Climate Change Impacts and Adaptation for International Transport Networks

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"It is not the strongest of the species that survives, nor the most intelligent that survives, it is the one that is most adaptable to change",
Charles Darwin

UNECE, Sustainable Transport Division

UNITED NATIONS

CMR

Contract for the International Carriage of Goods by Road

CH

Convention on Road Traffic

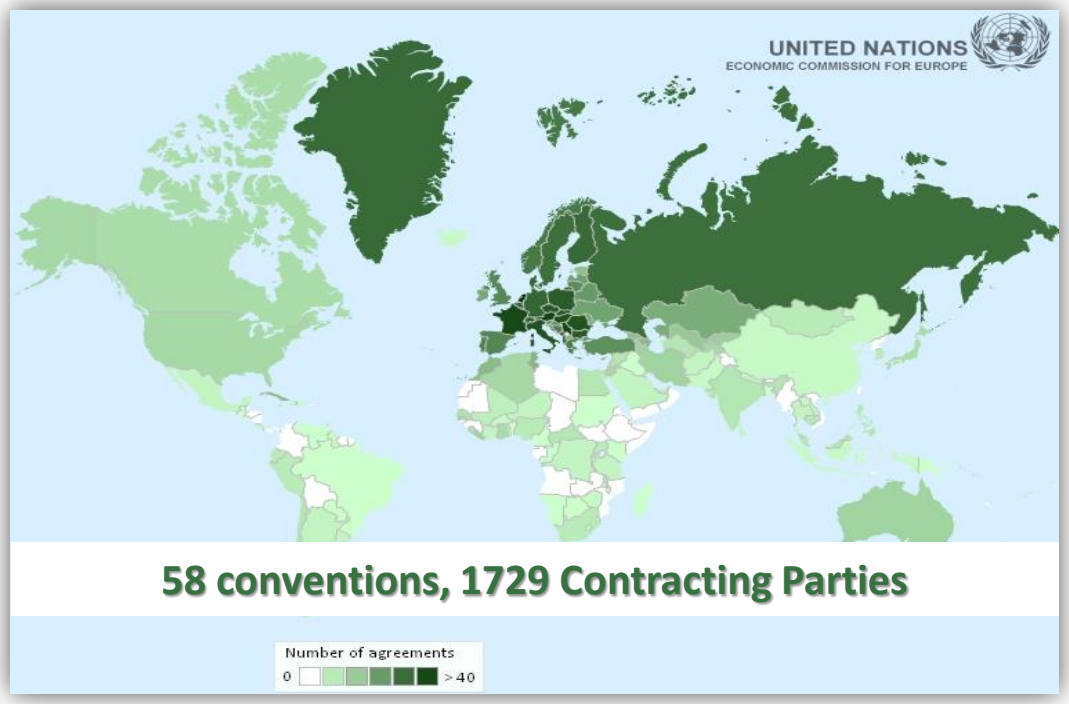
Border Crossing

Harmonization of Frontier Controls of Goods

Convention on Road Signs and Signals

E40

Infrastructure Agreements for roads (AGR), Rail (AGC), Inland Water Transport (AGN), Intermodal Transport (AGTC)



58 conventions, 1729 Contracting Parties

E1

World Forum for Harmonization of Vehicle Regulations (WP 29)

ADR

International Carriage of Dangerous Goods by Road

ADN

International Carriage of Dangerous Goods by Inland Waterways

ATP

Carriage of Perishable Foodstuffs

Work of Crews of Vehicles engaged in International Road Transport / Digital Tachograph

European Code for Inland Waterways

TIR

Global Customs facilitation tool

TRANSPORT

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

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1st Phase 2011-2013

a) Identify potential **climatic impacts on transport infrastructure**, including ports and their hinterland connections, as well as on transport services and networks across the broader supply-chain, including their type, range and distribution across different regions and transport modes;
b) Determine the **costs of climatic impacts for international inland transport networks**, including the broader implications for trade and development of impacted countries as well as identify the requirements for corresponding adaptation responses;
c) Identify existing **best practices in national policies and risk management** as well as formulation of relevant strategies to enhance the resilience of international transport networks, through changes in infrastructure design and operation planning and management, taking into account specific risks and vulnerabilities.

