8 April 2019

Dear [Redacted]

I refer to your request of 11 March 2019, pursuant to the Official Information Act 1982 (the Act), seeking:

- "a copy of the Ministry of Transport’s “Sector Report” on climate change
- any more up to date information on costs of climate events to transport
- any advice the Ministry or NZTA has given on practical steps which LAs should take to adapt their transport systems to weather related events and climate change"

The document ‘Sector Report: Managing climate related risks for land transport infrastructure’ is enclosed. Some information has been withheld under section 9(2)(a), which relates to protecting the privacy of natural persons. We have not identified any other information relevant to your request.

With respect to the information that has been withheld under Section 9 of the Act, I do not consider that there are any other considerations which render it desirable, in the public interest, to make the information available.

We have contacted the NZ Transport Agency, which has advised that there may be further information. At the time of this response to you, the NZ Transport Agency has advised that there may be some information on this subject, but not specifically about practical steps to adapt or respond specifically given to Local Government. I will write to you if there is more provided.

There is public information which may be of interest to you. In November 2016, the Government asked a group of technical experts across the public and private sectors to provide advice on how New Zealand could adapt to the effects of climate change. Information about the climate change adaptation technical working group and its reports, is available here: [www.mfe.govt.nz/climate-change/climate-change-end-government/adapting-climate-change/climate-change-adaptation](http://www.mfe.govt.nz/climate-change/climate-change-end-government/adapting-climate-change/climate-change-adaptation).

You have the right under section 28(3) of the Official Information Act to make a complaint about the withholding of information to the Ombudsman, whose address for contact purposes is info@ombudsman.parliament.nz.

Yours sincerely

Glen-Marie Burns
Manager, Urban Development & Environment
Purpose of Report

This sector report:

1) Provides the context for managing climate related risks to land transport infrastructure.
2) Describes the current impacts of the climate related events on New Zealand’s land transport network including the current costs that climate related events impose on the National Land Transport Fund (NLTF).
3) Identifies issues that take a ‘resilience’ approach to future planning and decision-making.
4) Identifies implications and opportunities for further work.

Context

A changing climate is not a new phenomenon. The current global experiences of severe weather events highlight two key uncertainties. These are the:

- rate of climate related events that are being experienced and how this may play out in the future
- impact human activity has on weather patterns.

Transport is one of the critical infrastructure services identified by the Ministry of Civil Defence and Emergency Management as essential for supporting the life of a community, enabling business, and underpinning the function of a society and the economy. Closures and repair needed on transport corridors can have enormous flow-on effects for the affected communities through loss of mobility and access to services that enable productivity.

The context for this sector report is based on latest research and lessons learned from recent experiences; and a resilience based approach for identifying issues and implications for the Ministry of Transport (the Ministry).

- Latest research and lessons from recent experiences

The costs of weather events to the land transport network have increased in the last 10 years from about $20 million per annum to over $90 million per annum.

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Manawatu Gorge Landslip, 2011

The landslide event at the Manawatu Gorge is another recent example of the risk to key transport routes from inland erosion and high rainfall events. Clearing the slip on State highway 3 and reinstating the highway cost the NZTA $19 million and took fifteen months to complete. The road closure was estimated to have cost the region $30 million through reduced economic activity and lost productivity. Some parts of New Zealand do not provide alternative routes to ensure communities remain connected. The impact of weather related events on transport infrastructure also include a social cost to communities.

The two largest weather related events experienced in New Zealand over the last 10 years have been the 2008 Condoleezza weather bomb, which was a low-pressure system that led to high rainfall and extensive flooding in Northland; and the February 2004 Wanganui-Manawatu floods, which caused record rainfall and devastating flooding in the lower North Island. Both events are indicators of the impact extreme weather events could have on transport infrastructure and communities. These events cost the NLTF $19 million and $95 million respectively in emergency works funding.

Extreme weather related events are predicted to increase in frequency. While there remains uncertainty around the rate and impact of a changing climate, New Zealand already experiences weather related events that impact on land transport infrastructure. The government can expect to face new challenges for funding and planning a resilient and cost effective land transport network.

Based on current information, New Zealand is expected to experience an increase in the occurrence of coastal storm surges, heating and freezing, and severe snow, ice, and wind events. For land transport infrastructure (including road and railway infrastructure), the effects of a changing climate will impact on decisions related to the safety, cost-effectiveness, efficiency of investment, and asset management\(^3\).

The information used in this report, which shows the impact of and identifies the implications of severe weather events, were developed by the National Institute of Water and Atmospheric Research (NIWA), based on predictions by the Intergovernmental Panel on Climate Change (IPCC)\(^4\). They assume a 2°C increase in average temperature by 2090.

