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### Inland Transport Committee

#### Working Party on Transport Trends and Economics

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

##### Fourteenth session

Geneva, 7 and 8 June 2018

## Report of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes on its fourteenth session

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## **I. Attendance**

1. The Group of Experts (hereafter called the Group) on Climate Change Impacts and Adaptation for Transport Networks and Nodes held its fourteenth session on 7 and 8 June 2018. The session was chaired by Mr. P. De Wildt (Netherlands).
2. Representatives of the following United Nations Economic Commission for Europe (UNECE) member States participated: Canada, Croatia, Denmark, Finland, Germany, Iceland, Monaco, Netherlands, Poland, Romania, Slovenia and the former Yugoslav Republic of Macedonia. Representatives of Australia also attended via tele-conference under Article 11 of the Terms of Reference of UNECE.
3. Representatives of the following United Nations organizations or specialized agencies attended the meeting: United Nations Conference on Trade and Development (UNCTAD) and the World Meteorological Organization (WMO).
4. An Expert of the European Union (European Commission, Joint Research Centre) also attended.
5. At the invitation of the secretariat, an expert from the following organization participated: CMS Cameron McKenna LLP.

## **II. Introduction – The work of the Group in second phase (agenda item 1)**

6. The Group of Experts recalled that its mandate during its second phase is to:
  - (a) Identify and establish, if possible, inventories of transport networks in the Economic Commission for Europe (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.
7. The Group also recalled its decision that WMO, through its World Climate Research Programme (WCRP), would provide projections for the following climatic factors: extremes on temperature, precipitation and winds. The Group should also request the data on sea level rising and floods by the European Union Joint Research Centre in Ispra, Italy where significant and relevant research has already taken place.
8. The Group had already prepared, with the help of Professor Velegrakis, chapter one of the Group's final report on the overview of recent climate change trends and projections affecting transportation in the ECE region. This overview includes the phenomenology meaning how is the climate changing, the recent climate projections, the climate change implications for transport as well as some conclusions and recommendations.
9. Furthermore, the Group has already prepared the draft of another chapter that summarizes good practices, strategies and case studies included either in the replies of Governments to the questionnaire or in the presentations made by the Governments during its sessions creating a library on good practices for climate change adaptation.

10. Finally, the Group recalled that it was agreed at its previous sessions that the data regarding transport infrastructure in the ECE region would be based on data provided by European Commission (TEN-T network) or other UNECE projects (EATL, Trans-European Motorway and Trans-European Railway (TEM and TER), E-road and rail Censuses) where the factor of criticality would be mainly based on the annual average traffic data (AATD) wherever this is available. The initial matching of data on transport infrastructure and on projections of the different climatic factors could produce a preliminary hot spots map. However, the experts agreed that a final and scientifically correct hot spots map could be produced only if other factors have been taken into consideration such as socio-economic factors, quality and type of the infrastructure, adaptation measures already taken etc.

### **III. Election of Officers (agenda item 2)**

11. The Group elected its officers, Mr. J. Kleniewski (Poland) as Chair and Mr. Piet De Wildt (Netherlands) as Vice- Chair for the period of its establishment.

### **IV. Adoption of the agenda (agenda item 3)**

*Documentation:* ECE/TRANS/WP.5/GE.3/27

12. The Group adopted the agenda.

### **V. Climate Change and Transport Networks and Nodes: Presentations of initiatives at national and international levels (agenda item 4)**

13. There were several presentations under this agenda item.

14. The representative of Canada, Mrs E. Smalley, presented the Canadian perspective on transportation and climate change adaptation. Canada's transportation network consists of more than 1.13 million two lane equivalent lane-kilometres of public roads, nearly 46,000 route-kilometres of rail tracks, 18 Canadian Port Authorities (CPA), nearly 550 public ports and 1035 small craft and fishing harbours as well as 26 National Airport System (NAS) airports.

