>1</sup>

# Transport in PESETA II

1. Risk for bridges due to river flooding



2. Rail derailment risk due to heat stress



3. Permanent and episodic inundation risk (1 m Sea level rise)

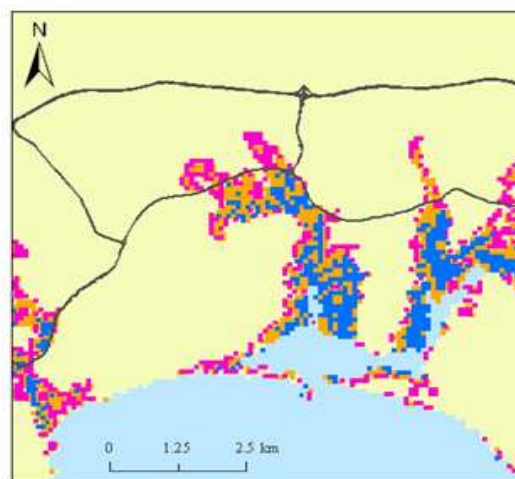


Illustration: One local situation (Portugal)

- 1m SLR plus 100yr sea storm
- 1m SLR
- Baseline

Source: PESETA II transport sector report, EUR 25553EN (Nemry and Demirel, 2012)



## **PESETA III - Impacts considered**

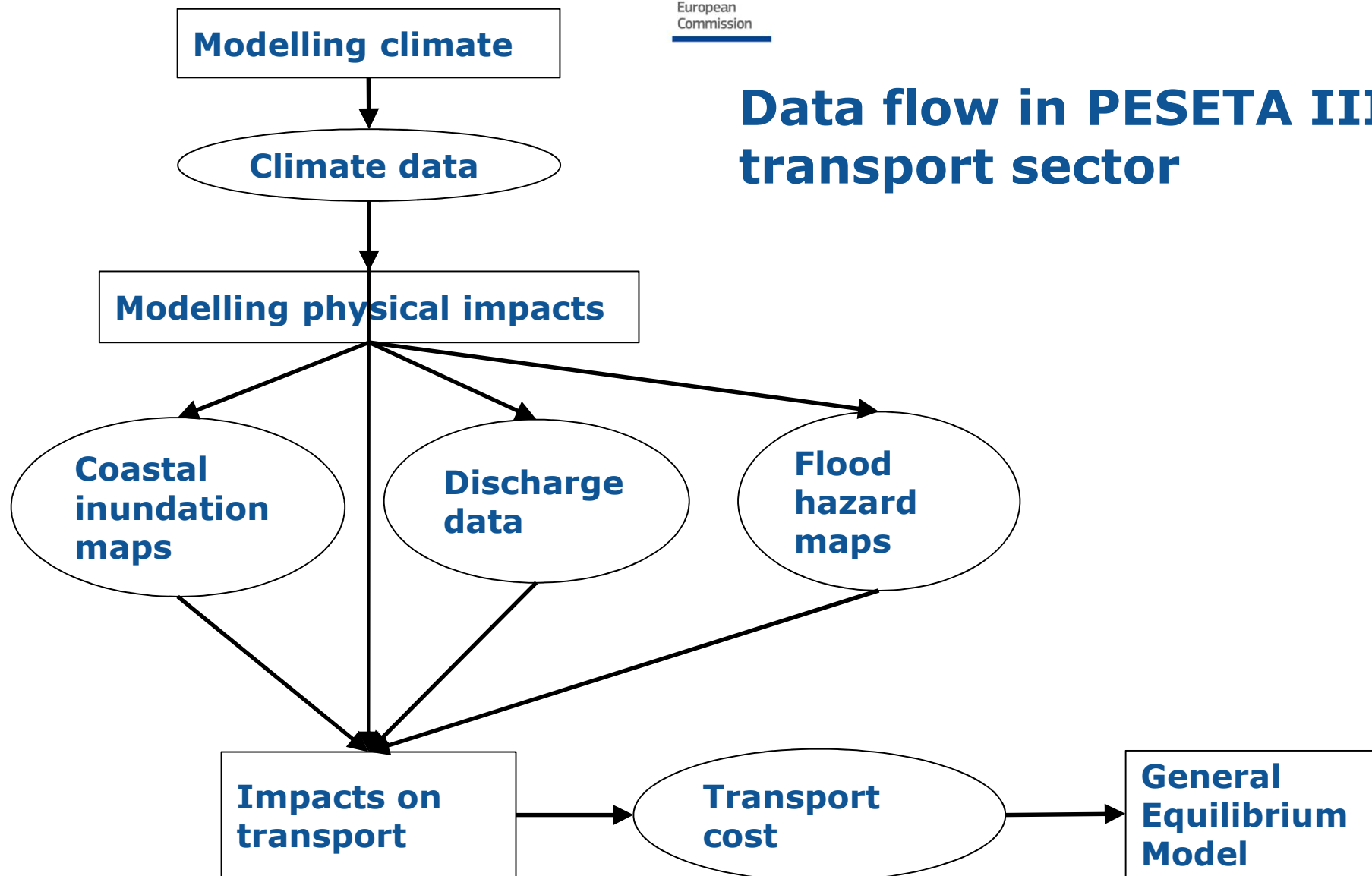
*Sea level rise and extreme weather events  
affecting seaports*