This report explores the effects of a changing climate on New Zealand's land transport infrastructure, and the role government could play in reducing the negative consequences of


Taking a resilience based approach

To understand the impact of extreme or severe weather related events on land transport infrastructure raises questions on how best to respond to them and what role government might play in the maintenance and repair of the infrastructure.

The Ministry is currently in the process of developing a Resilience Outcomes framework. The framework is aimed at building a shared understanding for the Ministry’s long term response to New Zealand’s transport system\(^5\). Some key points raised in the discussion on what ‘resilience’ is or how it is demonstrated are of particular interest to this paper such as that resilience:

- can be built into larger networks and systems and at different points and levels
- is about identifying priorities and providing appropriate/relevant responses (reduction, readiness, response or recovery)\(^6\)
- is about adaptation
- requires organisations with interests in the infrastructure to work together (for example, sharing information, in partnership, or in the efficient use of resources).

The issues raised in this report are reflected in the concepts outlined above and indicates opportunities for future work for the Ministry.

Government’s role in funding for impact of weather on land transport

The Government Policy Statement on Land Transport Funding 2012/13 – 2021/22 (the GPS) has identified a number of short to medium impacts to be achieved by the NTLF. These impacts are aligned to government’s priorities for economic growth and productivity, value for money and road safety. A key impact that supports the rationale for this sector report is to achieve “a secure and resilient transport network”.

The GPS sets out government’s contribution to funding New Zealand’s land transport infrastructure through the NLTF. The National Land Transport Programme (NLTP) contains the activity classes to which money is allocated for investment in land transport infrastructure and services.

The NZ Transport Agency allocates funding for land transport infrastructure through a number of activity classes. Funding for emergency works for weather related events affecting state highways and some local roads and public transport infrastructure comes from two activity classes in the NLTF:

- new and improved infrastructure for State Highways
- new and improved infrastructure for local roads

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\(^5\) One of four of the Ministry’s Statement of Intent 2013-2016 long term outcomes includes “Resilient – meets future needs and endures shocks”.

\(^6\) These are proxy terms based on the range of terms provided in the Ministry’s Draft Conversation Paper (may 2013)
There is no separate emergency works activity class. The current funding provided for responding to extreme weather conditions is discussed below:

- **Repairing State highway infrastructure**

The NZTA is responsible for the planning and funding of the State Highway network, and takes into account the impacts of the changing climate in the maintenance, planning and construction of land transport infrastructure. Currently, the NZTA plans for emergency funding to withstand 1-in-100 year events. Figure 4 below shows historical emergency work expenditure from the NLTF.

Figure 4

![Emergency works funding from the NLTF](image)

* Currently the planned emergency works spend is being far exceeded due to the Christchurch earthquake recovery. This is expected to impact on the emergency works spend for the next four to six years as reinstatement of destroyed infrastructure in Christchurch continues.

Proactive measures that are responsive to the impact of a changing climate could reduce the negative consequences of climate related weather events to commerce and communities before they occur. These measures could improve the security and resilience of the transport network.

This raises questions on what the proactive measures might be and how they would be applied. Further work may be required to better understand how the current transport network functions at present and if the response mechanisms in place continue to be an effective and efficient framework for investment.

- **Repairing local infrastructure**

A significant portion of the cost of repairing and replacing local transport infrastructure is externalised by local government\(^7\) through an activity class in the NLTF that covers emergencies. The NZTA sets the funding assistance rates (FAR) under the Land Transport Management Act

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\(^7\) NZIER 2004. *Economic Impacts on New Zealand of Climate Change-related Extreme Events: focus on freshwater floods.*
2003. The calculation of the FAR for emergency works is based on the impact of the event on the Approved Organisation (AO). These rates vary for each AO and the amount of funding made available depends on the size of the event and is based on:

- the territorial authority’s base FAR, which is determined every three years based on the size of the authority’s maintenance programme and the relative potential for rates income as measured by land value\(^8\)

- the cumulative cost impact of emergency events during the course of a year on the local authority’s maintenance programme (i.e. if an authority experiences more than one event, the emergency works FAR will increase during the year to account for the additional costs from each event)

The NZTA approves work that qualifies for emergency works funding. The repair of the damage is usually undertaken in two separate phases:

- immediate response – work necessary to re-open a road or other facility, where practicable, and
- permanent reinstatement – work required to restore the road to its former or similar condition.

While the NZTA can also provide funding for any improvements that address public safety or risks to assets, the decision to fund is made on its priority order relative to the current funding threshold. Local authorities often resort to other sources of funding such as insurance and other central government based community relief funding for those improvements not funded by NZTA.

The NZTA is currently undertaking a review of the FAR to explore whether the current framework for funding is effective. This review would be useful to identify how local authorities fare under the current system particularly in relation to the current funding thresholds and the criteria for applying them.

