

KEEPING OUR ROADS OPEN

Resilience



28/07/2017

The project at a glance – quick reminder

RESILIENCE KEEPING OUR ROADS OPEN

Resilience is about preserving and quickly restoring access to the network in the face of unplanned events.



Increasing robustness and improving alternate routes

KEY ASPECTS

Decreasing the recovery time

WHAT THE TRANSPORT AGENCY ALREADY HAS UNDERWAY?

- » Resilience emergency response plans
- » Greater resilience and better alternate routes being built
- » Improved scour protection and erosion control
- » Well advanced seismic strengthening
- » Ongoing maintenance activities, reducing blackspots
- » Avalanche control and rock fall management

WHAT IS THE RESILIENCE PROJECT DOING?

The Resilience Project has a number of work-streams that aim to deliver these outputs:

- » Up to date, field-tested, **business continuity plans and emergency response plans**
- » Evidence-based **tools and processes** to assess resilience risk and strategic responses
- » An expanded programme of targeted **improvements and maintenance** activities
- » Online, interactive **detour maps**.
- » Closer **links with key partners** (Local Government NZ, New Zealand Lifelines)

THESE ACTIVITIES BECOME PART OF BAU ON COMPLETION



Resilience HIP Web Page

Resilience – getting through

When there is a disruptive event on our roads people still need to get to where they are going. Resilience is about preserving and restoring access to the roading network despite unexpected disruptive events.

It is about making sure our roads can absorb and withstand disruptive events, that there are planned alternative routes when roads are closed and that they are reopened as soon as possible.

In practical terms, this means our state highway network can perform effectively in a crisis, adapt to changing conditions (including climate change) and recover quickly from disturbances.

We have created a number of tools, plans and resources to help achieve this.

For further information contact resilience-infrastructureplanning@nzta.govt.nz.

Business continuity plans →

As much as we can try to avoid disruptive events and emergencies, we can't always prevent them. In those instances we need to ensure the Transport Agency can operate effectively during, and after, any event that disrupts our business activities.

Emergency response plans →

This work stream focuses on ensuring our response teams are well prepared for events that can disrupt the network.

Resilience planning tools →

As we learn more about the resilience of the road network to the range of possible unexpected disruptions and other unexpected disruptions, we better understand where we need to invest - both to increase its resilience and to provide better indicators and predictors of potential disruption. We apply a resilience evaluation lens to the business case process used for our investment and management decision making.

Resources and information →

Tools, resources and links to a range of other sites and resources relating to resilience generally. A great source of background context and further information.

- [Resilience response framework](#)

Frequently asked questions →

Commonly asked questions relating to resilience.

<http://nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/resilience/>



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MAJOR IT OUTAGE



DO WE HAVE

Access to buildings?	YES
Access to IT ?	NO
Sufficient staff?	YES
Safe staff?	YES
Roading network available?	YES



PANDEMIC

DO WE HAVE

Access to buildings?	YES
Access to IT ?	YES
Sufficient staff?	NO
Safe staff?	YES
Roading network available?	YES

In our offices:
Emergency Procedures and Preparedness Plan (EPPP) Incident Management Plan
On our network:
Critical Business Function Plan
Traffic Operations Centre(s), NOC suppliers and emergency services will provide the initial response to any major infrastructure disruptions.

MAJOR EARTHQUAKE



IS THERE

Access to buildings?	NO
Access to IT ?	NO
Sufficient staff?	NO
Safe staff?	NO
Roading network available?	NO

In our offices:
Emergency Procedures and Preparedness Plan (EPPP) Incident Management Plan
On our network:
Traffic Operations Centre(s), NOC suppliers and emergency services will provide the initial response to any major infrastructure disruptions.

SLIP ON HIGHWAY



IS THERE

Access to buildings?	YES
Access to IT ?	YES
Sufficient staff?	YES
Safe staff?	YES
Roading network available?	NO

In our offices:
No effect
On our network:
Traffic Operations Centre(s), NOC suppliers and emergency services will provide the initial response to any major infrastructure disruptions.

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For more information →

at other sites and locally. A great source of information.



