New Zealand

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INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALASIA

Insuring Public Infrastructure Assets Against Damage Caused by Natural Disaster Events

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Cover Picture : Hurricane Sandy (2012). Damage caused by record storm surge, flooding and fire to a development on a narrow spit of land, barely above sea level near the John F Kennedy Airport in New York. Total damage caused US $68 billion.

FOREWORD

Many local authorities have traditionally insured their assets based on their depreciated replacement value. That's the cost of reproducing or replacing the asset less deductions for physical deterioration and relevant forms of obsolescence. For example, it might cost $10m to replace a 100-year-old building with one of similar size and quality. But, because the destroyed building has a depreciated replacement value of $2m, the owner will receive only $2m and have to fund the $8m balance themselves.

After the 2010/2011 earthquakes, Canterbury local authorities found that while indemnity insurance might be enough for a building or network infrastructure damaged or destroyed in a fire or storm, it may be nowhere near enough for a widespread natural disaster such as a major earthquake, tsunami or volcanic eruption. The cost of remedying such total destruction of public assets can be huge; for Christchurch City Council, $4.4b.The first question we must ask is whether indemnity, rather than replacement, insurance is enough.

The matter is far more complicated. The Canterbury earthquakes highlight the inappropriateness of current depreciated replacement values. A wide range of associated costs must be taken into account when calculating replacement and indemnity values and deciding the insurance risk management approach.

Then there is the more fundamental question of whether to insure some or all of the assets, or not at all. Any decision to self-insure must be made carefully. Potential consequences need to be fully understood. For instance, local councils commonly do not insure their roads and bridges because New Zealand Transport Agency's policy is to fund a significant part of repair costs. Yet councils can face hefty costs in their share of interim repairs and maintaining earthquake-damaged roads and bridges. And then there is the cost of being unable to permanently rehabilitate roads and bridges for perhaps several years, until the water, wastewater, stormwater, power, telephone and gas lines beneath them are repaired. In Christchurch, earthquakes damaged 895km of roads with more than 50,000 individual road faults. It may not be possible to insure for a risk of this nature. The organisation must be aware of potential liability, consider all available options and – if deciding not to or to only partially insure – know how it will fund its share of total repair/rehabilitation costs.

These are just some of the matters that must be considered when deciding which assets to insure and for how much. While every organisation has different risks and a different risk appetite, the key decisions everyone has to make are the same:

How best to:

- *identify all of the 'infrastructure type' risks to which the organisation is potentially exposed*
- *decide in the most objective way possible what should and should not be insured (and the type and extent of the cover required)*
- *thoroughly understand what the organisation's potential financial liability is likely to be should a major disaster occur (and how it would be funded).*

Peter Higgs, Chair NAMS NZ

Table of Contents

1. INTRODUCTION

This document is a general guide about what to consider when valuing assets for natural disaster insurance purposes.

A natural disaster will typically be:

- a storm, tornado or cyclone
- a flood
- an earthquake
- a landslide
- a volcanic eruption or geothermal activity
- a tsunami.

The guide does not include fire insurance other than fire occurring as a result of the listed perils. Fire insurance is a separate issue.

The general principles outlined here will apply to all types of entities responsible for managing public infrastructure. Public infrastructure may not necessarily be publicly owned but includes such functions as:

- buildings and structures
- roads and bridges
- sewerage
- water supply (including bore wells)
- stormwater
- land drainage
- irrigation
- dams and canals
- river control
- flood protection schemes including floodgates and stopbanks
- seawalls
- landfills
- parks and recreation
- buildings and cultural property
- heritage
- telecommunications
- energy (geothermal, electricity and gas)
- ports
- airports

It is noted that this guide only covers the management of financial risks associated with natural disaster events.

This guide needs to be considered within the context of a wider risk management framework/strategy for the organisation.

This would include the identification of all risks, the organisation's appetite for risk, avoidance measures and mitigation techniques – not just covering the financial risk by insurance.

2. DISASTER INSURANCE – a key risk management consideration

Insurance cover is one way to manage the financial risk of assets not being available to provide services following a natural disaster. Insurance cover manages the financial risk by transferring some of it to an insurer (an insurance company). This company typically transfers most of what has been transferred to it by getting reinsurance overseas. (*In some countries at least 90 percent is usually ceded to the international reinsurance market.*[1])

While natural disasters may occur infrequently, the consequences (in damage, repair time and costs incurred) can be huge when a major one strikes. The following figures show how great the impact can be. The first shows the level of insurance claims in New Zealand from 1968 until 2010 before the Canterbury earthquakes. The second shows the level of claims for the same events but including all claims for the Canterbury earthquakes from September 2010 until the end of 2011.

Figure 1 – Insurance Claims From Natural Disasters in New Zealand 1968-2010 excluding claims relating to the Canterbury earthquakes.[2]

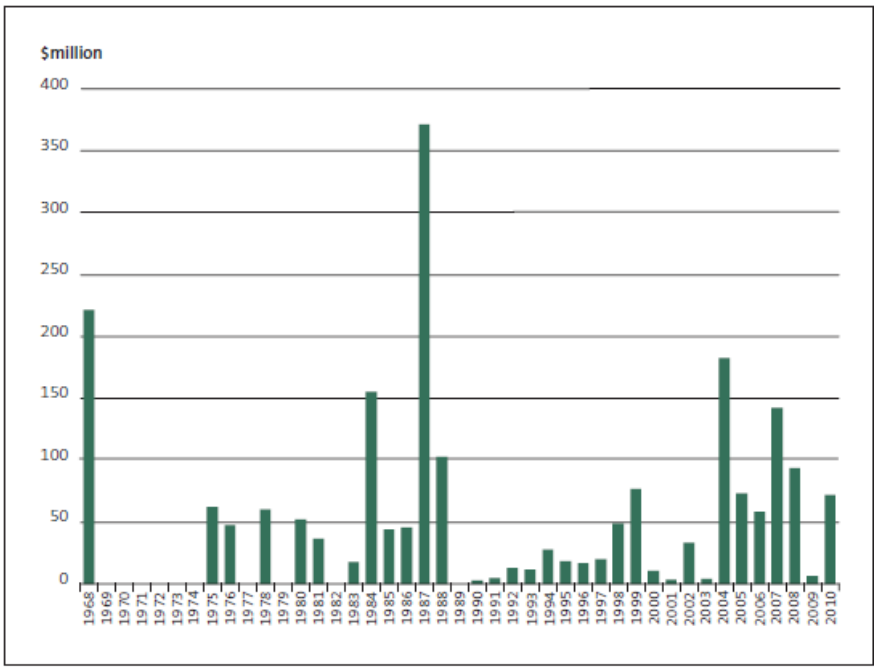
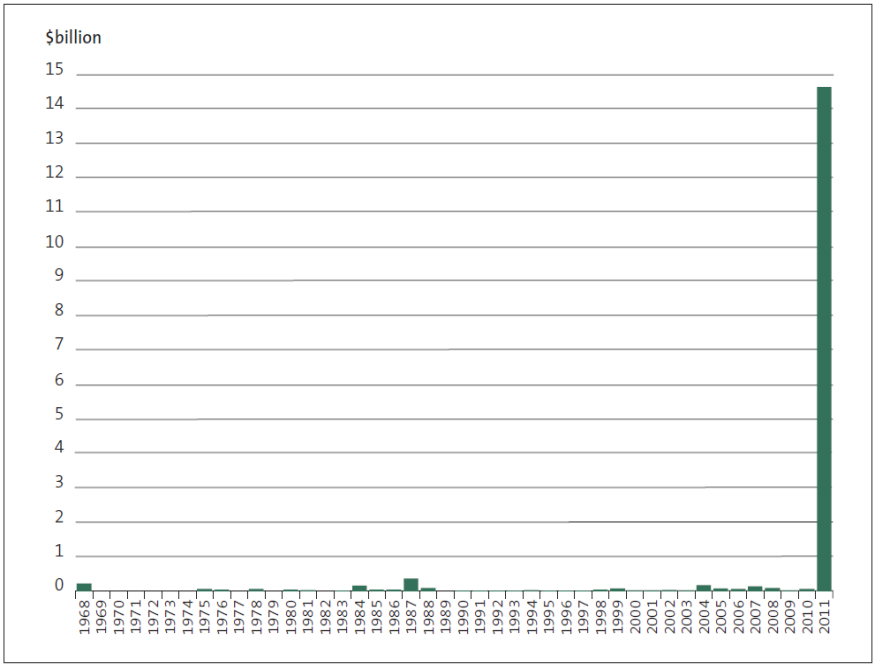


Figure 2 - Insurance Claims From Natural Disasters in New Zealand, 1968-2011 including claims relating to the Canterbury earthquakes.

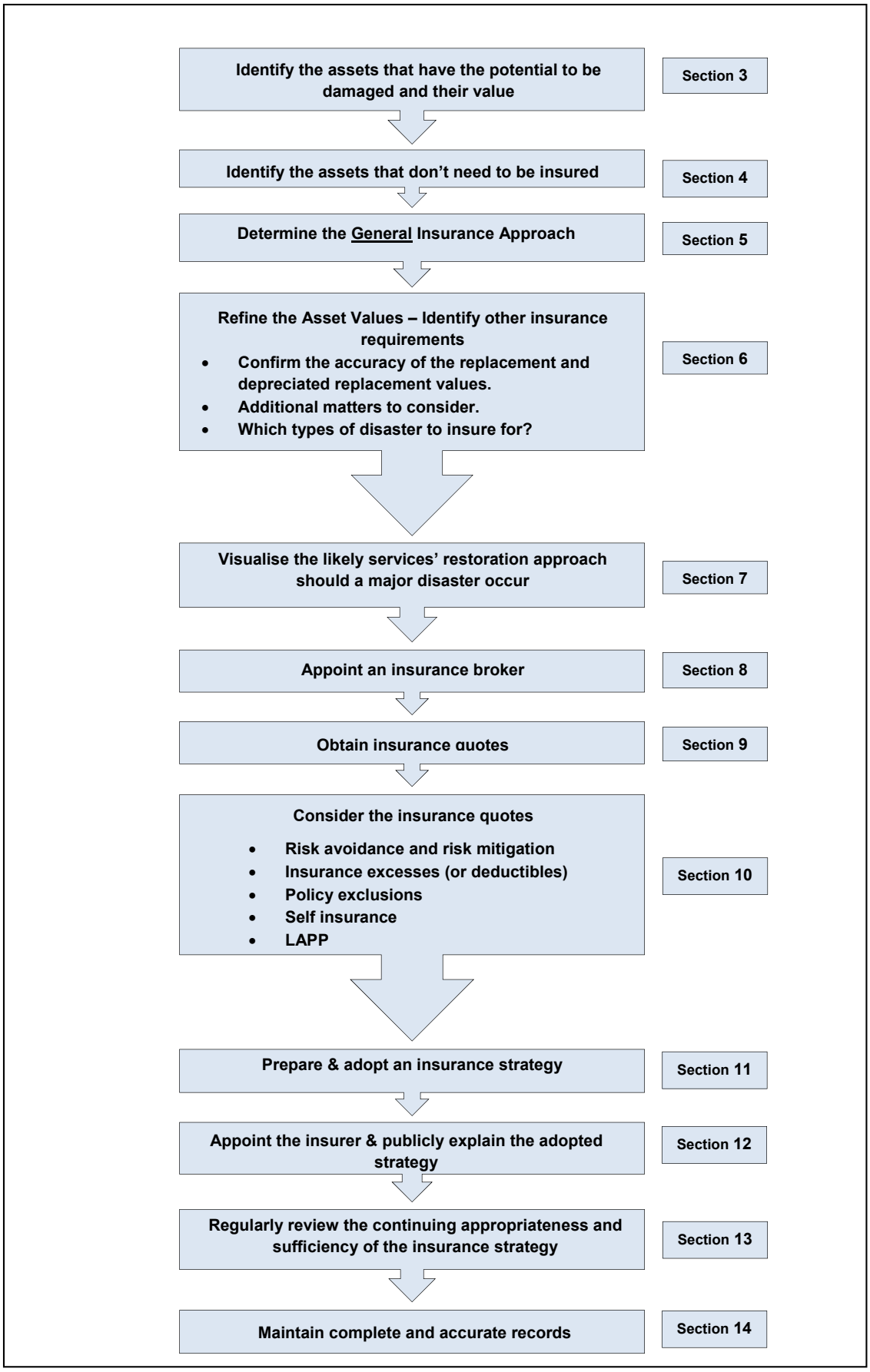
[1] World Bank – Global Facility for Disaster Reduction & Recovery (GFDRR) – "Insurance of Public Infrastructure Under Concessions".

