UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

Ad Hoc Expert Meeting on

Climate Change Impacts and Adaptation: A Challenge for Global Ports

Geneva, Palais des Nations, 29−30 September 2011

Main Outcomes and Summary of Discussions

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Acknowledgments

The present publication was prepared to provide some record of the deliberations at the Ad Hoc Expert Meeting on "*Climate Change Impacts and Adaptation: A Challenge for Global Ports*", held on 29-30 September 2011, and to make the insights of participating experts available to a broader audience. For further background information regarding the meeting, an Information Note prepared by the UNCTAD Secretariat (UNCTAD/DTL/TLB/2011/2) should also be consulted.

UNCTAD acknowledges with great appreciation the contributions of the panellists who informed the deliberations at the meeting and of all other experts who participated in the meeting, made written submissions, or both.

It should be noted that the Ad Hoc Expert Meeting followed earlier related activities by the UNCTAD secretariat, including the first session of the Multi-year Expert Meeting on Transport and Trade Facilitation: "*Maritime Transport and the Climate Change Challenge*", held on 16-18 February 2009 and a Joint UNECE-UNCTAD Workshop on "*Climate Change Impacts on International Transport Networks*", held on 8 September 2010. For any further information, please contact the Policy and Legislation Section in the Division on Technology and Logistics of UNCTAD at policy.legislation@unctad.org.

UNCTAD/DTL/TLB/2011/3

All relevant documentation related to the meeting, including speakers' presentations and audiofiles of the sessions, are available on UNCTAD's website at www.unctad.org/ttl/legal.

Preliminary Programme

Day 1: Thursday 29 September, 2011

10:00 – 10:15	***Mr. Petko DRAGANOV**, Deputy Secretary-General of UNCTAD*	***Opening Statement and Welcome Address***

10:15 – 13:00	**Session One** ***Moderator: Ms. Regina ASARIOTIS,** Chief, Policy and Legislation Section, TLB, DTL, UNCTAD*	
Panellists	Prof. Stefan RAHMSTORF, Potsdam Institute for Climate Impacts Research	***Climate Change: State of the Science***
	Mr. Pascal PEDUZZI, Global Change and Vulnerability Section, UNEP/DEWA/GRID-Europe	***Climate Change Threats to Ports and other Transport Facilities: An Overview***
	Mr. Susumu NARUSE, Secretary-General, International Association of Ports and Harbors	***Climate Change Impacts: Adaptation Measures in Ports***
	Mr. Philippe CRIST, Organization for Economic Co-operation and Development (OECD)/ International Transport Forum (ITF) Joint Transport Research Centre	***Transport Infrastructure and Network Adaptation to Climate Change: Strategies and Issues for Ports***
	Interactive Debate	
15:00 – 18:00	**Session Two** ***Moderator: Mr. Andrew MATHER,** eThekwini Municipality, Durban, South Africa*	
Panellists	Mr. Simon BENNETT, International Chamber of Shipping	***Preparing for the Worst: the Shipowners' Perspective***
	Mr. Mike SAVONIS, ICF International	***United States Ports: Addressing the Adaptation Challenge***
	Dr. Leonard NURSE, University of the West Indies, Barbados	***The Vulnerability of Caribbean Ports to the Impacts of Climate Change: What are the Risks?***
	Mr. Vladimir STENEK, International Finance Corporation, World Bank	***Climate Risk and Ports***
	Interactive Debate	

18:15 – 19:30	***Cocktail Reception offered by the Secretary-General of UNCTAD***

Preliminary Programme
Day 2: Friday 30 September, 2011

10:00 – 13:00	**Session Three** ***Moderator: Dr. Leonard NURSE,*** *University of the West Indies, Barbados*	
Panellists	Prof. Robert J. NICHOLLS, University of Southampton, Southampton, United Kingdom	***Extreme Flood Events And Port Cities Through the 21st Century: Implications of Climate Change and Other Drivers***
	Mr. Andrew MATHER, eThekwini Municipality, Durban, South Africa	***South African Coasts and Ports: What Will Climate Change Bring?***
	Prof. Nicole VON LIEBERMAN, Hamburg Port Authority, Hamburg, Germany	***Climate Change Impacts on Port Development: A Case Study of the Port of Hamburg***
	Dr. Adolf NG, The Hong Kong Polytechnic University, Hong Kong, China	***The Experiences of Chinese Ports in Adapting to Climate Changes: "Still a House of Cards"***
	Interactive Debate	
15:00 – 17:00	**Session Four** ***Moderator: Mr. Mike SAVONIS,*** *ICF International*	
Panellists	Dr. Miguel ESTEBAN, Waseda University, Tokyo, Japan	***Climate Change and its Effects on Ports: Increase in Downtime and Infrastructure Requirements***
	Mr. Austin BECKER, Stanford University, United States	***Adaptation Strategies for Seaports: Global Implications and Local Perspectives***
	Ms. Sin Lan NG YUN WING, Director, Ministry of Environment, Mauritius	***Adaptation to Climate Change in Mauritius with Focus on Port Areas and Related Sectors***
	Dr. Laurent CRETEGNY, Institute for Economic Modelling, Lausanne, Switzerland	***Ports in Developing Countries: Lessons from the World Bank Economics of Adaptation to Climate Change Study***
	Interactive Debate	
17:00 – 18:00	**The Way Forward, Conclusions and Recommendations**	

