Resilience Response Framework

Introduction

This framework aims to assist in determining an appropriate strategic response for an identified resilience problem. It is important to understand that it is best to approach this as a hierarchy of interventions, with a range of responses to consider before a significant capital response. It is about identifying the right response for the situation. Once a resilience risk is identified, the first action is to identify the **point of entry** in the response framework. This is not necessarily a linear process. Factors in this process will include the likelihood and consequence of the risk eventuating, as well as comparing the cost of ongoing and/or increasing maintenance against the capital cost of removing the risk entirely (capex vs opex expenditure).

The information below provides possible responses to consider within each response category, which move from improving monitoring through to completely avoiding or removing the risk to an acceptable level of residual risk through large investment.

How to use the framework: First assess the need to act against existing business ans usual practices**.** If new interventions are required move through each step in the response framework, starting from left to right, to the point where there is an acceptable balance or trade-off between the required investment and the residual risk to the network and its users.

Existing business as usual

The Transport Agency and it's partners already undertake a wide variety of initiatives in an attempt to improve the resilience of the State highway network. Through these initiatives (such as Emergency Procedure and Preparedness Plans, Customer and Stakeholder Communications Management Plan, and the Bridge Replacement Programme) the known risks to the network are assessed and are being actively managed.

However, the network is exposed to many more risks that will be outside of existing programmes and procedures. This framework may be of value for reassessing the appropriateness of current risk management processes, but also for new risks as they emerge and more is understood about them.

Accept (monitor)

If a resilience risk has been identified, but has been determined to be either a low risk of eventuating, or too costly to address in the short term, the best course of action is to develop and put in place a **monitoring plan**.

Monitoring may be low tech such as a routine inspection by a NOC representative at an agreed interval. Alternatively, where more accurate 24/7 hour information is required early warning systems/remote sensors may be justified to capture real time information for asset management purposes as well as communications.

The monitoring plan should include thresholds to determine when the risk has increased to a point where a specific action is required. It should then determine the next reasonable response.

The monitoring plan should link directly to the Emergency Procedures Preparedness Plan (EPPP) communication plan, and also consider how other utility providers need to be involved.

Preparedness

Specific **response plans** should be developed in case the risk eventuates before expected, or before a physical response has been put in place. The plan should include a description of the route or area, the importance of the route (including the priority of the structures within the route), and identify the key risks. These plans should also be tested with emergency drills to ensure they are fit for purpose. These plans should be integrated with the Instant Management Plan and the Business Continuity Plan (BCP).

It is important to understand the nature and location of other key lifeline **networks/utilities** (transport, gas, telecommunication, electricity, water) located in the area that are likely to be affected by an event. It is important to understand direct and indirect impacts. This is best achieved by working with utility providers. This may include establishing information sharing protocols. It is also important to understand the criticality of their services through the corridor. For example they could be reliant on a utility link within the road corridor, and any disruption would cause significant interruptions to the customer.

In the highest risk locations consider linking early warning signs/remote sensors to mechanisms that block access to parts of the network during a significant event to prevent loss of life.

Finally an integrated **communication plan** should be considered/ developed. The plan should identify likely affected people, communication options and needs. This should ensure access to multiple communication channel options so that information can keep flowing despite power or other communication failures.

Reduce (maintain)

The lowest level of physical response to a resilience risk is often a low cost maintenance response. Responses may be through increased or targeted maintenance or a reduction in the renewal timeframes.

For the most part this will be managed and implemented by a NOC contractor. The Network Outcomes Contract may include KPI incentives for the contractor to identify and remove resilience risks to ensure that the network remains open.

Another maintenance approach may be to **fail gracefully** by recognising that not all risks can be avoided. This is about ensuring infrastructure is capable of absorbing damage to the greatest extent feasible/affordable, before succumbing gracefully (ie not failing suddenly or catastrophically). Again this would probably need to be aligned with an EPPP or special preparedness plan and monitoring plan in case a failure does occur.

Reduce (improve)

An improvement will require new capital investment, and will initiate either a **minor resilience application, enhanced resilience application** or a **business case** for larger investments.

An improvement may take various forms:

- reduction of the risk itself (e.g. rock fall)
- Adopt or retrofit to higher design standards
- New more robust or relocated assets
- Improvement to an alternative route
- Variable message signs or other communication devices
- Improved cell phone/ comm's coverage
- Purchase of recovery equipment

Prevent/Remove/Avoid

Where feasible and affordable, build or relocate **critical infrastructure** in safe locations to avoid the risk, sometimes creating a new alternative route or asset.

A large scale example of this is the Transmission Gully route out of Wellington. This will provide a new route away from the coastal route which is subject to many resilience risks. It also provides some redundancy in the network.

Other measures include land use planning controls to prevent development in areas that are subject to future resilience issues, such as low laying coastal areas that may be subject to sea level rise or areas susceptible to subsidence or liquefaction.

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Background

The response framework must be used alongside a strong consideration of risk, and risk management. The type and size of risk eventuating will have a significant impact on the response. The table below illustrates that as a risk increases the type of response is likely to become increasingly physical and will come with a higher implementation cost.

Note that risk is quantified as the likelihood of an event occurring and the consequence of an event occurring. For further information on managing risk, see the NZ Transport Agency's Minimum Standard Z/44—Risk Management.