[2] New Zealand Office of the Controller and Auditor General – 'Insuring Public Assets' June 2013. Information based on statistics compiled by the Insurance Council of New Zealand.



Infrastructure risk management and insurance is a multi-disciplinary responsibility requiring engineering design and construction, financial and business management, planning, specialist valuation, legal, risk management and insurance expertise. The diagram on the next page summarises the processes involved.

TABLE 1 – THE RISK TRANSFER PROCESS



3. IDENTIFY THE ASSETS THAT COULD BE DAMAGED BY A NATURAL HAZARD EVENT

The first step is to identify and document all property, plant and equipment assets that might need to be insured. Then document their current condition and remaining lives.

This information will come from the asset information database. The data quality should be given a confidence rating under the grading system outlined in Table 4.3.1 in the NAMS New Zealand Infrastructure Asset Valuation and Depreciation Guidelines'. The information should be reviewed and updated to ensure it includes all of the assets, and its accuracy, before proceeding.

New Orleans Hurricane Katrina 2005

4. IDENTIFY THE ASSETS FOR WHICH INSURANCE MAY NOT BE REQUIRED

Having ascertained the completeness and accuracy of the asset data, the next step is to identify assets that may not need to be insured at all or only partially insured. Examples where this might apply include:

4.1. Land

Insurance is not generally able to be obtained for land.

4.2. Local Authority Infrastructure Assets (Other Than Roads and Bridges)[3]

Government policy is to reimburse 60 percent of eligible emergency response and essential infrastructure repair costs above the following thresholds:

- 0.0075 percent of the net capital value of the city council, district council or unitary authority involved
- 0.002 percent of the net capital value of unitary authorities where the assets are of a type ordinarily managed by regional councils
- 0.002 percent of net capital value in the case of regional councils.

For example, if the combined eligible costs are $10m and the threshold is $3.6m, a local authority will be eligible to be reimbursed $3.84m (60 percent of the $6.4m above the threshold).

Financial assistance from this source is generally available for the repair or recovery of:

- essential infrastructure assets – including water, stormwater, electrical, sewerage and gas facilities and other structures such as retaining walls and tunnels upon which essential services depend. (These must be local authority assets, not the property of trading utilities).
- river management systems (including drainage schemes when part of integrated river systems) and flood protections schemes where there is major community disruption or continuing risk to life
- other community assets damaged as a consequence of the failure of flood protection schemes.

[3] Guide to the National Civil Defence Emergency Management Plan 2006 Section 26

4.3. Roads and Bridges[4]

The New Zealand Transport Agency may provide financial assistance towards the repair cost of roads and bridges after a weather or other natural disaster event. The Funding Assistance Rate differs between authorities.

4.4. Residential Homes[5]

The Earthquake Commission provides limited natural disaster insurance against loss or damage to residential homes, land and contents in the case of the following natural disasters:

- earthquake
- natural landslip
- volcanic eruption
- hydrothermal activity
- tsunami.

The cover is generally a maximum of:

- $100,000 for buildings
- $20,000 for contents
- the cost to repair damaged land under and around the home.

5. DETERMINE THE GENERAL INSURANCE APPROACH

After the organisation has decided which assets should be insured and is satisfied its asset data is at least 'reliable', the next step is to carefully determine the best insurance cover for each type of asset. Analysing likely recovery and repair requirements, if a major natural disaster were to occur, will highlight the importance of this.

Such an analysis needs to be done not only for each type of asset (eg, roads, water supply or sewerage) but for each category of asset within each type. Start by asking the basic questions:

(a) Does this asset (or category of asset) need to be insured at all?

(b) If the answer to (a) is 'Yes' should it be insured for its replacement or its indemnity value?

[4] www.pkb.co.nz Process Map/Activity Classes/Maintenance and Operation of Roads/Emergency Works.

[5] Earthquake Commission 'What We Do'

TABLE 2 - REPLACEMENT INSURANCE v INDEMNITY INSURANCE[6]

Replacement Insurance is:

A policy under which an insurance company will replace a lost or destroyed item with a new one or repair the item so it is as new as practically possible.

If the policy owner wants a cash settlement, they may only get the indemnity value depending on the wording of the policy.

There is an upper limit on what can be claimed. For a Nominated Replacement Value type policy, this is specified in the insurance policy as the sum insured. For a full replacement value or 'open ended' type policy, usually available for buildings, the limit is the area of the damaged structure.

Indemnity (Present day value) Insurance is:

A policy that puts the policy owner back in the same financial position as they were before the loss occurred, so they are no better or worse off than immediately before the loss.

The settlement is based on how much the policy owner would pay for the item second-hand or the replacement cost of the item less an allowance (depreciation) for age and use.

Indemnity Value may also be referred to as 'Market Value' or 'Present Day Value'.

The answers to these first questions might include:

- A relatively new community centre that would be rebuilt on the same site if destroyed – replacement insurance, if obtained at a price considered reasonable having regard to the risk; otherwise, indemnity insurance.
- A 100-year-old hall in poor condition that wouldn't be replaced if destroyed – indemnity insurance, if obtained at a price considered reasonable having regard to the risk. Otherwise don't insure at all.
- A sewage treatment plant – replacement insurance for 40 percent of its value (being the council's share after Government's contribution), if obtained at a price considered reasonable having regard to the risk; otherwise, indemnity insurance for 40 percent of its indemnity value.
- The roads and bridges network – may not need to insure at all because NZTA can be expected to pay a significant part of the repair/rehabilitation costs. The council to fund its share from a reserve fund – to which contributions will be made annually – and, if necessary, borrowing.
- The water supply local pipelines (not including treatment plant, facilities or strategic mains) – replacement insurance for the council's 40 percent share, if obtained at a price considered reasonable having regard to the risk, but for a capped sum; otherwise, indemnity insurance for a capped sum. The reasoning for the capped sum being that the network is so geographically spread, the risk of damage to the whole network at any one time is negligible.

About 300km of sewer pipes and 124kms of water mains were damaged by the 2011 earthquakes in Christchurch. The city council estimated its 40 percent share of the cost of replacing underground infrastructure will exceed $800m.[7]

[6] Source: Insurance Council of New Zealand Replacement v Indemnity Insurance.

[7] Office of the Controller & Auditor General – "Local Government – Results of the 2012/13 Audits" Page 69 and Christchurch City Council 'Stronger Christchurch Infrastructure Rebuild Plan

- Playground equipment – replacement insurance, if obtained at a price considered reasonable having regard to the risk, but for a capped sum; otherwise, indemnity insurance for a capped sum. This is on the basis that it is highly unlikely all playground equipment will be destroyed at the same time.

The above analysis can't be done generally or superficially. A spreadsheet should be prepared to document:

- all of the organisation's assets by type
- each category of asset within each type separately and, in the case of the 'strategic type' assets, each asset (of group of assets) separately. For example, under the 'sewerage' heading, list separately each sewage treatment plant, major pump station, disposal line and significant main line in order of criticality. Group the local reticulation for each geographic area (or neighbourhood). (See Table 3 – Items 7&8)
- replacement value for each asset category or subcategory, as used for annual statement of accounts
- indemnity value for each asset category or subcategory, as used for annual statement of accounts
- initially identified insurance approach for each asset subcategory of asset (see earlier examples) and reasoning.

6. REFINE ASSET REPLACEMENT AND INDEMNITY VALUES and IDENTIFY OTHER INSURANCE COVER REQUIREMENTS

6.1. Other Matters to Be Considered

The conclusions reached from the above process must be further analysed and refined because the costs incurred after a major disaster are certain to be more than, say, a building being destroyed by fire or by another 'one off' event. The greater the event, the greater the cost.

Table 3 lists some examples of other costs that must be considered. Some will increase the accounting replacement and indemnity values. Others will identify where particular cover may need to be mentioned in the insurance policies. The key point is that each organisation must carefully consider every issue, like those in Table 3, against every line item in the spreadsheet before deciding the extent and approach of insurance cover.

Christchurch Earthquake 2011

Start by going back and further developing the asset values (as used for the annual statement of accounts) to figures that represent:

- the costs likely to be incurred if the asset was totally destroyed by a natural disaster and had to be totally replaced

- the asset's current value (being the current cost of replacing the asset following a disaster with its modern equivalent, less deductions for all physical deterioration and all relevant forms of obsolescence and optimisation[8]).

Ensure that the valuation is undertaken by an independent valuer. The valuer should hold a recognised and relevant qualification and have recent experience in the location and category of the property, plant and equipment being valued.[9] In calculating the values, sufficient attention must be paid to the matters listed in Table 3. It is noted that many of these matters do not normally form part of a valuation. Avoid using 'averages'. The valuation must be formal accepted, in writing, by the senior asset manager for each type of asset and by the appropriate officer at senior executive level.

TABLE 3

CONSIDER THESE WHEN CALCULATING INSURANCE COVER FOR POTENTIAL EARTHQUAKE DAMAGE PROTECTION – not all-embracing, some examples to illustrate the type and breadth of matters that need to be considered.

No.	Issue	Comments
1.	**Inflation/Cost Escalation**	Be careful to understand the difference between these two terms and how they might have to be applied to different assets. Inflation is the rate of increase in the **general** price level of all goods and services. Cost Escalation is a change in the cost or price of a **specific** goods or service over time. The two can vary greatly. In 2003 to 2007, US inflation was less than 5 percent while the cost of steel increased by 50 percent.
2.	**Demolition/Removal Clean-Up:** The cost of demolishing destroyed assets and/or their removal and general clean-up	Includes buildings, structures and piped networks – possibly several times after a series of earthquakes. The cost of cleaning up liquefied material, especially in liquefaction areas, is potentially a significant problem.
3.	**Temporary Accommodation** The cost of providing emergency or temporary accommodation.	Perhaps for an extended time.