UNCTAD Ad Hoc Expert Meeting on
Climate Change Impacts and Adaptation: A Challenge for Global Ports

Geneva, 29–30 September 2011

Main outcomes and summary of discussions

In view of the strategic importance of global ports as gateways to international trade, and the potentially wide-ranging impacts of climate change on ports' infrastructure and services, the United Nations Conference on Trade and Development (UNCTAD) held an ad hoc expert meeting entitled "Climate Change Impacts and Adaptation: A Challenge for Global Ports" on 29–30 September 2011, in Geneva, Switzerland.[1] More specifically, the meeting aimed to help (a) advance the understanding of vulnerabilities and risks, as well as associated adaptation requirements; and (b) identify existing best practices, information and data sources, issues requiring further study, and partners and mechanisms for effective collaboration.

The two-day meeting, which was opened by the Deputy Secretary-General of UNCTAD, Mr. Petko Draganov, provided a platform for expert discussions on how best to improve the understanding of climate-change impacts on ports and develop effective and appropriate adaptation response measures. The participants included policymakers and planning authorities, port and shipping industry representatives, relevant intergovernmental and non-governmental organizations, scientists and engineers (see Annex). All material relating to the meeting, including the speakers' presentations and an information note prepared by the UNCTAD secretariat, is available at the meeting's website (go to http://www.unctad.org/ttl/legal and click on "Meetings and Events").

While a summary of the discussions, focusing on the issues highlighted during the individual sessions, is presented a little further into this document, some of the main messages that emerged as part of the two-day discussions may be summarized as follows:

(a) There is a need for more awareness-raising about the complex implications that climate change may have on ports and related transport networks, including port hinterland connections and the cities in which they are located or that are adjacent.

(b) Bridging the gap between science and policy is crucial. In this respect, collaboration and dialogue between all stakeholders – in particular, scientists and academia, the transport industry, the insurance sector, and financial and lending institutions, as well as policymakers and governments – is an important issue.

(c) Although the effects of climate change at a global level are increasingly well known, the limited availability of data at the local and regional level implies that the design of relevant and appropriate response measures needs to take into account high levels of uncertainty. The availability and efficient dissemination of timely, more tailored information and data, as well as their efficient flow and transmission, is therefore important.

[1] The expert meeting follows earlier related activities of the UNCTAD secretariat, including the first session of the Multi-year Expert Meeting on Transport and Trade Facilitation, held on 16–18 February 2009, which focused on Maritime transport and the climate change challenge, and a joint UNECE–UNCTAD workshop on Climate change impacts on international transport networks which was held on 8 September 2010.

(d) In view of the complexity of some of the issues at stake, further research and analytical work is needed, including through targeted case studies. Risk and vulnerability assessments are key to effectively addressing climate-change impacts on ports and related transport infrastructure.

Concrete next steps that emerged from the discussion include the following:

(a) Several experts agreed to establish a neutral web-based platform for participants at the Ad Hoc Expert Meeting, to provide continuity to the deliberations, and to share studies, research, data and information. This platform would, in due course, be open to other interested parties, in order to foster dialogue, cooperation and information-sharing between all interested parties.

(b) Several experts agreed to prepare a joint academic paper on the subject, which would draw from a diverse range of complementary areas of expertise and knowledge. Other participants at the Ad Hoc Expert Meeting would be invited to express their interest in joining the initiative. The paper could, in due course, form the basis for a more policy-oriented document prepared by the UNCTAD secretariat.

(c) Recognizing the importance of further awareness-raising and capacity-building, including for ports in developing regions, the International Association of Ports and Harbors (IAPH) suggested that its March 2012 meeting in Sri Lanka could be used as a suitable platform for further dissemination of information and discussion; the possibility of convening a conference or other meeting on the topic of climate-change adaptation for ports could, subject to funding, also be explored further.

(d) IAPH, representing the global port industry, expressed an urgent need for port case studies to be carried out, in particular for the purposes of risk assessment. Relevant case studies should, subject to funding and resource considerations, involve at least five ports covering different regions and types of ports, including river ports.

(e) For the purposes of developing guidance, checklists, and other tools in support of adaptation in ports, it would be useful if existing best practices, as well as relevant information on adaptation measures from other economic sectors, could be identified and collated. Pilot studies could also play a useful role in developing specific tools and adaptation solutions.

(f) Experts agreed that it was important to promote more dialogue, cooperation, information-sharing and partnerships among all stakeholders and interested parties. Existing institutional and expert cooperation should be deepened and new areas of cooperation should be explored. Particularly highlighted in this context were:

    (i) Cooperation between UNCTAD and the United Nations Economic Commission for Europe (UNECE), especially in relation to the work of the recently established UNECE Group of Experts on Climate Change Impacts and Adaptation for International Transport Networks, as well as cooperation between UNCTAD and the World Meteorological Organization (WMO), particularly with a view to raising the profile of transport and ports in the context of ongoing WMO work.

