SOLGM

Climate change

Local government can make a difference

leadinglearninglinking

FOREWORD

Much of the debate about the existence of climate change has been resolved. The most recent report of the International Panel on Climate Change was also unequivocal in its findings that human activity is affecting the world's climate, atmosphere and oceans.

Local authorities have statutory responsibilities to adapt to, and help the community to adapt to, the effects of climate change. Regardless of these obligations, the potential effects on water security, coastal communities and natural ecosystems are serious enough that shutting our eyes to the effects of climate change would represent poor stewardship on our part.

This report is the second in what will be an ongoing series of thought leadership reports from SOLGM. Its purpose is to survey the action that local authorities individually and collectively can take to help local communities adapt to climate change.

Our intent is that this report will act as stimulus to thought and action. It has been deliberately kept short and practical, and steers away from technical discussion of the science and of mitigation.

This report arises out of an initiative of SOLGM's Sector Futures Working Party. I particularly want to thank the following for their contributions to this report:
- Blair Dickie, Principal Advisor – Science and Strategy, Waikato Regional Council (project leader)
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This report is one of the outputs from SOLGM's Sector Good Work Programme. The next will be SOLGMs guidance on *section 17A* reviews (due for release at the end of September).

Barbara McKerrow
President SOLGM
August 2015

EXECUTIVE SUMMARY

The *5th Assessment Report* of the International Panel on Climate Change (IPCC) provides a clear, close to unequivocal understanding both of the degree of climate change occurring, and the impact of human activity. This evidence and recent developments in the policy sphere, such as the review of the Emissions Trading Scheme, and New Zealand's announcement of its intended nationally determined contribution for reducing greenhouse gases, make it timely to review the roles and responsibilities of local government in mitigating and adapting to climate change.

The *Resource Management Act 1991* and subordinate National Policy Statements make it clear that local authorities' role is essentially to assist and support communities to adapt to the foreseeable effects of changing climate. This role is complementary to that of central government, which is to set national greenhouse gas emissions targets and develop policies to achieve these.

Climate change is likely to affect many local authority functions and responsibilities. Research has suggested there is particular risk for water security, coastal communities and natural ecosystems. The changes will impact New Zealand's communities, environments and economy over very long-term timeframes, and will require sustained and consistent, but flexible, responses.

Councils have opportunities to develop strategic initiatives and practical tools to support positive transitions. The likelihood is that an integrated mix of regulatory and non-regulatory responses will be needed. Many of the opportunities fall into three broad areas:

- building community understanding and preparedness
- developing practical processes and tools to help New Zealanders adapt
- strengthening resilience against adverse impacts.

Some local authorities have embarked on spatial planning, in part to act as a guide for decision-making and the preparation of strategies, policies and plans. This is a way to bring together local authorities, government and other agencies in a manner that generates an integrated response. Local authorities are also developing their own internal guidance to support these – we cite three current examples in the body of the report.

One obvious role that local authorities can play is as a trusted provider of reliable tools and information so that local communities can be informed of the probability, type and severity of impacts, and steps they can take. Regional councils are increasingly moving into this space by providing climate data and models at a local level – there may be an opportunity to provide this data through a common platform. Emergent technologies (especially augmented reality used with or without wearable devices) could easily be used or adapted to provide graphic and stark visual interpretations (for example, how much coastal land will be inundated at varying levels of sea level rise).

Local authorities have wider opportunities than data provision to work together. The Victoria University Climate Change Research Institute has suggested that the sector establish a community of practice to aide collaboration in planning, natural hazard management, biodiversity, biosecurity and infrastructural management. We agree, and consider that such a work programme could easily be incorporated into the work programme of sector groups.

A common work programme or approach is likely to be more effective if it proceeds from a common position. The sector as a whole should proceed from a common understanding of climate change as an issue and of local government's role in responding to climate change. The existing 2009 Local Government Leaders position Statement on Climate Change would be the starting point.

Such a position statement would then serve as a basis for local government to approach central government for various policy, regulatory and information matters that would better support adaptation. These include:

- a clear, quantitative statement on projected sea level rise
- completion of a draft NPS for Biodiversity to give weight to biodiversity offsets for climate compensation
- development of national criteria to identify nationally significant infrastructure, and
- clarification of the legal position where land has been identified as at risk of inundation both in terms of the use, and local authorities' ability to signal the future risk on instruments such as LIMS.

A 'whole of government' approach with central government agencies would help advance matters. This will be especially important with the review of the Emissions Trading Scheme (NZETS).

CONTENTS

1. BACKGROUND

It is timely to revisit New Zealand local government's role in relation to climate change, in the light of recent information and initiatives, both in this country and internationally.

1.1 The science

The *5th Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC) is clear and provides more certainty to the understanding gained from earlier IPCC Assessment reports. The effects of human activities on the climate are unequivocal, resulting in:

- elevation of atmospheric concentrations of carbon dioxide, methane and nitrous oxide to levels unprecedented in at least the past 800,000 years
- carbon dioxide concentrations increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions, and
- ocean acidification from absorption of about 30% of carbon dioxide emissions[1].

The NZCCC (New Zealand Climate Change Centre) *Summary of New Zealand-relevant findings* is based on the IPCC's *5th Assessment Report*.[2] New Zealand is already experiencing climate change, with long-term trends toward higher temperatures, more hot extremes, fewer cold extremes, and shifting rainfall patterns in some regions. More change is expected, including:

- average temperatures rising further, with up to 60 more days of more than 25C for northern areas by 2090
- time spent in drought in eastern and northern New Zealand projected to double or triple by 2040
- global sea level rise by 2100 of between 0.3 metre and 1 metre above the 1986-2005 average. Even if temperatures peak and decline, sea level rise is projected to continue for many centuries at a rate depending on future emissions. Sea level rise around New Zealand may be up to 10% higher than the global average
- increase in days with 'very high' and 'extreme' fire danger index in some locations by up to 400% by 2040 and 700% by 2090
- shifts in wind speed and direction, with increased frequency of extreme wind events, and
- a decline in peak snow accumulation and snowlines rising to higher elevations.

Last year was the hottest year recorded since 1880, according to separate analyses by scientists from NASA, the NOAA (National Oceanic and Atmospheric Administration) and the UN WMO (World Meteorological Organisation)[3][4][5]. Last year also had the hottest global sea surface temperature ever recorded and global average air temperature over land and sea surface of 0.57C above 1961-1990 levels.