Contract: Taranaki New
Contract No. TNOC
Client: NZ Transport Agency
Downer Job No. 53

Contract Plan	Issue Date
Emergency Procedures and Preparedness Plan	July 2014



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Resilience planning tools →

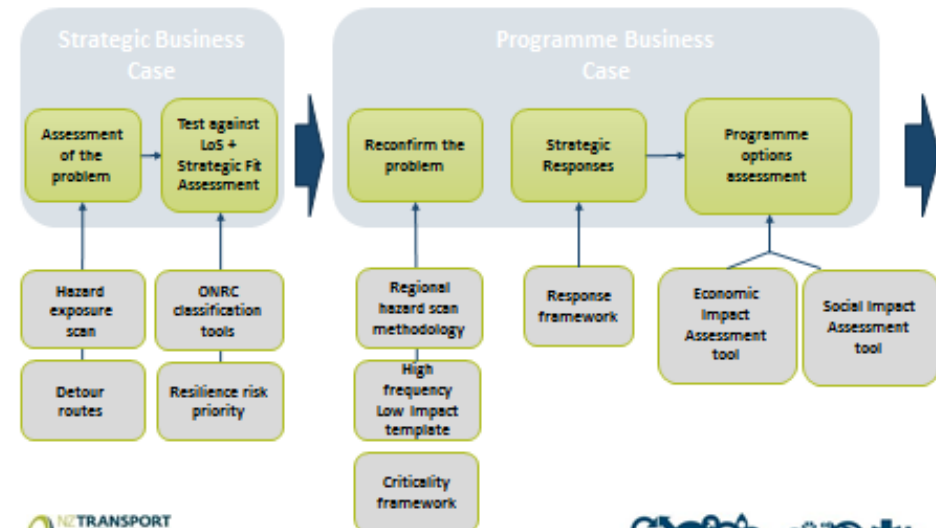
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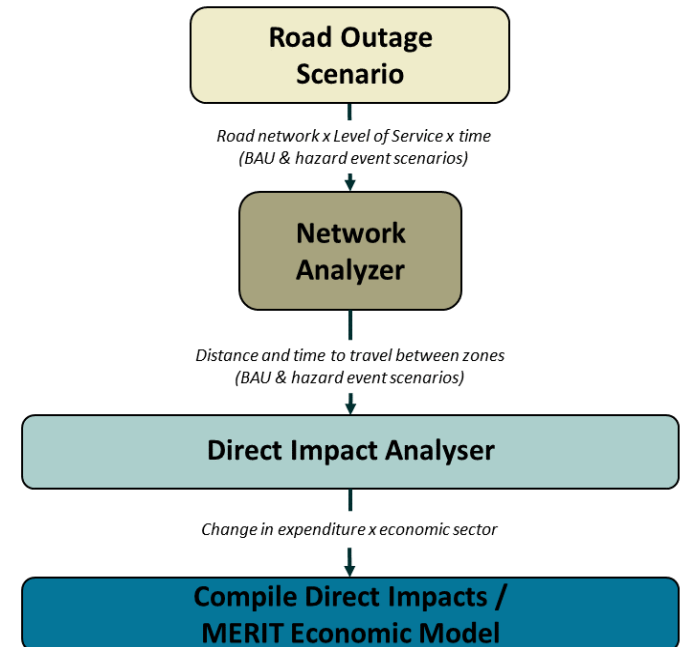
Resilience Tools for Business Cases