[8] UK Chartered Institute of Public Finance and accounting (CIPFA). "Transport Infrastructure Assets Code – Guidance to Support Asset Management, Financial Management and Reporting – Draft October 2009"

[9] New Zealand Institute of Chartered Accountants, Wellington – Accounting for Property, Plant and Equipment – New Zealand equivalent to International Accounting Standard 16 – Paragraphs 35.1 & 35.2

No.	Issue	Comments
4.	**Higher Technical Standards and Consent Conditions** The cost of repairing or reinstating buildings or other assets to a standard higher than the state they were in at the time they were damaged.	Because the resource consent and/or building consent requirements have increased. (eg, the need to comply with more stringent environmental conditions and technical (including earthquake) standards.
5.	**Resilience** The cost of repairing or replacing damaged assets with more resilient infrastructure systems.	
6.	**Keeping The Services Operating** The cost of making damaged buildings and other infrastructure safe. The cost of having to keep them operating in a damaged condition to continue providing services (albeit to a lesser extent), at a higher cost, for an extended period. The cost of temporary repairs. The cost of enablement to allow repairs to occur.	It may not be possible to permanently repair anything for some time. For instance, if repaired too soon after a major earthquake, they may be damaged as badly or worse during the aftershocks. Tanked or bottled water and temporary sewerage facilities may need to be provided. When buildings, roads and bridges, water supply, wastewater and stormwater lines are damaged, repair work must be carefully programmed in an integrated way. It can't all be done at once. Piped networks will need to be reinstated before roads are permanently repaved. In some situations, it may be necessary to continue providing services to a declining 'user base' for an extended time, possibly years until the area can be fully vacated. For example, where land is declared to be unfit for restoration and rebuilding, and existing houses have to be vacated.

No.	Issue	Comments
7.	**Strategic/Critical Assets (see definitions)** The need to separately consider the amount of insurance cover required for every strategic (or critical) asset or group of assets.	**<u>VITAL</u>** The estimated cost of reinstating each strategic (critical) asset MUST be separately calculated. (See the next item).
8.	**Other Assets – Not Appropriate to Generalise** The importance of not generalising the cover for 'other assets'.	The cost of restoration can vary considerably – from place to place and for specific assets. With piped networks, there can be huge variances in: • the type, size and depth of the pipes • the type of ground in which they are installed • groundwater issues and liquefaction • ease of access (eg, a dense urban/commercial location or rural) and of physical replacement • the work needed to repair services next to other vulnerable services • the most appropriate method of reinstatement. The application of 'an average cost per metre' across the district or across each separate 'system' is not appropriate.
9.	**The 'Demand Surge'** The potentially much higher costs for materials and labour that may have to be paid as a result of the 'demand surge' should a major hazard event occur – especially immediately after the disaster event.	*Building owners may wish to consider adding a margin on their insurance cover for potential demand surge inflation that could see rebuilding costs rise significantly as the competition for building resources increases following a catastrophic event.* *International experience would indicate that demand surge inflation can be higher than 25 percent.*[10] Other 'demand surge' experiences are reported as being: • Australia (Newcastle earthquake), 35 percent • Australia (Cyclone Tracy in Darwin), 75 percent

[10] Insurance Council of New Zealand – 'Submissions & Issues/ Commercial Earthquake Insurance'

No.	Issue	Comments
		• Australia (ACT bushfires in 2003), 50 percent • Australia (Cyclone Larry in Queensland), 50 percent • United States (Florida Hurricane 2004), 20-40 percent. AIR Worldwide Corporation (a risk modelling and technology firm specialising in risks associated with natural and man-made catastrophes, weather and climate) recommend clients apply a 30 percent demand surge factor to modelled losses following Hurricane Katrina.[11]
10.	**The Extent of The Damage** The cost of the investigation work required to determine the extent of damage and type of repairs required.	Extremely difficult, especially in the case of widespread earthquake damage to underground water supply, wastewater and stormwater infrastructure. *Based on the information available to date, Christchurch City Council has been able to identify a small number of individual assets that are damaged beyond repair and have been written off. However, in the main, it is still not possible to determine whether the assets are damaged beyond repair and should be written off, or can be repaired. This process may take several more years as final decisions about write-off versus impairment of individual assets cannot be made until detailed engineering reports are available and a repair/replace decision has been agreed with Council's insurers and/or Government agencies.*[12] Potential costs under this heading must not be underestimated. This was one of Christchurch City Council's most significant 'additional' costs.

[11] David Chan "The Scourge of Demand Surge"

[12] Christchurch City Council Annual Report 2013 Page 147

No.	Issue	Comments
11.	**Land Contours - Flooding** The cost of remedying damage caused by changes to the land contours and of deciding how changed flood patterns can be best managed in future. (Flood studies, floodplain management plans, engineering and design work to develop flood mitigation infrastructure, contracts' documentation, land purchase, works construction and supervision).	*One of the primary contributors to increased flooding hazards in Christchurch are the earthquakes that resulted in subsidence in some areas, narrowing of channels and uplifting of riverbeds.*[13] *In some parts of Christchurch, the earthquakes caused changes to residential land and/or to rivers and estuaries that mean some houses are now susceptible to flooding where previously they were not and some are now more likely to experience a greater depth and/or frequency of flooding.*[14] Land settlement may continue for decades.
12.	**Health and Safety** The cost of general health and safety management and of keeping the affected community informed.	
13.	**The Insured Quantum** The need to be fully aware of the practical effect of the chosen insurance approach.	For instance, the council may decide to insure all playground equipment for a maximum of $100,000 for any one claim because the equipment is so disbursed. But a major earthquake may result in repair bills many times that amount.
14.	**The Need to Coordinate Replacement and Repair Work with Other Infrastructure Providers.** The need to coordinate replacement and repair work with other infrastructure providers in the short and long term – to ensure essential services are provided during and immediately after the event, and temporary repairs made until permanent work can be done.	• Local councils – roads • Utility service providers – water supply – wastewater – stormwater – electricity and gas – telecommunications • Airport authority • Port authority

[13] University of Canterbury Study Dr Christopher Gomez (Geography), Dr Tom Cochrane (Civil and Natural Resources Engineering), Marion Gadsby (Environment Canterbury) Su Young Ko (Geography Masters Student) in research supported by the Natural Hazards Research Platform, Canterbury Civil Defence Emergency Management Group, Earthquake Commission, GNS Science, Christchurch City Council, Waimakariri District Council, Selwyn District Council, Environment Canterbury, Chorus, Orion, Contact Energy, and the University of Canterbury Quake Centre. Increased Flooding Vulnerability (IFV) is a type of land damage covered by EQC.

[14] Earthquake Commission "Land With An Increased Risk of Flooding'

No.	Issue	Comments
		• Railways The last thing stakeholders want to see is roads being dug up again to install and repair utility services soon after being repaired.

6.2. Deciding the Higher Level Question – What Type of Potential Disaster to Insure For?

All this needs to be considered within the parameters of wider questioning:

- How great is the risk of a major natural disaster event occurring in this area?
- What type of disaster is it likely to be?
- To what extent do we need insurance protection relating to it?

Answering these questions with any accuracy is impossible. With climate change, the Ministry for the Environment predicts more extreme weather events such as floods.[15] The Natural Hazards Research Management Platform[16], - a site created in 2009 by the New Zealand Government to provide secure, long-term funding for natural hazard research, provides much information about geological and weather-related processes such as earthquake, volcano, flood, snow, wind, rainstorm, landslide and tsunami activity. Table 4 (Attachment D) shows the magnitude and geographic spread of past events, the full list of insurance claims for damage caused by natural disasters in New Zealand since 1968. The most serious were:

Queensland Flood 2011

- Canterbury earthquakes, 2011
- Bay of Plenty earthquakes, 1987
- Wahine storm, 1968
- Lower North Island floods, 2004.

The 2011 Canterbury earthquake was the 10th most costly insured catastrophe in the world between 1970 and 2012.[17]

In deciding which potential disasters to insure against, the challenge is to make the most informed decision possible after carefully considering:

[15] Ministry for the Environment https/www.mfe.govt.nz/issues/climate/about/impacts.html

[16] NHRP Natural Hazards Research Management Platform

[17] University of Pennsylvania – 'Insuring Infrastructure Against Disaster Losses' A paper by Howard Kunreuther presented at 'Managing the Risk of Catastrophes: Protecting Critical Infrastructure in Urban Areas' – Federal Reserve Bank of New York November 2013.

- the type and magnitude of past disaster events in the locality
- the likely potential effects of climate change
- any specific or potential hazards to which the area is known to be exposed, eg, developed low lying land prone to regular flooding

The United States Federal Emergency Management Authority (FEMA) has a standard method of identifying flood zones.[18]

- the organisation's responsibility to ensure financial sustainability, its obligations to future stakeholders, its appetite for risk and the affordability of appropriate risk cover
- the impossibility of predicting if an earthquake will ever happen, let alone its likely magnitude:

Useful prediction of large damaging earthquakes in a timely manner is generally notable for its absence, the few claims of success being controversial. Extensive searches have reported many possible earthquake precursors but none has been found reliable.

In the 1970s, scientists were optimistic that a practical method for predicting earthquakes would soon be found but by the 1990s continuing failure led many to question whether it was even possible. While some scientists still hold that, given enough resources, prediction might be possible, many others maintain earthquake prediction is inherently impossible.[19]

Volcanic activity prediction has not been perfected but significant progress has been made."

Could the Canterbury Earthquake Have Been Predicted?[20]

In 2010/11, the Canterbury region had six months of unexpected and extremely difficult challenges resulting from damaging and deadly earthquakes and associated aftershocks. The aftershock on 22 February 2011 was far more damaging and deadly compared to the larger magnitude event on 4 September 2010.

Question: Why didn't scientists know about the faults that caused these two earthquakes?

Answer: Before 4 September, there were no surface signs of the Greendale fault or the fault that generated the Lyttleton Fault. There was no evidence for seismicity on these faults (ie, foreshocks). Following 4 September, there was significant aftershock in the area of the Lyttleton Fault and around many faults in the region but no clear indication a larger earthquake was imminent there.

Despite substantial scientific effort, the specific timing, location or magnitude of earthquakes cannot be predicted. Faults can be silent and unseen for many thousands of years before rupturing and causing damage.

[18] FEMA Map Service Centre – FEMA Flood Zone Designations.

[19] Wikipedia – Earthquake Prediction

[20] The Royal Society of New Zealand and the Office of the Prime Minister's Science Advisory Committee – "The Canterbury Earthquakes: Scientific answers to critical questions"

7. VISUALISE THE LIKELY APPROACH TO RESTORING SERVICES IF A MAJOR DISASTER OCCURS

Then there is another matter.

Following a major disaster, an organisation will not want to just blindly reinstate assets that were there before. Its responsibility is to provide services for current and future stakeholders in the most effective, efficient and sustainable way.

Considering any opportunities the disaster may have created must be part of a restoration approach.