(ii) Cooperation between the scientific community and the port industry, with a view to better identifying ports' specific research needs and ensuring that available information is more tailored to respond to ports' requirements.

Summary of discussions

Session 1

Moderator: ***R. Asariotis, Policy and Legislation Section, Trade Logistics Branch/Division on Trade and Logistics, UNCTAD***

The session helped provide context and set the scene for the further deliberations. Prof. Stefan Rahmstorf, Potsdam Institute for Climate Research, Germany, presented an overview of the scientific findings on climate change. The presentation by Mr. Pascal Peduzzi**,** Global Change and Vulnerability Section, UNEP/DEWA/GRID-Europe, illustrated the types of impacts that ports as well as other transport infrastructure may face, highlighting potential risks, vulnerabilities and exposure. Mr. Susumu Naruse, Secretary-General, International Association of Ports and Harbors, provided the perspective of the global port industry, presenting relevant industry initiatives related to climate change mitigation and adaptation, and highlighting some key considerations regarding effective adaptation planning. Finally, Mr. Philippe Crist, Organization for Economic Cooperation and Development (OECD)/International Transport Forum (ITF) Joint Transport Research Centre, focused in his presentation on risks and strategies for ports in relation to transport infrastructure and on network adaptation to climate change.

Relevant issues highlighted during the session included the following:

(a) Over the last century, there has been an increase in atmospheric greenhouse gas (GHG) concentrations – including a very rapid rise in CO_2 levels – as well as a global temperature rise. Sea level rise, which is correlated to changes in global temperatures, appears to be occurring faster than previously predicted and may exceed the ranges predicted by the IPCC AR4 (2007).

(b) Ports will be affected by climate change, with the main drivers being sea level rise and extreme events such as storm surges.

(c) When assessing the vulnerability of ports to climate change impacts, it is important to also take into account the potential impacts of climate change on coastal transport networks and port hinterland connections. Port operations depend on the integrity of relevant hinterland transport connections; for instance, a failure of critical inland network links may impact severely on port operations.

(d) Climate change may adversely impact transport in several ways:

(i) Climate change-induced storm surges, coastal erosion and flooding may affect ports and other coastal transport infrastructure (e.g. coastal roads, railways and airports);

(ii) Increases in the frequency/intensity of floods or droughts can affect estuarine and river navigation and affect the operability of locks (of importance also for key transit points, such as the Panama Canal);

(iii) Changes in the frequency/intensity of extreme events, such as tropical cyclones, can lead to increase in wind hazards, coastal flooding, flash floods and landslides that can damage railways, roads and bridges and severely disrupt transport networks;

(iv) Higher temperatures can affect slope stability and roads, cause dilatation of badly designed railways and, in northern latitudes, may result in permafrost melts that can severely impair transport networks.

(e) Climate change may also induce positive change for transport, such as the opening of new polar navigation routes, resulting in significant time and cost savings. The exploitability of such alternatives is, however, still uncertain in view of political, economic and environmental concerns as well as maritime risks connected with navigation in the Arctic.

(f) While mitigation measures are necessary to control future sea level rise rates, adaptation policies and measures are necessary to control impacts of the already unavoidable sea level rise. Adaptation is critical.

(g) There is a need for data and information about climate change factors and impacts at local and regional levels. Location-specific considerations such as subsidence and the rate of its occurrence need to be taken into account. There is a particular need for further information about climate factors such as storm surge, wind and wave movements.

(h) While global projections provide some useful indication for developments at regional levels, regional projections are required in order to better understand the magnitude of the challenge and to design relevant and appropriate response measures.

(i) Climate scientists could provide further and more detailed information that would be of greater relevance to ports and shipping and be more user-friendly. Bridging the gap between science and policy is crucial, as are timely and better flows of information.

(j) Ports are major gateways to trade, major economic actors, and also major population centres. Given the importance of ports to global trade, as well as to local economies, the development and implementation of appropriate adaptation strategies and measures to address climate-change impacts on ports and their hinterland connections is critical.

(k) The global port industry is increasingly integrating climate-change impact considerations into its activities and agendas. IAPH noted that adaptation measures are, however, more difficult to discuss at the organization level, as ports differ with regard to their respective natural, social and historical backgrounds, and future threats such as sea level rise and intensification of storms are not defined locally in a numerical manner.

(l) There appears to be a lack of awareness of climate-change impacts, especially in small ports, and efforts should be stepped up to bridge the knowledge gap. In view of the complexity of some of the issues at stake, further research and analytical work is needed.

(m) According to IAPH, there is an urgent need for port case studies, in particular for the purposes of risk assessment. To this end, subject to funding and resource considerations, at least five port case studies covering different regions and types of ports, including river ports, should be conducted. Potential obstacles to adaptation could be considered as part of these studies.

(n) Meetings and seminars, including under the auspices of IAPH, may help raise awareness and build capacity in relation to climate-change adaptation in ports.