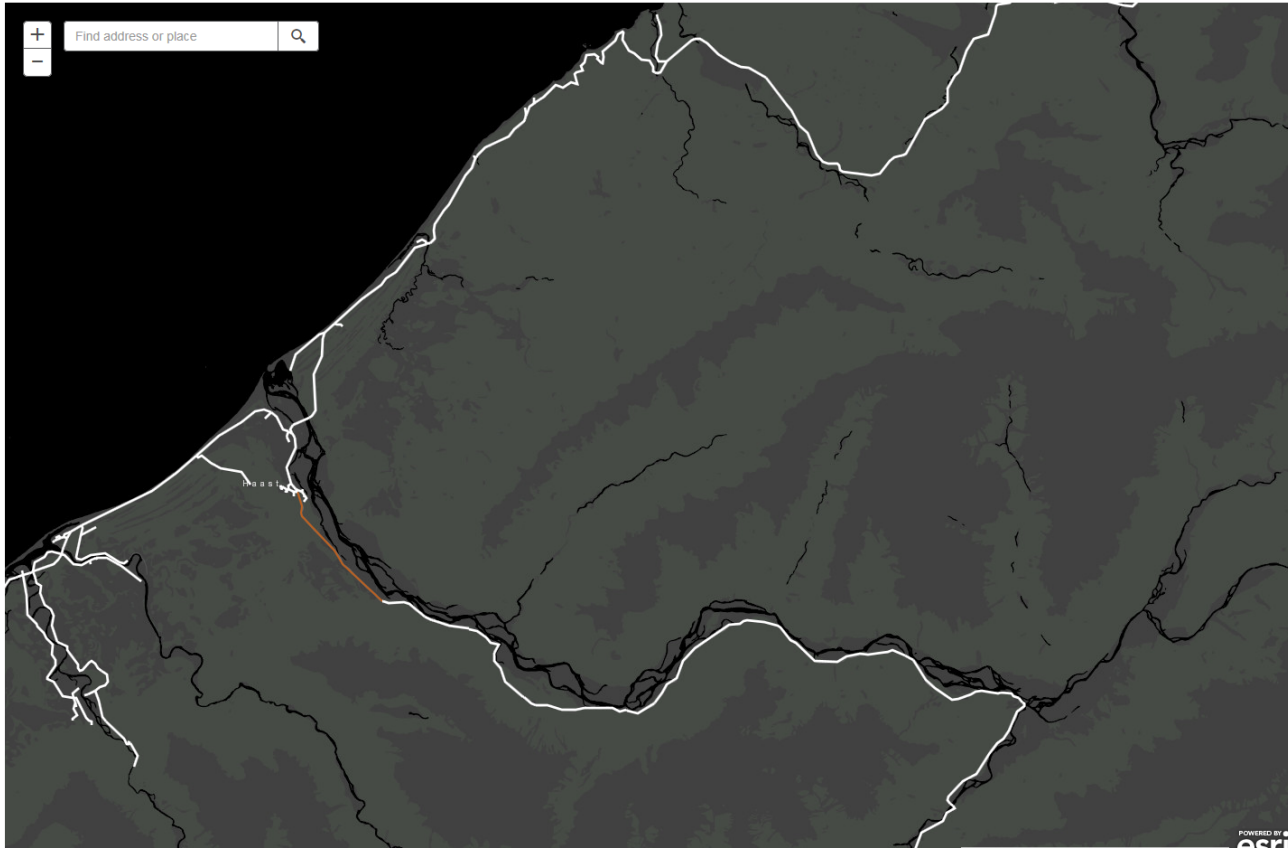
MERIT



Measuring the Economics of Resilient Infrastructure Tool



MERIT



Create model

Instructions

- 1 Zoom to area of interest
- 2 Choose model type
- 3 Choose area of network outage, **Create Barrier**
- 4 When satisfied that you have correctly specified your scenario, click on Submit button


Email

Models

Census Area Units Model (1865*1865 OD matrix)

