UNECE - UNCTAD Workshop on Climate Change Impacts on International Transport Networks

Road Networks: A Scottish Perspective

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Topics

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Background

- August 2004
- Over a period of 10 days, three major landslide events resulted in closures of sections of the Trunk Road network
- Each landslide was triggered by a severe rainfall event
Background

- 9 August 2004, A85 Cairndow
Background

- 11 August 2004, A9 Dunkeld
Background

- 18 August 2004, A85 Glen Ogle
The Scottish Government commissioned two studies through Transport Scotland:

- **Landslides Study**: To consider current practices and recommend future approaches to landslide prediction, management and response.

- **Climate Change Study**: To evaluate current climate change predictions, identify their potential effects on the Scottish Road network, and recommend actions as appropriate.
Study Methodology

Study Brief:

- Undertake a desktop analysis of current climate change predictions for Scotland
- Determine detailed implications for operation and management of Scottish road network
- Consider a range of weather types including: temperature, rain, snow, wind, fog, and coastal flooding
Study Methodology

• Study team led by Jacobs, and included:
  – Highways design and operation specialists
  – Climate change specialists
  – UK Met Office provided climate change prediction advice

• Climate change predictions were prepared for each weather type, for 2020s, 2050s and 2080s

• Study was based on the UKCIP02 outputs, supplemented by additional Met Office data
Study Methodology

- Implications of climate changes predictions were analysed in terms of:
  - the impacts these would have on the operation and maintenance of the road network
  - how these weather types were currently addressed in design and/or operation of the road network
- Recommendations were developed for adaptation measures based on the findings of this analysis
- It was important to recognise that there were inherent uncertainties in climate change modelling
Types of Recommendation

- Study delivered different ‘types’ of recommendation:
  - Design: changes in design approach
  - Operational: changes in operational practices
  - Research: seeking further data to support recommendation development
  - Policy: requirement to reconsider the policy approach

- Recommendations were also categorised as:
  - Priority
  - Short-term
  - Long-term
Examples of Findings and Recommendations

- Predicted increases in rainfall were found to be the issue of greatest concern.
- 2020s Predicted % Changes, Medium-High Emissions Scenario
- General increase, particularly in eastern Scotland, ranging from 4-13% in 2020s to 10-30% by 2080s.
Examples of Findings and Recommendations

• Predicted changes in rainfall gave rise to a number of Priority recommendations:
  – Revise parameters for surface water design by increasing storm depth by ~20% (Design)
  – Revise parameters for hydraulic design of watercourse structures by increasing capacity by ~20% (Design)
  – Identify locations of existing flooding and develop cost/benefit assessment of remedial works (Operational)
  – Pre-emptively clear detritus from watercourse structures in areas of known flooding risk (Operational)
  – Research catchment runoff estimation parameters and develop risk based design approach (Research)
Examples of Findings and Recommendations

- Other findings and recommendations included:
  - Consider the stiffness of pavement materials (Design)
  - Incorporate drainage systems during maintenance works where these are not already present (Operational)
  - Develop an integrated flood warning/road hazard system in partnership with other public bodies (Policy)
  - Assess costs/benefits of providing wind barriers at locations regularly closed to high-sided vehicles (Operational)
  - Consider a severe weather events road user education programme, supported by real-time information displayed on the network of Variable Message Signs (Policy)
Further Work Undertaken/Planned

• Following publication of the Climate Change Study in 2005, further work undertaken consists of:
  – Review of UKCP09 outputs published in 2009, which provide probabilistic predictions of climate change
  – Preparation of an Updated Study, based on the UKCP09 outputs, expected to be published later this year
  – Anticipate that monitoring of progress in delivering recommendations will continue
Wider Issues

- Although this work focuses on adaptation, the Scottish Government is also committed to mitigation
- Climate Change (Scotland) Act 2009 provided statutory framework for reduction in total carbon emissions, by 42% by 2020 and 80% by 2050
- Transport Scotland are developing a Carbon Management System to assess carbon emissions arising from its work and to assist in emission minimisation across asset life-cycles
Conclusions

- Adaptation is required in response to climate change predictions to maintain desired levels of asset performance.
- This will entail changes in design approach, operational practices, and infrastructure policies.
- These proposals must be evidence led, recognising uncertainties inherent in climate change modelling.
- In Scotland, Transport Scotland are leading this work for the Scottish Government, and have supported the delivery of this presentation.
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