A report by Dr Jan Wright, the Parliamentary Commissioner for the Environment, on *The science behind sea level rise* (2014)[6] was aimed at taking the highly technical academic literature that informs the IPCC reports and making it accessible and relevant to New Zealanders.[7]

1 https://www.ipcc.ch/report/ar5/
2 http://www.nzclimatechangecentre.org/#sthash.q8VkzT2G.dpuf
3 http://www.nasa.gov/press/2015/january/nasa-determines-2014-warmest-year-in-modern-record/
4 http://www.climatecouncil.org.au/2014-hottest-year-on-record-globally
5 https://www.wmo.int/pages/mediacentre/press_releases/pr_1009_en.html
6 http://www.pce.parliament.nz/publications/all-publications/changing-climate-and-rising-seas-understanding-the-science/
7 The PCE's report's Overview is included as Attachment 1 to this paper.

The PCE's report links measured increases in past CO_2 levels with temperature and sea levels. It explains the chemical and physical processes involved and clearly states the amount of sea level rise that is already locked in (0.3m by mid-century) and the projections if mitigation is not effective.

A follow-up report is to be released in mid-2015 to identify areas around the country most vulnerable to sea level rise and assess the risks to infrastructure in those areas. Risk is not limited to residential properties in coastal locations, but to publicly funded and owned infrastructure, including levees, sea walls, airports, roads, railways, water supply, wastewater treatment and flood protection.

2 Policy responses

Recent policy initiatives both internationally and in New Zealand include:

1. *UNFCCC CoP (United Nations Framework Convention on Climate Change Conference of Parties) agreements*. In late 2014 the leaders of the United States and China, the two countries responsible for about 45% of global greenhouse gas (GHG) emissions, announced new measures to reduce their emissions.[8] This resolves problems arising from the previous lack of engagement by these countries in the 2009 Copenhagen CoP,[9] and is positive for the December 2015 CoP in Paris which will aim for universal agreement on a framework for global GHG emissions post 2020.

2. The US announced emission reductions of between 26% and 28% by 2025 from its 2005 levels, and China announced it would peak its CO_2 emissions by 2030. The European Union has announced it would cut emissions by at least 40% by 2030.[10]

3. The UNFCCC requirement for nations (including New Zealand) to submit INDCs (*intended nationally determined contributions*) for reducing GHGs after 2020, is to be included in the negotiations at the Paris CoP.[11] New Zealand's INDC was announced on 7 July 2015 by the Minister for Climate Change Issues[12] as a 30% reduction in GHG over 2005 level equivalent to reduction of 11% over 1990 levels. The regional implications[13] may differ around the country.

4. *The NZ-ETS (Emissions Trading Scheme) review*. New Zealand has established an accounting infrastructure to measure emissions and sequestrations (sinks) functions through land use and land use change databases. The market mechanism is the ETS established under the *Climate Change Response Act 2002*. The legislation requires review of the ETS at least every five years; a review is scheduled for later in 2015, and would logically follow the determination of the INDC.

8 http://newsroom.unfccc.int/unfccc-newsroom/us-china-climate-moves-boost-paris-prospects/
9 http://www.stuff.co.nz/business/3253590/Four-reasons-why-Copenhagen-failed
10 http://newsroom.unfccc.int/unfccc-newsroom/eu-agrees-40-greenhouse-gas-cut-by-2030/
11 The language of the UNFCCC negotiations has shifted from the top-down terminology of 'commitments' to a bottom-up framing of 'contributions': Jo Tyndall: MFaT Climate Change Briefing COP 20 Lima Peru, Auckland, 17 November 2014.
12 http://www.beehive.govt.nz/release/climate-change-target-announced
13 For example, price changes that may affect regional economic development or provide incentives / disincentives for land use changes required to meet regional resource allocation objectives.

2. THE ROLES AND REQUIREMENTS OF LOCAL GOVERNMENT

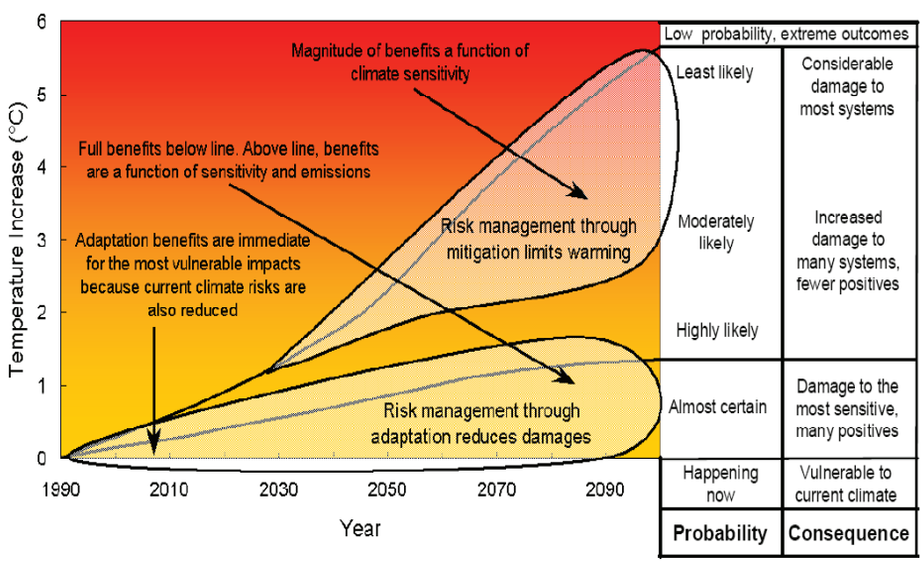
changing climate will affect a wide range of local government roles, functions, activities and statutory responsibilities. The statutory role of local government with respect to climate change comes from the *Resource Management Act* and subordinate National Policy Statements. Councils' role is broadly to assist and support our communities to adapt to the foreseeable effects of a changing climate.

2.1 Adaptation and mitigation

These two terms have specific meanings in the global climate change context. In New Zealand's statutory and policy frameworks, the respective mandated roles of local and central government hinge on the clear understanding and differentiation of each:

- *adaptation* – actions to address unavoidable climate change, to minimise risk and disruptions, and to strengthen resilience and preparedness, and
- *mitigation* – actions to reduce GHG emissions and to modify actions, aiming to reduce the likelihood of further change which may have more severe, more damaging and more costly impacts.