*Sea level rise and extreme weather events  
affecting airports*

*Floods and droughts affecting inland waterways*



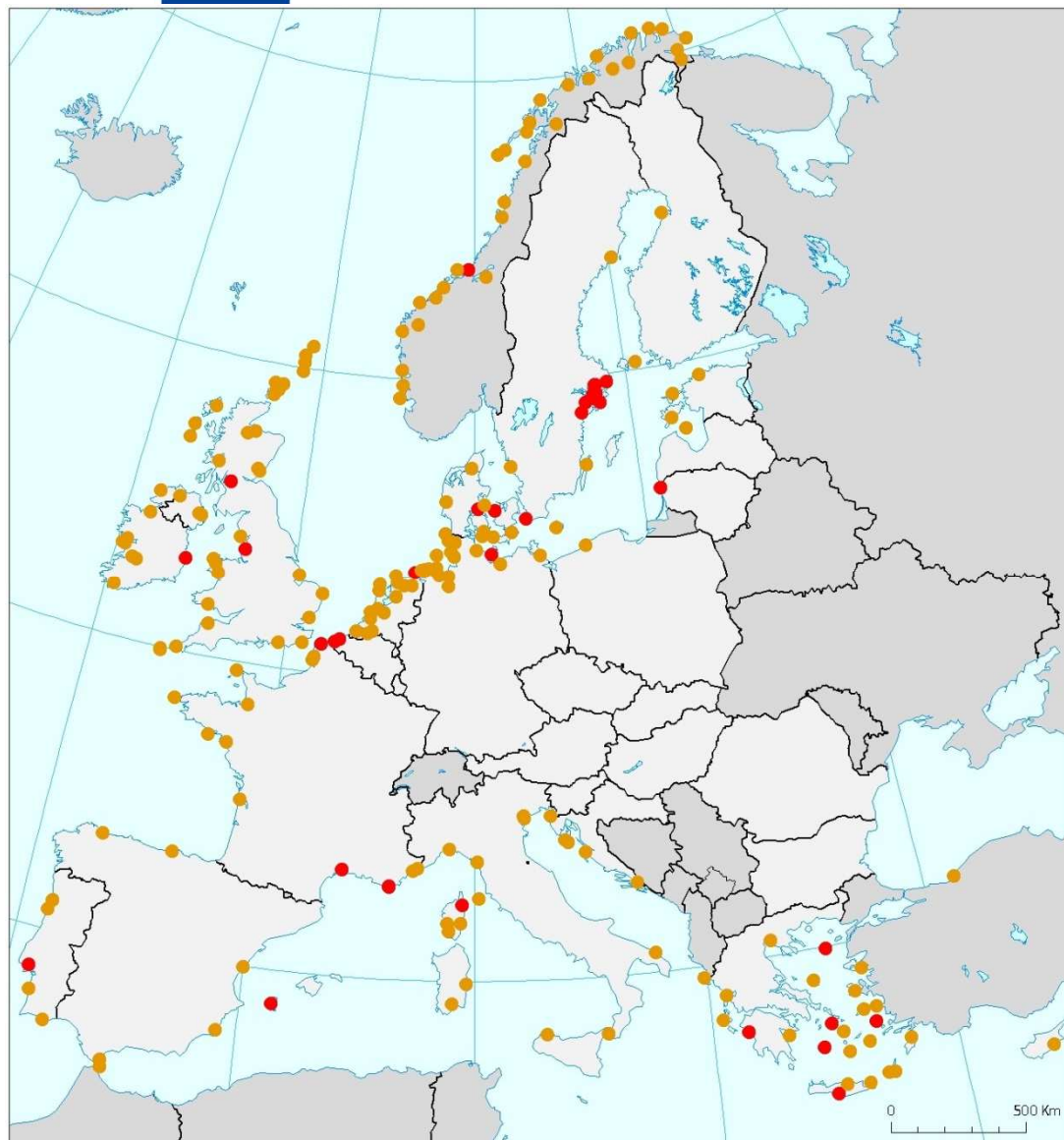
## Data flow in PESETA III: transport sector