(o) The mismatch between the timeframes for (i) port planning, (ii) the lifetime of infrastructure and (iii) climate-change factors, combined with the uncertainty inherent in climate-change predictions, requires a shift in the planning paradigm.

(p) Risk assessment and planning need to take into account multiple stressors that may occur simultaneously.

(q) The timing of adaptation measures is also important to counter both the gradual and the sudden impacts of climate change.

(r) It is important for governments to set their adaptation priorities, approaches and strategies in respect of both transport infrastructure and networks.

(s) While no one size fits all, and despite existing uncertainties, a port adaptation strategy needs to identify the current and future climate changes that are relevant for a particular port. Such a strategy needs to assess vulnerabilities and risks for the port and related transport networks and to prioritize actions using a risk-based adaptation strategy. Synergies and co-benefits should be sought and adaptation options need to be monitored and re-evaluated.

(t) Adaptation strategies, including with a view to protect, retreat or accommodate, should move away from a mode- and infrastructure-specific focus to allow for a broader transport network perspective.

(u) Existing best practices need to be identified and collated, as does information on adaptation measures from other economic sectors.

(v) UNECE informed the meeting about the recently established UNECE Group of Experts on Climate Change Impacts and Adaptation for International Transport Networks, highlighting important areas of synergy and encouraging active participation by experts in this initiative.

Session 2

Moderator*: A. Mather, eThekwini Municipality, Durban, South Africa*

In his presentation, Mr. Simon Bennett, International Chamber of Shipping, discussed the possible implications of climate change for the global shipping industry and presented the industry perspective, including in respect of potential funding mechanisms for port infrastructure adaptation necessitated by climate change. Mr. Mike Savonis, ICF International, United States, presented the experience of some ports in the United States, which are increasingly aware of the climate change challenge and are already taking steps to put adaptation measures in place to increase their resilience. The presentation by Dr. Leonard Nurse, University of the West Indies, Barbados, identified key climate-change risks, and discussed possible strategies for reducing the vulnerability of Caribbean ports to these risks. Finally, the presentation by Mr. Vladimir Stenek**,** International Finance Corporation, World Bank, focused on projects that financial institutions have developed in respect of adaptation, and highlighted the importance for the financial sector of understanding climate risk. In particular, Mr. Stenek presented a case study of the Muelles el Bosque port in Colombia, including an overview of the risk assessment methodology.

Relevant issues highlighted during the session included the following:

(a) The shipping industry accepts the international scientific consensus on climate change, and the need to play its part in addressing the challenge. To this end, the shipping industry is actively pursuing CO_2 reduction measures at the International Maritime Organization (IMO). Regarding possible market-based measures under consideration, it was noted that members of the International Chamber of Shipping (ICS) had expressed their preference for an environmental compensation fund with monies raised via charges on ship bunker fuel.

(b) The shipping industry also recognizes that it needs to contribute to efforts aimed at addressing climate change driven impacts, including those on ports. If adopted, the UNFCCC "Green Fund" could help finance ports' adaptation to climate change, as could a possible IMO environmental compensation fund. There was, however, a concern that many governments see shipping as a "cash cow".

(c) ICS suggested that if governments decided to raise funds from mitigation of GHG emissions through market-based measures, it may be worthwhile to consider whether and to what extent these funds or part of these funds can be reinvested to support the adaptation of ports to climate change, particularly in developing countries, and to ensure the long-term sustainability of the sector.

(d) Drawing from the experience of some ports in the United States in respect of adaptation measures, it was noted that a number of steps needed to be taken to achieve the goal of "reliability under a full range of conditions".

(e) Risk assessment, based on innovative approaches such as scenario planning, needs to be undertaken with regard to exposure, vulnerability and resilience. When designing adaptation response measures, it is important to bear in mind that pre-emptive approaches are usually less costly. Continuous monitoring is required in view of the uncertainties inherent in climate-change factors and in the business environment.

(f) There are a number of challenges to adaptation. These include – among other things – funding, politics, regulation, other competing priorities, stronger pressure of immediate concerns, and geographical and operational boundaries, as well as constraints relating to research and technology.

(g) In respect of the Caribbean region, it was noted that although observed and modelled sea-level changes were generally consistent with global hemispheric trends, concerns remained with respect to the future intensity of extreme weather events and changes in the intensity and directions of winds and waves.

(h) The economic costs for small island developing States (SIDS) in the Caribbean may be significant if no action is taken, including in respect of protection of existing installations and by building flexibility into new design. Managerial and operational responses such as reducing wastage of water and electricity, as well as government policies such as planning regulations and incentives for renewable energies, constitute other potential adaptive response measures for ports.

(i) Financial and lending institutions are increasingly careful to include social and environmental sustainability considerations in their decision-making processes and when assessing financial risk. From the perspective of financial institutions, it is important that information on climate-change impacts and related uncertainties be

taken into account in assessing financial risks. There is merit in considering both opportunities and risks.

(j) The International Finance Corporation has developed a climate risk and adaptation programme to address the specific needs of the private sector (e.g. different and more granular data sets, shorter information period etc.).