New Zealand legislation focuses local government on the effects of climate change (adaptation). This is a complementary role to that of central government (mitigation), which is to set national GHG emissions targets as part of New Zealand's contribution to international agreements for mitigation of global climate change, and develop market mechanisms to achieve these. The diagram below shows the relationship between the two.[14] An additional 1C (global average) of warming over 1990 levels is regarded as almost certain (or 2C from pre-industrial times). Activities to address the risks associated with this almost certain rise in temperature and change to climate are known as adaptation. Activities to limit the risks of the average temperature increasing beyond this level are described as mitigation.



14 IPCC *4th Assessment Report Climate Change 2007*: Working Group II: Impacts, Adaptation and Vulnerability

adaptation and mitigation both occur. Adaptation is obligatory but without activities that limit warming into the future, we will reach a point where the adaptation actions would either be unaffordable or technologically impossible for communities to advance.

There are few, if any, direct requirements for local government to engage in climate change mitigation. Any activities to reduce GHG emissions are subject to the same motives that any responsible business or organisation is bound by. These include:

- economic efficiencies via operational reviews, innovation and the prudent use of resources so as not to waste ratepayers' funds on water, transport and energy
- the benefits of a positive reputation as a morally responsible corporate citizen and, in the case of councils, as leaders by example for our communities, and
- the benefits of developing an integrated response and aligning strategies with central government and others.

2.2 LGNZ Leaders' Position Statement

In 2009 Local Government New Zealand drafted a position statement to help councils understand and determine their roles to support their communities in relation to climate change.[15]

The Position Statement:

1. recognises that climate change is occurring
2. 2. commits the sector to work with communities to prepare for the future, with the key role of local government to lead community responses to the risks and opportunities of climate change
3. 3. clarifies the sector view on the respective roles of local government and central government, recognising that
   - it is in the area of adaptation that local government has the networks, planning tools and opportunities to add most value to the national effort, and
   - central government has the international responsibilities and economic tools to establish emissions targets and price emissions.

2.3. The legislation

A range of legislation and associated National Policies determines local government's specific roles and responsibilities in relation to a changing climate:

2.3.1 *Resource Management Act 1991*

The *Resource Management Act* (*RMA*) and its subordinate policy statements are the primary drivers of local government action in relation to climate change, particularly in the area of adaptation responses and the reduction of risk from natural hazards.

The reference to climate change adaptation is unambiguously positioned in Part 2 of the *RMA*. *Section 7(i)* requires that all persons exercising powers and functions under the *RMA* must have particular regard to the effects of climate change. This statutory expectation is reinforced throughout the *RMA*. For example the definition of sustainable management is to *enable social, economic and cultural well-being and health and safety while … safeguarding the life-supporting capacity of air, water, soil and ecosystems*.

15 The LGNZ Leaders' Position Statement is included as Attachment Two to this paper.

Additionally, regional policy statements must identify the local authority responsible in the whole or any part of the region for specifying objectives, policies and methods for the control of the use of land to avoid or mitigate natural hazards or any group of hazards.[16] This links directly to the principle of reduction of risk from the *Civil Defence and Emergency Management Act 2002* (*CDEM*).

In addition to the *RMA* itself, further clarification of the local government role in climate change adaptation comes from two key National Policy Statements. The New Zealand Coastal Policy Statement 2010:

- requires adoption of a precautionary approach for the use and management of coastal resources potentially vulnerable to effects of climate change
- requires the identification of coastal hazards and assessment of hazard risks over at least 100 years, having regard to various phenomena causing coastal change, including sea level rise and the effects of climate change on storm frequency, intensity and surges, and
- mandates subdivisions in the Coastal Environment to reflect the dynamic nature of coastal processes and the potential of natural hazards over at least the next 100 years.

The National Policy Statement for Freshwater Management (National Objectives Framework) 2014 (NPS-FM 2014) requires consideration of the reasonably foreseeable effects of climate change when setting water quality and quantity objectives in Freshwater Management Units (Policies A1 and B1).

The *Resource Management (Energy and Climate Change) Amendment Act 2004*, enacted in response to New Zealand's ratification of the Kyoto Protocol, specifies that the purpose of those *RMA* amendments is to require local authorities to plan for the effects of climate change (*section 3(b)(i)*). The amendment also explicitly restricts the ability of regional councils to consider the discharge of greenhouse gases as a contaminant..[17]

2.3.2 *Local Government Act 2002*

The *Local Government Act* (*LGA*) is the primary statute that provides the machinery for local government to exist. The LGA determines the purpose of local government as (among other things) to:

- enable democratic local decision-making and action by, and on behalf of, communities, and
- meet the current and future needs of communities for good-quality local infrastructure, local public services, and performance of regulatory functions in a way that is most cost-effective for households and businesses.

There is no direct reference to climate change in the *LGA*. However, actions by councils are linked to the purpose of providing good quality infrastructure to fulfil the needs of communities and the performance of regulatory functions conferred by other legislation.

Good quality in this context means effective, efficient and appropriate to the future needs of the community. Climate change adaptation has links to all three of these elements of good quality. For example, greater frequency and severity of adverse weather will have

16 *RMA section 62 (1)(i)(i).*
17 *RMA section 104E*. This provision was established to deal with the potential for businesses to be caught in a double jeopardy situation through a local government condition of consent requiring greenhouse gas offsets, whilst at the same time being subject to a carbon charge (a tax was envisaged at the time but later policy saw the establishment of the NZ-ETS).

implications for levels of service expected from protective assets such as seawalls and stopbanks (i.e. will raise the standard of what's needed to be effective). Those planning renewal of infrastructure of any type will need to consider whether the communities of today will have to retreat in the light of sea level rise.

2.3.3 *Civil Defence and Emergency Management Act 2002*

CDEM's statement of purpose includes recognition of climate change, by among other things, requiring local authorities:

- to co-ordinate, through regional groups, planning, programmes, and activities related to civil defence emergency management across the areas of reduction, readiness, response, and recovery, and
- encourage co-operation and joint action within those regional groups.

The *CDEM Act* has a post-event focus with the risk reduction element being covered through a link to the *RMA*.[18] There are no explicit references to climate change in the *CDEM Act*.

2.3.4 *Building Act 2004*

The *Building Act* regulates building work and among other things has the purpose of ensuring that buildings are designed, constructed, and are able to be used in ways that promote sustainable development. Climate change is not explicitly mentioned. However, *section 30F* mentions the issue of national multi-use approvals subject to conditions that apply to specified climates. The inference is that this relates to existing climatic conditions and not to projected climates.