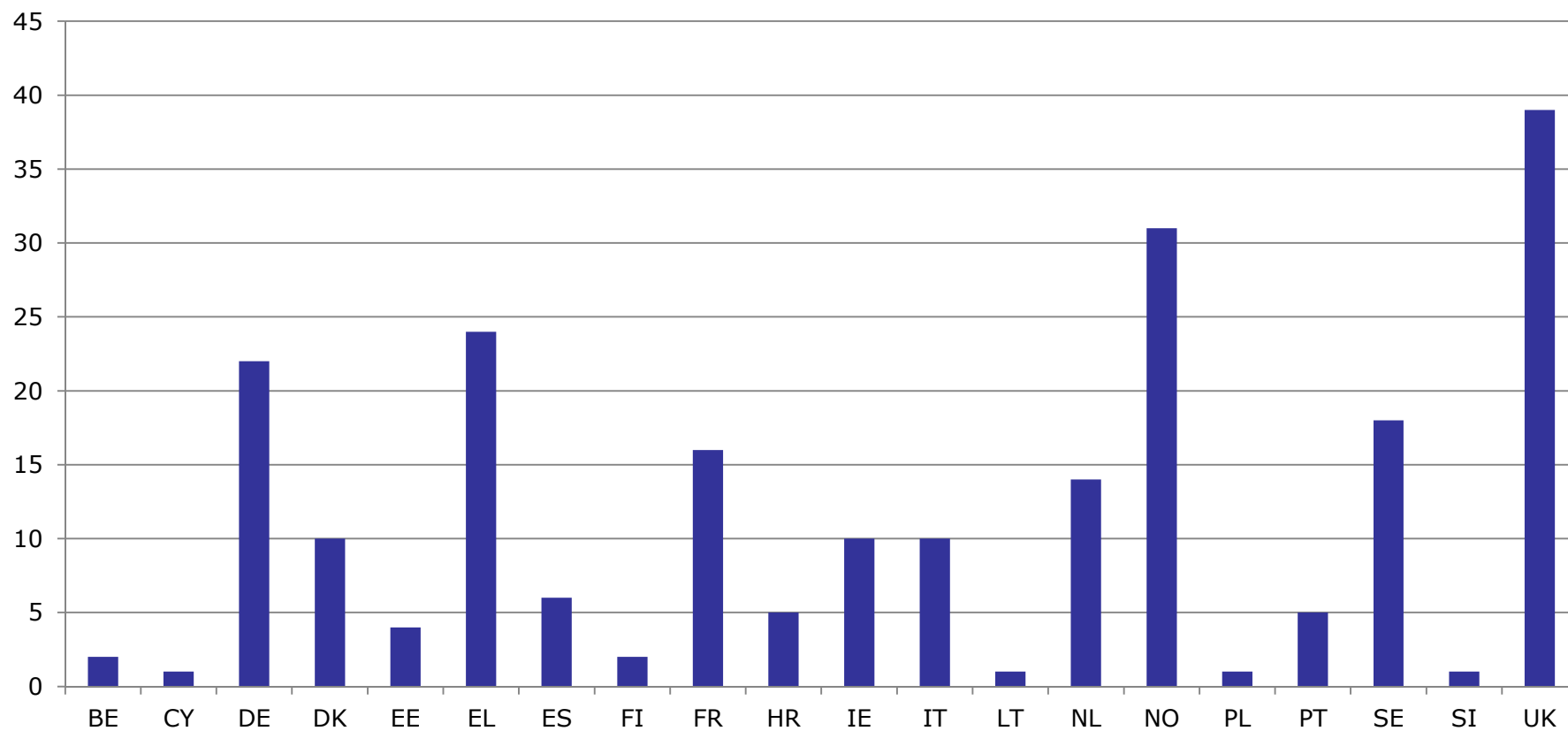
European  
Commission

# Airports under inundation risk in 2060 and 2100

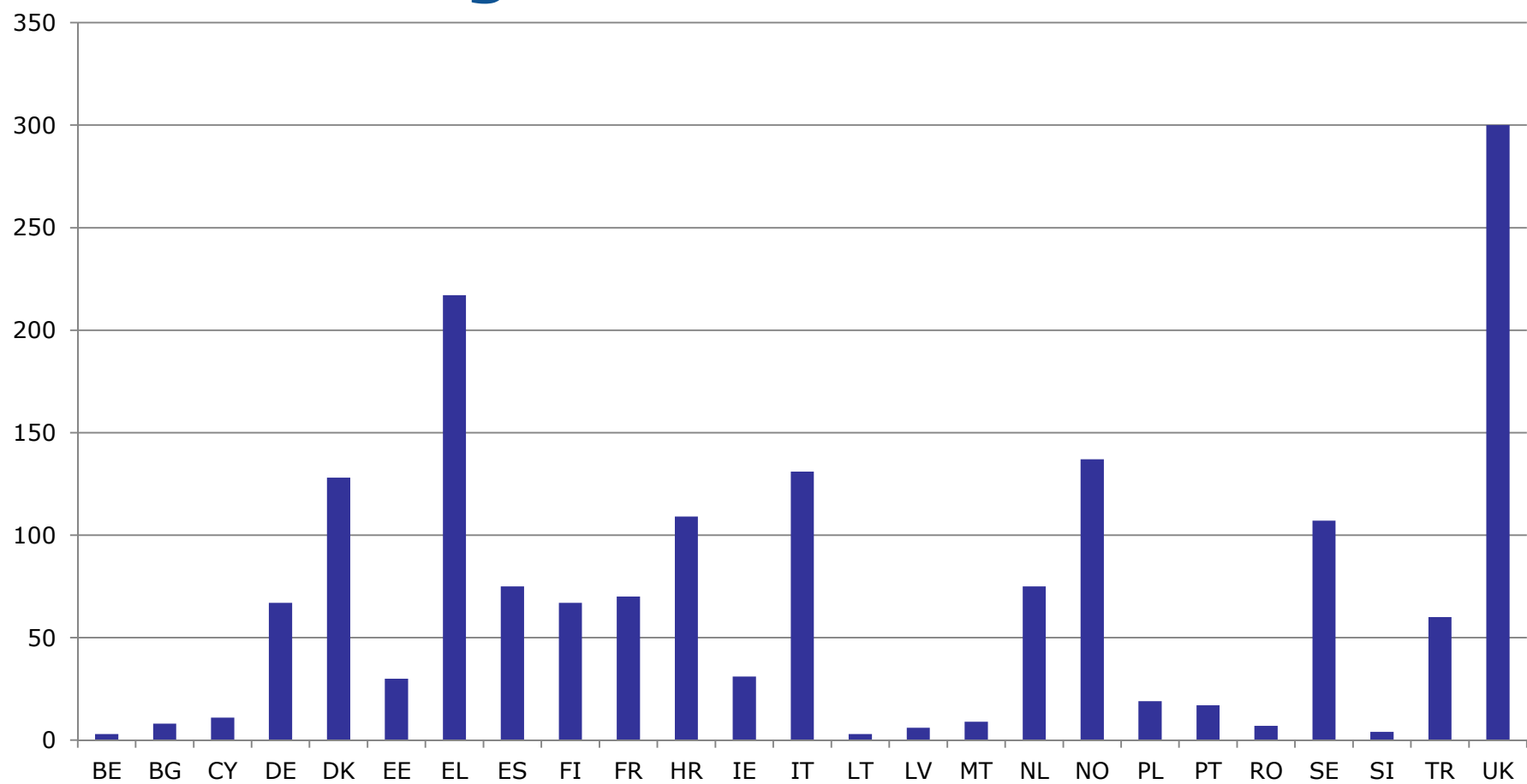




