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Session Report

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TECHNICAL SESSION RF 6 HDM-4 AND RESILIENCE
THURSDAY FEBRUARY 10, 08.00 AM TO 09:30 AM (CALGARY)

1. KEYWORDS

HDM-4, Climate Change, Resilience, Flooding, Decarbonisation

2. PRESENTATION OF THE SESSION (XX COPY THE SAME TEXT AS ON THE WEBSITE XX)

HDM-4 is an economic appraisal tool that is used worldwide for assessing different road investment strategies. Typical uses of HDM-4 include a project evaluation where the economic and technical efficiency of the proposed scheme are analysed, as well as preparing annual road work programmes under budgetary restrictions. In the light of climate change and other impacts that may affect pavement performance, it is now more common to determine how resilient the proposed plan of work is to such effects, or to design resilience into HDM-4 prior to the analysis.
This foresight session looks at approaches to address resilient road investment strategies using HDM-4. The session will present case studies where resilience has been addressed by HDM-4 from several different countries, as well as take a forward look at how HDM-4 can address this important issue in the future.

3. PROGRAMME OF THE SESSION

Session Chair: Oscar de Buen Richkarday, PIARC Honorary President, Mexico
Session Organiser: Eric Stannard, CEO of HDMGlobal, UK
Session Secretary: n/a

Person	Organisation, Position…	Title of the presentation
Kevin McPherson	Asset Management Consultant, TRL Limited	HDM4 and its importance in assessing climate resilience measures
Tyrone Toole	Chief Technology Leader, Road Asset Performance, Australian Roads Research Board, Australia	Resilient Maintenance Planning in Australia
Michael Anyala	Senior Road Asset Management Specialist, Asian Development Bank, Indonesia	Applying Foresight Thinking and HDM-4 to Improve Resilience of Roads in Asia and the Pacific
Martin Humphreys	Martin Humphreys, Lead Transport Economist, World Bank, USA	The Sustainable Future for HDM-4

4. TECHNICAL FINDINGS AND DEBATE

The presentation by Kevin McPherson set out the impact climate change will have on the road infrastructure in the future and the importance in managing those risks to ensure a resilient road network is available for transportation. Temperature, precipitation, windstorms and sea level changes were highlighted as having the greatest impact on road networks. The responses available to road agencies to address the challenges were presented and can be highlighted as:

- Review and update policies and standards for planning, programming, design and maintenance
- Alignment of policies with National Adaptation Plans (NAPs)
- Provide the required funding to carry out regular periodic and routine maintenance
- Improve monitoring of infrastructure
- Research and implement new materials and technologies
- Conduct Climate Risk and Vulnerability Assessments of their assets
- Enforce stricter specifications and quality assurance during construction

It was discussed that although the current HDM-4 models were developed before climate change and resilience was noted as being a concern, there are strategies that can be adopted to include the impact of increases in temperature and precipitation within an analysis. Improvements to the existing models were suggested to enable HDM-4 to be used more directly to analyses the effectiveness of maintenance and improvement strategies to maintain a road network resilient to the forecast changes in weather patterns.

Following on from the climate resilience theme, Ty Toole presented details of resilient maintenance planning in Australia. It was highlighted that monitoring climatic data was important to identify long term trends as well as cyclic events and use these to inform maintenance planning and risk assessments to the network. The importance of collecting pavement performance data was highlighted so that lessons could be learned, and future strategies adapted to treat the common causes of pavement failures. Understanding these two elements allowed the Australian team to identify regional variations in pavement performance to temperature / precipitation cycles and using this data to perform an analysis to identify which parts of the road network where most at risk from failure or disruption.

Analysis showed that a “stitch-in-time” approach was more beneficial than a reactive maintenance strategy. They also looked at a full resilient solution and this produced mixed results – for lower trafficked roads the high road agency cost could not be economically justified, but for higher-order roads such a solution was more viable. Therefore, the best approach for the network was a mix of “stitch-in-time” maintenance activities and fully resilient improvements which lead to a net saving of $2.7 per additional $ invested in the network.