Section 71 links granting of a building consent to natural hazard areas[19] and states that building consent must be refused if:

- a) the land on which the building work is to be carried out is subject or is likely to be subject to one or more natural hazards, or
- b) the building work is likely to accelerate, worsen, or result in a natural hazard on that land or any other property.

An exemption is permitted if the consent authority is satisfied that there is or will be adequate provision to protect the building or land from the hazard. It is important to note that the definition of hazard in this case does not include projected wind increases. The nominal life of a building is 50 years under the *Act*.

18 *CDEM Act 2002, section 17 (3*)

19 *Section 71(3)* of the *Building Act* defines natural hazard as any of: erosion (including coastal erosion, bank erosion and sheet erosion), falling debris (including soil, rock, snow and ice), subsidence, inundation (including flooding, overland flow, storm surge, tidal effects, and

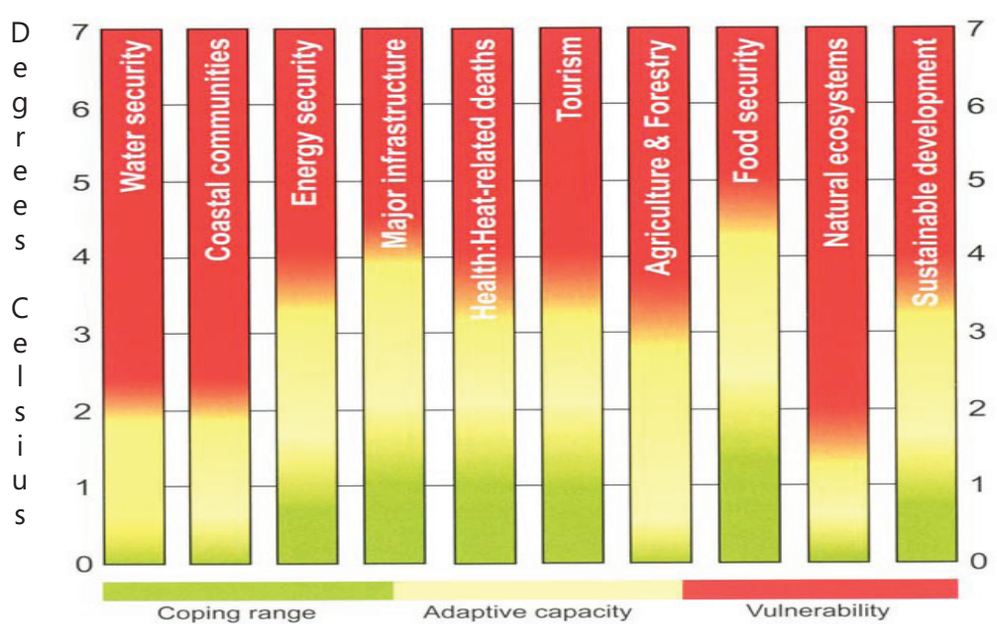
3. VULNERABLE SECTORS OF PARTICULAR SIGNIFICANCE FOR LOCAL GOVERNMENT

With the exception of projected sea level rise, the effects of climate change are projected to play out differently across New Zealand. Other common elements – such as rising temperatures, more frequent extreme winds and changing rainfall patterns – will affect different areas to different extents and in different ways. Each region and district will need to assess the particular risks and vulnerabilities for its area's communities, essential services and infrastructure, environment and economic sustainability.

The IPCC[20] has assessed the sensitivity and vulnerability of New Zealand's key resources and major economic sectors, and identified adaptation constraints and opportunities. Three highly vulnerable sectors of particular relevance for local government are: ***water security; coastal communities and natural ecosystems***.[21] These are all assessed as having low adaptive capability, and will be pushed beyond their coping range at just 1.5C to 2C global temperature rise.[22]

As well as the impacts in the three highly vulnerable sectors, the issues and implications of changing climate will range across many local government roles and functions. Developing effective adaptation responses will require coordination between the councils in an area or region, and between councils and central government agencies, to focus on the particular needs and priorities of each community, region and district. A recent interview with Massey University researcher Dr Bruce Glavovic[23] sheds light on this.

The following diagram illustrates the relative vulnerability of the 10 key economic sectors to projected temperature increases (y axis).



20 https://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch11.html

21 The impacts on New Zealand's agriculture sectors and on major infrastructure will also be highly significant for local government roles, functions and responsibilities. With agriculture, the issues will be closely linked with water security and biosecurity; with infrastructure, the long lead times, and questions of cost and affordability for communities will create particular challenges.

22 This is the target level of temperature rise to which international GHG emissions management efforts are aimed, and is considered the threshold for the potential onset of 'Dangerous Climate Change'. This limit was agreed in a 1996 statement of European Council environment ministers: http://europa.eu/rapid/press-release_PRES-96-188_en.htm?locale=en

23 http://www.radionz.co.nz/national/programmes/ninetonoon/audio/20173909/bruce-glavovic-on-rising-sea-levels

3.1 Water allocation and security

Although the statutory policy frameworks provide separately for freshwater quality and quantity, sustainable management of this resource requires an integrated approach to freshwater and all its contexts. Water in rivers, streams, lakes and aquifers reflects local geology, past and present land use, and the effects of activities (discharges etc).

Projected changes in precipitation (amounts, frequency, intensity, seasonal patterns) will change the dynamics and the characteristics of many waterways into the future. Councils will need to address these changes when setting objectives, limits, levels and flows. These will influence groundwater recharge and the diffusion and assimilation of contaminants into surface water and groundwater, and therefore the minimum volumes that should be retained in waterways.

Regional councils' roles for the allocation of water include the requirements under the NPS-FM 2014 for Water Quality objectives and limits (Policy A1) and Water Quantity objectives, flows and levels (Policy B1) to have regard to the reasonably foreseeable effects of climate change. Territorial authorities are also interested as the owners, funders and operators of three waters infrastructure and as the providers of three waters services.

3.2 Coastal communities

Sea level rise is one of the more certain outcomes of climate change.[24] The IPCC's *5th Assessment Report* confirms projections of an additional 0.3m global sea level rise by mid-century. This is now 'locked in' as a result of current climate conditions and global emissions profiles – the only response available to coastal communities is adaptation.

The rate of sea level rise for the remainder of the century and beyond depends on the effectiveness of the global communities' efforts to reduce GHG emissions. The IPCC projects a 1m sea level rise by the end of the century based on a rising emissions scenario.