15. Canada's Pan-Canadian Framework on Clean Growth and Climate Change was developed with the provinces/territories and through engagement with Indigenous peoples – to meet Canada's emissions reduction targets, grow the economy, and build resilience to a changing climate. Adaptation and climate resilience includes:

- (a) Translating scientific information and Traditional Knowledge into action;
- (b) Building climate resilience through infrastructure;
- (c) Protecting and improving human health and well-being;
- (d) Supporting particularly vulnerable regions; and
- (e) Reducing climate-related hazards and disaster risks.

16. Canada's federal transportation department is undertaking a number of adaptation initiatives, including: an initiative to enhance northerners' capacity to adapt their transportation systems; a program that funds projects to better understand climate risks to federal transportation infrastructure; a knowledge synthesis of climate risks and adaptation

practices for the Canadian transportation sector; and, the integration of climate considerations into a national transportation infrastructure program. The Government of Canada is also investing significant funds in green infrastructure and disaster mitigation and adaptation, and is working to integrate climate resilience into design guides and codes.

17. The presentation of the representative of Germany, Mrs. S. Hansel, was focused on adapting the German transport system to climate change and extreme weather events. The German Adaptation Strategy (DAS) and Adaptation Action Plan (APA) aim at reducing vulnerability to climate change impacts maintaining or enhancing adaptability of natural, societal, and economic systems. Increasing the resilience of transport and federal transport infrastructure to climate change and extreme weather events will be realized by:

- (a) Integrating the knowledge on climatic changes in atmosphere and ocean with practical knowledge about the modes of transport (waterway, road, railway);
- (b) Building on the results of preceding projects (e.g. KLIWAS for waterways and AdSVIS for roads);
- (c) Developing targeted climate services that go beyond basic climatological statistics and integrate user requirements;
- (d) Providing a basis for the implementation of the German Adaptation Strategy.

18. The research topics include scenarios development. Based on selected GHG-emission, land use and traffic scenarios meteorological / oceanographic / hydrological data and evaluations (observations and projections) are provided for assessing changes in the future impact of flooding hazards, storm hazards, landslides and navigability and water quality for both coastal and inland areas. The hazard and transport mode specific results of climate impact analyses are integrated in a common framework – the climate impact assessment (exposure analysis + sensitivity analysis) that shall be further developed to a risk assessment (criticality of impacted transport network sections). Based on these assessments – as a common national ground for all fields of action – guidelines for handling the addressed hazards are developed for the transport sector and specific adaptation options are suggested and tested.

19. The representative of Croatia, Mrs. A. Barišić, provided information about the activities undertaken from the Croatian Government in order to adapt transport infrastructure into the climate change impacts. Temperature in Croatia is increasing. Bigger changes are expected in the continental part of the country. Furthermore, the amount of rainfall has decreased during the winter season and more extreme weather events are expected - especially drought and heat strikes during the summer. Projections show that the climate in Croatia will become warmer and drought.

20. The future activities of the Croatian Government among others include:

- (a) Development of Climate change adjustment measures in the Transport sector;
- (b) Proposing and evaluating Climate adjustment measures in cooperation with stakeholders;
- (c) Renewal and rehabilitation of Transport infrastructure according to priorities;
- (d) Cooperation with scientific institutions in design and analysis for the needs of climate modelling in the transport sector.

21. The representative of Iceland, Mrs. A. Thorleifsdóttir, presented the importance of transport in Iceland in an era of climate change. She reported that Iceland is moving from a response and mitigation phase and is currently developing an adaptive strategy that takes into consideration three main topics: the isostatic changes, the sea-level changes, as well as the extreme weather events with serious impacts such as rock- and mudslides, temperature

changes being of a minor consequence to transport. She also presented the critical infrastructure of the country pointing out that the population is concentrated in the south-west side of the country and in the coastal areas. A fact that makes climate change visible in Iceland is that the glaciers are melting at an ever-increasing speed. The loss of the ice mass is causing land rise in the South East and subsidence in the South West including the Capital area and thus causing increased severity of rising sea-level. The new Transport plan for 2019–2033 will include a “heat map” showing the areas where adaptation is most required.