# Airports facing risk of inundation in 2100



## Ports facing risk of inundation in 2100



## Ports in the Lisbon area under inundation risk in 2100



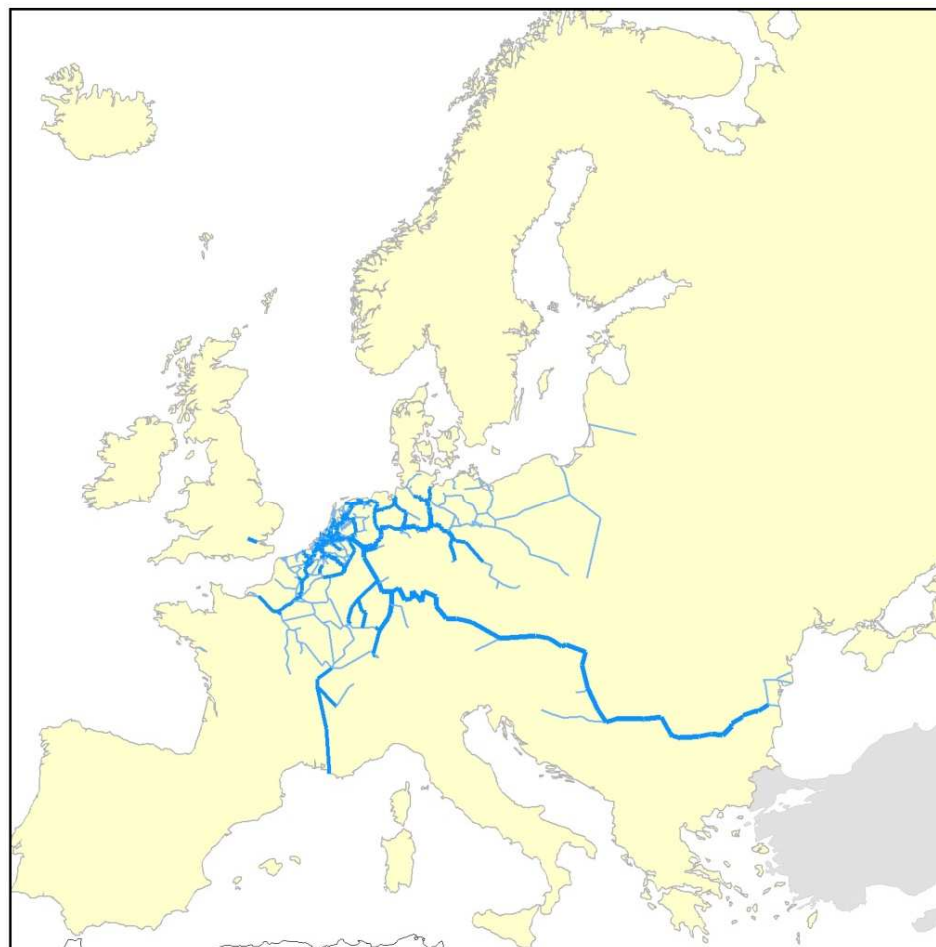