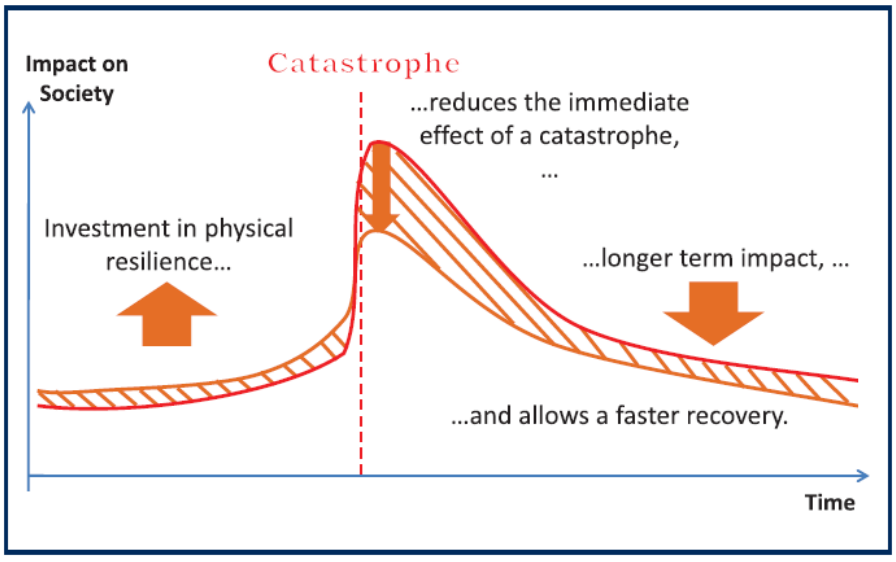
The principal objectives following a major disaster will be to:

Thailand Tsunami 2006

(a) return infrastructure networks to a condition that meets the levels of service before the event

(b) incorporate greater resilience into the network, where restoration works are undertaken, and where reasonably possible and economically viable[21]

Figure 3 - Resilience



22

(c) consider the feasibility of providing, if desirable, better quality or enlarged assets 'now' instead of reinstating damaged assets as they were before.

[21] Christchurch 'Infrastructure Recovery Technical Standards and Guidelines'

[22] World Economic Forum – 'A Vision for Managing Natural Disaster Risk – Proposals for Public/Private Stakeholder Solutions' (April 2011)

While natural disasters impose hardship on the population, they also represent opportunities to replace existing productive capital with more resistant and efficient economic assets.[23]

The following types of questions will arise after a disaster event:

- Should this building be repaired or replaced
  - at all?
  - on the same site or elsewhere?
  - to its previous standard?
  - be rebuilt in a different or greater form?
- Should this pipeline be:
  - reinstated in different materials?
  - reinstated with greater capacity?
  - in the same location?
  - reinstated in another place (eg, in line with a policy the council now has to locate water and sewerage pipelines away from private land and on public property as much as possible)?
- Can service needs be met in a better way?

In perhaps a good number of cases, the answers will cause the organisation to:

- want to repair, reinstate or replace the asset in a different place or in a different form
- want to take the insured value (or the estimated cost of repairing it) as a cash sum instead of repairing or reinstating it, if asset is repairable
- fund the extra cost between its improved or different approach and the insurance proceeds.

When the Christchurch earthquake occurred, the city council had a stadium insured for $143m.

The stadium was damaged beyond repair and has been written off.[24] The council provided a smaller temporary facility as an interim measure while it considers its longer term options, possibly a large covered stand on a different site at a $500m cost).[25]

In determining its future insurance approach, the organisation therefore needs to:

- visualise what the situation might be should a major disaster occur
- pose and answer the above types of questions
- check to ensure the proposed insurance approach will enable, not impede, its probable plan. With the Christchurch stadium, the insurer's initial stance was for the former stadium to be repaired.

[23] Swiss Re and Inter-American Development Bank (IDB) – "Natural Disasters Financial Risk Management – Technical and Policy Underpinnings for the Use of Disaster – Linked Financial Instruments in Latin America & The Caribbean" 201 (Page 4).

[24] Christchurch City Council Annual Report 2013 – Page 147

[25] Stadium Deal Critical – Christchurch Mayor – February 2014

8. APPOINT AN INSURANCE BROKER

Once the organisation has a reasonably accurate idea of the type and extent of insurance cover required, obtain specialist insurance advice from a reputable insurance broker (or other suitably qualified person) with an acceptable track record in public infrastructure insurance. The matter is too complex for the organisation to decide alone.

Insurance brokers are specialists in insurance protection. They are independent, have in-depth working knowledge of the insurance market, are able to provide professional objective advice on identifying risks and risk exposure, and recommend cost-effective solutions. Instructed by the organisation, they act on its behalf and after receiving instructions about the type and extent of cover required:

- advise on its sufficiency
- advise where and how it might be obtained
- canvass the market to obtain quotes for the best protection at a competitive price.[26]

The broker should be carefully selected (perhaps via a tender or expressions of interest); the appointment confirmed via a board or council resolution; the criteria for selection recorded and formally commissioned with carefully documented terms of reference.

9. OBTAIN INSURANCE QUOTES

To identify the organisation's options, the broker should be requested to:

- familiarise themselves with the insurance requirements as the organisation sees them
- review and advise about their appropriateness and sufficiency
- obtain quotes (after agreeing a possible future infrastructure insurance strategy with the organisation) based on several alternative scenarios so all reasonably practicable options (including self-insurance) can be identified and compared.

Another option is the possibility of calling for quotes collectively with others (perhaps between adjoining local authorities) as is done by New Zealand Tertiary Education and Crown Research institutions, and District Health Boards.

The potential advantages of insuring collectively are:[27]

- constant cover based on collective risks for all of participants
- options for improved cover and management of premiums
- access to specialised skills for risk management
- more efficient because insurance is technically complicated
- some participants may obtain levels of insurance cover they may not receive as individual entities.

Local authorities face similar sets of asset and liability risks and, therefore, have enormous opportunities to benefit from economies of scale if they can work together.

[26] The Insurance Brokers' Association of New Zealand (Inc)

[27] Office of the Controller and Auditor General – "Insuring Public Assets' – June 2013 – Page 34

If all councils were to delegate risk advisory and insurance negotiations to a council-owned Local Government Insurance Agency (LGIA), the LGIA could start using common sector expertise and size to benefit individual councils.[28]

10. CONSIDER THE INSURANCE QUOTES

10.1. Introduction

Discussions with the insurance broker, and responses to the request for quotes, will raise various issues including that:

- insurance may not be able to be obtained for some aspects of the cover sought

  "*In principle, State and local governments should simply insure their assets. In practice, insurance is not available for most public assets that could be affected by natural disasters.*" [29]

- cover may be able to be obtained for some aspects but not to the extent or manner sought

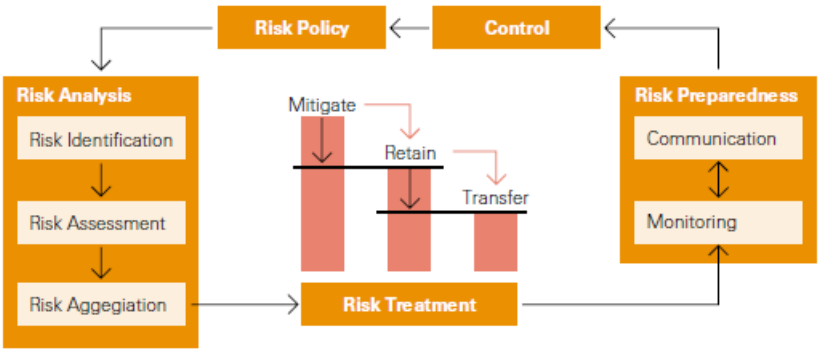
- premiums offered may be considered too high for the risks being mitigated.

Each option's benefits and costs, extent to which desired outcomes would be promoted or achieved in an integrated and efficient manner, and the impact on the organisation's capacity to meet present and future needs[30] should be addressed under the following headings.

10.2. Risk Avoidance and Risk Mitigation

The decision to insure cannot be made in isolation, as the following figure shows. It is just one of the steps in the risk management process. Risk identification and measurement is essential to assess exposure and develop appropriate risk transfer and financing solutions for reconstruction.

Figure 4 – The Risk Management Process[31]



A fundamental requirement of all insurance is that the organisation should do all it can reasonably be expected to do to mitigate or avoid every insured risk.

- Does the organisation have a current risk management policy formally adopted by the council/board?

[28] Stobo, Craig – 'New Zealand Local Government – Insurance Market Review' – A report prepared for Local Government New Zealand December 2013.
[29] Australian National Commission of Audit – 'Towards Responsible Government' – Feb/March 2014 – Chapter 10.9 Natural Disaster Relief.
[30] Adapted from New Zealand from Local Government Act 2002 – "Requirements in Relation to Decisions" – Section 77
[31] Swiss Re and the Inter-American Development Bank IDB – 'Natural Disasters Financial Risk Management – Technical and Policy Underpinnings for Use of Disaster – limited Financial Instruments in Latin America & the Caribbean 2011 (Page 15)

- Does the organisation have a formal framework for identifying and managing all risks, not only direct 'physical asset type' risks?
- Is there a risk register?
- Are risks being regularly added to and deleted from the register and:
  - have the likelihood and consequences of each risk been assessed?
  - is there a current mitigation plan for each risk?
  - has the responsibility for managing each risk been allocated to a named position or person?
  - is a written record being kept of the current status of each risk?
- Is the situation regarding the most significant risks being regularly reported to senior management and to the council/board?
- Is there anything else the organisation can do to avoid or mitigate each risk and, by so doing, reduce the financial risk and obtain insurance cover at a lower cost?

  For instance:

  - is the council, in the case of a local authority, entirely satisfied it is responsibly carrying out its obligations under Section 71 of the Building Act 2004 not to grant consent for the construction of, or major alterations to, buildings on land that is, or is likely to be subjected to inundation (including flooding, overland flow, storm surge, tidal effects and ponding)?
  - is a 'natural hazard' risk assessment (including potential effects of climate change) being properly carried out before zoning or approving the use of land for more intensive development and before proceeding with every infrastructure construction project?
  - does all infrastructure for which the organisation is responsible totally comply with all 'earthquake resistance' standards?

It is clear that the bigger issue for local authorities is their access to skills and expertise to think about and manage risk, not just the purchase of insurance which tends to be the last mitigation option.

(Councils need to be encouraged) to spend more resources on risk profiling, risk management and risk mitigation to improve self-reliance and resilience, identify, own, share and leverage this information to reduce the costs of poor information. [32]

Contrary to popular belief, population expansion and not climate change has been the key driver of the rising cost of natural disasters. Population increases in places highly prone to risk has made natural disasters more costly.[33]

10.3. Insurance Excesses (or Deductibles)

An excess (or deductible) is a form of partial self-insurance, the amount the organisation must pay when making an insurance claim. The insurer pays the amount of the claim over the excess.

Can the quoted premiums be reduced to a more realistic or affordable level by the organisation taking a higher voluntary excess?

[32] Stobo, Craig - "New Zealand Local Government Insurance Market Review" – A report prepared for Local Government New Zealand – December 2013

[33] Schnarwiler, Reto – Head of public-sector business Swiss Re (one of the world's largest reinsurers). – Speaking while in Australia to address a conference on climate change – July 2010

10.4. Policy Exclusions

Consider carefully what the proposed policy exclusions are and their likely impact.

Ensure their potential impacts and their acceptability are totally understood.

10.5. Self Insurance

Self-insurance is a way of managing risk by having either cash or borrowings to use when an unexpected loss happens, rather than having insurance. This option should be considered when insurance cover is not able to be obtained for certain assets, either at all or to the extent or in the manner sought, or the premiums are considered prohibitively high.

Where insurance isn't able to be obtained at all, as with some Christchurch cases since the earthquakes, there is no other option. Voluntarily self-insuring for potential damage from a major natural hazard event, as Figures 1 and 2 illustrated, must be considered with the greatest care.