- Local government responses

Local government is responsible for local roading infrastructure, and authorities are required by the Resource Management (Energy and Climate Change) Amendment Act 2004 to ‘have regard to the effects of climate change in their planning and approvals’. Due to the decentralised nature of local and regional councils, it is more challenging to ensure that local and regional councils plan for the impact of extreme weather related events on land transport.

As a result, local authorities bear substantive risks in planning initiatives that provide for reducing weather related risks because they can be challenged by developers and land owning interests through the Environment Court. For example, the Otago Regional Council estimates that three major cases before the Environment Court over the past six years have accrued $247,000 in direct costs. Environment Canterbury estimates that they spend $200,000-300,000 annually advocating

\(^8\) The NZTA’s base FARs vary amongst authorities, tending to be lower for urban authorities and higher for less densely populated rural authorities.
their policy position for flood risk management. Similar costs and experiences are reported by local authorities around New Zealand\(^9\). 

Local Government New Zealand (LGNZ) informs that the current incentive structure allows local authorities to take a minimalist, wait-and-see attitude because of the costs of associated litigation. LGNZ indicates that it would be easier for local authorities to provide for controls in hazardous areas without fear of appeal if hierarchical planning documents had clear requirements for local authorities to make such provisions in their plans.\(^{10}\)

As a result an authority may find that it is in their interests to wait for a road to be destroyed in a disaster event and receive emergency works funding from the NLTF at an increased FAR; rather than to take a more proactive preventive approach. This lack of planning imposes unexpected funding pressures on the NLTF.

There is an opportunity to explore how local authorities could contribute to the FAR review so that there is a consistent approach to their planning for weather related risks to their land transport networks. This approach also raises the issue of emergency funding and whether the NZTA should consider a reinstatement of such an activity class. The question is – What role should the Ministry take in working with other parties to ensure local authorities plan better for unexpected weather related events?

**Emerging issues for investment in land transport related to weather events**

While current research, international and national, points to an increase in frequency and severity of weather related events, there remains a gap in the ability to predict these events with any level of certainty. Better modelling of future scenarios would provide useful information for planning purposes.

Given the uncertainty, there are number of issues that could still be considered to achieve greater resilience in the land transport sector. In order to decide on the options for investment it would be useful to get a better understanding on:

- the current resilience of the land transport infrastructure based on whether the status quo approach already provides for:
  - reduction in infrastructure breakdown
  - a well maintained infrastructure that can withstand severe weather events (readiness)
  - ability to be easily repaired for quick response.

- which networks are more vulnerable than others and whether it is possible to prioritise transport corridors so that different levels and points can be identified for a recovery investment.

The options for investment would be based on the scale and scope of the risks the funding is intended to address such as:

- emergency response (fix properly or maintain until next time)

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- maintain key corridors consistently
- wait for impact of a weather related event to respond.

**Implications for future work for the Ministry of Transport**

In order to better understand the costs imposed on the land transport network from weather related events, further work could be undertaken in the following three areas:

- a focus on how current land transport corridors respond to severe weather events and how this relates to government’s funding decisions and expected outcomes
- quantifying the costs and benefits of land transport investments responding to weather related events of key land transport corridors to help determine the relative merits of investing in infrastructure that reflects a resilience based approach
- investigating the reinstatement of emergency funds in the FAR Review currently being undertaken by the NZTA. The next round of consultation is scheduled for November 2013
- investigating the Ministry’s involvement to work with the NZTA and local authorities to assist with local authorities to plan for emergency infrastructure funding for local roads, perhaps through the FAR Review.

Withheld under section 9(2)(a) of the Official Information Act 1982
What is climate change?

Over the past 50-100 years, increasing industrialisation and human activity have begun to affect the Earth’s natural climate. Activities like use of fossil fuels, farming, burning coal and downing forests, release greenhouse gases (mainly carbon dioxide, methane and nitrous oxide). These gases gather in the atmosphere and trap the sun’s heat, causing the Earth to heat up.

These changes in global climate can affect regional weather patterns and can increase the occurrence of extreme weather events. They can also change average environmental conditions, including sea levels, rainfall, and temperatures (United Nations Framework Convention on Climate Change, http://unfccc.int/)

APPENDIX 1 – RESEARCH FINDINGS

Climate impacts on land transport

NIWA’s research on the future effects of climate change in New Zealand are acknowledged by Ministry for the Environment, and serve as a basis of much of New Zealand’s climate planning.

