Planning for infrastructure vulnerability due to climate change

Developing a vulnerability assessment approach to support network planning and resilience investments for managing future climate threats and natural hazards.

The *Planning for infrastructure vulnerability due to climate change* project developed and tested a network vulnerability assessment approach based on best practice methods, data and stakeholder input. The project's first year delivered two pilot assessments to demonstrate the practicality, capability and adaptability of the approach and provide recommendations for future development.

Background

Extreme climatic or weather events have the potential to damage and/or disrupt the operation of road infrastructure with unacceptable associated social, environmental and economic consequences. The Western Australian state-controlled road network comprises more than 18,500 kilometres of major roads and highways, as well as bridges, culverts, drainage and other related road assets and furniture. Many of these assets and linkages, are or may become increasingly, vulnerable to future climate hazards or events. To better address the availability of the road network to road users and reduce expensive maintenance costs, Main Roads sought to determine its capability in understanding and responding to the vulnerability of the road network to impacts of climate change and extreme weather events. In addition, Main Roads WA sought to improve understanding of adaptive treatment options to enhance the resilience of the network.

Approach

Research

- Researched road best practice in identifying and analysing road network vulnerability due to climate change.
- Reviewed Main Roads' current practice, and compared these with other Australian state road agencies and international best practice.
- Discussed findings and obtained stakeholder feedback.

Analysis

- Researched best-practice climate change projections and scenarios
- Mapped forecasted climate threats to Main Roads' key long-lived asset types
- Identified resilience options for vulnerable road networks and assets.

Pilot Vulnerability Assessment

- A link-based assessment for a remote highway in a climate exposed region, consisting of thousands of road segments, hundreds of culverts and one structure.
- A project-specific assessment for a planned (new) structural asset in an urban area.

Knowledge Sharing

- Developed a technical report, cost benefit analysis, and training & communications materials.
- Allows for learnings and new knowledge created.

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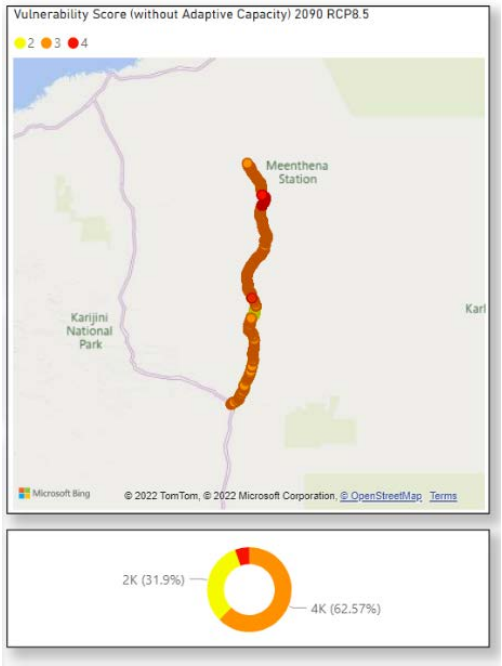
Key Research Outcomes

The research developed and recommended a best practice, stakeholder-informed network vulnerability assessment framework based on an indicator-based approach using data available from Main Roads' asset management systems but also with stakeholder-input for considering local factors.

Using this method and the information gathered, the project undertook a pilot vulnerability assessment considering two very different real-world examples: a remote strategic link and a planned structural project in an urban area. The pilot made number of observations and recommendations to Main Roads including for process improvements, tool refinements and future development

The image shows sample pilot results for the remote strategic link vulnerability assessment.

MAP OF MARBLE BAR RD ROAD SEGMENTS VULNERABILITY SCORE (2090 RCP8.5)



KNOWLEDGE SHARING

Technical report

The project's technical report covers:

- best practice methodologies for assessing future climate risks and road network infrastructure vulnerabilities
- current Main Roads practices, tools and guidance for assessing network and asset vulnerability
- regional climate risk forecasts and scenario modelling
- thematic mapping of Western Australia's state-controlled road network, link and asset vulnerabilities to climatic impacts
- adaptation treatment options for vulnerable networks, links and assets
- pilot study observations and recommendations

Training and Communications

- The project has delivered four workshops with Main Roads staff to share project learning and input local expertise into the methodology.
- A public webinar

FUTURE CONSIDERATIONS

Next steps include to:

Develop an entire state-controlled road network assessment model.

Develop guidance material for how to use the vulnerability score in asset planning, preservation, maintenance, and renewals prioritisation.

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