

Adaptation of transport networks to climate change

WORKSHOP ON SUSTAINABLE DEVELOPMENT GOALS AND HOW THEY CAN BE ACHIEVED IN INLAND WATERWAYS

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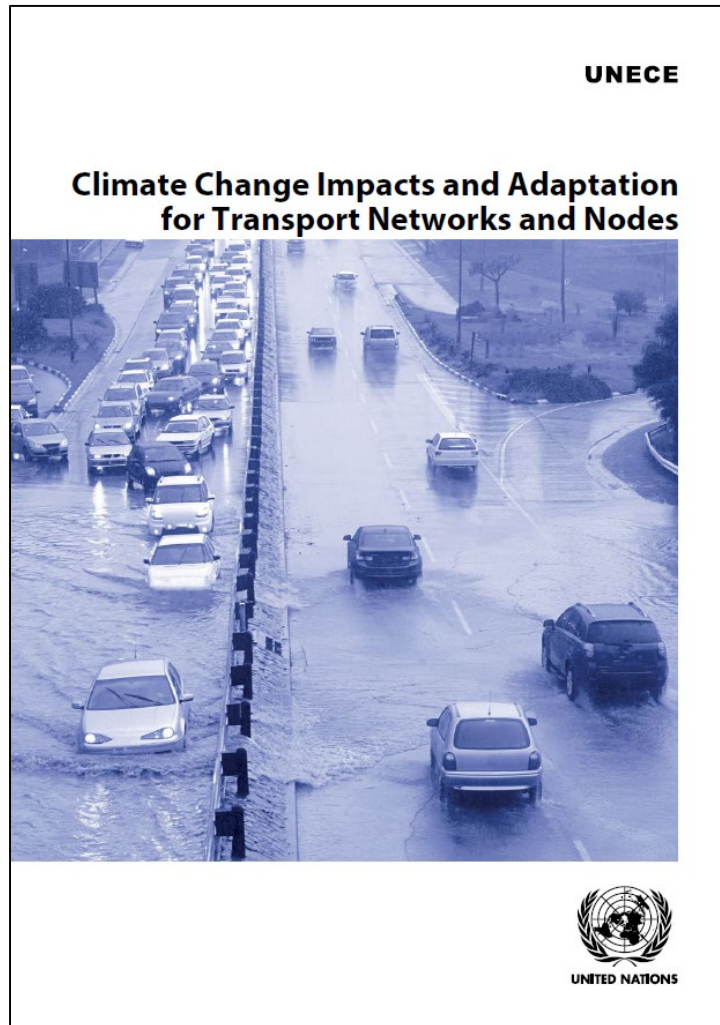
Martin Dagan