(k) Climate change impacts need to be clearly explained in appropriate terms to ensure increased awareness and better understanding among stakeholders and the general public. Effective communication may involve "translating" information to make it more concrete and material, to help to mainstream adaptation as part of planning and development processes.

(l) Pilot studies are important, as there is a need to develop specific tools and adaptation solutions.

(m) Climate information is needed for ports and the shipping industry. Climate scientists could provide further and more detailed information that would be of greater relevance to ports, and readily usable, including – for example – information on the impacts of storm surges, which are more localized and entail inherent uncertainty.

(n) WMO encouraged activities that seek to integrate information on wave directional shifts and changes in wave heights, and on other related uncertainties, into climate modelling.

(o) It is important to look at best practices worldwide, and it would be useful for entities such as UNCTAD or IMO to take on this issue and review existing relevant work in order to identify some best practices, and draw up a list of these, presenting them in a simplified and user-friendly manner.

(p) Dialogue among all interested parties and stakeholders is crucial, as are partnerships and the involvement of key agencies.

(q) The impact of climate change on ports is not only a transport issue, particularly in the case of port cities.

(r) While ports may have little control over decisions affecting city planning and transport agencies and partners outside the port area, it is still important for ports to help raise awareness in respect of climate-change impacts and adaptation.

Session 3

Moderator: ***L. Nurse, University of the West Indies, Barbados***

Prof. Robert J. Nicholls, University of Southampton, United Kingdom, presented the results of a study on asset and population exposure to flood risks in port megacities, highlighting the importance of a combination of factors including demography and economic growth but also climate change. The need to devise adequate policy responses for exposed cities, including port cities, to alleviate the effect of potential future disasters, was underscored. Mr. Andrew Mather, eThekwini Municipality, Durban, South Africa, presented the particular situation of South Africa's coastal and port systems, focusing on likely climate-change impacts and areas of risk. Prof. Nicole von Lieberman, Hamburg Port Authority, Germany, presented the results of a study considering the potential impacts of climate change on ports' superstructure designs, with a focus on the Port of Hamburg. Finally, a presentation by Dr. Adolf Ng, Hong Kong

Polytechnic University, Hong Kong (China), focused on the experiences of Chinese ports in adapting to climate change, highlighting the need to build "organizational resilience" when addressing climate-change impacts on ports. Japan shared the particular experience of the port city of Nagoya, which had suffered from natural disasters and, more specifically, typhoons.

Relevant issues highlighted during the session included the following:

(a) There is a need to engage in a global risk assessment exercise and to focus on all drivers of risks, including climate change and socio-economic factors, such as expanding global coastal populations, higher asset values, and the subsidence of cities especially in deltas and low-lying areas.

(b) Extreme weather events on the scale of Hurricane Katrina can trigger a reconfiguration of cities, including an element of abandonment; in many cases, relocation could be more difficult for ports than for cities.

(c) In 2005, about 40 million people and assets of $3 trillion (around 5 per cent of global GDP) were estimated to be exposed to flood risks, due to sea-level rise and increased storminess and subsidence in 136 major port cities. By 2070, population and asset exposure in the same 136 port cities could rise to 150 million people and $35 trillion respectively. Given the large number of ports globally, overall global asset and population exposure could be of a far greater magnitude.

(d) Adaptation and mitigation should be dealt with simultaneously. However, the benefits of adaptation are more immediate.

(e) Adaptation should be multifaceted and involve a portfolio of solutions, including disaster response plans.

(f) Promoting a network of cities to share experiences and allow for comparative analysis can be an effective way of taking the lessons learned from research and practice and widely disseminating relevant insights.

(g) The experience of South African ports reiterates the limitations associated with lack of relevant data at the local level, as well as the difficulties arising from the port ownership structure and jurisdictional matters. These can create uncertainty about which parties are responsible for driving and funding adaptation action. However, a detailed risk assessment of the South African port system is currently under way, with design standards for new ports being reviewed.

(h) Climate change impacts on other economic sectors, such as agricultural production and fisheries, entail some implications for logistics and trade.

(i) Ports that depend on access channels and tidal movements, such as the Port of Hamburg, face the added operational challenge of ensuring the required dredging and safe sediment relocation. Assessing and responding to the impacts of climate change on construction work and operations is costly.

(j) There remains a need for risk assessments and analyses to complement static calculations and to further the scientific research in the field of maintenance dredging and relocation of sediments. Equally, research and new designs are required for the already important issue of drainage systems planning.

(k) Chinese ports are highly vulnerable to climatic changes, with different regions having different problems mainly due to differing climatic zones. However, at present, the

approach to adaptation in China remains more reactive than proactive; ports are not yet fully ready to adapt to climate change impacts, partly because climate change impacts on ports appear to be relatively "implicit" and less visible; climate change adaptation and mitigation are sometimes confused/not considered as distinct issues; and few studies are dedicated to investigating the risks of climate change on Chinese ports and the related adaptation requirements.

(l) Competition considerations may hinder adaptation action in ports if relevant measures (appear to) negatively affect a port's efficiency. Lack of information on areas of intervention and on the subject of adaptation further complicates adaptation action in ports. An established quantitative demand for infrastructure development and investment is sometimes required before any funding is allocated to these objectives.