# Inland Waterways

## Floods

River inundation maps

## Droughts

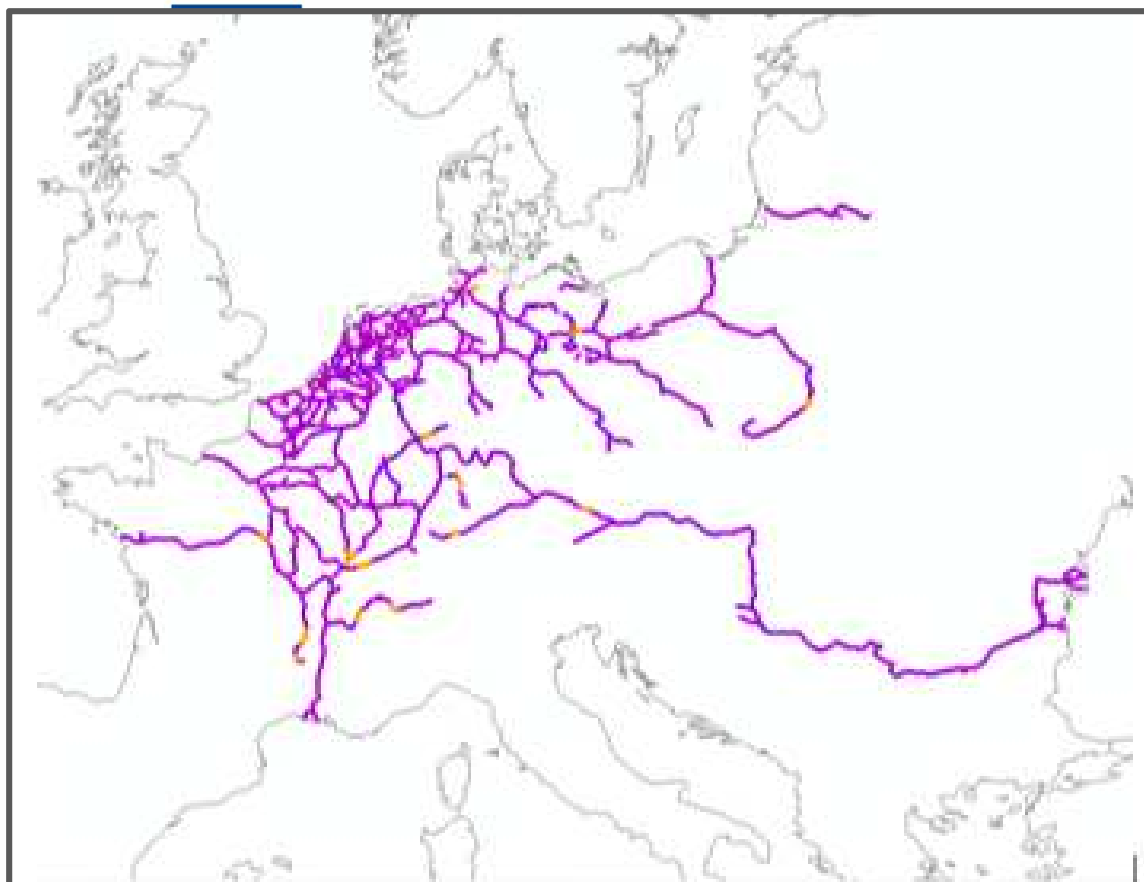
Discharge data for  
specific bottlenecks