Watercare Services Ltd, an entity with $5 billion worth of land and underground water supply and wastewater, is an example of an entity that self-insures those assets. Its reasoning is that the cost of insurance exceeds the risks and that it has the capacity to borrow to fund any loss or damage.

The Auckland Council is another that has 'self insured'. It has assessed that the cost of insuring its:

- landfills
- transport infrastructure
- stormwater and flood protection schemes
- playground equipment
- streetscape
- lighting
- monuments
- other non-building assets in the open

exceeds the risks.[34]

If an organisation decides to self-insure, its insurance strategy must explain:

- the exact risks it has self-insured
- the likelihood of those risk events happening and the potential consequences of such events
- the organisation's maximum potential financial exposure
- how the organisation would fund those costs should a major disaster occur
- any action the organisation may have to take as a result of the proposed strategy (eg, transfer funds to a disaster reserve fund annually or limit borrowing to ensure it has the capacity to borrow and stay within prudent limits should a major disaster occur).

Self-insurance decisions are made based on the belief that the organisation has sufficient capacity to fund the damage and associated recovery costs by borrowing, using reserve funds set aside for the purpose or by selling assets. Ensure the explanation covers all potential costs including:

- the cost of repairing or replacing assets for which the decision to self-insure is proposed
- the cost of all insurance excesses (or deductibles)
- the cost of repairing or replacing assets below the threshold amount and before any available government contributions 'kick in'
- the cost of differences between likely actual replacement cost and indemnity insurance (see Table 3)
- the cost of differences between likely actual replacement cost and replacement insurance (see Table 3)
- the cost of repairs and replacement work that may be necessary relating to risks specifically excluded by policy exclusions
- the interim cost of having to fund repairs and replacement work until Government or insurers' contributions are settled.

  The ultimate quantum of all the insurance recoveries cannot currently be reliably measured as there will continue to be uncertainty around the range of possible outcomes for a number of years.

  While the Council is confident it will receive Crown funding, at 30 June 2013 it cannot reliably measure what the quantum of this funding will be.[35]

[34] Office of the Controller and Auditor General – "Insuring Public Assets" June 2013 – Page 39

[35] Christchurch City Council Annual Report 2013 Page 147

- the cost of providing better quality assets or assets with increased capacity (betterment) that the organisation might reasonably be expected to want to make.

> Christchurch City Council estimated the total cost of the earthquake response and recovery relating to its infrastructure to be $4.4 billion, with $1b covered by insurance; $1.8b, the Crown; and $1.6b, the Council.[36]

The principal disadvantages of self-insuring are:

- the opportunity cost of maintaining a liquid reserve
- the time it takes to build an appropriate level of funds to cover disaster risks (initially and following any depletion of the fund) – less protection compared with insurance during those times
- the difficulty – as the level of severity and expected interval between disaster events increase – in building sufficient reserves and, between events, the temptation to use reserves for other purposes.[37]

10.6. The Local Authority Protection Programme Disaster Fund (LAPP)

For New Zealand local authorities, insuring with LAPP instead of accepting any of the tender bids is another option.

The LAPP is a 'cash accumulation pool' set up and administered by Civic Assurance (a company that has been providing insurance services to local authorities since 1941). This covers the 40 percent local share. Each member makes an annual contribution to the fund in return for cover for the cost of restoring their infrastructure after a damaging event.[38]

11. PREPARE AND ADOPT AN INFRASTRUCTURE INSURANCE STRATEGY

From all of the above, the preferred option(s) will be selected and a proposed future insurance strategy prepared.

Adopting such a strategy is a key governance decision. This should be made by resolution of the governing board, council or committee (e.g. audit/risk committee). Because of the scale of risk, such decisions should not be made at management level.

The draft strategy must relate to the whole organisation to show the total picture (ie, not done separately for each type of asset) and should be accompanied by a report that comprehensively:

- describes the natural disaster risks to which the organisation is exposed, the likelihood of them occurring and the potential consequences
- details the assets that may be damaged
- explains 'how' and 'where' costs of all types might be incurred by the organisation in recovering from the various types and levels of natural disaster events
- explains the options that have been considered to ensure the organisation is able to fully fund (from Government, insurance and its own sources) all repair, replacement and associated costs should a major disaster occur
- explains the preferred option, its implications and why it has been selected.

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[36] Christchurch City Council Annual Report 2013 Page 145

[37] OECD – 'Disaster Risk Assessment & Risk Financing' – AG20/OECD Methodological Framework Page 59.

[38] New Zealand Office of the Controller and Auditor General
- Insuring Public Assets – June 2013 – Page 42
- Local Government – Results of the 2012/13 Audits – Page 62

The report should be 'signed off' by the most senior 'in-house' person responsible for risk management and the insurance broker. This should be accompanied by a statement, signed by both, that in their professional opinions, adopting the strategy would result in the natural disaster risks being managed in the most optimum and affordable way possible having regard to the options available. It should also be accompanied by a letter from a solicitor specialising in insurance certifying they have checked the proposed policy conditions and have not identified any issues that might be contrary to the organisation's best interests.

Before adopting the proposed strategy, the organisation must be entirely satisfied it understands all the 'fine print' in the proposed policies and is absolutely clear about the policy exclusions. If it has any questions, it should pose them to the broker and/or solicitor and seek to have them answered, in writing, before making its decisions. If that is not done, there is a real risk of arguments later – usually about the extent of the insurance company's liability. The insurance company will absolutely understand what every word, comma and full stop in the proposed policy means. It is vital the organisation, the other party to the contract, does too. A good example of how complex even the seemingly most straightforward issues can become, and of how essential it is to obtain competent broker and legal advice, is the following sentence in the definition of Replacement Insurance mentioned earlier:

Japanese Earthquake 2011

If the policy owner wants a cash settlement, they may only get the indemnity value depending on the wording of the policy.

Common Misunderstandings[39]

Replacement Policy

Sections of insurance policies that relate to replacement and asset valuation are often misunderstood.

A replacement policy aims to replace or restore property as new. These policies may have an upper limit on the amount payable and, if you are not aware of this, you could be insured for less than you think.

[39] Queensland Government: http://www.business.qld.gov.au/business/starting/starting-a-business/business-insurance

Flood Cover Definitions

The different definitions for flood and inundation in insurance policies often cause confusion.

Most insurance policies do not cover damage to a property if caused by:

- *inundation of water flowing from a natural watercourse*
- *inundation of water from both the storm and overflow of a natural watercourse (unless most of the damage is caused by stormwater)*
- *other phenomena, such as earth movement, even though this may itself have been caused by water from a storm.*

Don't accept anything about the proposed policy at face value. Question and require that you be satisfied about everything. For example:

- What happens if repeat earthquakes (including extra damage from aftershocks) occur? Is the organisation covered for each 'event' and what constitutes a repeat 'event'?
- Is the methodology for assessing damage to underground assets sufficiently specified in the policy? Is the methodology unambiguous and acceptable to the organisation and does it clearly spell out the obligations (including the financial obligations) of both parties?
- Are the design standards, to which the replacement assets will be built, specified and quite clear?
- Is it absolutely clear exactly what each asset (or group of assets) is insured for and (in the case of 'three waters' infrastructure) when the insurance relates to the network as a whole or to discrete assets?
- Is the insurance company obliged to settle claims, especially claims relating to damage done to essential services, within a specified time following the disaster event?
- Are the circumstances when the organisation may want to opt to take the insured sum rather than repair or replace damaged assets quite clear – and acceptable?
- Is the organisation satisfied that the policy makes adequate and clear provision for all matters listed in Table 3?

12. APPOINT THE INSURER AND PUBLICLY EXPLAIN THE ADOPTED STRATEGY

Once the council/board has formally adopted its insurance strategy, the selected insurer can be formally appointed.

In the case of local authorities, councils should also publicly explain their disaster insurance strategy. Stakeholders have a real interest in knowing the extent to which their district's ability to rapidly recover from a disaster event has been provided.

A proposed amendment to the NZ Local Government Act 2002[40] requires the following information be included in every council's future annual report:

- the total value of all assets that are covered by insurance contracts and the maximum amount to which they are insured

[40] New Zealand Local Government Amendment Bill (No 3) 2014 (Schedule 10)

- the total value of all assets that are covered by financial risk sharing arrangements and the maximum amount available to the local authority under those arrangements
- the total value of all assets of the local authority that are self-insured and the value of all assets of the local authority that are self-insured, and the value of any fund maintained by the local authority for that purpose.

But this is not sufficient. The strategic approach should be explained more comprehensively in the Long Term Plan (or by some other public communication method) and any submissions received in response considered. A recent (2013) survey of 38 New Zealand councils revealed that none could confirm they had a clear mandate with their communities for their appetite for risk.[41]

13. REGULARLY REVIEW THE CONTINUING APPROPRIATENESS AND SUFFICIENCY OF THE INFRASTRUCTURE INSURANCE STRATEGY.

The organisation or appropriate committee (usually the audit/risk committee) should, at least annually, formally satisfy itself that:

- the current insurance strategy continues to be relevant
- there is no change to the extent to which, and the conditions under which, financial assistance will be available from the Government (or government agencies) should a natural disaster occur
- the insurance cover held is a correct interpretation of the organisation's infrastructure insurance strategy
- the party (or parties) with whom the assets are insured is/continues to be a reputable body with whom the organisation is happy to do business.
- the amount of cover held for each asset (or class of assets) has been calculated based on sound 'up-to-date' supporting information and competent professional valuation, insurance and legal advice and will be sufficient to fund the cost of repairs and/or replacement (to the extent the organisation has resolved to insure) should a major disaster occur
- the approach decided regarding any insurance excesses (or deductibles) continues to be appropriate
- the premiums being paid represent value for money (having regard to the risks involved, the reputation of the insurer, the protection provided and the prices and conditions of cover available from other parties)
- to the extent it has decided to self-insure, the organisation continues to have sufficient ability to fund the costs incurred should a major natural disaster occur – and the way in which that would be done has been documented, is up to date and being adhered to
- the strategy continues to be consistent with other relevant organisation planning and management documents, including – in the case of local authorities – asset management plans, business continuity and 'lifelines' plans, the Long Term Plan and Annual Report
- the organisation fully complies with any risk management or other obligations it may have under various insurance policies
- a post-disaster impact assessment has been undertaken for any risk event (no matter what size) occurring during the past 12 months – and areas where risks can be further mitigated identified and the necessary action taken.

The basic replacement and depreciated values of the assets should also be revalued comprehensively at intervals of no more than three years and updated annually. If done "in house', a suitably qualified external party must

[41] Stobo, Craig 'New Zealand Local Government Insurance Market Review – A report prepared for Local Government New Zealand - December 2013'

independently peer-review the asset valuation review and annual update of data required to ascertain the cover for natural disaster event insurance over and above replacement value. This peer review is recommended even if an external party performs this initially.

The annual update should be more than just a process of adding and deleting assets to the insurance list. A good example of 'best practice' is to annually select 10 to 20 different strategic (or critical) assets in each asset category, comprehensively review the sufficiency of their insurance cover and apply any general lessons learned through that process to the insurance cover for other assets.

Japanese Earthquake 2011

14. MAINTAIN COMPLETE AND ACCURATE RECORDS

A complete audit trail must be kept of all reports to, and decisions of, the organisation, council and committees, and all matters relating to asset valuations and communications with the organisation's broker, insurers, insurance legal advisers and asset valuers.