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11 The terms ‘climate change’ and ‘adaptation’ are attributed to the agencies providing the research findings. It is not the Ministry of Transport’s language.
The Ministry for the Environment acknowledge that climate change is likely to have a significant impact on our economy, environment, and society. This section identifies the most significant effects climate change is predicted to have on the land transport network. The areas to be explored are:

- coastal inundation from sea level rise combined with storm surge, resulting in risks of disruption for coastal land transport corridors, and potentially the need for reinstatement or relocation
- inland flooding, high rainfall, and erosion, resulting in closed and/or damaged transport infrastructure often needing repair or re-engineering
- prolonged high temperatures, resulting in increased heat stress and rail buckling

Coastal inundation from sea level rise

The average sea level around New Zealand is predicted to rise between 18 and 59 cm above 1990 levels by 2090. Much larger increases of over 1 m cannot be ruled out given uncertainties around the melting of ice sheets.

The NZTA has studied the national risk profile of New Zealand’s coastal road and railway networks from inundation as a result of sea level rise and storm surges. About 160 km (3.6%) of the rail network, 222 km (1.4%) of State highways, and 2112 km (1.6%) of local roads are at risk from inundation. This includes at least 10 multimodal coastal corridors (with both road and rail links) potentially at risk, where closing any section would cause major transport disruptions.

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13 From the New Zealand Transport Agency’s (NZTA) commissioned report on climate change risks to the land transport network to develop a national risk profile of coastal roads, by MWH (Montgomery Watson Harza) Global engineering and the National Institute of Water and Atmospheric Research (NIWA).

14 A storm surge is an offshore rise in sea levels due to low pressure weather systems – typically tropical cyclones – and is caused by high winds pushing at the oceans surface. During cyclone Sandy in late 2012, sea levels in parts of New York rose by up to 4 metres (The Atlantic).

15 Areas less than 5 metres above current sea levels were considered to be at risk due to increased storm surge frequency and intensity.
The potential costs to respond to the effects of coastal inundation under a worst-case scenario, where all low-lying sections of the network identified in this study are repaired or replaced, were estimated as the following\(^{16}\):

- **national rail network**: approximately $80 million in ballast and foundation replacement;
- **state highway network**: approximately $88 million in raising and rebuilding all affected sections;
- **local road network**: approximately $840 million in raising and rebuilding all affected sections.

Local roads are not part of the NZTA’s planning, but they have the greatest length of network exposed to risk of coastal inundation from sea level rise by far.

**Inland flooding, high rainfall, and erosion**

New Zealand is at a high risk from flooding and erosion due to high average rainfalls and hilly terrain. Both road and the rail infrastructure are vulnerable to flooding and erosion events. The rail network experienced about 68 floods between July 2004 and September 2008\(^{17}\). The NZTA estimates that climate change is set to double the flood risk for track sections prone to flooding by 2090.

All but one region in New Zealand has recorded floods affecting the State highway network\(^{18}\). Vulnerability of the State highway network is not well defined and a national profile of flood risk has not been developed due to the lack of adequate records of flood events and when they occurred. Similarly, adequate records related to flood events affecting local roads are not available. This causes difficulty in estimating future risks, but is potentially the greatest risk to New Zealand’s land transport network. The increased rainfall in some regions (see Figure 2) is expected to increase the likelihood and frequency of flooding events.

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\(^{16}\) Most inundation and storm surge risk would lie in the lower half of the 0 to 5 metre zone. The estimated costs do not take into account those areas already protected by sea defences.

\(^{17}\) Regions with the highest flood prevalence were central Bay of Plenty, Palmerston North, Arthur’s Pass and Rangiora in Canterbury.

\(^{18}\) A regional comparison was not possible due to a shortfall in data and uncertainty in how flood data is reported.
Prolonged high temperatures

Temperature extremes cause stress and movement on steel bridges and railway tracks, an expansion of concrete joints, and the softening of asphalt leading to potholes and a rapid loss of surface condition. This increases maintenance costs for the roading network. Figure 3 indicates projected changes in average annual temperatures.

High temperatures also increase the risk of rail track buckling. About a quarter of New Zealand’s rail track is currently subject to speed restrictions due to heat during the summer, slowing the movement of freight through those areas. Dryer regions are likely to experience more hot days in the future. Optimised design and a high standard of maintenance can minimise, the impact of temperature increases and rail buckling from climate change.

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20 The ‘critical rail temperature’ in New Zealand is currently 30°C. Regional climate change predictions show temperature ‘hot spots’ may occur in Canterbury, Hawkes Bay, the Waikato, and Wairarapa regions.
Figure 3:

Best estimates of temperature rises in New Zealand are for an expected increase of about 1°C by 2040, and 2°C by 2090.

However, different emission scenarios and modelling of climate sensitivities suggest temperatures could increase by anywhere between 0.2°C and 2°C by 2040, and 0.7°C and 5.1°C by 2090.