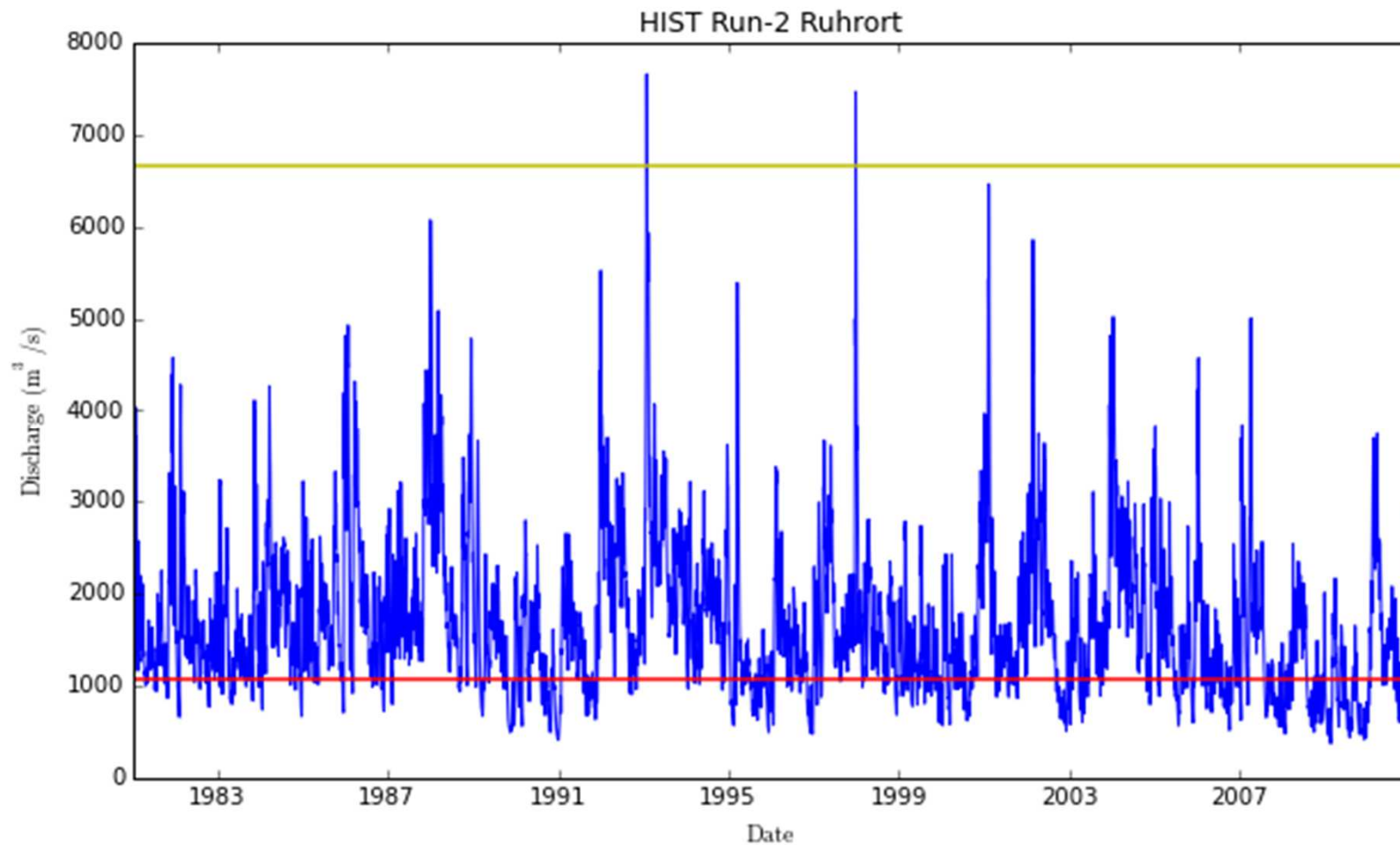
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## Floods