Both regional and territorial councils have roles and responsibilities for planning and natural hazard risk reduction in the coastal environment, guided by the New Zealand Coastal Policy Statement.

Issues councils and communities should consider include:

- more frequent coastal inundation and storm surges, with effects on coastal infrastructure, roads, rail and communications networks
- effects on groundwater levels in coastal aquifers, including effects:
  - on three waters services and other buried infrastructure
  - on foundations to roads, levees and other infrastructure
  - increased liquefaction risk
  - potential shifts in the freshwater/saltwater interface
  - increased groundwater discharge to streams
- effects on estuaries, harbours and intertidal zones, and on their habitats, fisheries and wildlife
- effects on the structure and integrity of flood protection schemes for low lying coastal plains
- natural hazard management and planning for residential developments and other community facilities on the coast or in low-lying areas

24 A more detailed discussion of sea level rise and the likely impacts is included as Attachment 1.4 to this report. Further information and consideration of the implications for New Zealand coastal communities can be found in the PCE report: http://www.pce.parliament.nz/publications/all-publications/changing-climate-and-rising-seas-understanding-the-science/ Executive summary included as attachment 1.1 of this report

- the relative effectiveness and affordability of 'hard' engineered solutions (structures that provide a short term respite from coastal inundation and erosion) and 'soft' solutions that work with the natural environment with minimal adverse effects but may offer limited protection, and
- the prerequisite conditions to trigger a retreat.

3.3 Natural ecosystems

Biodiversity, like natural hazards, is an area of joint responsibility between regional and territorial councils, who are required to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.[25] The respective roles are clarified in Part 4 *RMA* with regional councils having the function of the establishment, implementation and review of objectives, policies and methods for maintaining indigenous biological diversity.[26] This is matched with territorial councils' function of the maintenance of indigenous biological diversity.[27] Any overlap in roles for the management of biodiversity, including control of land use, is determined through the relevant Regional Policy Statement.[28]

Neither regional councils nor territorial authorities can discharge their responsibilities for biodiversity without taking the projected changes in climate into account.[29] Indigenous species and their ecosystem communities are the 'whole time integrators' of the totality of their environments, including the underlying climatic conditions as well as the effects of multiple resource management decisions. Climate change will lead to changes in the physiological processes, viability and habitat range of many plants and animals, including pests and weeds, production (introduced) species and threatened native species.[30]

The agricultural, forestry and tourism sectors will face challenges in managing indigenous biodiversity and production ecosystems. Biosecurity threats will include projected increased incursions of pest species that may have previously been unable to survive in New Zealand, but are better adapted for new conditions. Implications for primary production will include changes in each region's suitability for different types of farming, and increased requirements for water storage.

Many councils are embarking on spatial plans to assist their individual or collective (regional) economic development aspirations, which include identifying infrastructure to support these goals. A logical step would be to include recognition of the ecosystem services (green infrastructure) we receive from functioning ecosystems, and include provisions for these in such plans. Any strategy would need to recognise that the effects of climate change may be greater than expected within individual regions and ecosystems. Therefore, an inter-regional (or national) climate response strategy for biodiversity may be more effective than the provisions that may be included in local and regional plans.

25 *RMA section 6(c).*
26 *RMA section 30(1)(ga)*
27 *RMA section 31(1)(b)(iii)*
28 *RMA section 62(1)(i)(iii)*
29 The proposed National Policy Statement for Biodiversity (2011) set out a range of policies for local government to identify and manage biodiversity and significant areas and habitats, and introduced the possibility of using offsets as an option to deal with residual adverse effects where they cannot be fully mitigated (Policy 5). Such provisions would at best be ad hoc without a comprehensive strategy to understand the effects of changing climate and provide for the transition of New Zealand's indigenous biodiversity from areas with little expectation of viability to areas with projected future climate and conditions that would better suit their physiology and needs. This may involve investment in the construction of habitats. The proposed NPS is on hold at present: http://www.mfe.govt.nz/more/biodiversity/protecting-nzs-biodiversity/proposed-national-policy-statement-indigenous.
30 An example is the iconic tuatara, a survivor from Gondwanaland – temperature affects the gender of hatchling tuatara, with higher proportions of males being produced in warmer conditions: http://researcharchive.vuw.ac.nz/xmlui/handle/10063/155

3.4 Other important responsibilities for councils

Natural hazards management

All regions, cities, towns and districts are at risk from greater climate variability, including changing temperature and rainfall patterns and increasing storm intensities. In terms of councils' resource management, strategic planning and risk management responsibilities, there are significant threats from higher storm intensities, more extreme wind events, and the potential for weather-related hazards such as floods, slips, erosion, fire and drought. In many cases these also pose significant risks to life and property, to essential lifelines and public services, and to existing economic activity.

Storm surge Buffalo beach Whitianga

Wind damage Canterbury

Under the *Local Government Act*,[31] all councils must now establish an Infrastructure Strategy to identify significant infrastructure issues over at least the next 30 years, costs and options for managing those issues and the implications of those options. Infrastructure Strategies must cover existing or proposed council assets used to provide services to the community for water supply, sewerage, stormwater drainage, flood protection and control works, and the provision of roads and footpaths – all of which will be significantly affected by the effects of climate change.

For those natural hazards that the relevant Regional Policy Statement has determined will be managed at a regional scale, the Regional Plan will be the instrument that includes objectives, policies, rules and other methods for each identified hazard and area. This has been interpreted to mean that activities in the identified areas would require resource consent. Different provisions would apply at the local level under a District Plan where a presumption of existing use rights would apply.

Resource allocation and land use

Regional and territorial councils have complementary and interconnecting responsibilities for planning and policies for managing natural and physical resources and of the effects of the use, development or protection of land.[32] The medium-term and long-term implications of climate change include:

- planning for coastal communities threatened by sea level rise and coastal erosion
- territorial councils' planning controls for subdivisions
- land use planning that recognises and fulfils responsibilities for reducing risk from projected new fluvial, coastal and landslip hazards
- providing for coastal wetlands, including New Zealand's internationally recognised RAMSAR wetlands, to 'migrate' or shift inland

31 *LGA section 101B.*
32 *RMA sections 30* and *31*, and Part 5.