Put everything in writing and, when insurance decisions are made, act on them immediately. The Christchurch earthquake occurred just four days after one council there made some fundamental insurance decisions.

Ensure the originals of all insurance policies are kept in a safe place.

CASE STUDY

Christchurch City Council

Background:

At the time of the Canterbury earthquakes, Christchurch City Council (CCC) had insurance cover with LAPP for above-ground infrastructure assets and was a member of the LAPP fund for underground infrastructure. LAPP's insurance cover for 'above-ground' infrastructure was capped. Riskpool undertook risk modelling to advise Civic Assurance of the cap amount. Riskpool is a mutual liability trust fund created by New Zealand local authorities to provide professional indemnity and public liability protection for local government organisations.

CCC did not have a formally documented insurance strategy but reviewed its insurance cover annually and during the year if there was a significant change to its business.

The Council reviewed its asset valuations every three years on a rolling basis (a different class of assets each year) and based the sum insured for disaster purposes on these asset valuations. Registered valuers provided two valuations, one for financial purposes (under NZIAS 16) and the other for insurance. The insurance valuation was to be calculated in line with NAMS Infrastructure Asset Guidelines and the valuers signed off their work to this effect. The valuations included values for replacement cost, indemnity, demolition, replacement inflation and indemnity inflation.

Extent of Damage from the Canterbury Earthquakes

In June 2013, CCC's estimate for the recovery works for the underground assets for wastewater, water supply and stormwater was approximately $1.9 billion. The Government covers around 60 percent of recovery costs for three waters infrastructure above a specified threshold.

The estimate for recovery works for the above-ground wastewater, water supply and stormwater is assessed at $216 million.

Damage on larger buildings is still (June 2014) being identified but is in the region of $2 billion or more.

Issues around Insurance Settlements

CCC has received most of its indemnity claim from LAPP for above-ground wastewater, water supply and stormwater infrastructure where assets were totally destroyed. It has not received any settlement for assets already repaired as the council, insurer and reinsurers are yet to agree on any individual asset.

CCC has received full settlement for the insured sum for underground infrastructure, the claim being significantly above the cap of $200 million. This cap was based on work done by GNS as the maximum damage Wellington councils insured under LAPP were likely to suffer in two events. Christchurch's maximum damage was assessed as $30 million an event. The actual damage incurred was $2.6 billion.

Despite not yet receiving any settlement for above-ground three waters assets, CCC had to replace or repair some of these assets soon after the earthquakes to ensure network continuity. CCC's position is that LAPP insured the asset capacity across the network not just the discrete assets (eg, a pump station). This position has not yet been accepted by LAPP.

CCC currently only has insurance cover for fire for the three waters assets and is self-insured for earthquakes, flooding and other natural disasters.

Additional Costs:

The most significant extra costs CCC incurred were caused by:

- investigation costs to determine the extent of the damage

- clean-up of liquefied material from pipes and drains before starting repair work (significant cost in areas with liquefaction)

- improvements in system resilience (eg, pressure sewer to replace gravity sewer)

- cost of operations, which is not reduced until the capital construction is completed. This may never return to pre-earthquake levels (eg, the pressure sewer systems have higher operations and maintenance costs than traditional gravity sewer systems).

Demand surge was only significant during the response phase immediately after the big earthquake events.

The programme of rebuild works is vast with significant challenges, particularly in utility coordination of repair and renewal works. CCC – together with the Canterbury Earthquake Recovery Authority, New Zealand Transport Agency and construction companies City Care, Downer, Fletcher Construction, Fulton Hogan and McConnell Dowell – established the SCIRT (The Stronger Christchurch Infrastructure Rebuild Team) alliance to rebuild the city's earthquake damaged roads, fresh water, wastewater and stormwater networks.

Resilience:

CCC has designed its recovery works to improve infrastructure resilience where possible. For example, changing the configuration of gravity sewer systems to minimise deep pipes, proposing pressure sewer systems to replace gravity pipes and replacing brittle pipes with flexible pipe materials.

Lessons Learned

Senior council executives and the council should review and sign off a written insurance strategy.

Senior asset management staff should sign off future valuations. The previous practice was always to involve asset owners but, in hindsight, the final sign-off by someone more senior was missing.

Valuers need to spend more time in valuing assets under the two standards, making allowance for differing soil conditions across a council region rather than averaging it.

CCC recommend future insurance policy contracts for three waters infrastructure assets should detail:

- agreed methodology for assessing damage to underground assets
- cover for costs incurred to assess damage to underground assets
- design of three waters assets to NZS1170 standards
- recognition that insurance provided is based on the asset management and design strategy and plans
- "time caps" for settlement of claims, recognising council's need to cover essential services and its obligations under the Civil Defence and Emergency Management Act.

References:

The Press, June 2013

SCIRT website http://strongerchristchurch.govt.nz/

Diane Brandish Corporate Finance Manager

Mark Christison Water & Waste Manager

CASE STUDY

Waimakariri District Council

Background:

At the time of the Canterbury earthquakes, Waimakariri District Council (WDC) had insurance cover with Civic Assurance for above-ground infrastructure assets and was a member of the LAPP fund for underground infrastructure. It did not have a formally documented insurance strategy. The council based the sum insured for disaster purposes on its asset valuations, reviewed every three years.

In September 2013, WDC's estimate for recovery works for the three waters and roading assets was around $43 million including $10 million contingencies. The bulk of the recovery work is for wastewater, around $22 million. The Government covers about 60 percent of recovery costs for three waters infrastructure above a threshold figure.

The 'Before' Insurance Values:

Before the earthquakes, WDC had a comprehensive unit replacement cost methodology for calculating valuations. It estimated wastewater sewer costs, taking into account factors such as depth to sewer, depth to water table, soil type and surface cover, pipe diameter and material. However, sewer replacement costs following the earthquakes were higher than replacement values on the council's balance sheet.

A specific example of the higher replacement cost is WDC's deep sewer pipes below the water table, often in areas with the worst liquefaction damage.

The 'After' Insurance Values:

WDC now has two separate asset valuations – one for the annual accounts and the other for assessing the amount of hazardous event insurance cover required. The council bases its asset valuation for the balance sheet on the optimised replacement cost for each asset (eg, a gravity sewer asset may have an optimised replacement cost based on relining or replacing with pressure sewer). The valuation for disaster purposes is based on the estimated replacement cost (not optimised) plus a factor of 30 percent to allow for a less competitive procurement procedure in the event of a major hazardous event (ie, demand surge).

WDC intends to refine its insurance valuation methodology to allow more specific increases by assets for the extra costs attributable to hazardous events. It has already improved this by incorporating some findings from the recovery works, eg, using the depth to sewer and soil type to trigger extra replacement cost factors for sheet piling and weld pointing (to lower groundwater during replacement).

Additional Costs:

The most significant additional costs WDC incurred were caused by:

- demand surge
- investigation costs to determine the extent of the damage
- difficulties repairing deep sewer systems
- improvements in system resilience (eg, more flexible sewer pipes)
- maintaining temporary services, particularly in the Canterbury Earthquake Recovery Authority red zone.

Resilience:

WDC has designed its recovery works to improve infrastructure resilience where possible. For example, changing the configuration of the gravity sewer systems to minimise deep pipes and replacing brittle pipes with flexible ones.

Governance:

WDC has a steering group that includes a discipline lead from each of the three waters, roading and property areas to improve utilities' coordination. This group identifies overlapping projects and makes decisions about procurement to minimise disruption and get the best finished product. In the Kaiapoi town centre, one contractor provides work for the 'three waters' and roads replacement as well as the town enhancement work.

References:

WDC Earthquake Recovery Committee Meeting Minutes 24 September 2013

CASE STUDY

Selwyn District Council

Background:

At the time of the Canterbury earthquakes, Selwyn District Council (SDC) had insurance cover with Lumley for property and infrastructure assets. It also had a formally documented insurance strategy. The Council based the sum insured for disaster purposes on the asset valuations for infrastructure but had separate valuations for property assets including some allowance for demand surge, and a provision for cost escalation (if applicable) and demolition costs.

The assets are revalued every three years. In the intermediary years, SDC commissions a full valuation of nine key property assets to determine a replacement cost escalation estimate to apply to all buildings.

Insurance Adequacy:

Damage to SDC infrastructure was minimal compared to the damage suffered by the neighbouring area, and resulted solely from the September 2010 earthquake. The replacement costs were adequately covered by insurance. Demand surge was not a significant factor for SDC.

Betterment:

All of SDC's extra costs were due to betterment (ie, replacing damaged assets with assets that provide a higher level of service) and these have been funded through a targeted earthquake recovery property rate to be levied for one year only.

Insurance Not Available:

In December 2013, SDC had no earthquake insurance cover for underground infrastructure and limited cover for property assets as it could not get full cover at an affordable price. In lieu of paying insurance premiums, Selwyn District Council has established a self-insurance fund for earthquake damage to infrastructure assets.

Governance:

The staff report regularly to council on the council's insurance status.

ATTACHMENT 'B'

TERMS USED IN THIS GUIDELINE

Acceptable Risk[42]	The level of potential losses a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions. In engineering terms, acceptable risk is also used to assess and define the structural and non-structural measures needed to reduce possible harm to people, property, services and systems to a chosen tolerated level, according to codes or "accepted practice" and based on known probabilities of hazards and other factors.
Betterment	Capitalised improvements to assets that result in better quality work, increased capacity and/or extended useful life.
Civic Assurance[43]	Civic Assurance and its predecessors have provided insurance and financial services to local authorities since 1941. Most local authorities are shareholders. Civic Assurance offers a range of insurance products to local authorities but does not offer material damage cover for above ground property.
Climate Change Impacts[44]	In New Zealand likely climate change impacts include: • higher temperatures, more in the North Island than the South, (but still likely to be less than the global average) • rising sea levels • more frequent extreme weather events such as droughts (especially in the east of New Zealand) and floods • a change in rainfall patterns – higher rainfall in the west and less in the east.
Consequences[45]	The outcome of a risk event affecting objectives. Consequences can be certain or uncertain and can have positive or negative effects or objectives. They can be expressed qualitatively or quantitatively and initial consequences can escalate through knock on effects.
Cover[46]	The scope of protection provided by an insurance policy.
Critical Asset[47]	An asset which, if destroyed or seriously disrupted, would cause major disruption to the service being provided. For instance, a sewage treatment plant and disposal pipeline will be critical assets in the sewerage network while the local reticulation in a residential neighbourhood will not. Not

[42] United Nations – International Strategy for Disaster Reduction.
[43] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[44] Ministry for the Environment – Climate Change Impacts in New Zealand
[45] ISO/Guide 73 – 2009 (en) : Risk Management - Vocabulary
[46] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[47] UK Institute of Civil Engineers (ICE) – 'The State of the Nation – Defending Critical Infrastructure' 2009

	everything in the network can be critical and there will be degrees of critical.
Current[48]	Totally up to date, accurate and complete, and continues to be entirely relevant to the present situation: • at this moment • now.
Demand Surge[49]	Refers to incremental losses resulting from an increase in replacement costs attributable to shortages in building materials and service providers. For example, when a major hurricane strikes and many of a city's building roofs need replacement or repair; roofers increase their prices and suppliers run low on materials. The increased demand drives up replacement costs and increases losses. The larger the disaster and damage to property, the greater the magnitude of the demand surge.
Depreciated Replacement Cost (DRC)[50]	The Replacement Cost (RC) of an asset less accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired future economic benefits of the asset.
Disaster[51]	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Disasters are often described as a result of the combination of exposure to a hazard; conditions of vulnerability present; and insufficient capacity or measures to reduce or cope with potential negative consequences. Disaster impacts may include loss of life, injury, damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.
Disaster Risk[52]	Potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time.
Excess[53]	A portion of an insurance claim the insured party must pay. It is usually the first part of the loss claimed, up to a value set out in the insurance policy.

