



5 October 2009

The Executive Director
National Infrastructure Unit
The Treasury
P O Box 3724
Wellington

By email to: info@infrastructure.govt.nz

Dear Sir

Towards the First National Infrastructure Plan Submission from the National Engineering Lifelines Committee

We would like to make this submission on the National Infrastructure Unit's September 2009 document *Infrastructure: Facts and Issues*.

The National Engineering Lifelines Committee

The National Engineering Lifelines Committee brings together key national utilities (Transpower, Telecom, NZ Transport Agency, Vector and Water NZ), along with other organisations with an active interest in promoting resilience (Ministry of Civil Defence and Emergency Management, EQC and GNS Science). This committee is particularly conscious of dependence on network infrastructure, and the broader objective of developing more resilient communities. The views expressed in this submission are not necessarily those of these individual organisations.

Focus of this Submission

We would like to highlight through this submission the need to include resilience in the planning and implementation of infrastructure developments and renewal. The NELC considers that the *resilience of infrastructure against adverse events* be included as a specific component of the National Infrastructure Plan.

In terms of the questions posed in paragraph 5 of the document, this is both a 'Missing' issue and a 'Cross sectoral' issue, and one we believe that should be addressed in the National Infrastructure Plan as a decision-making principle.

Understanding Infrastructure Vulnerability and Criticality

The vulnerability of New Zealand's economy to adverse events has been well-established through hazard studies and national simulation exercises. While this work has focused in the main on natural disasters, events over recent years have highlighted the nature of crises can also develop from equipment failures.

The interconnectivity of physical infrastructure adds a further dimension of complexity and criticality to this. The potential for cascading effects of the failure of one infrastructure sector across other sectors is very high.

The economic impacts of major natural hazard events have recently been estimated, and the component relating to infrastructure is significant. In the case of the Wellington Fault earthquake, a recent study has estimated that reticulated water would not be available in Wellington City for between 35 and 50 days. This event is also likely to result in both state highways into the Wellington region being unusable for at least two months. A BERL report under preparation for the Greater Wellington Regional Council has estimated the economic cost of a Wellington Fault earthquake that is directly attributable to lifeline utility failure as \$3.1 billion, which corresponds to a reduction of 14% in annual GDP of the metropolitan area or 2.3% in national GDP.

Internationally, methodologies for evaluating the benefits and costs of disaster mitigation measures for urban infrastructure systems which take a life cycle costing approach have been developed by Dr Stephanie Chang of the University of British Columbia. In one case study using this methodology relating to earthquake, societal losses from earthquake were found to outweigh utility agency losses by 100 times¹.

One of the issues relating to infrastructure planning and vulnerability is that items of *nationally significant infrastructure* are not specifically identified. The 2008 Cabinet-directed national simulation exercise 'Ruaumoko' highlighted the previously under-appreciated vulnerability of the narrow corridor through Auckland City through which energy (electricity, gas and fuel) runs, along with road and rail access to the north. A specific recommendation in the exercise report was that work should be undertaken *across government agencies to establish a process for identifying and addressing lifeline utility vulnerabilities that are of national significance*.

In an actual experience which highlights a similar point, the loss of gas supply to Hawke's Bay and Gisborne in the 2004 Lower North Island floods highlighted the risks that ageing road bridges pose to the vital utility services that they support. The collapse of the Pohangina River bridge affected the supply of gas to the East Coast for almost a week at a peak time for food processing for export.

It is noted that fibre-optic cables are commonly supported off state highway bridges, some of which are more than 50 years old and in need of seismic strengthening. Much of our infrastructure is aging and the principles of resilience must also be systematically applied in renewal programmes.

Investment in infrastructure resilience is far more cost-effective and efficient at the time new infrastructure is developed. It is therefore important that new major infrastructure developments take into account the 'weak links' posed by existing infrastructure. Unless this interdependency is considered systematically, other unintended vulnerabilities can be introduced.

¹ Stephanie E Chang 2003; Evaluating Disaster Mitigations: Methodology for Urban Infrastructure Systems

In terms of the section in the document on Planned Investment (pages 77 to 94), there are projects listed with the potential to significantly enhance local, regional and national resilience. This potential should be taken into consideration in determining priorities for project selection, and in the specific scheme design. For example, the Levin to Wellington SH1 project (page 78) should be addressing the physical vulnerability of highway access into Wellington for food and other freight with regard to meteorological and seismic hazard. Similarly, the Pahiatua Track improvement project (page 80) should receive an additional endorsement when resilience considerations are applied as part of the decision-making process, as the experiences of the 2004 flood event highlighted the importance of this route for milk tanker traffic when the Manawatu Gorge is closed – a relatively regular occurrence with the potential for an extended disruption.

Other Resilience Dimensions

Infrastructure resilience has other dimensions in addition to physical considerations. Pandemic planning has drawn attention to vulnerabilities that can arise from staffing shortages. Infrastructure providers need to operate within a set of clear resilience-enhancing regulatory arrangements.

Resilience also involves the development of operational arrangements to promote co-ordinated and effective responses to adverse events when they occur. Another facet is ensuring that key end-users such as those in the health and education sectors understand the service disruptions they could foreseeably experience and have appropriate alternate or backup arrangements in place.

Addressing these additional aspects is typically a low-cost activity compared to capital works. It does however require commitment and leadership, and needs to be embraced by both government agencies with infrastructure responsibilities and infrastructure providers.

Resilience issues and the active exchange of information are specifically addressed in programmes of other governments, with the Australian *Trusted Information Sharing Network* being of particular relevance to New Zealand (see ww.tisn.gov.au).

Summary and Recommendations

While infrastructure development is usually thought of in the context of supporting economic growth, consideration also needs to be given to planning for adverse events in order to minimise disruption for the regional and national economy. Adverse events encompass utility network outages and storms that occur not infrequently, through to lower probability but high-impact events such as earthquakes. Recent events both here and overseas have shown how easily the complex and interdependent infrastructure sectors can be disrupted, and how rapidly the effects of a problem in one sector can cascade and affect other sectors.

Planning for physical resilience typically involves the adaptation of utility networks to reduce vulnerability, and seeking to provide diversity in key routes as part of network upgrades where cost-effective.

Infrastructure providers typically undertake risk management and plan for resilience internally to a high level within their organisations. There is however a need for a much greater level of collaborative work around collective risks – identifying and addressing the weak links at regional and national levels that require interagency and inter-sector effort. An overarching and co-ordinated approach encouraged via the National Infrastructure Plan would help achieve traction across the various sectors.

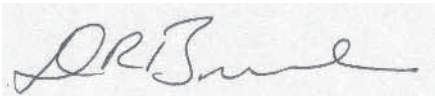
The National Engineering Lifelines Committee recommends that the *resilience of infrastructure against adverse events* be included as a component of the National Infrastructure Plan. This is seen as an important part of improving the effectiveness of investment in infrastructure by government and providers.

Specifically, the NELC recommends that the National Infrastructure Plan should include:

1. Indications of which items of existing infrastructure are nationally significant, and comments on their vulnerability to adverse events (where known);
2. The resilience aspects that should be considered at the time of infrastructure decision-making (eg. increased regional or national resilience through enhanced route diversity; if there are associated opportunities from a project for other infrastructure providers to increase their network resilience);
3. The incorporation of these resilience considerations as additional '*principles to guide government decision-making in respect of the selection of projects*'(page 11); Principle 4 (aspects to be considered in decision-making - page 16) would appear to be a very suitable place for this.

We trust the points raised in this submission are of assistance. We would be happy to provide additional information in relation to infrastructure resilience issues if you require.

Yours sincerely



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