(m) A multi-level governance structure is important, and the role of governments in creating an enabling environment that helps build/enhance the resilience of ports to climate change impacts is crucial.

Session 4

Moderator: *M. Savonis, ICF International, United States*

Session 4 focused further on the impacts of climate change on ports, and on the associated adaptation requirements, and provided an opportunity for all participants and speakers to engage in constructive discussions on how to further improve understanding of the issues at stake and move the debate forward. The issues covered by Dr. Miguel Esteban, Waseda University, Japan**,** in his presentation, included, in particular, the impact of climate change on ports in relation to downtime and infrastructure requirements. Mr. Austin Becker, Stanford University, United States, presented insights gained from a case study on the plans of the Port of Gulfport in the United States to elevate the port. He also presented the results of a global survey on the state of awareness among ports about climate change impacts and general levels of preparedness. Ms. Sin Lan Ng Yun Wing, Ministry of the Environment, Mauritius, conveyed the experience of Mauritius in the field of adaptation to climate change, with a focus on Port Louis Harbour. Dr. Laurent Cretegny, Institute for Economic Modelling, Switzerland, presented lessons from the recent World Bank study on the economics of adaptation to climate change.

Relevant issues highlighted during the session included the following:

(a) Port downtime is expected to increase due to stronger tropical cyclones, potentially creating bottlenecks in the supply chain.

(b) There will be a need to adapt port infrastructure to sea level rises, potentially through elevation of port levels/infrastructure and through adjustments to design standards and codes.

(c) Research that has focused on Japan shows that there is a positive correlation between GDP growth and real port capital stock. In this context, increased port downtime requires greater investment in port capacity, if negative impacts on GDP are to be limited.

(d) Stronger tropical cyclones and changing wave patterns will often require the strengthening of breakwaters and other sea defences. It is important that changes in

sea level and maximum wave heights be taken into account when designing breakwaters intended to be "climate-proof", though this could lead to overdesigning. However, this approach may be expensive. It could be argued that it would be more cost-effective to repair and reinforce existing breakwaters in the future rather than to redesign them now. However, there are inherent risks in this approach.

(e) Small-scale engineering solutions and design refinements may, in some cases, be of considerable importance and contribute significantly to enhanced resilience.

(f) Ports worldwide are concerned about climate change, but they remain insufficiently informed and unprepared, with most ports not planning or having in place adaptation policies and strategies.

(g) A strategy adopted by the Port of Gulfport in the United States, which is based on elevating the entire port by 4.6 metres, illustrates the complexity of implementing resilience strategies, the various roles that decision-makers play, and the funding mechanisms required to move major infrastructure improvements forward.

(h) The preliminary results of a study extrapolating similar large-scale strategies to 155 ports worldwide suggest that in addition to the very significant material costs associated with elevating or protecting ports globally, the human resources necessary to undertake the required work may not be available. It should be noted, however, that the investigation is subject to important limitations; given that ports face diverse local conditions, a highly capital-intensive strategy may not be necessary or optimal. For developing countries, the costs of capital-intensive adaptation solutions such as raising ports or constructing flood barriers may be prohibitive and therefore impossible.

(i) The experience of Port Louis Harbour in Mauritius underscores the particular relevance of concerns about climate-change impacts on SIDS, which depend entirely on external trade and the relevant transport systems for their survival. In these countries, adaptation measures such as the construction of floodwalls may help to alleviate the problem, but they fail to address the problem fully.

(j) A "retreat" adaptation option is not viable for island countries. For SIDS, actively mobilizing funding to support adaptation is absolutely critical.

(k) The African Adaptation Programme is an example of measures taken to advance work on adaptation to climate change impacts in the region. In Mauritius, climate change-related projects will soon be implemented, including the Climate Change Adaptation Programme in the Coastal Zone of Mauritius. This project will also cover the port sector.

(l) Drawing on the findings of the World Bank Study on the Economics of Adaptation to Climate Change, it was noted that the impacts of climatic changes for developing countries would be much more costly if no adaptation action was taken.

(m) It was further noted that hard adaptation measures (e.g. capital-intensive infrastructure) and soft adaptation measures (e.g. institutions, policies, enabling frameworks) were equally important and should be adopted at the same time. It was stated that the right balance between hard and soft adaptation measures was needed.

(n) As poor countries suffer the most from climate change, there is a need to focus on weather resilience and adaptive capacity; among other things, this requires building human and social capital. Economic development should also be approached differently, for instance by adopting forward-looking design standards for new or

upgraded ports. Policies need to provide economic incentives that enable private sector investment, i.e. autonomous or spontaneous adaptation.

(o) It is important to ascertain the cost of adaptation to climate-change impacts for ports and other relevant stakeholders; at present, little relevant data is available.

(p) One critical lesson to be drawn is not to rush into making investments that have a long time frame, but to adopt a considered approach; in some cases, small steps and adjustments can lead to good results.

(q) There is merit in enhancing the dialogue between the port industry on the one hand and academia, scientists and researchers on the other, with the port industry conveying in clear terms its research needs. Engaging port operators and managers and clarifying the kind of information they need is crucial to facilitating adaptation action.

