greater WELLINGTON
REGIONAL COUNCIL

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Committee **Environment**
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Findings from the Natural Hazards work for the State of the Environment Report

1. Purpose

To inform the Committee of the main points emerging from the natural hazards technical report, written as part of the development of the State of the Environment Report.

2. Background

Over the last year, officers have been working on technical reports for the State of the Environment Report (SER) which will be published by the end of 2005. Technical reports are being written reporting on the objectives of each of the chapters in the Regional Policy Statement (RPS).

This report covers the findings of work done for the natural hazards technical report and SER chapter, which reports on the RPS objective "Any adverse effects of natural hazards on the environment of the Wellington Region are reduced to an acceptable level." The natural hazards technical report, along with the other technical and background reports, will be available on the website when the SER is released.

3. Comment

It is difficult to adequately report on natural hazards within the Pressure-State-Response (PSR) model used for the resources reported on in the rest of the SER. This is in part because natural hazards involve the interaction of human behaviours and natural processes, and are not simply an environmental value whose quality is affected by humans.

The RMA definition of a natural hazard includes events that "adversely affect or *may* adversely affect human life, property or other aspects of the environment". The definition, therefore, includes the concept of potential – not only events that have occurred, but events that may occur in future. Reporting on the state of natural hazards under the PSR model must include not only events that have occurred within the last ten years, but also describe potential effects of natural hazards in the future, i.e. a measure of our risk[1] at present. This is particularly important in conveying a complete picture of the state of natural hazards as large, low frequency events are often not represented within a ten year time frame. In other words, the events of the last ten years may not be representative of the magnitude of hazards facing our region, so must be placed in context by giving an overview of the risk facing the region from natural hazards.

There are few national indicators for natural hazards (particularly risk indicators), and we found that while we have a lot of information on natural hazards in the Region, and a rough idea of how often they are likely to occur, there is little quantitative data on the potential consequences and the value of things (assets, people) at that may be affected. Reporting on the state of natural hazards, therefore, did rely largely on reporting on events over the last ten years. We also used some new and previously published data on the extent and likelihood of various hazards.

4. Main findings

The main findings for the state of our natural hazards are:

- **Earthquakes** - earthquakes over magnitude 2 recorded in central New Zealand are shown in **Figure 1** below. Since 1997 12 earthquakes (one as far away as 180km north of East Cape) have caused significant damage in the region. The most expensive of these was the magnitude 5.5 Upper Hutt earthquake in January which cost the Earthquake Commission (EQC) $1.33 million on almost 1000 damage claims. There are several major active faults in and near the region capable of producing at least magnitude 7 earthquakes. Return periods for ground shaking, from any earthquake source anywhere, for a bedrock site in central Wellington is given in **Table 1** below (figures for softer sediment sites will be lower due to amplification of sediments).

[1] Risk, when used to refer to natural hazards, is a combination of the likelihood natural hazard event occurring and the potential consequences of it occurring.