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1st Phase 2011-2013

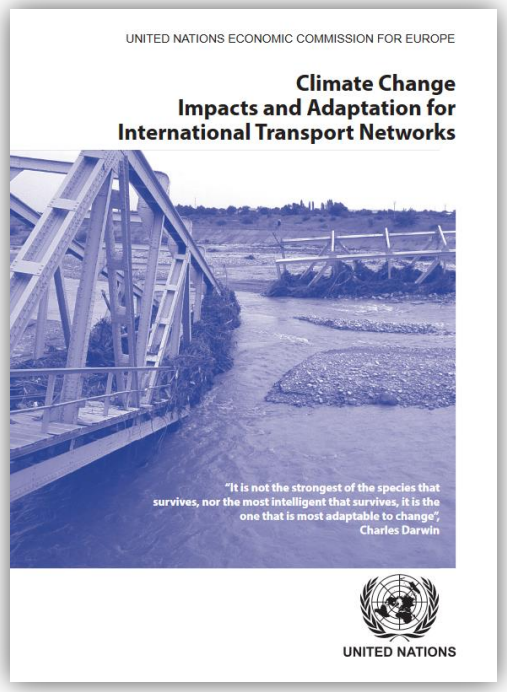

Table 4 Summary of potential climate change impacts on transportation (the list is not exhaustive).

Factor	Impacts		
Temperature	**Road**	**Rail**	**Ports, IW and airports**
Factor	**Impacts**		
Temperature	Road	Rail	Ports, IW and airports
Higher mean temperatures; Heat waves/ oughts;Increased variability in warm/cool days	Thermal pavement loading/ degradation; asphalt rutting; thermal damage of bridges; increased landslides in mountains; asset lifetime reduction; increased needs for cooling (passenger/freight) and, thus, fuel; shorter maintenance windows; increased construction and maintenance costs; changes in demand	Track buckling; infrastructure and rolling stock overheating/failure; slope fires and failures; electronics and signaling problems; speed restrictions; asset lifetime reduction; higher needs for cooling/ fuel; shorter maintenance windows; increased construction and maintenance costs; demand changes	Damage to infrastructure, equipment and cargo; higher energy consumption for cooling cargo; lower water levels and restrictions for inland navigation; air transport payload restrictions; warmer weather will reduce snow/ice removal costs and extend the construction season
Permafrost degradation and thawing; Reduced arctic ice	Road buckling; decreases in travelling days; slope instability and embankment failures; coastal erosion affecting coastal roads	Rail track damages; slope instability and embankment failures; freight and passenger restrictions	Damages in port and airport infrastructure; longer shipping seasons-NSR; shorter shipping routes-NWP/less fuel costs, but higher support service costs
Precipitation	Road	Rail	Ports, IW and airports
Changes in the intensity/Frequency of extremes (floods and droughts)	Inundation; increased landslides and slope, earthwork and equipment failures; impacts on vital nodes e.g. bridges; poor visibility that increases accidents; more frequent slush flows; delays; changes in demand	Submersion, bridge scouring, problems with drainage systems and tunnels; landslides; underground flooding; embankments/ earthwork damages; operational problems; delay, changes in demand	Land infrastructure inundation; damage to cargo and equipment; navigation restrictions in inland waterways due to droughts;

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2nd Phase 2015-2017

a) Identify and establish , if possible, **inventories of transport networks** in the ECE region which are **vulnerable to climate change impacts**, if possible in a geographic information system (GIS)environment;
b) Use/develop models, methodologies, tools and good practices to address **potential extreme hazards** (e.g. high temperatures and floods) to selected inland transport infrastructure in the ECE region under different scenarios of climate change;
c) Identification and analysis of **case studies on the potential economic, social, and environmental consequences** of the climate change impacts and provide a cost/benefit analysis of the adaptation options.