SC.3/WP.3 workshop

Geneva, 12 February 2020



Focus



Outcomes of the work of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

in relation to






13.1 Strengthen **resilience and adaptive capacity to climate-related hazards and natural disasters** in all countries

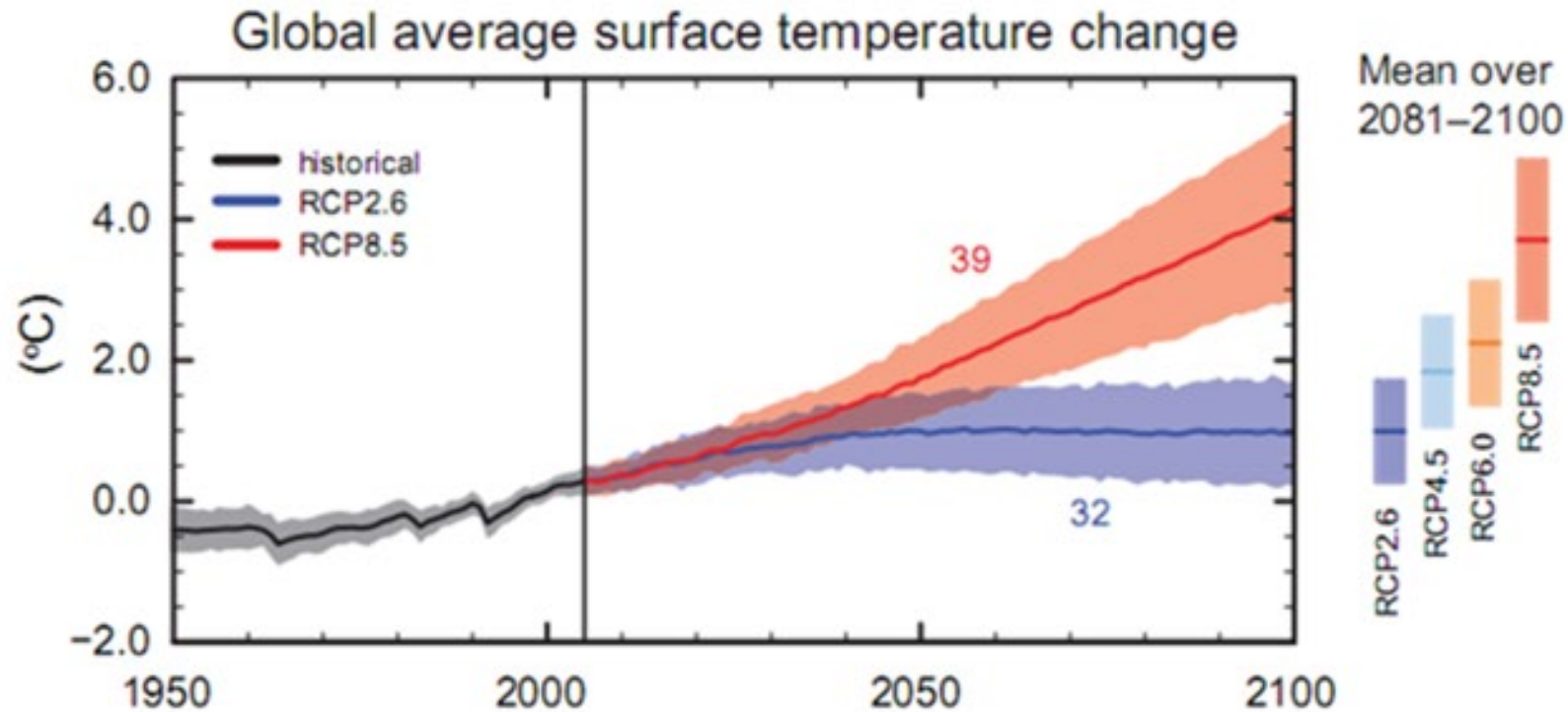
13.2 Integrate climate change measures into national policies, strategies and planning

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, **adaptation, impact reduction** and early warning