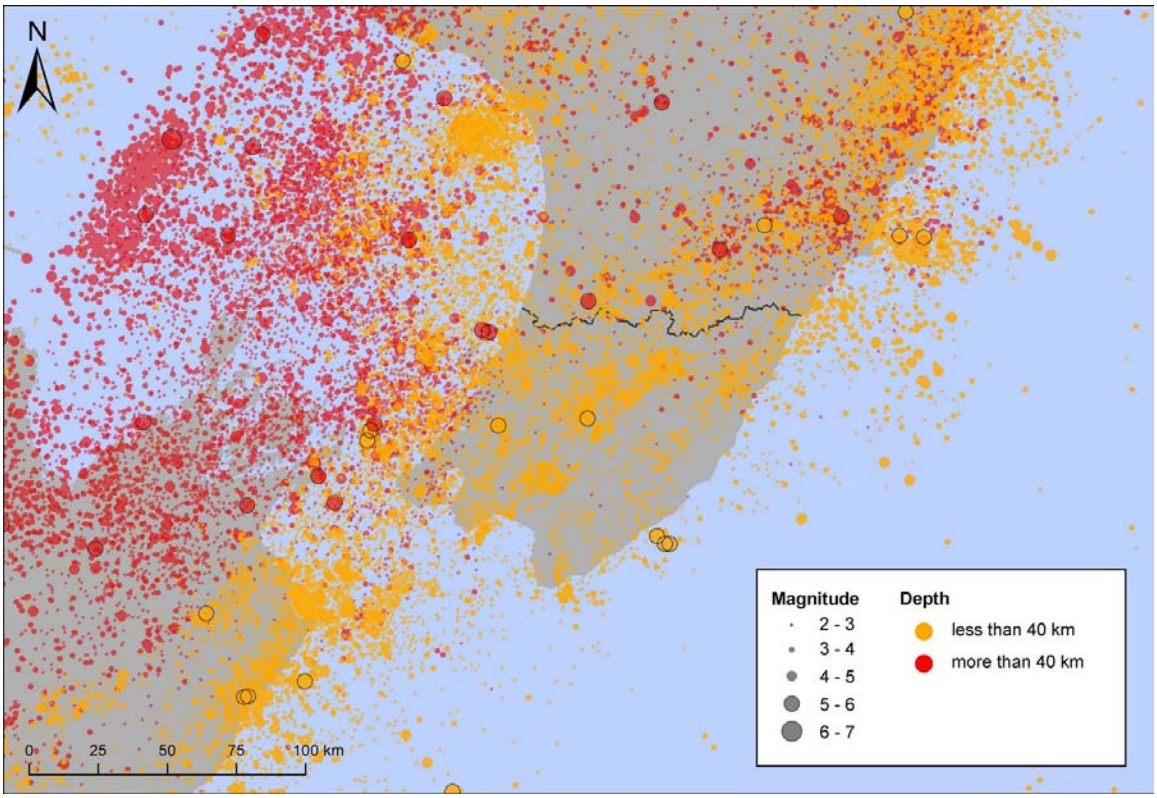

Figure 1: Earthquakes >M3 recorded in central New Zealand, July 1995 - June 2005 (source: GeoNet)

Ground shaking intensity (Modified Mercalli intensity scale)	Average return period (years)
V	2
VI	9
VII	42
VIII	170
IX	450

Table 1: Expected ground shaking intensity return periods for a bedrock site in central Wellington (source: Institute of Geological and Nuclear Sciences)

Modified Mercalli intensity scale:

V Felt outside, sleepers wakened, some crockery broken, hanging pictures move.
VI Felt by everyone, furniture moves, plaster cracks, some minor chimney damage.
VII General alarm, difficult to stand up, damage to weak masonry buildings, small slides and rock falls, unrestrained water cylinders may move and leak, windows crack.
VIII General alarm approaching panic, unreinforced chimneys fall, stone and brick walls damaged, possibly collapse, moderate landslides, ground cracks, liquefaction.
IX Panic, serious damage to masonry buildings, some destroyed, many partially collapse, ground cracks, some houses shift off their foundations.

- **Tsunami** - the region was not affected by damaging tsunami in the last ten years. Both the 2001 Peru and 2004 Asian tsunamis reached New Zealand, but measured less than 30cm by the time they got to us. We have several offshore tsunami sources close to the region including numerous offshore faults and submarine landslides in Cook Strait. We are also vulnerable to distant tsunami generated off the coast of South America. It is estimated that a damaging tsunami impacts on some part of the Wellington region coast on average every 85 years or so.

- **Flooding** - the region was seriously affected by several floods in the last 10 years, notably the two October 1998 events (Kapiti, Hutt, Wairarapa), February 2004 (Kapiti, Hutt, Wairarapa), January 2005 (Kapiti, Hutt) and March 2005 (eastern Wairarapa, Wainuiomata). Flooding in the region over the last decade has caused four deaths, hundreds of evacuations (most in the January 2005 event), and tens of millions of dollars of damage, including more than $11 million worth to Greater Wellington flood protection assets alone. Meteorologists predict more La Nina events over the next 20-30 years, which may bring more easterly weather patterns, impacting the Wairarapa. Over the longer term, however, climate change is likely to increase the average yearly rainfall on the Kapiti Coast and Wellington and increase the likelihood of intense rainfall events.

- **Landslides** - there were at least 17 major landslide events, involving widespread landsliding, property damage and/or evacuations, over the last decade. Most of these were triggered by heavy rain and accompanied by flooding, such as the October 2003 Paekakariki debris flows. Since 1997 EQC has received over 1200 claims, totalling more than $5 million for landslide damage to houses and contents in the region. Over half the claims, accounting for more than 60% of the value paid out, were from Wellington City.