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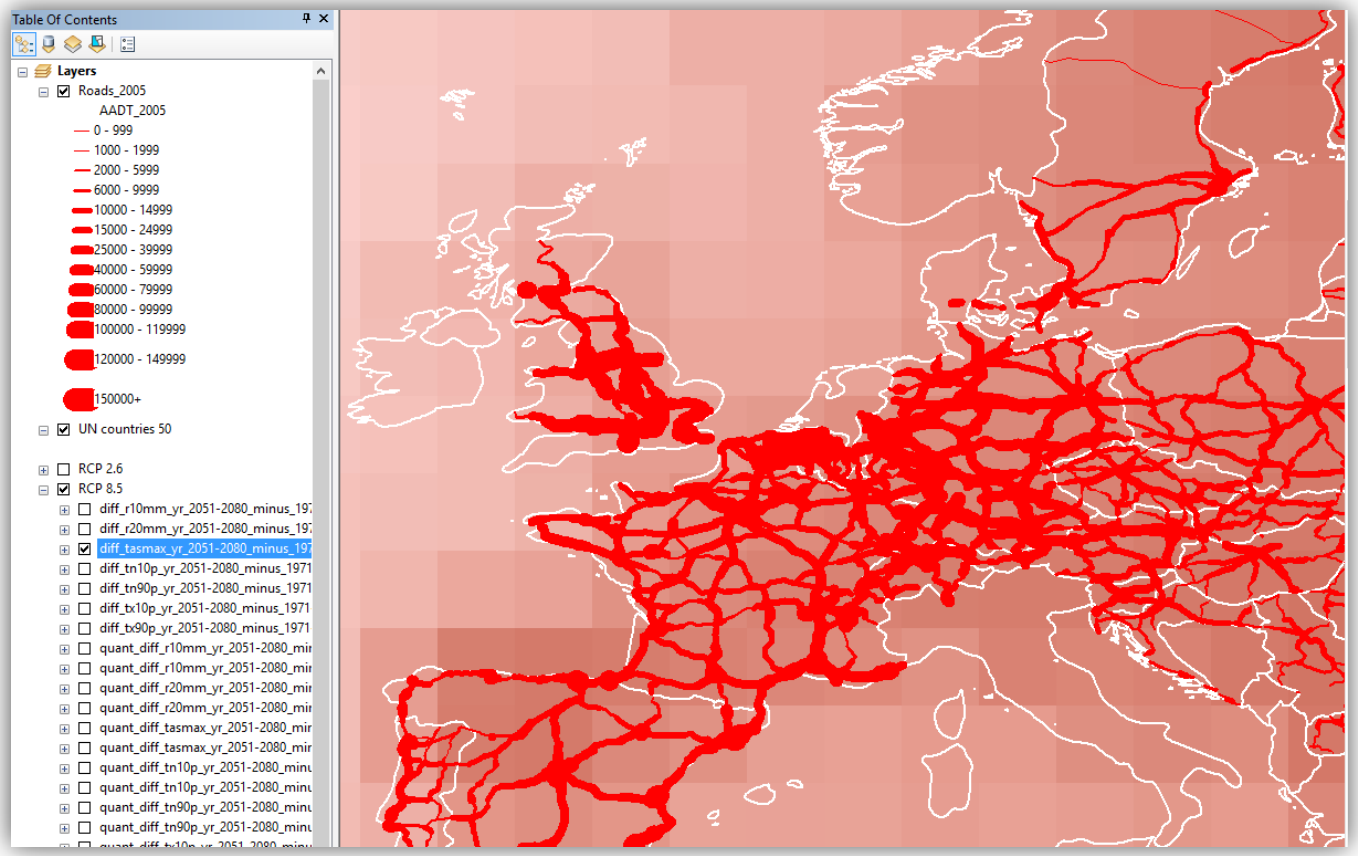
2nd Phase 2015-2017

Identification of Critical Transport Infrastructure based on traffic on a GIS environment