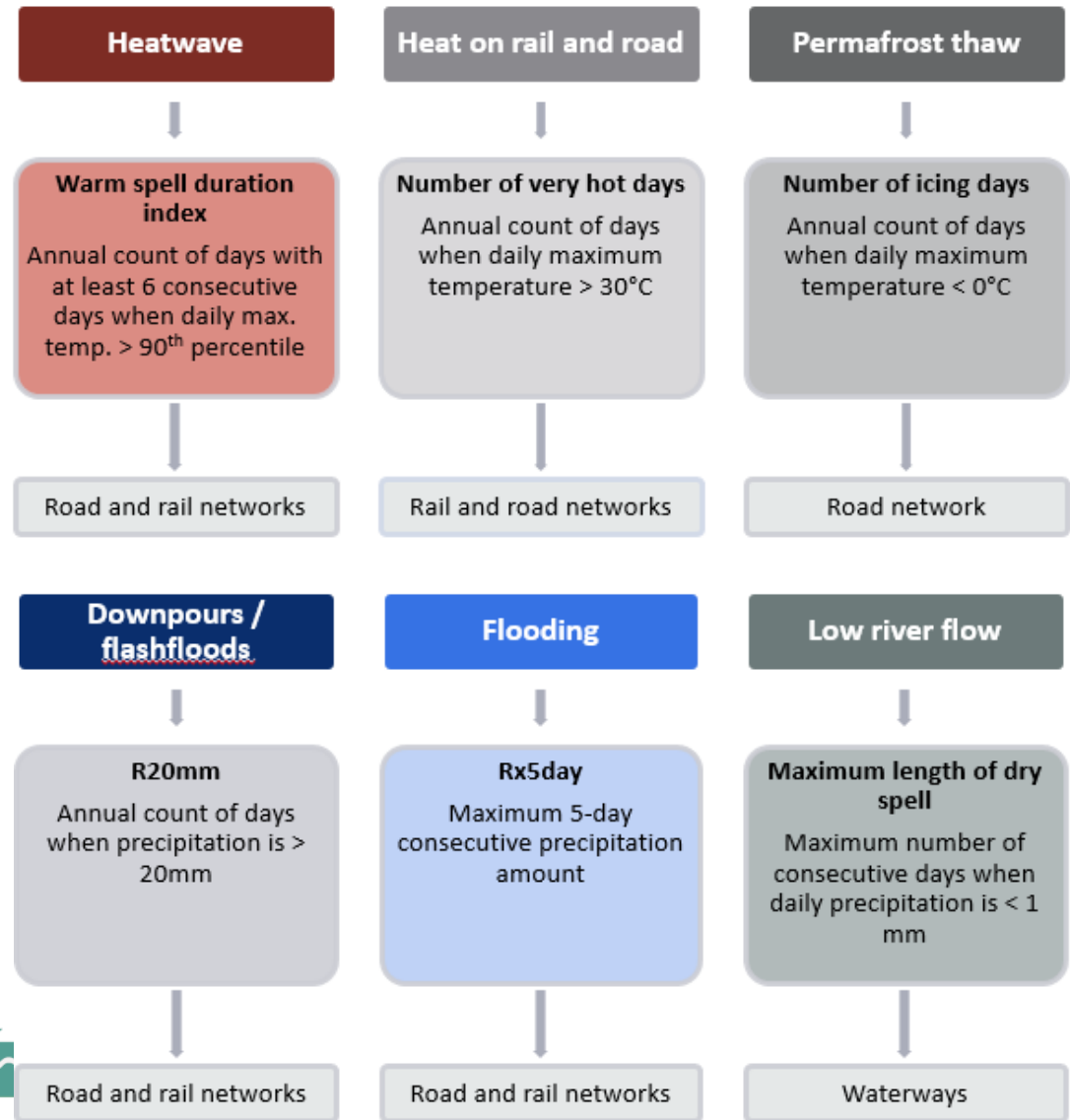
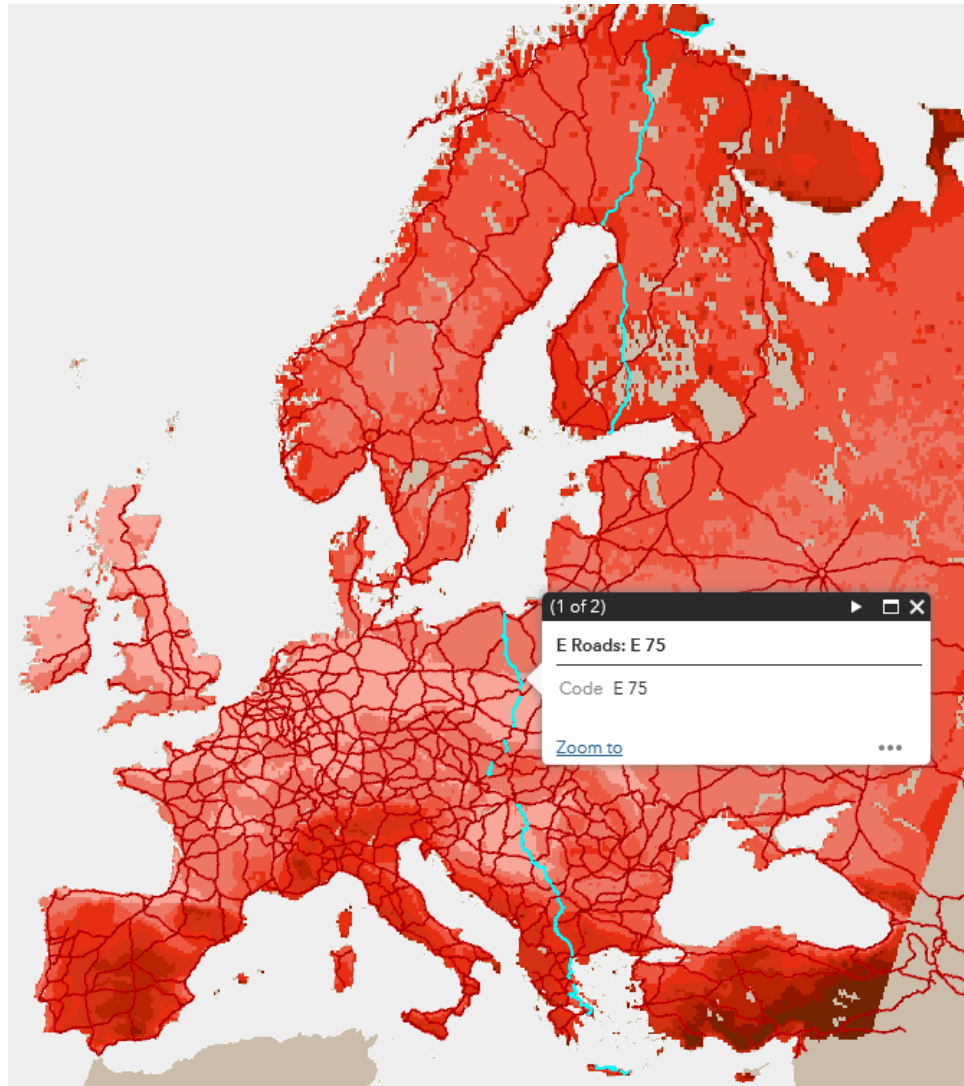
Some examples of climate change impacts on transportation infrastructure and operations