- providing for land use and other provisions that will expand corridors and other ecosystem connections to allow wildlife and biota to transition to areas that better reflect the conditions they need – for example, linking existing and future Significant Natural Areas (SNAs) and the active creation of new habitats
- water allocation to reflect understanding of the projected meteorological variables of quantity, frequency and intensity of rainfall, and factor these into planning to meet future demand, and
- three waters (potable, waste and stormwater) infrastructure and services, which will be significantly affected by changing rainfall patterns and increased intensity and frequency of storms..[33]

Working with iwi and hapū

Tangata whenua, as kaitiaki of the places, taonga species and natural resources in their respective rohe or takiwā, are important strategic partners for local authorities and communities in the ongoing work of addressing the effects of climate change and developing practical responses. Matters to be considered include:

- the majority of marae, and many wāhi tapu, wāhi tūpuna, other important sites and mahinga kai areas, are on the coast and on waterways, and are thus especially vulnerable to climate change impacts
- the values and mauri inherent in these places (and in other taonga including indigenous flora and fauna also vulnerable to changing climate) are unique and irreplaceable, and inextricably intertwined with whakapapa, iwi and hapū identity, tūrangawaewae and kaitiakitanga
- many iwi and hapū environmental management plans and other strategies have considered climate change issues and developed policies in response
- mana whenua have extensive knowledge of the ecosystems, species and resources in their takiwā, knowledge which will be useful in developing adaptation responses, and
- many local and regional authorities are working within and building practical relationships with iwi and hapū in their areas, which may include formal co-governance agreements and the provisions of Treaty claim settlement legislation.

Managing uncertainty and liability

Recently, US insurance companies have focused on local authorities, arguing that climate change is now a foreseeable risk.[34] It is understood that decision-makers would not be liable for costs of climate change effects if planning decisions were closely linked to compliance with planning laws and known information at the time the decisions were made. However, planning authorities should carefully consider potential liabilities when making development decisions.

In the New Zealand situation, everyone exercising powers and functions under the *RMA* are required to have particular regard to the effects of climate change. The issue becomes problematic in relation to the extent of known information. Many aspects of climate change can be understood only in terms of trends, probabilities and likely ranges of the expected impacts. The level of information necessary for precise quantification will emerge only through time.

33 LGNZ's 3 waters initiative acknowledges future challenges including problems following severe weather events: http://www.lgnz.co.nz/home/our-work/our-policy-priorities/4.-infrastructure/3-waters-programme/.
34 http://www.marketplace.org/topics/sustainability/who-will-pay-climate-change-not-us-insurer-says

The Ministry for the Environment has consistently rejected the idea of promulgating a National Environmental Standard for sea level rise, and has issued guidance with no regulatory backing. In the face of citizen challenges, councils must justify their use of government guidelines, or commission independent work to establish a site specific projection of sea level rise. The uncertainties are compounded for other effects of climate change that need to be taken into consideration when making planning decisions under the RMA.

A recent report from the Insurance Council of New Zealand[35] recommends taking a long term view of natural hazards and the responsibilities of local government. The ICNZ suggests that local authorities should be required to deny consent applications where taking the long view shows that risks from natural hazards will increase. In relation to sea level rise and coastal planning, the Parliamentary Commissioner for the Environment has commented that: *"if councils allow development in the knowledge that maybe they shouldn't, then there may also be liability falling on them."*[36] This aligns with the Government's intent with the 2004 Climate Change Response amendments to the *RMA*, when the Minister for the Environment observed that: *"Local government have to ensure that suburbs aren't built on areas that might become new flood plains."*[37]

35 http://www.icnz.org.nz/ Protecting New Zealand from Natural Hazards – Summary included as attachment 1.3 to this report
36 Dr Jan Wright, 27 November 2014
37 Hon Pete Hodgson 11 October 2004

4. OPPORTUNITIES FOR LOCAL GOVERNMENT

Like any process of change, climate change brings a range of opportunities. Recognising the potentials for new practices, new ideas and innovations, and new ways of doing things is essential to develop and sustain effective responses. Many of the opportunities for local government are focused around:

- building community understanding and preparedness
- developing practical processes and tools to help New Zealanders deal with the new conditions, and
- strengthening resilience (environmental, essential services, communities, institutions) and minimising adverse effects.

4.1 An integrated approach to adaptation

The regulatory role of local government is to support and help communities to adapt to the effects of climate change. Responsibility for adaptation to climate change effects is conferred on local government under the *RMA*. But in reality, to respond effectively to the complexities of climate change and its diverse impacts on many of their statutory roles and functions, councils will need to integrate both regulatory and non-regulatory policy solutions.

Communities have strong opportunities to develop broad-ranging strategies to meet the particular needs and priorities of their areas. These would be based in the core statutory requirements, but extend beyond the means provided by the *RMA* to utilise:

- relevant policy options available under the suite of other legislation applicable to local government (as surveyed above), and
- non-statutory tools and methods to bring together communities, tangata whenua, sectors and businesses, science research and innovation, the insurance industry, health sector and central government agencies, to develop shared solutions to local issues.

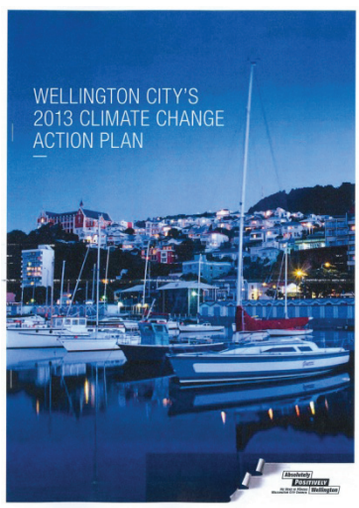
Some regions have embarked upon preparing spatial plans to guide decision-making and the preparation of statutory policy and plans.[38] This is a way to bring together local government and significant stakeholders in pursuit of an integrated climate response.

When councils and their communities, and local sectors and businesses are developing long-term strategies, economic development programmes or other forward-looking initiatives, there are obvious opportunities to integrate practical measures to respond to changing climate.

38 This process has been required of the Auckland Council under the special legislation that created it, resulting in the Auckland Plan. http://www.legislation.govt.nz/act/public/2009/0032/latest/DLM2044909.html

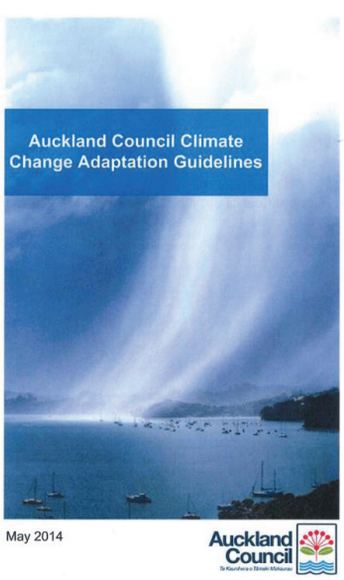
Case study: Combined adaptation and mitigation action plan

Wellington City Council has developed a Climate Change Action Plan which guides the actions of the council and the community. It contains a single adaptation chapter or action area with the remaining six action areas addressing the mitigation opportunities from: buildings and energy; land transport and shipping; waste; council operations; and the forestry and aviation sectors.