22. The representatives of Australia, Mrs. C. Evans and Mr. W. Hore-Lacy, presented the Australian Transport Assessment and Planning Guidelines (ATAP) which among other topics works towards network vulnerability. This is being undertaken through practical approaches for assessing the vulnerability of transport networks (road, rail, etc.) including (a) problem and option identification, (b) cost-benefit analysis of options as well as the development of guidance for undertaking vulnerability assessments. In addition, the Advanced Technologies Lab (ATLab) was presented which main vision is to be the primary source of transport data and knowledge for strategic policy and decision making. The aperture application was presented which is able among other scenarios to perform simulated flooding events with bridge closures etc. Also, a scenario of the disruption of one major national railroad line was presented. Furthermore, the area of Victoria and more specifically the city of Melbourne were presented as case studies. The transport infrastructure of the city including the locations of the hospitals and the bridges were simulated with projections for storm tides, bushfire prone areas as well as temperature change.

## **VI. Partners and expected contributions (agenda item 5)**

23. The representative of UNCTAD, Mrs. R. Asariotis, provided information on the UNCTAD capacity-building project on "Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States". Case studies focusing on two vulnerable SIDS<sup>1</sup> in the Caribbean region (Jamaica and Saint Lucia) have been carried out to enhance the knowledge and understanding at the national level and to assist in developing a transferable methodology for assessing climate-related impacts and adaptation options in other SIDS. The key outcomes of the project include assessment potential vulnerabilities to climatic change of two Caribbean SIDS, focusing on potential operational disruptions and the marine inundation risk to coastal international airports and seaports of Jamaica Saint Lucia under different climate scenarios. The results of UNCTAD study should also be included in the final report of the Group as a case study on coastal transport infrastructure.

24. The Group recalled that at its previous sessions requested specific projections for different climatic factors from WMO. The Group had noted that, given the size of the UNECE region, and the subsequent requirements for transmission and storage of data are too large for currently available and accessible method. Therefore, the Group agreed to take two steps to establish a fully functioning system; as a starting point, the system would employ the climate projections driven from the global climate model (GCM) with a spatial resolution of ~300 km, and as such provide a coarse look at possible future changes in climate variables. These results may serve as a basis for more detailed investigation at a later stage. Given the nature of the investment cycles and different lifetimes of critical infrastructure assets, the group agreed that fifty years would represent a suitable time

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<sup>1</sup> Small Island Developing States

horizon over which to consider possible changes in climate variables. An additional consideration when investigating possible future changes in climate is the emissions scenario under which changes are to be analysed. Given that the Group will be exploring changes in a future time period fifty years from now, it is important to consider more than one scenario, because the differences between different scenarios start to become more prominent with time. In the same context, it is important to investigate and indicate the extent of uncertainty within the newly developed system. The Group concluded that the system would employ the RCP2.6<sup>2</sup> scenario which is consistent with the goal set by the Paris Agreement, and the RCP8.5, which may be considered a “business as usual” scenario.

25. Furthermore, the Group also had decided that WMO, through its World Climate Research Programme (WCRP), would provide projections for the following climatic factors: extremes on temperature, precipitation and winds. The Group was also to receive the data on sea level rising and floods by the European Union Joint Research Centre in Ispra, Italy where significant and relevant research has already taken place. The secretariat should contact the JRC.

## **VII. Discussions on the final report of the Group of Experts (agenda item 6)**

26. Following the discussions on the maps prepared by the secretariat on GIS environment that match together the transport infrastructure in ECE region with the climatic factors projections provided by the WMO/WCRP, the Group concluded the following:

(a) The resolution of climatic factors projections (200 km) does not permit the identification even of some initial hot spots; the prototype outcome prepared, demonstrates a feasibility to provide the governments in the ECE region with a quantified and visualized understanding on future climate impact in general. In addition, experts of WMO/WCRP advised that a more region-specific and detailed perspectives could be provided by employing the higher resolution climate information produced by regional models, which could be available in 50 km resolution or of higher resolution in different regions.