			
Temperature <ul style="list-style-type: none"> Higher mean temperatures; heat waves/droughts; changes in the numbers of warm and cool days Reduced snow cover and arctic land and sea ice; permafrost degradation and thawing 	Road <ul style="list-style-type: none"> Thermal pavement loading and degradation Asphalt rutting Thermal damage to bridges Increased landslides Reduced integrity of winter roads and shortened operating seasons 	Rail <ul style="list-style-type: none"> Track buckling Infrastructure and rolling stock overheating/failure Slope failures Signaling problems Speed restrictions Asset lifetime reduction Higher needs for cooling Shorter maintenance windows 	Waterways and ports <ul style="list-style-type: none"> Damage to infrastructure, equipment and cargo Higher energy consumption for cooling Potential reductions in snow/ice removal costs Occupational health and safety issues during extreme temperatures
Precipitation <ul style="list-style-type: none"> Changes in the mean values; changes in intensity, type and/or frequency of extremes 	<ul style="list-style-type: none"> Inundation, damage and wash-outs of roads and bridges Increased landslides Impacts on bridges 	<ul style="list-style-type: none"> Flooding, damage and wash-outs of bridges Problems with drainage systems and tunnels Delays 	<ul style="list-style-type: none"> Infrastructure inundation Navigation restrictions in inland waterways due to river water levels changes
Sea levels/storm surges <ul style="list-style-type: none"> Mean sea level rise Increased extreme sea levels 	<ul style="list-style-type: none"> Erosion of coastal roads Flooding, damage and wash-outs of roads and bridges 	<ul style="list-style-type: none"> Bridge scour, catenary damage at coastal assets Disruption of coastal train operation 	<ul style="list-style-type: none"> Asset inundation Navigation channel sedimentation Maintenance costs