(r) There appears to be a divide between scientific knowledge and the decision-making process. Scientists should disseminate information widely, while trying, to the extent possible, to address existing uncertainties so that the message is as "deterministic" as possible. At the same time, existing uncertainties need to be addressed. Better dissemination of information would promote constructive debate and improve decision-making processes.

(s) The Philippines noted the relevance of climate change for archipelagic countries, emphasizing that the country had recently been visited by two typhoons and was one of the most vulnerable in the world in terms of natural hazards and disaster risk. It was commented that the Philippines was not a part of the Pilot Programme for Climate Resilience (PPCR), which involves nine countries. (The PPCR is a programme within UNFCCC's Climate Investment Funds.) Funding was needed, and PPCR had a role in helping meet some of those needs.

(t) There has to be a mechanism to further raise awareness and to bring the expert knowledge to the field to be widely shared. In this regard, it was suggested that IAPH meetings and seminars could be used, especially in developing regions. IAPH suggested that its March 2012 meeting in Sri Lanka could provide a suitable platform for further dissemination of information and discussion; the possibility of convening a conference or other meeting on the topic of climate change adaptation for ports could, subject to funding, also be further explored.

(u) In addition to the lending agencies, the port industry should explore the possibility of providing incentives to its constituency, focusing on the benefits of climate resilience.

(v) It was proposed that an academic paper on the subject be prepared, co-authored by interested expert participants at the Ad Hoc Expert Meeting, to draw from diverse range of complementary areas of expertise/knowledge. The paper could, in due course, form the basis for a more policy-oriented document prepared by the UNCTAD secretariat.

(w) It was recalled that the UNFCCC process dealt with both adaptation and mitigation; adaptation-related provisions and dedicated mechanisms should be explored, and efforts should be made to capitalize on existing synergies. Funding mechanisms for adaptation under the UNFCCC include the national adaptation programmes of action (NAPA). A cursory assessment of some 60 existing/completed NAPAs in 2010 indicates that very few included any coastal infrastructure projects; it would be useful to build guidance into the NAPA process to address some of these issues specifically.

(x) Raising awareness, conducting risk assessments, and developing adaptation plans is necessary and important.

(y) There is a need to further deepen existing institutional and expert cooperation, including between UNCTAD and the United Nations Economic Commission for Europe (UNECE), especially in relation to the work under the newly established UNECE Group of Experts on Climate Change Impacts and Adaptation for International Transport Networks.

(z) Cooperation between UNCTAD and WMO is important, including with a view to raising the profile of transport and ports in the context of ongoing WMO work (the WMO framework for climate services, which focuses on stakeholders and industry sectors including transportation).

(aa) Enhanced dialogue, cooperation and information-sharing between all interested parties should be promoted, including through the establishment of a neutral web-based platform or a virtual group space for participants at the Ad Hoc Expert Meeting to provide continuity to the deliberations, and to share studies, research, data and information.

(bb) It was noted that prescriptive requirements or messages which may impose an undue burden especially for developing countries should be avoided.

ANNEX

List of participants

Experts

Brazil

Ms. Monica **Nunes**, General Coordinator of Environmental Studies and Projects in Ports, Ministry of Ports

China

Mr. **Sun** Yaohua, Attaché, Permanent Mission, Geneva

Dominican Republic

Ms. Magaly A. **Bello de Kemper,** Ministro Consejero, Misión Permanente, Ginebra

Ethiopia

Mr. Leulseged Tadese **Abebe**, Permanent Mission, Geneva

France

Mr. André **Leuxe,** Adjoint au chef du bureau des études économiques générales, DGITM, Ministère de l'écologie, du développement durable, des transports et du logement, Paris

Germany

Mr. Björn **Oriwohl**, Counsellor (Transport), Permanent Mission, Geneva

Ghana

Mr. Anthony **Kwasi**, Permanent Mission, Geneva

Greece

M. Andreas **Papastamou**, Premier secrétaire (Affaires économiques et commerciales), Mission permanente, Genève

Iraq

Mr. Bashar **Al-Nuaimee**, First Secretary, Permanent Mission, Geneva

Japan

Ms. Misaki **Kodama**, Advisor, Permanent Mission, Geneva

Mauritius

Ms. Tanya **Prayag-Grijadhur**, Second Secretary, Permanent Mission, Geneva

Mexico

Mr. Hugo **Rodríguez Nicolat,** Permanent Mission, Geneva

Myanmar

Ms. Khin Thida **Aye**, First Secretary, Permanent Mission, Geneva

Nigeria

Ms. Jolade Adekois **Orimoloye**, Minister, Permanent Mission, Geneva

Philippines

Ms. Elizabeth **Te**, First Secretary, Permanent Mission, Geneva

Poland

Mr. Maciez **Brodowics**, Attaché, Permanent Mission, Geneva

Saudi Arabia

Mr. Emad **Adham**, Counsellor, Permanent Mission, Geneva

South Africa

Ms. Nosisi **Potelwa**, Counsellor, Permanent Mission, Geneva

Thailand

Ms. Platima **Atthakor,** First Secretary, Permanent Mission, Geneva

Viet Nam

Mr. Tuan **Vu Duy,** Third Secretary, Permanent Mission, Geneva

Ms. Duy Le Minh **Khuat**, Third Secretary, Permanent Mission, Geneva

Venezuela (Bolivarian Republic of)