Michael Anyala from the ADB started his presentation by stating that to achieve greater resilience in road transport we needed to understand the long-term trends of transport requirements of the road networks. The foresight thinking involves defining a vision for the future and devising a strategy to get there. The future transport trends is a complex system of change and includes population and behaviour patterns, integrated transport systems and growth, climate and environmental risks, as well as changing economic and trade patterns together with geopolitics. Michael presented eight different possible visions for the future:

1. Safe, reliable and efficient systems
2. Inclusive and accessible spaces and services
3. Resilient systems
4. Seamless transport and logistics systems
5. Deliver environmentally considerate outcomes
6. Robust institutional, financial, and technical capacity

7. Technology-enabled transport services, and
8. Strong regional cooperation and comprehensive development

To be able to achieve the visions of the future, robust analysis, prediction and planning tools are required are access and manage the strategy to achieve these visions and deliver a resilient network of the future. Michael Anyala considered where HDM-4 could currently be applied to some of these visions and how it could be adapted in the future to meet them.

One current application of HDM-4 was described – this focuses on the carbon impact of road network management and improvement and takes the existing HDM-4 software and extends its functionality through the use of an external toolkit to determine the life-cycle carbon cost of the network improvements under consideration.

Martin Humphrey's from the World Bank spoke about the sustainable future for the HDM-4 software in the last presentation in the session. Firstly, Martin set out the background to the present HDM-4 software which has seen strong support and use throughout the world. Since the development of HDM-4 the functional demands for an analysis tool has changed as knowledge has advanced, technology has improved, and demands on the road network have emerged. The new vehicle to provide the management and funding of the HDM-4 software was introduced, the Global Facility to Decarbonize Transport (GFDT).

The GFDT new vehicle will handle the funding of the upgrading/extending/piloting and rolling out of "HDMM- Version 5". The group will be organised into a Steering Committee comprising major sponsors of the project, together with a Project Management Team who will coordinate several Working Groups who will focus on the functional improvements to be included in the software.

The work of the group has already started with some initial first steps. This includes insuring there is no break of service in the transitional period between the end of the current licence period with HDMGlobal and going live with the new institutional model and updated HDM-4 software version. A detailed workplan is under development and as the project develops more details will be released to keep everyone fully informed.

5. RECOMMENDATIONS FOR DECISION MAKERS, FOR PIARC OR FOR INTERNATIONAL ORGANISATIONS

The session highlighted the importance of taking a holistic forward look at the challenges that a road transport will face in the future, to define a vision for that network, and seek strategies to reach that vision. One important aspect of the challenges has been identified the impacts of climate change, and the requirement to produce lower the carbon impact of road networks and vehicle use. It has been shown that it is economically more efficient to take proactive action rather than reactive. The economic efficiency of a solution can varies depending on the network's usage, and therefore it is important to have a robust analysis tool such as HDM-4 to help to justify the decisions taken.

HDM-4 is a tool that has worldwide recognition and has been used extensively around the world for the past 20 years. It is important that such a standardised tool continues to be available to assist in the decision-making process in the light of new requirements and challenges. The World Bank is leading this initiative and has the backing of major organisations such as the Asian Development Bank (ADB) and the Foreign and Commonwealth Development Office (FCDO) in the UK.

6. PREPARATION OF THE SESSION

Patrick Mallejacq, PIARC Secretary General, invited HDMGlobal to organise a session around the use of HDM-4 for resilience and to include details of the future plans for HDM-4.

This session was planned, designed and organised Eric Stannard, and Oscar de Buen Richkarday.

Thanks is given to the speakers who were in different regions throughout the world and gave up their time to contribute to and participate in this session. Thanks is given to the audience for their attention and follow up questions.