Case study: Internal guidance for adaptation action

Auckland Council has developed a guidance booklet for internal use. It recognises that climate change is one of the risks decision-makers must take into account and that these should not be considered in isolation. The 27 page document is designed to help staff keep up to date, and identify and assess risks. The guidelines include:



- links to the latest national and international climate change science
- methodology for identifying climate related risk, and
- further information on assessing those risks.

The guidelines have been prepared for internal use and are in three parts:

- Part A links to the Auckland Council's relevant planning documents: the Auckland Plan; the Regional Policy Statement element of the Proposed Unitary Plan and the Natural Hazard Risk Management Action Plan;
- Part B covers climate change science for temperature, rainfall, wind and sea-level rise, and
- Part C provides screening tools for information collection and risk assessments.

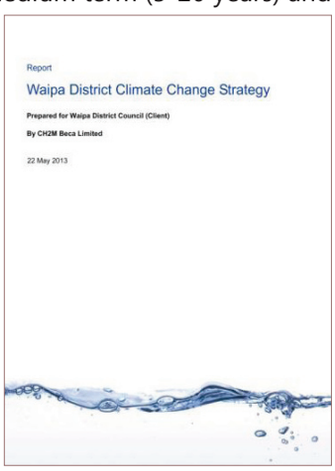
Case study: Internal guidance for adaptation action

Waipa District Council has recognised the influence of climate change on its provision of three waters services to communities around the district.

The strategy, developed in 2013, backgrounds climate change and localises the projected impacts to the Waipa District and in particular to:

- water demand and supply
- wastewater treatment, and
- stormwater.

It includes issues that are specific to the Waipa District, such as the influences on peatlands which make up a significant part of the district. It also includes high level actions for each of the three water services (including infrastructure requirements) for the short term (1-5 years), medium term (5-20 years) and beyond.


Report

Waipa District Climate Change Strategy

Prepared for Waipa District Council (Client)

By CH2M Beca Limited

22 May 2013

Some councils have undertaken other initiatives to develop an awareness of and responses to climate change and its implications. For example, Greater Wellington Regional Council has released for public consultation a draft Climate Change Strategy to guide resiliences.[39] The draft strategy includes discussion of the council's roles, the connections to other policies and strategies, a vision and objectives, policies and actions for the council for mitigation, adaptation and increasing community awareness of the impacts and implications for the region. Environment Canterbury developed information about the expected effects of climate change to help portfolio teams in the development of the 2015/25 Long Term Plan.[40] Yet another approach is that taken by the Waikato Regional Council by identifying the effects of climate change as a regional issue in the 2G-RPS and thereby incorporating this into the decision-making responsibilities of everyone exercising powers and functions under the *RMA* in that region.[41]

39 http://haveyoursay.gw.govt.nz/climate-change
40 ttp://ecan.govt.nz/advice/Sustainable-Living/Pages/climate-change.aspx
41 http://www.waikatoregion.govt.nz/Council/Policy-and-plans/Regional-Policy-Statement/Regional-Policy-Statement-Review/

4.2 A trusted information provider

Local government can support communities in their adaptation to climate change effects by providing reliable information and tools so that citizens can be informed of the projected impacts for their locality, the respective probabilities of such effects and best practice ways of addressing them.[42] The natural focus of councils on their local area or region gives a logical advantage for establishing public confidence and understanding, in that the broader global and international information is made relevant to where people live and work.

For example, Bay of Plenty Regional Council has developed actions aimed at future-proofing the region and helping it adapt, including commissioning tools that calculate the height of the sea at 21 locations around the Bay, and that model local potential changes in temperature, rainfall, wind, drought, frost days and pasture growth.[43] This information has been shared with primary industries and the wider community. Similarly, Waikato Regional Council has commissioned work from ClimSystems Ltd to regionalise the latest projected climate changes from the IPCC 5th Assessment Report and has made this available to all on the region's website.[44]

One of the most useful activities local government can do to assist community security is to identify high hazard areas as a consequence of the latest scientific information. This will be closely linked with councils' planning, zoning and risk management functions.

An example of the tools that might be developed for councils to inform and engage with their communities is to use web-based visualisation of LiDAR[45] information for the projection of sea level rise effects in coastal areas. Sea level rise is one of the more certain and predictable outcomes of climate change, and relatively uniform in extent across the country. Thus this technology for informing communities would be a good opportunity for collaboration and combined treatment by the sector.

42 This is in line with the general principle that citizens should be free to exercise their own decision-making abilities relating to property rights in the absence of state interference unless; the potential impacts:
- are catastrophic or of such a magnitude that they are unable to recover (either financially or are a risk to life); or
- cause externalities such that the community is left to pay for the costs.

43 http://www.boprc.govt.nz/sustainable-communities/climate-change/

44 Wang M, Li Y, Yin C 2014. An assessment of the impacts of climate change in the Waikato region : applying CMIP5 data. Waikato Regional C

45 A remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light. Used in this case as an acronym of Light Detection And Ranging

Case study: Opportunity for citizen self-discovery of sea level rise impacts

Most New Zealanders have access to a computer, tablet or smart phone and, in the case of the latter, each device knows where it is (embedded GPS). The opportunity exists for the elevations of coastal communities to be accurately mapped and for the projections of sea level rise to be mapped at 0.2m intervals at the very location of interest and at the scale that is most appropriate for the enquiry. The outcome will be to allow the public to find out for themselves the inundation risk for any property under various scenarios.

Additional information potentially affecting water elevation can be included with accompanying guidance as to water levels (tide marks such as Mean High Water Spring [MHWS] and Highest Astronomical Tide [HAT]) as well as estimates of storm tides and projected sea level rise relative to particular coastal areas. A similar mapping application has been undertaken by NOAA.[46]

Another comprehensive online system for communities to learn about the projected impacts of changing climate on their local areas is Cal-Adapt,[47] a web-based climate adaptation planning tool developed by the California state government with expert help from Berkeley University and Google. Cal-adapt allows the user to identify climate change risks in specific geographic areas throughout the state. Users can either query by location, or click on an interactive map to explore what climate impacts are projected in their area of interest, including temperature, snowpack, rainfall, wildfire risk, and sea level rise.