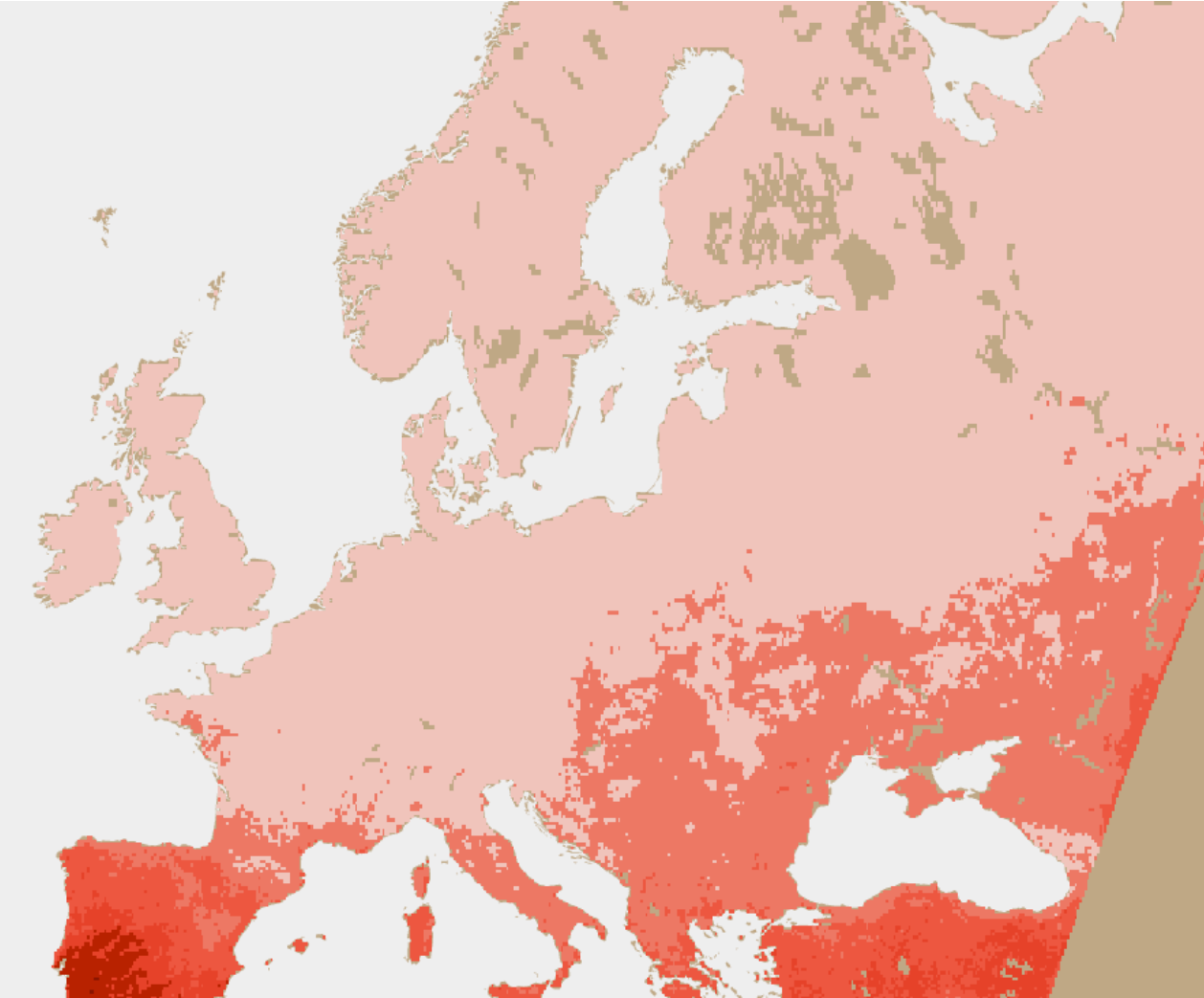
Current impacts vs future potential impact