	Depth_10 years	Diff_100/10 years
Inland waterways in risk (km) (water depth $\geq$ 5)	None	344.45km

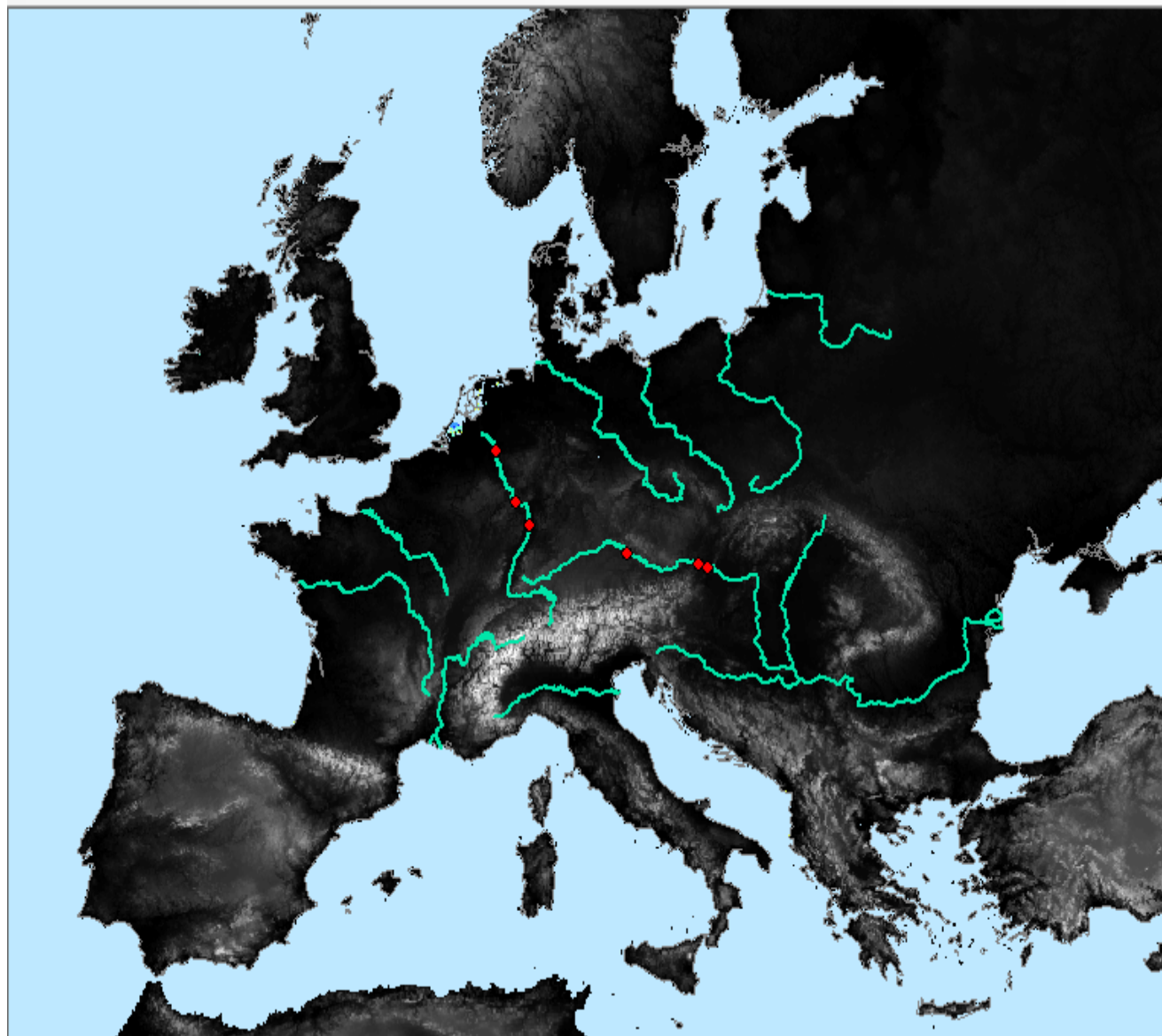
## Over time variation of daily discharges





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# Draughts



## Number of low water level days (annually)

Point	Run	1981-2010	2011-2040	2041-2070	2071-2099
Ruhrort	1	18	12	17	36
	2	18	12	6	7
	3	18	12	4	0
	4	18	11	21	25
	5	18	6	11	14
Kaub	1	18	12	15	32
	2	18	12	4	5
	3	18	11	3	0
	4	18	10	21	25
	5	18	5	7	12
Wildungsmauer	1	18	4	3	5
	2	18	10	0	0
	3	18	6	0	0
	4	18	11	9	8
	5	18	1	0	0
Hofkirchen	1	18	5	7	12
	2	18	5	1	0
	3	18	4	0	0
	4	18	7	8	6
	5	18	0	0	2