Mr. Fabio di **Cera Paternostro,** Second Secretary, Permanent Mission, Geneva

Ms. Anny **Rojas Mata**, Second Secretary, Permanent Mission, Geneva

United Nations

United Nations Conference on Trade and Development

Ms. Anida **Yupari Aguado**, Economic Affairs Officer

Ms. Roshni **Dave**

United Nations Economic Commission for Europe

Mr. Michalis **Adamantiadis**, Chief, Transport Facilitation and Economics

Mr. Konstantinos **Alexopoulos**, Economic Affairs Officer, Transport Facilitation and Economics

Mr. Adonis **Velegrakis,** Professor, Consultant on Climate Change

Ms. Azhar **Jaimurzina**, Economic Affairs Officer

Specialized agencies

World Bank

Mr. Daniel **Kull**, Senior Disaster Risk Management Specialist, Global Facility for Disaster Reduction and Recovery

World Meteorological Organization

Mr. Edgard **Cabrera**, Chief, Marine Meteorology and Ocean Affairs Division, Geneva

Ms. Boram **Lee**, Senior Officer, Marine Meteorology and Ocean Affairs Division, Geneva

World Trade Organization

Mr. Devin **McDaniels**, Economic Affairs Officer

Non-governmental organizations

General category

Ingénieurs du monde

M. François **Ullmann**, Président

International Federation of Business and Professional Women

Ms. Elizabeth **Clement-Arnold**, NGO representative

World Association for Waterborne Transport Infrastructure (PIANC)

Mr. René **Kolman**, Representative

Special category

Intenational Council of Environmental Law

Ms. Laura **Covino-Kerpelman**, Volunteer consultant

International Multimodal Transport Association

Ms. Mahindokht **Faghfouri**, President

International Ocean Institute

Mr. Awni **Behnam**, President

Special invitees

Athens University of Economics and Business, Greece
Ms. Myrto **Pastidou**
Det Norske Veritas (DNV), Norway
Mr. Michele **Acciaro**, Senior Researcher
ENVIRON International Corporation, United States
Mr. Steven **Messner**, Partner in scientific consulting firm
Estudio López Dardaine, Buenos Aires, Argentina
Mr. Mauricio **López Dardaine**
Heriot-Watt University, Edinburgh, United Kingdom
Mr. Dong-Wook **Song**, Professor, Logistics Research Centre
International Association of Dredging Companies, The Hague, Netherlands
Mr. René **Kolman**, Secretary-General
International Rainwater Harvesting Alliance, Geneva
Ms. Hannah **Price**, Communication Officer
Instituto de Desenvolvimento, Logística, Transporte e Meio Ambiente, Brazil
Mr. Frederico **Bussinger**
University of Southampton, United Kingdom
Mr. AbuBakr **Bahaj,** Professor of Sustainable Energy
World Maritime University, Malmö, Sweden
Mr. Seong-Hyeok **Moon**, Professor
Mr. Carlos **Canamero**, Consultant, Geneva

Panellists
(Listed in chronological order of intervention)

Mr. Stefan **Rahmstorf**, Professor and Scientist, Potsdam Institute for Climate Impact Research
Mr. Pascal **Peduzzi**, Head, Global Change and Vulnerability Section, UNEP/DEWA/GRID-Europe
Mr. Susumu **Naruse**, Secretary-General, International Association of Ports and Harbours
Mr. Philippe **Crist**, Administrator and Senior Researcher, Organization for Economic Cooperation and Development (OECD) & International Transport Forum (ITF) Joint Transport Centre
Mr. Simon **Bennett**, Director of External Relations, International Chamber of Shipping
Mr. Mike **Savonis**, Fellow, ICF International
Mr. Leonard **Nurse**, Senior Lecturer, University of the West Indies, Barbados
Mr. Vladimir **Stenek**, Climate Change Specialist, International Finance Corporation, World Bank
Mr. Robert **Nicholls**, Professor, University of Southampton, United Kingdom
Mr. Andrew **Mather**, Project Executive: Coastal Policy, eThekwini Municipality, Durban, South Africa
Ms. Nicole **von Lieberman**, Civil Engineer, Head of Division (Tidal Elbe and Hydrology), Hamburg Port Authority, Germany
Mr. Adolf **Ng**, Assistant Professor, Hong Kong Polytechnic University, Hong Kong (China)
Mr. Miguel **Esteban**, Assistant Professor, Waseda University, Tokyo, Japan
Mr. Austin **Becker**, PhD candidate, Stanford University, United States
Ms. Sin Lan **Ng Yun Wing**, Director, Ministry of the Environment, Mauritius
Mr. Laurent **Cretegny**, Senior Principal Economist, Institute for Economic Modelling, Lausanne, Switzerland