- **Coastal erosion** - much of the region's coast is hard bedrock, but coastal erosion is an issue in areas of unconsolidated sediments such as at Castlepoint, Riversdale, Palliser Bay, Kapiti Coast, and some parts of Wellington and Porirua Harbours. While there have been few major coastal erosion episodes over the last ten years - the worst being the loss of a two storey house at Te Kopi in Palliser Bay during a southerly swell in June 1996 - long term coastal erosion trends are still an issue in many places. Te Kopi, 2002, is shown in **Figure 2** below. Climate change, with subsequent sea level rise and more intense weather patterns, is likely to exacerbate the coastal erosion hazard.

Figure 2: Coastal erosion of soft mudstone at Te Kopi, Pallister Bay (photo taken in 2002)

- **Severe wind** - damaging winds, disrupting transport, felling trees, power and telecommunications lines, and lifting roofs, have affected some part of the region at least once a month on average over the last ten years. The severe wind hazard varies widely over the region with the windiest areas generally being the eastern Wairarapa coast (particularly Castlepoint and the area around Tora) followed by the southern Wairarapa and Wellington coasts (**Figure 3** below).

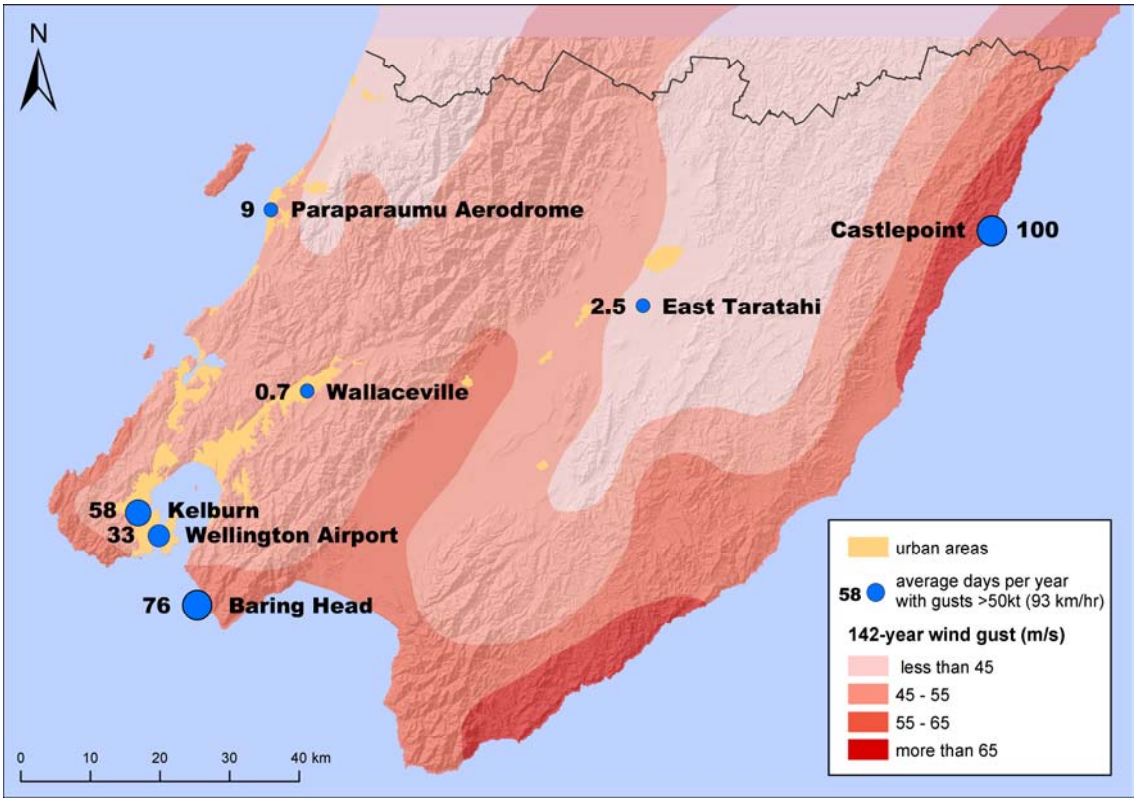

Figure 3: 142 year return period wind gust (m/s) across the Wellington Region and average number of days per year recording gusts over 50 knots (93km/hr) (source: National Institute of Water and Atmospheric Research). Note that the 142 year return period wind data does not allow for localised topographic effects.