## Restrictions of bearing capacity due to low water levels

Gauge (m)	Proportion of bearing capacity for different ship types				
	CEMT 2	CEMT 3	CEMT 4	CEMT 5	CEMT 6
3.5	1	1	1	1	1
3	1	1	1	1	0.8
2.5	1	1	1	1	0.65
2	0.95	0.95	0.95	0.8	0.5
1.5	0.5	0.45	0.4	0.3	0.2



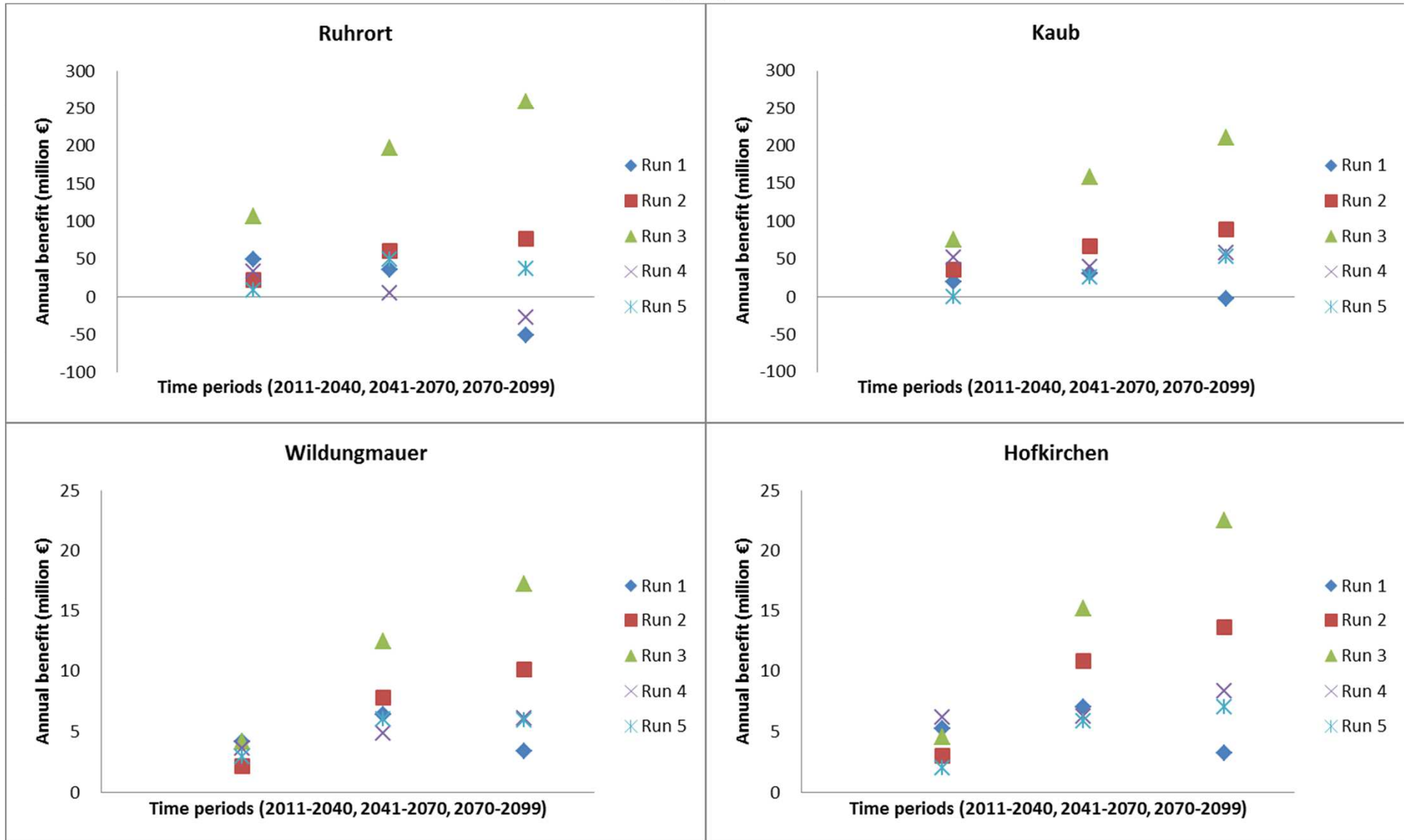
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# Time periods by discharge levels





European Commission





# Future work

*PESETA IV*





***Thank you***

*aris.christodoulou@ec.europa.eu*