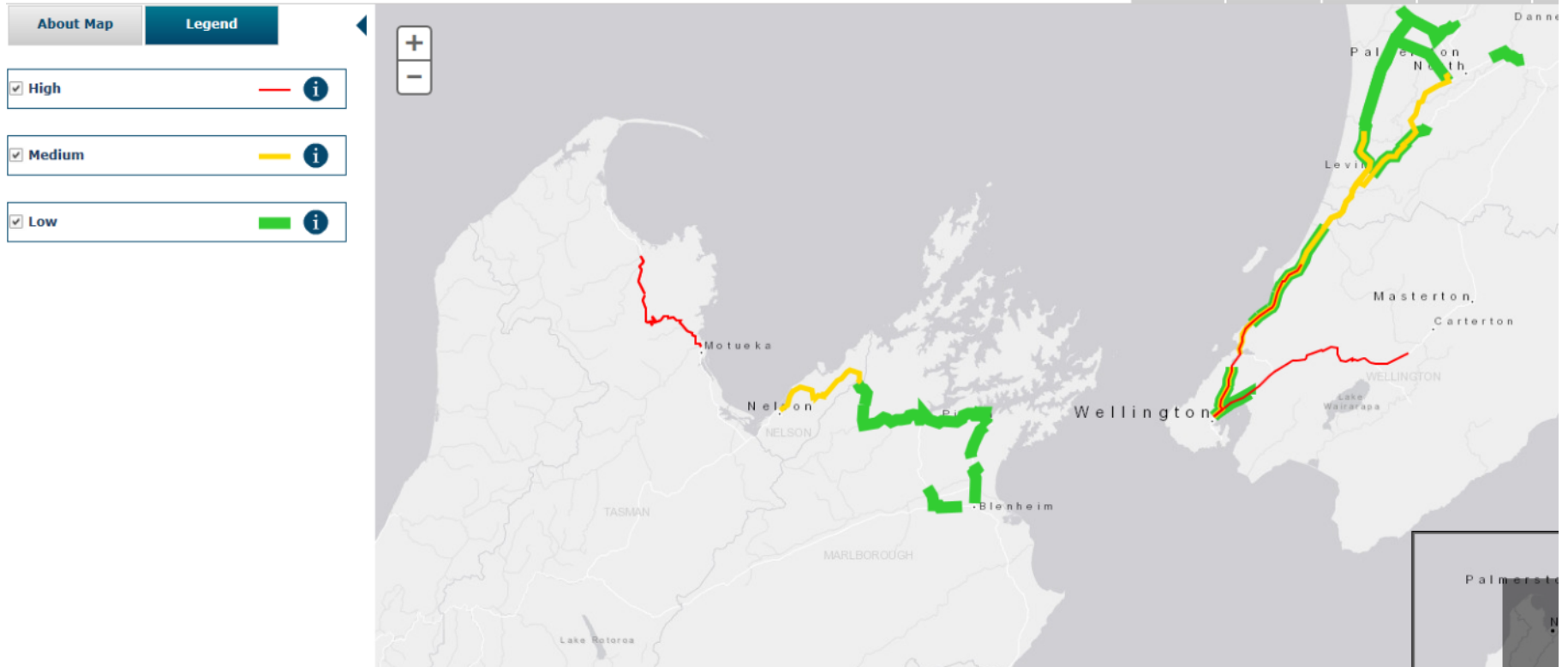
Warning! This model may involve very long run times.

Territorial Authorities Model (66*66 OD matrix)