- **Wildfire** - 1,544 wildfires burnt a total of 1,460 hectares of land in the region between 1995 and 2005. Wildfire incidents were particularly high during the hot, dry summers of 1997/98, 2000/01 and 2002/03. Around 20% of the Wellington region is judged to be at high or extreme risk from wildfire. Nationally, the number of wildfires has fallen over the last ten years. This has been put down to more public education, more and better-equipped volunteer fire fighters, and better co-operation between the National Rural Fire Authority and the New Zealand Fire Service.

- **Drought** - three serious droughts occurred over the last ten years: 1997/98 (Wairarapa), 2000/01 (Wellington, Hutt, Kapiti, southeast Wairarapa) and 2002/03 (Kapiti, Wairarapa). These droughts brought widespread water restrictions and water supply problems, stock reductions and increased fire risk. The likelihood of drought in Kapiti and Wellington is likely to increase over the next 20 to 30 years with the predicted increase in La Nina events. In the longer term, however, climate change is likely to bring more westerly air flows, creating an increased likelihood of drought in the Wairarapa.

- **Volcanic activity** - while there are no active volcanoes in the Wellington region, we could be (and have been in the past) affected by ash fall from Mt Taranaki or the central North Island volcanoes. Westerly and southerly winds kept ash away from the region in the 1995 and 1996 Mt Ruapehu eruptions. If winds had been northerly, however, we could have received around 1mm of ash. Even small amounts of ash can irritate lungs and eyes, contaminate water supplies, damage vehicles and houses, and close airports. The return period for this sort of event in the region is estimated at 1300-1600 years.

Greater Wellington plays a leading role in managing natural hazards in the Wellington region, along with several other organisations. Responses include:

- Hazard and risk investigations and monitoring - carried out by Greater Wellington, territorial authorities (independently or in partnership with Greater Wellington), Institute of Geological and Nuclear Sciences (GNS), National Institute of Water and Atmospheric Research (NIWA) and universities, particularly Victoria University. The Earthquake Commission and the Foundation for Research, Science and Technology also fund hazard research.

- Regional plans - Regional Freshwater, Soil and Coastal Plans all have policies to help manage natural hazards.

- District plans and building consent controls - all territorial authorities recognise natural hazards as a resource management issue.

- Information provision - fact sheets, the Greater Wellington and Wellington Region Civil Defence Emergency Management Group websites, the Hazards Online database, presentations to groups, and response to public enquiries from Greater Wellington, and district plans, Land Information Memorandums, Project Information Memorandums and signage in some areas from territorial authorities.

- Civil Defence Emergency Management - the new Wellington Region Civil Defence Emergency Management Group Plan became operative in 2005 setting the context and direction for the Region's Civil Defence Emergency Management.

- Flood protection and warning - floodplain management plans (western Region) or river schemes (Wairarapa) are in place for the Otaki, Waikanae, Hutt, Waiohine, Waingawa, Waipoua and Ruamahanga Rivers, and telemetered rainfall and water level data is used for flood warnings.

- Preventative measures - soil erosion control programmes and coastal care groups operate in the region.

- Rural fire authorities - comprising territorial authorities and the Department of Conservation.

- Lifeline groups - represented by the Wellington Lifelines Group and the Wairarapa Engineering Lifelines Association.

In the future, Greater Wellington must continue to carry out regional hazard investigations, but not only on the where and when of natural hazards but also more on the potential consequences of these events. We need to be able to quantify and monitor risk - where, what and who is at risk - using measurable risk indicators particularly for earthquakes, flooding, tsunami and coastal erosion. Without this information we cannot accurately comment on the state of, or the risk from, natural hazards within the region over time, making it difficult to know how well we are achieving our aim to reduce the potential adverse effects of natural hazards.

We must also continue to work with territorial authorities on local hazard investigations, and to advocate for appropriate land use through district plans.

An April 2005 survey showed that 80% of residents in the Wellington region consider themselves very or quite well informed about hazards – up from 69% the previous year. However, only 65% have emergency food supplies, 69% have emergency water stored, and just 26% have a household emergency plan. Greater Wellington and the new CDEM Group need to continue to promote hazard awareness and preparedness.

5. Communication

A communication plan is being developed for the State of the Environment Report, which will be published in December of this year.

6. Recommendations

That the Committee:

1. ***Receives*** *the report, and*

2. ***Notes*** *the contents.*

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