[48] Sharplin, BD – Strategic Infrastructure Asset Management – Asset Management Words & Terms
[49] David Chan 'The Scourge of Demand Surge 2008'
[50] IPWEA/NAMS International Infrastructure Management Manual - 2011
[51] United Nations – International Strategy for Disaster Reduction – Terminology on Disaster Reduction 2009
[52] United Nations – International Strategy for Disaster Reduction - Terminology on Disaster Reduction 2009
[53] Insurance Council of New Zealand – Glossary

Financial Sustainability	The organisation's ability to manage expected financial requirements and financial risks and shocks over the long term without the use of disruptive revenue or expenditure measures. Being able to manage likely developments and unexpected financial shocks in future periods without having to introduce substantial and economically significant or socially destabilising revenue or expenditure adjustments. [54]
Hazard	• An exposure that creates or increases the probability of loss or damage. [55] • A source of potential harm. A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.[56]
Hazard Zones[57]	Areas marked on an insurance map showing difference characteristics (perhaps the different degrees of likelihood) of the risk. For instance, flood zones that show geographic areas subject to varying levels of flood risk and type of flooding.
Indemnity Insurance[58]	A policy that puts the policy owner back in the same financial position as they were before the loss occurred, so they are no better or worse off than immediately before the loss. The settlement is based on how much the policy owner would pay for the item second-hand or the replacement cost of the item less an allowance (depreciation) for age and use. Indemnity Value may also be referred to as Market Value or Present Day Value.
Indemnity Value[59]	The current value of an asset that takes into account its age and condition at the time of loss or damage.
Infrastructure[60]	The fixed, long-lived structures that enable goods and services to be produced and underpin many aspects of quality of life. Refers to physical networks, principally transport, water energy and communications and includes buildings (like treatment plants, pumping stations, community centres and public halls, recreation centres, libraries, office buildings, public baths, residential accommodation, depots and so forth) and any

[54] IPWEA/NAMS Australia – Australia Infrastructure Financial Management Guidelines
[55] Insurance Council of New Zealand – Glossary
[56] United Nations – International Strategy for Disaster Reduction - Terminology on Disaster Reduction 2009
[57] United States Federal Emergency Management Agency FEMA – Flood Zones -Definition/Description
[58] Insurance Council of New Zealand – 'Replacement v Indemnity Insurance'
[59] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[60] Adapted from New Zealand Government - Resource Management Act 1991 & National Infrastructure Plan 2011

	equipment, device or other facility made by people and which is fixed to land.
Infrastructure Insurance Strategy[61]	A logically structured document that records the organisation's adopted approach for the insurance of its infrastructure assets, the reasons it has chosen the option and the action it has resolved to take to implement it. Includes details of the extent to which the organisation may also have decided to transfer risk in other ways and/or to self-insure.
Insurance	The equitable transfer of the risk of a loss, from one entity to another in exchange for payment.
Insurance Broker[62]	An independent agent who advises people wanting insurance and arranges insurance cover for them.
Insurance Contract[63]	A formal contract between the insured and insurer agreeing to the level of cover to be provided and the terms and conditions of that cover. This comprises three separate documents: • the policy wording • the policy schedule/notice • the proposed application.
Insurance Strategy	See Infrastructure Insurance Strategy.
Insured Value	The maximum amount an insurance company will pay if an insured asset is deemed a total loss.
Insurer	A company that underwrites an insurance risk. The party in an insurance contract who undertakes to pay compensation when a risk event occurs. A provider of insurance.
Likelihood[64]	The chance of something happening – whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically over a given period.
LAPP	The (New Zealand) Local Authority Protection Programme Disaster Fund.
Liquefaction[65]	The term used to describe when some soils behave more like a liquid than a solid during the shaking from an earthquake. During an earthquake, soil particles are rearranged and compacted, forcing out water onto the surface, creating sand volcanoes or sand boils, water fountains and surface cracking. Along with liquefaction, lateral spread can also occur, which is

[61] Sharplin, BD – Strategic Infrastructure Asset Management – Asset Management Words & Terms

[62] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013

[63] Insurance Council of New Zealand – "Glossary"

[64] ISO/Guide 73-2009 : Risk Management – Vocabulary

[65] The Royal Society of New Zealand and the Office of the Prime Minister's Science Advisory Committee 'The Canterbury Earthquakes: Scientific answers to critical questions".

	when the liquefied soil flows into lower areas, such as river channels, under the force of gravity.
Maximum Probable Loss	The largest loss which the underwriter considers likely to occur.
Policy[66]	A document issued to an insured from an insurer setting out the terms of the insurance contract.
Policy Exclusion[67]	A provision within an insurance policy that eliminates cover for certain circumstances or specific losses.
Premium[68]	The amount required to be paid to obtain a specified amount of insurance cover for a set period.
Reinstatement	A provision within an insurance policy that results in insurance cover continuing to be provided following an event that results in a claim.
Replacement Cost[69]	The cost the entity would incur to acquire the asset on the reporting date. The cost is measured by reference to the lowest cost at which the gross future economic benefits could be obtained in the normal course of business. Or, the minimum it would cost to replace the existing asset with a new modern equivalent asset (not a second hand one) with the same economic benefits (gross service potential) allowing for any differences in the quantity and quality of output and in operating costs.
Replacement Insurance[70]	A policy under which an insurance company will replace a lost or destroyed item with a new one or repair the item so it is as new as practically possible. If the policy owner wants a cash settlement, he may only get the indemnity value depending on the wording of the policy. There is also an upper limit on what can be claimed. For a Nominated Replacement Value type policy, this is specified in the insurance policy as the sum insured. For a full replacement value or 'open ended' type policy, usually available for buildings, the limit is the area of the damaged structure.
Resilience[71]	The capacity to avoid or at least escape the severity of shocks – climate change, bushfires, water shortages, earthquakes, serious flooding, hurricanes, tornados and tsunami etc.. The ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from effects of a hazard in a timely, efficient manner including

[66] Insurance Council of New Zealand – "Glossary"
[67] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[68] New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[69] IPWEA/NAMS International Infrastructure Management Manual 2011
[70] Insurance Council of New Zealand – 'Replacement v Indemnity Insurance'
[71] United Nations – International Strategy for Disaster Reduction- Terminology on Disaster Reduction 2009

	through preserving and restoring its essential basic structures and functions. Resilience means the ability to "resile from" or "spring back from" a shock. The resilience of a community to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organising itself before and during times of need.
Risk	• A measure of the degree of exposure the organisation has, or might have, to the consequences that might result from an event that might happen. A hazard, exposure or chance of loss. [72] • The combination of the probability of an event and its negative consequences.[73]
Risk Appetite	• The amount of risk, on a broad level, an organisation is willing to accept in pursuit of stakeholder value. • The amount of risk that an organisation is willing to pursue or retain. [74]
Risk Avoidance	Action that may be taken to avoid a risk – and a specific risk exposure.
Risk Exposure	The degree to which people, property, systems or other elements present in hazard zones are subject to potential losses.
Risk Event[75]	A discrete, specific occurrence that negatively affects the ability of an infrastructure asset to continue to perform its part in the delivery of services to the prescribed standards.
Risk Management[76]	The systematic approach and practice of managing uncertainty to minimize potential harm and loss. Risk management comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. It is widely practised by organizations to minimise risk in investment decisions and to address operational risks such as those of business disruption, production failure, environmental damage, social impacts and damage from fire and natural hazards. Risk management is a core issue for sectors such as water supply, energy and agriculture whose production is directly affected by extremes of weather and climate.

[72] Adapted from: United Kingdom Water Industry Research Ltd – 'Tool for Risk Management of Water Utility Assets' - 2008
[73] ISO/Guide 73-2009 : Risk Management – Vocabulary
[74] ISO/Guide 73-2009 : Risk Management – Vocabulary
[75] Sharplin, BD – Strategic Infrastructure Asset Management – Asset Management Words & Terms
[76] United Nations – International Strategy for Disaster Reduction - Terminology on Disaster Reduction 2009

Risk Mitigation[77]	Action that may be taken to systematically reduce the organisation's exposure to a risk and/or the likelihood of its occurrence. The lessening or limiting of adverse impacts of hazards and related disasters. The adverse impacts of hazards often cannot be prevented fully but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures encompass engineering techniques and hazard-resistant construction as well as improved environmental policies and public awareness.
Riskpool	A mutual liability trust fund created by New Zealand local authorities to provide professional indemnity and public liability indemnity for local government organisations.
Risk Transfer	Involves the shifting of risks to another who, in exchange for a premium, provides compensation when a disaster occurs, ensuring that any financing gap that might emerge is partially or fully bridged. Risk transfer may be obtained through insurance policies or capital market instruments such as catastrophic bonds. The insurance and reinsurance sectors are the main sources of risk transfer. [78] The process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party. Insurance is a well-known form of risk transfer, where coverage of a risk is obtained from an insurer in exchange for ongoing premiums paid to the insurer. Risk transfer can occur informally within family and community networks where there are reciprocal expectations of mutual aid by means of gifts or credit, as well as formally where governments, insurers, multi-lateral banks and other large risk-bearing entities establish mechanisms to help cope with losses in major events. Such mechanisms include insurance and re-insurance contracts, catastrophe bonds, contingent credit facilities and reserve funds, where the costs are covered by premiums, investor contributions, interest rates and past savings, respectively.[79]
Self-insurance[80]	A way of managing risk by having access to funds, either cash or borrowings, for use when an unexpected loss happens, rather than having insurance.

[77] United Nations – International Strategy for Disaster Reduction -Terminology on Disaster Reduction 2009

[78] OECD – 'Disaster Risk Assessment & Risk Financing – A G20/OECD Methodological Framework

[79] United Nations – International Strategy for Disaster Reduction - Terminology on Disaster Reduction 2009

[80] Adapted from : New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013

	Note The term is a misnomer because no insurance is involved. More properly called risk retention.
Stakeholder[81]	A person or organisation that can affect, be affected, or perceive to be affected by a decision or activity.
Strategic Asset	(Not to be confused with Critical Asset) An asset or group of assets that the local authority needs to retain to maintain its capacity to promote an outcome it considers important to the current or future wellbeing of the community. [82] Public sewerage and water supply systems are strategic groups of assets because they contribute to the 'healthy community' outcome. The roading network is a strategic group of assets because it contributes to the 'safe and easy to get around' outcome.
Sum insured value[83]	The maximum amount an insurer will pay out under an insurance policy. If there is a loss limit and the insurance pay-out is capped, this is taken into account.
Total Loss[84]	A loss where the cost of repair exceeds the market value of the insured item or where it is uneconomical to repair the item. The insurer will generally pay the insured the replacement or indemnity value of the damaged item limited to the total sum insured under the contract.
Underwrite[85]	The process an insurer goes through in evaluating, accepting or rejecting insurance risk.
Underwriter[86]	A person responsible for underwriting an insurance contract. It is also a reference to the insurance company assuming the risk.
Vulnerability[87]	The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its

[81] ISO/Guide 73 – 2009 : Risk Management - Vocabulary
[82] Royal Commission on Auckland Governance – "Report of the Royal Commission on Auckland Governance" 2008
[83] Adapted from : New Zealand Office of the Controller & Auditor General – "Insuring Public Assets" – June 2013
[84] Insurance Council of New Zealand – Glossary
[85] Insurance Council of New Zealand – Glossary
[86] Insurance Council of New Zealand – Glossary
[87] United Nations – International Strategy for Disaster Reduction - Terminology on Disaster Reduction 2009

exposure. However, in common use, the word is often used more broadly to include the element's exposure.