Attempt to understand the future impacts



Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes



Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

Some of the lessons learned:

- Data limitations
 - on transport infrastructure (geocoded) and on usage data (traffic volumes, freight processed)
- First step analysis as a good basis – exposure identified
- First step analysis insufficient / complementary analysis needed (natural and anthropogenic factors, characteristics of specific asset, downscaling of projections, impact modelling....)



Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

Some of the recommendations:

- Improve availability of geocoded networks and nodes data (call to WPs managing the infrastructure agreements)
 - Geocode networks and nodes data and present them in GIS
 - Share data on use (census by WP.6)
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- Implement national projects (with assistance where necessary) to better understand vulnerability to climate change of transport systems



Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

List of inland waterways of international importance

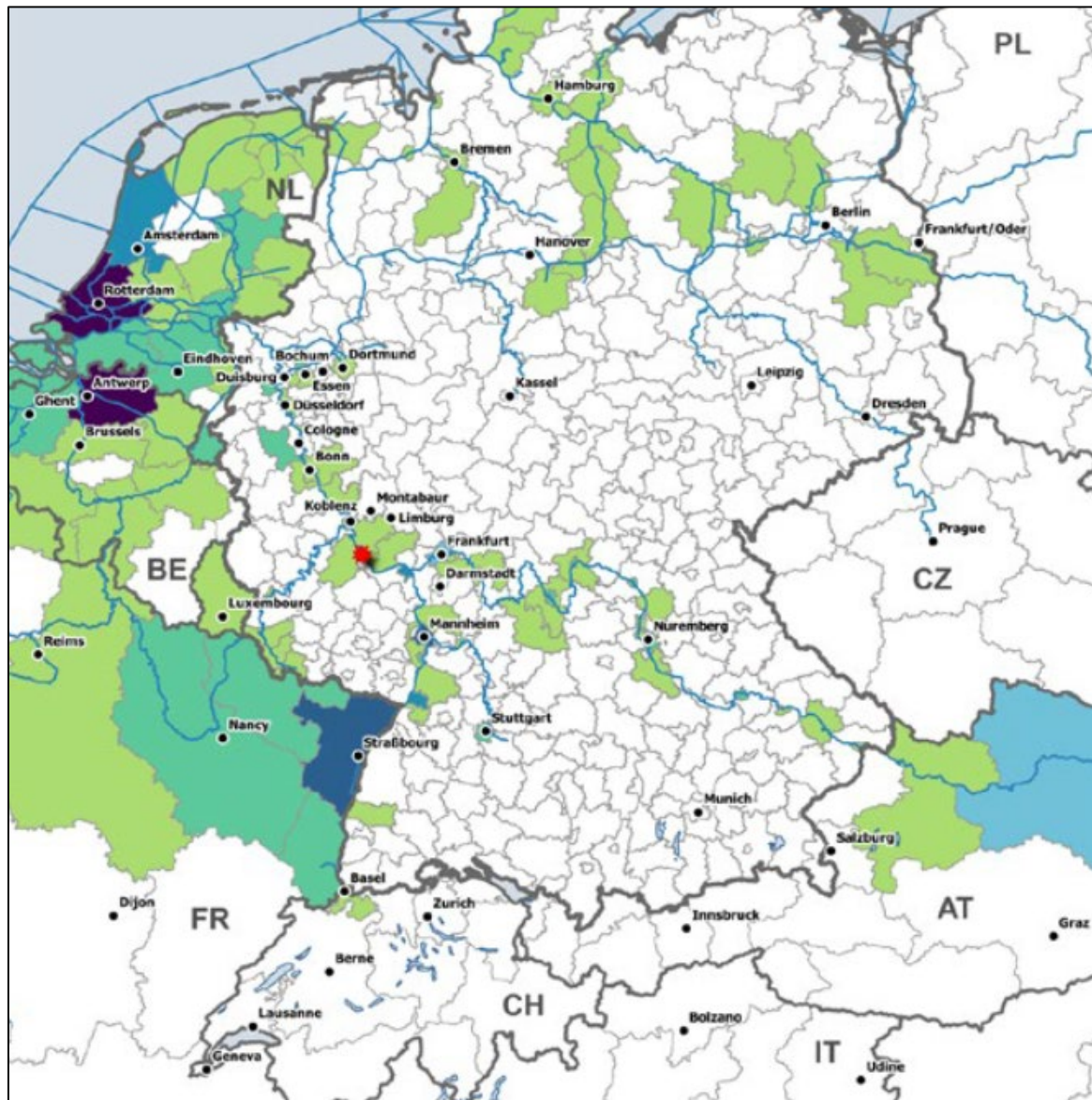
Number of E Waterway		
Main Waterway	Branches	Description of the route*
1	2	3
E 01		Dunkerque-Douai-Valenciennes-Condé-Pommeroeul-Mons-Charleroi-Namur-Liège-Maastricht, Moerdijk to Rotterdam/Europoort via rivers Maas, Kijl, Noord and Nieuwe Maas
	E 01-02	Meuse from Namur to Givet
	E 01-04	Liège-Visé Canal
	E 01-04-01	Monsin Canal
	E 01-01	Kwaadmechelen-Dessel-Bocholt- Nederweert-Wessem- Canal de la Meuse
	E 01-06	Kanaal van St. Andries
	E 01-03	Zuid-Willemsvaart from Maas to Veghel
E 02		Zeebrugge-Brugge-Deinze-Kortrijk-Lille-Bauvin
	E 02-02	Brugge-Oostende Canal
	E 02-02-01	Plassendale-Nieuwpoort Canal
	E 02-04	Leie-Roeselare Canal
E 03		Gorinchem-Moerdijk-Terneuzen-Gent via Nieuwe Merwede, Schelde-Rijn Connection, Terneuzen-Gent Canal and Gent Circular Canal
E 04		Vlissingen-Antwerpen-Rupelmonde-Bruxelles-Seneffe via Westerschelde, Boven-Zeeschelde, Rupel, Bruxelles-Rupel and Charleroi-Bruxelles Canals
E 05		[Compiègne-Escaut]-Valenciennes-Condé-Tournai-Gent-Dendermonde-Antwerpen-Hasselt-Genk-Liège via Oise, Seine-Nord Connection, Haut Escaut, Bovenschelde, Gent Circular Canal, Boven-Zeeschelde and Albertkanaal
	E 05-02	Peronnes-Pommeroeul via Nimy-Blaton-Peronnes Canal
	E 05-01	Bossuit-Kortrijk Canal
	E 05-04	River Dender up to Aalst
	E 05-06	Viersel-Duffel-Mouth of the Rupel via Netekanaal, Beneden-Nete and Rupel



Requested follow-up

- Geocode AGN ✓
- Make available data on the collection of the traffic data --

* Portions of E waterways which do not exist at present but which are included in relevant infrastructure development programmes are indicated in square brackets [...].



Flooding in the area of Oberwesel (forecast 2030)

Inland waterway transport over the section of Oberwesel by regions

in tons/d



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District borders © GeoBasis-DE / BKG 31.12.2015
 Nuts regions © European Union, 1995 till today
 Country borders/Waterways/Lakes © EuroGeographics 2016

Influence of weather and climate extremes on supraregional traffic flows – Stress test scenario Middle Rhine



Thank you for your attention