Social assessment

Social Impact Assessment



Resilience Response Framework

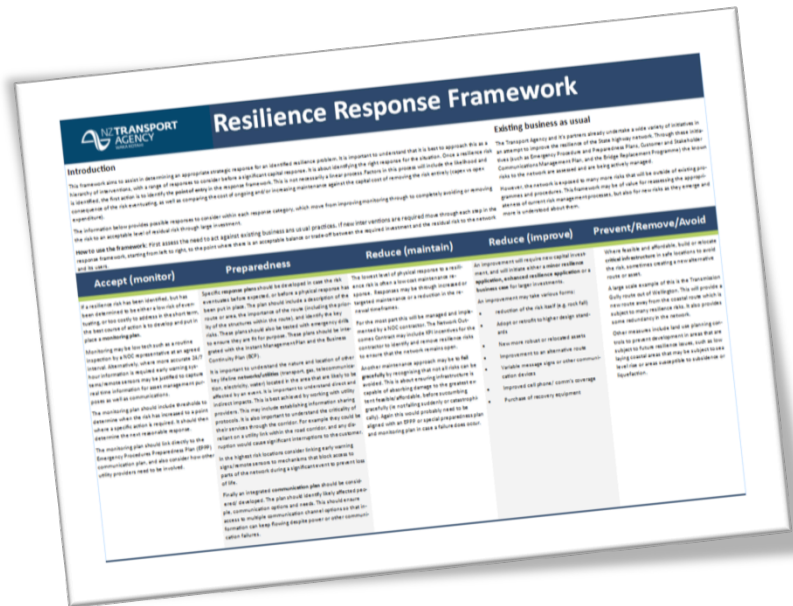
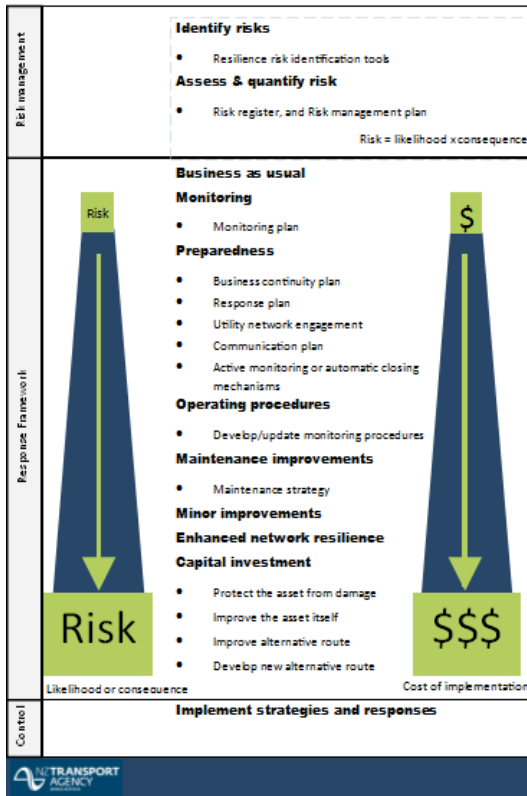
Accept (monitor)

Preparedness

Reduce (maintain)

Reduce (improve)

Prevent/Remove/Avoid



Case Studies

Resilience hazard maps

July 2017

Low frequency hazards

The resilience hazard maps provide an assessment of key low frequency, high impact natural hazards (such as earthquakes) that may impact the availability of the network, and includes an assessment of the extent and duration of the outage. (See <http://nzta.maps.arcgis.com/home/gallery.html#organizationid=modified> and click on SH Resilience option.)

We have gathered information from a number of sources to assess the likely resilience of our state highways to a variety of major events.

This is a useful resource for providing evidence on the relative exposure of our networks to low frequency significant natural hazards like earthquakes and volcanic activity. This will help inform where we need to invest in the future. In the state highway resilience maps section, click along the Themes tab at the top to see the different hazard type assessments.

Availability State

The Availability State indicates whether the road section would be fully available, at various reduced levels or not at all. This gives an indication of the degree of access on a link after an event.

Outage State

The Outage State indicates the duration over which the road will be in the Availability State above. This gives an indication of the duration of loss or reduced access in links along the road network.

Disruption State

The Disruption State combines the availability and outage states to produce a single parameter indicating the level of disruption caused by the hazard type at each road section.



State highway resilience

Lessons learnt from Kaikōura

July 2017

The NZ Transport Agency has been working to understand and enhance the resilience of its state highway network to natural hazards.

As part of this work, the Transport Agency commissioned a national scan of the resilience of the state highway network to a range of low frequency, high impact natural hazard events. This was completed in December 2016. (See maps at <http://nzta.maps.arcgis.com/apps/MapSeries/index.html?appid=5a5163ea3d4e41ab638e4a06462829d2>)

KAIKŌURA EARTHQUAKE OPPORTUNITY

The 14 November 2016 Kaikōura earthquakes severely affected SH1 and other roads in the area.

The Transport Agency took the opportunity to run a further scan of the resilience of the state highway network to earthquakes.

And that while not every section of a high-risk road was affected or closed after an event, this has little effect on the availability of the route as a whole.

Another key observation was that earthquakes loosen slopes, create instabilities and generate debris in catchments due to slope failures. This leads to greater potential for subsequent landslides and debris flows in future storm events which would not have occurred pre-earthquake.