(b) Even if the resolution was more focused (for instance 20 km) the identification of hot spots would still be a big challenge because:

(i) Many countries of the ECE region do not have yet the governmental structure and are not yet in a scientific position to analyse needs and to develop options for climate adaptation and resilience. Consequently, they are not yet able to support such an analysis;

(ii) The identification of hot spots by the Governments is a complex and long-lasting exercise where the match of accurate data on transport infrastructure and climatic factors projections is just the first step. Detailed analysis of geomorphology, of transport infrastructure conditions, quality and technical specifications as well as sensitivity to climate change impacts should be performed. Furthermore, use of indicators to operationalise the exposure, sensitivity and criticality of network sections should be performed and forecasts for traffic and land use should be included; A clear and agreed definition of a hot spot should be warranted;

(iii) Only countries that already have the governmental structure established and have started to perform such hot spots analysis would be able to provide a mapping

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<sup>2</sup> Representative Concentration Pathways

of hot spots in their countries / regions and even these countries have still restrictions with regard to data availability, extent and spatial resolution to deliver a complete analysis for their transport sector;

(iv) A corridors-oriented approach should also be followed since the TEN-T network and the EATL project (including the Via Carpatia project) are based on international transport corridors development and possible disruption of transport service in one country due to climate change impacts would actually disrupt the entire service along the corridor;

(v) The maps prepared by the UNECE and WMO/WCRP secretariats should be included in the final report of the Group showing a more macroscopic/regional perspective of the issue rather than countries focused analysis. The specific hazards of each region should be highlighted on a case-by-case basis. Furthermore, the Group agreed that UNECE and WMO/WCRP should explore the possibility to engage higher resolution climate projections (at least 50km resolution) in the maps, for all ECE region.

27. The experts agreed that the initial outline of Group's final report should adapt to the new conditions shaped following the replies to Group's questionnaire as well as the preparation of the GIS illustration of transport infrastructure and climatic factors projections. The adapted new outline should ensure the maximum possible awareness raising and this could be achieved by including as many case studies as possible. The Group has initially agreed to the following tentative structure of its final report:

- (a) Chapter 1: An overview of climate change phenomenology;
- (b) Chapter 2: Analysis of the questionnaires;
- (c) Chapter 3: National policies, methodologies and good practices on adapting transport infrastructure to climate impacts;
- (d) Chapter 4: Hot Spots Maps
  - (i) Case Studies: Countries will present at least one regional case study with a climate impact analysis (this should include maps and different scenarios but not cost benefit analysis);
  - (ii) UNECE – WMO/WCRP Hot spots map analysis and presentation;
  - (iii) Generic Guidelines to Governments on how to prepare a hot spots map (conditions, parameters, indicators).
- (e) Chapter 5: Case studies on socio economic impacts – cost benefit analysis (Countries will prepare case studies where the socio-economic impacts with cost benefit analysis of a real/ catastrophic incident will be illustrated);
- (f) Chapter 6: Conclusions and Recommendations.

28. The Group agreed that the Chair of the Group with the help of the secretariat will further elaborate the above-mentioned outline (titles, content etc) including guidelines on how those case studies will be developed and they will distribute it to all experts for their comments and approval.

## **VIII. Other business (agenda item 7)**

29. There were no other items.

## **IX. Date and place of next meeting (agenda item 8)**

30. The Group of Experts noted that its fifteenth session is scheduled to be held in Geneva on 6 and 7 December 2018.

## **X. Summary of main decisions (agenda item 9)**

31. The Group adopted its main decisions of its fourteenth session and requested the secretariat and the Chair to prepare the full and complete report for circulation to the members of the Group for comments on items other than those contained in its main decisions.

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