ATTACHMENT 'C'

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ATTACHMENT 'D'

TABLE 4 – COST OF DISASTER EVENTS IN NEW ZEALAND – 1968 - 2014[88]

Year	Event	Date	Original $m.	Inflation Adjusted as at. 31/12/2011 $m.
2014	Easter Weekend Storm and Floods	17-Apr	45.6	
2014	Cyclone Lusi	15-16 Mar	4	
2014	Canterbury storm	23-Feb	3.3	
2014	Canterbury and Lower North Island storm	4-5 Mar	21.9	
2013	Nationwide storm	14-16 October	12.4	
2013	Nationwide storm	11-12 September	74.5	
2013	Cook Strait earthquake	16-Aug	16.2	
2013	Cook Strait earthquake	21-Jul	14.9	
2013	Nationwide storms	20-22June	39.3	
2013	North Island floods	4-7 May	2.9	
2013	Nelson/Bay of Plenty storm and floods	19-22 April	46.2	
2012	Auckland Tornado	6-Dec	8.7	
2011	Canterbury Earthquake accumulated total	various [2010 - 2011]	12,000 [EQC]17,000 [Insurers]	
2011	Storm/Flooding Bay of Plenty to Northland	29-Jan	19.8	20.11
2011	Flooding, Hawkes Bay	26-27 Apr	6.4	6.45
2011	Flooding Mid-Upper North Island	23-Jan	6.9	7.01
2011	Taranaki tornados	19-Jun	1.6	1.6
2011	Nelson Floods	15-16 Dec	16.8	16.8
2011	Auckland tornado	3-May	6	6.04
2010	Flooding North & South Islands	24-27 May	5.5	5.8
2010	Southland Storm	18-Sep	49.3	51.46
2010	Gisborne Flooding	13/14 Oct	0.25	0.26
2010	Wellington Thunderstorm	12-Mar	1.2	1.27
2010	Flooding - Northland/Coromandel/Eastern BOP	1-Jun	12.5	13.18
2009	Taranaki Tornado	21-Jul	0.5	0.53
2009	Fiordland Earthquake	15 Juy	1.5	1.6
2009	North Island Storms	11/12 Juy	1.7	1.82
2009	Bay of Plenty Hail Storm	11-May	2.3	2.47
2009	Kaitaia Tornado	4-Jul	0.0075	0.01
2008	Nationwide Storms	30-Jul - 1-Aug	46.3	50.29
2008	Flooding Nth Canterbury and Marlborough [prelim.]	26-Aug	0.8	0.87
2008	North Island Storms	26-27-Jul	26.7	29.02
2008	Hastings Earthquake	25-Aug	0.23	0.25
2008	Cambridge Tornado	17-Oct	1.03	1.11
2008	Canterbury hail storm	17-Nov	11.2	12.07
2007	Storm event - Far North	29-Mar	12.5	14.33
2007	Flooding - Nelson & New Plymouth	23-May	1.1	1.25

[88] Insurance Council of New Zealand 'Statistics & Data'

Year	Event	Date	Original $m.	Inflation Adjusted as at. 31/12/2011 $m.
2007	High Winds Event, Central North and Lower South Islands	23-24-Oct	4.8	5.41
2007	Gisborne earthquake	20-Dec	30.5	34.11
2007	Flooding Hawkes Bay	17-Jul	1.1	1.25
2007	Storm event - Far North / Auckland / Coromandel	10 -12-Jul	60.5	68.65
2007	Frost claims - Otago & Canterbury	7 - 9-Jul	7	7.94
2007	Tornado events	4 - 5-Jul	8.3	9.42
2006	Flooding - Oamaru / Dunedin	26-Apr	1.8	2.11
2006	Storms North & South Islands	12-Jun	42.5	49.36
2006	Windstorm damage - Mid to Upper North Island	9-Nov	3.4	3.91
2006	Storm/Flood events - Wellington, Manawatu, Wairarapa	5-7-Jul	2.7	3.13
2005	Coastal erosion - Haumoana H.B.	Â	0	0.03
2005	Flooding - Lower Nth Island	31-Mar	0.6	0.73
2005	Storm damage Bay of Plenty	25-Mar	0.9	1.09
2005	Flooding - Gisborne/East Cape	23-Oct	0.7	0.83
2005	Christchurch Hailstorm	23 & 24-Mar	13	15.8
2005	BOP Tauranga / Matata	18-May	28.5	34.46
2005	Greymouth Tornado	10-Mar	9.2	11.19
2005	Rain Storm - Dunedin	7-Feb	5	6.09
2005	Flooding - Wellington Region	6-Jan	2.5	3.05
2004	Storm Damage - North Island	20 & 21 Jan	0.75	0.94
2004	Flooding - Hawkes Bay	18-Oct	4.8	5.9
2004	Eastern Bay of Plenty Floods	17 & 19-Jul	17.6	21.77
2004	Storms - North and South Islands	15 & 20 Aug	8.7	10.74
2004	Storm Damage - Lower Nth Island	15 & 16 Feb	112	140.06
2004	Wanganui Hailstorm	6-Apr	1.3	1.62
2003	Lower North Island Flooding / Storm Damage	9 -10-Jun	1	1.27
2003	North & South Islands / Storms & Floods	3 & 4 Oct	2.3	2.9
2002	North Island Flooding / Storm Damage	21-Jun	21.5	27.69
2002	Dunedin Flooding	17-Jan	0.3	0.39
2002	Canterbury Flooding	14-Jan	0.25	0.33
2002	Wellington / Wairarapa Flooding	10-Jan	0.6	0.78
2002	Canterbury Hail Storm	5-Jan	3	3.92
2001	Wellington / Wairarapa Floods	10-Dec	0.6	0.79
2001	Masterton Hailstorm	7-Jan	1.5	2
2001	Storm Damage North Island	4-Nov	0.5	0.66
2000	North Island Severe Weather	26-Sep	4.2	5.66
2000	Canterbury Storms	12-Oct	9.4	12.63
2000	Tauranga / Eastern Bay of Plenty Floods	10-Apr	1.9	2.61
2000	Auckland / Coromandel Floods	3-Jul	7.6	10.37
1999	Northland & Pukekohe Floods	22-Jan	5	6.96
1999	Dargaville Floods	18-Apr	1.7	2.37
1999	South Canterbury Storms	2-Jul	0.6	0.84

Year	Event	Date	Original $m.	Inflation Adjusted as at. 31/12/2011 $m.
1999	Whangarei / Rotorua Floods	1-May	2.1	2.93
1999	Queenstown Lakes District Floods	1-Dec	46.1	63.83
1998	North & South Islands Storms	30-Oct	2	2.77
1998	Upper North Island Storms	29-Nov	5	6.93
1998	North & South Islands Storms	22-Oct	6.2	8.57
1998	Mercury Energy Crisis	1-May	10.2	14.19
1998	North & South Island Floods / Storms	1-Jul	11.8	16.36
1997	Northland Floods	30-Jun	1.2	1.69
1997	Auckland Floods	28-Sep	0.7	0.98
1997	Coromandel Floods	25-Sep	0.5	0.7
1997	Auckland Floods	24-May	3.7	5.22
1997	South Island Storms	21-Jan	1.1	1.55
1997	South Island Windstorms	19-Dec	0.2	0.28
1997	Southland & Otago Wind & Hail	13-Nov	0.4	0.56
1997	Cyclone Dreena	11-Jan	3.2	4.5
1997	Wairoa Floods	3-Jun	0.5	0.71
1997	North & South Island Windstorms	1-Dec	2.9	4.05
1996	Cyclone Fergus	30-Dec	1.6	2.25
1996	Weather related losses June & July	3-Jul	8.1	11.55
1996	Weather related losses	1-Dec	2.1	2.96
1995	Whangarei & District Floods		1.7	2.47
1995	New Plymouth Floods	25-Apr	3.6	5.27
1995	Thames / Kaiaua Floods	18-Jul	2.8	4.07
1995	North & South Island Floods	2-Jul	4.5	6.54
1994	Hastings Hailstorm *		10.8	16.43
1994	South Canterbury Floods	19-Feb	1.5	2.29
1994	North & South Storm / Floods	1-Nov	6	8.98
1993	Kaikoura Flood	24-Dec	7.6	11.61
1992	Auckland Tornado		1.1	1.71
1992	Canterbury Snowstorm	28-Aug	7	10.88
1991	Albany Tornado		1.5	2.36
1991	Otago Floods	18-Feb	1.6	2.53
1990	Taranaki / Wanganui Floods	8-Aug	1.8	2.9
1988	Manawatu Floods	25-Jul	2.5	4.53
1988	Cyclone Bola	8-Mar	37	68.08
1988	Greymouth Floods	1-Sep	13.4	24.21
1988	Greymouth Floods	1-May	3.2	5.85
1987	Bay of Plenty Earthquake		192	371.12
1986	Auckland Floods		0.4	0.92
1986	Nelson Floods		0.4	0.92
1986	North Otago / South Canterbury Floods	13-Mar	18.5	43.88
1985	Thames / Coromandel / Te Aroha		5.9	14.98
1985	Wellington / Hutt Valley		1.4	3.55

Year	Event	Date	Original $m.	Inflation Adjusted as at. 31/12/2011 $m.
1985	Auckland Floods		3.6	9.14
1985	Chatham Islands		0.8	2.03
1985	Gisborne Floods		1.7	4.32
1985	Hawkes Bay / Wairarapa		0.9	2.28
1985	South Auckland	1-May	2.9	7.6
1984	Greymouth Floods		3.5	10.36
1984	Auckland Floods		1.8	5.33
1984	Invercargill / Southland Floods	1-Jan	45.8	139.51
1983	Christchurch Storm		3.5	10.85
1983	Marlborough / Golden Bay Floods		2.3	7.13
1981	Kerikeri Floods	1-Mar	2	8.25
1981	Thames / Coromandel / Paeroa Floods	1-Apr	7	28.57
1980	South Island Summer Floods	17-Jan	2.3	11.16
1980	Taieri / Otago / New Plymouth Floods	5-Jun	8	36.55
1980	Onehunga Tornado	1-Aug	1	4.46
1978	Otago Floods	16-Oct	10.3	59.94
1976	Wellington / Hutt Valley Floods		6.2	47.55
1975	Canterbury Storms	1-Aug	7	62.41
1968	Wahine storm	10-Apr	3.5	57.4
1968	Loss of Wahine	10-Apr	10	164