As a result, the pre-earthquake resilience assessments do not fully reflect the resilience of the state highway network where storms lead to loosened ground, debris flows from

Case Study

Measuring the Economic Resilience of Infrastructure Tool (MERIT)

June 2017

SH4 CLOSURE - RAEITHI TO WHANGANUI



In June 2015 floods in the lower North Island forced people in Whanganui from their homes and closed a number of State Highways around the lower North Island.

Road closures included sections of SH4, SH43 and SH3 through the Manawatu Gorge.

MERIT was used to assess the economic consequences of the closure in SH4 from Raetihi to Whanganui.

Fast facts

EVENT - June 2015 major floods forced people in Whanganui and surrounding areas from their homes and significantly disrupted businesses. SH4 from Raetihi to Whanganui closed for about a month.

IMPACT - After the first month loss to commodity production in the region was around \$1.7 million. Total loss in Gross Domestic Product (GDP) over six months estimated at \$10.7 million.

ECONOMIC IMPACT OF SH3 MANAWATU GORGE OUTAGE

The SH3 Manawatu Gorge is an important link through the lower central North Island connecting Palmerston North to Napier.

In 2011 a large slip closed the route for 183 days. A total of 270,000 cubic metres of soil, rock and debris was removed from the site in an effort to reopen the road.

An alternative route was available via the Pahiatua Track or Saddle Road, which added up to 20 minutes to each journey.



Fast facts

EVENT - 2011 a large slip closed the SH3 Manawatu Gorge route for 183 days.

IMPACT - one year from the event the total loss in GDP was \$6.3 million. The cost per day was approximately \$34,200.



Resilience insights for strategic and programme business cases

July 2017

Useful guides have been produced for those developing strategic and programme business cases with resilience issues.

They are in the Resilience - getting through section of the Transport Agency's Highways Information Portal website in our tools page. The guides include insights and examples of how to use a resilience lens on the planning process and can be used by anyone developing a strategic or programme business case to incorporate resilience into their thinking.

What is resilience

When talking about resilience it is important to define what is meant by resilience, as it can mean different things to different people. We define resilience as 'the availability and restoration of road function when there is an unplanned

CAUSE
SH1 has sections that are prone to closure from natural events (extreme rainfall, sea surge, earthquakes).
The remoteness and mountainous terrain of some sections of the state highway is such that it is particularly vulnerable to closure from slips, snow/ice and road crashes (eg lack of alternative routes, topography, bridge pinch points, poor alignment and narrow width, and slow response times to move larger vehicles).
Lack of practical alternative routes when main route is unavailable.

disruptive natural environment or emergency event (eg crashes), including whether there is an alternative available and road user information is provided. Or 'keeping roads open (as much as possible) during an unplanned disruption so people and businesses can make the most of what is needed'. Resilience is not about managing road closures or jams.

Strategic business cases

GOOD
Highways that are resilient are difficult to close. The probability of a road closure is low. The probability of a road closure is low. The probability of a road closure is low.

CONSEQUENCES

Adverse economic impacts. Disruptions to freight and passenger services. Negative effects on community severance. Other infrastructure network communications and connectivity.

Benefit statements must highlight value of acting

The guidance for developing any benefit statements suggests considering the following questions:

- Are the benefits of high value to the organisation (furthering its objectives)?
- Have the benefits that will result from fixing the problem been adequately defined?
- Will the performance measures (KPIs) that have been specified provide reasonable evidence that the benefits have been delivered?
- Is there a logical connection between the effect of the problem and the benefits, and their KPIs?

EXAMPLES OF BENEFIT STATEMENTS

The following are examples from the Strategic Business Case. Benefit statements are rather brief and should be tangible, achievable and realistic. Resilience examples include:

- Improved route availability enables economic activity
- Reduced economic impact of road closures
- Minimised economic impact of closures
- Low probability events.
- Improved regional resilience gives wider network availability.



Resilience
Keeping our roads open so people can get to where they are going despite unplanned events.



Have We Covered What You Need?



Contact:
Stuart Woods
stuart.woods@nzta.govt.nz

Web: <http://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/resilience-project>