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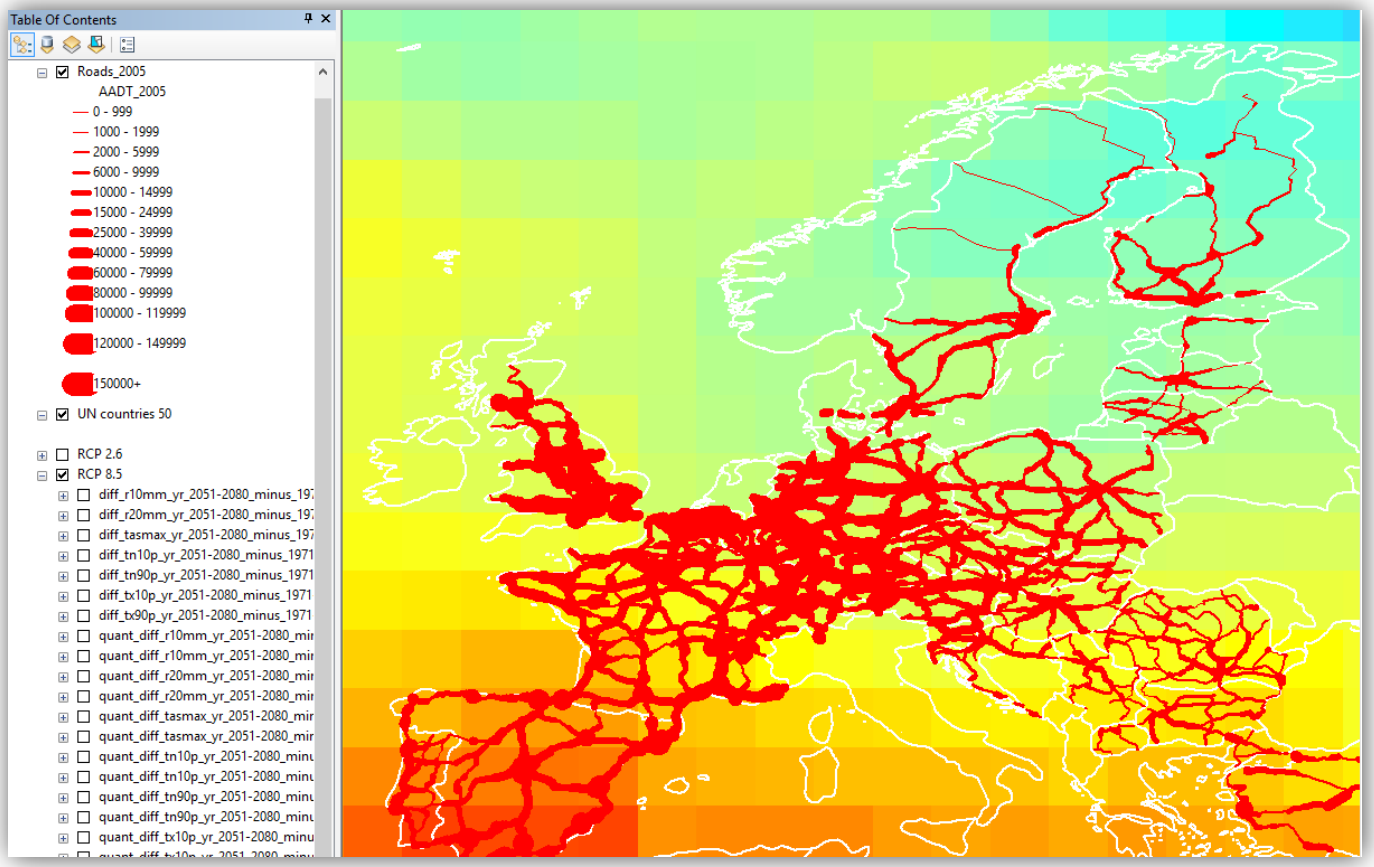
2nd Phase 2015-2017

Preparation of a HOT SPOTS Map by bringing together the critical transport infrastructure and the projections for the different climatic factors



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2nd Phase 2015-2017

Assumptions of Group of Experts Work

a) The region that should be covered should be the ECE region, 56 countries;
b) Projections for temperatures, precipitation, winds, sea level rising, fog and floods extremes;
c) Projections of these changes should be made available under 2 scenarios, RCP 4.5 and RCP 8.5;
d) The time period should be relevant to timeline (planning, construction and operation life) of transport infrastructure therefore 2000-2030-2050;
e) The number of the models of which the results will be used (mean) should be around 10;
f) The G.I.S resolution should be 0,11 degrees;
g) The critical transport infrastructure that will be plotted with those climatic factors projections will be the road and rail networks, inland waterways, airports, ports, logistics centres and intermodal terminals.

Precipitation	Extreme annual precipitation
	Intensity of extreme rainfall
	Duration of heavy rainfall
	Floods
	Droughts
	Flash floods in rivers
	Snow
Temperature	Extreme temperature
	Daily maximum temperature
	Frost days
	Heat waves
Wind	Intensity of extreme winds
	Frequency of strong winds
	Wind direction
Fog	Fog intensity
	Frequency of intense fog
Sea level rising	

Thank you

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