From Cal-adapt website

More detail on the sea level rise issues for coastal communities, natural resources and ecosystems is appended as attachment 1.4 to this report. Case studies[48] using six North Island communities concluded factors for tipping the balance in favour of positive environmental outcomes are:

- relationship building
- addressing issues of power and ensuring representative decisions
- alignment between the regulating agencies and the existence of a coordinated plan
- timely response to events, and
- introducing good science at the right time.

These case studies identify the following factors that have been instrumental in driving negative environmental outcomes:

- *community* – local groups holding the line, poor wider community representation, poor relationship with regulators and technical experts

46 http://coast.noaa.gov/digitalcoast/tools/slr
47 http://cal-adapt.org/, https://toolkit.climate.gov/tool/cal-adapt
48 http://trauma.massey.ac.nz/issues/2010-1/blackett.htm

- *local government* – poor alignment of policies, capture by special interest groups, poorly defined hazards policy, low retention of institutional knowledge
- *technical experts* – disagreement over suitable solutions, conflicting philosophies within disciplines.

One of the most effective mechanisms for translating technical information on projected climate influences is through the *RMA* plans. This is being achieved in the Dunedin City plan against a recent backdrop of severe flooding for low lying parts of the city.

Case study: Use of climate projections into *RMA* plans

The flooding in early June 2015 had a significant impact on many areas of Dunedin but the South City was particularly affected. Hundreds of homes were flooded and families displaced. Dunedin City Council is working closely with welfare agencies to ensure those displaced are able to move back in to warm, dry homes as soon as practicable. However, for the longer term, work is continuing on protection options raised in the July 2014 Beca report which was commissioned by DCC.

The report considered long-term protection options and was designed to give the council an idea of whether it was possible to protect the Harbourside and South City area from the impact of climate change, and if it was, then how much that might cost. The next stage of the work is to explore non-protection options and then carry out a cost-benefit analysis of the options for discussion with the community. Adapting to the effects of climate change will be a long and iterative process and the council and community are thinking about and planning for the longer-term effects now.

The Second Generation District Plan which will be notified in September 2015 has taken the approach of:

- limiting development to existing levels when it comes to residential development in South Dunedin, meaning that no increases in the density housing or family flats will be permitted in the residential zone in South Dunedin
- requiring all new residential housing to be relocatable, and
- requiring all new residential housing to have a minimum floor level that is consistent with other low-lying coastal communities. This represents a change from the current approach, which requires only new residential buildings to have a floor level above the crown of the road. The revised approach is more conservative, as it will result in higher floor levels above ground level than the current approach.

4.3 Combined sector initiatives

The use of online information systems described in the case study above would be most useful and more trusted if they were provided in a systematic way with consistent national coverage. However, the capacity, funding and expertise to provide reliable, accessible information on this scale are not uniformly distributed around the country's local authorities. Currently only the larger councils (regional and large metro councils) might have the resources to gather and process information and present it as required. Given that regional councils have the lead responsibility through Regional Policy Statements for controlling the use of land for natural hazards (RMA section 62 (1)(i)(i)), there would be a strong opportunity to work collectively towards developing a New Zealand-specific online information tool to help make locally relevant climate change projections available to the public.

Other aspects of councils' development of responses to climate change also offer opportunities for collaboration between local authorities, whether in a region or across the sector, and between councils and others including science research agencies, universities, tangata whenua, the insurance industry, and primary production sector bodies.

Maximising the potential of working together and sharing knowledge and experiences will help councils to reduce costs, avoid reinventing wheels, and support reliability and comprehensiveness in the information underpinning their policies and strategies and provided to communities. Victoria University's Climate Change Research Institute has advanced the idea of establishing a Local Government Community of Practice (Research Aim 4 of the Climate Change Impacts and Implications Programme).[49] Collaboration between councils around issues with planning, natural hazard risk management, biodiversity and biosecurity, coastal management, three waters and other infrastructure, would also logically be supported by existing professional gatherings and advisory groups in the sector, and could be integrated into the ongoing work programmes of SIGs, TAGs, and mayoral and chief executives forums.

4.4 Input to central government processes

Central government provides nationally consistent policy direction for climate change through the *RMA* and subordinate Policy Statements for the coast and freshwater, as outlined above. Non-statutory guidance is provided through regularly updated guidelines, fact sheets and manuals. The Government's guidelines for councils' activities in relation to climate change, and the guidance for addressing natural hazards (including climate change influences), are under review.

Central government has also signalled a review of the *Resource Management Act*. It is signalled that this will elevate the management of natural hazards to a matter of national importance for all decision-makers.

As part of its international contribution to climate change research and to provide more accurate advice to councils, the Government has identified climate change as a significant research work stream. The Deep South National Science Challenge[50] currently being developed is a flagship project in this area. The mission of this science challenge is to: "*Transform the way New Zealanders adapt, manage risk, and thrive in a changing climate*." A key output will be the development of a new Global Climate Model that will allow more accurate, sub-national climate projections into the future.

As noted above, central government is also in 2015 developing New Zealand's INDC (or emissions reduction target) and reviewing our national Emissions Trading Scheme (NZ ETS).

In all of these central government processes, the voice of local government is an essential contribution to ensure that decision-makers are adequately appraised of the local and regional implications. The particular issues for each region, area and sector will differ across the country, and will impact in particular ways at regional and local levels. The local government sector needs to work closely with central government to ensure that communities' interests, priorities and concerns are reflected in policy and decisions.

49 http://ccii.org.nz/research-aims/ra4/
50 http://www.deepsouthchallenge.co.nz/&http://www.msi.govt.nz/update-me/major-projects/national-science-challenges/

4.5 Moving forward to develop effective responses

The challenges outlined in this paper and other discussions will be increasingly significant for local government, for central government, and for communities, iwi and hapū, businesses, primary production, and other sectors (including notably health). Taking a proactive approach – to identify and understand the likely effects and what might be included in the toolbox of effective local and sectoral responses – is a responsibility for all New Zealanders.

4.5.1 A shared local government position

There could be potential for New Zealand councils to review and renew the 2009 Local Government Leaders' Position Statement on Climate Change (Attachment 2 to this paper) in the light of new information and increased understanding of the likely impacts. This could help:

- raise the profile of adaptation issues for communities and decision-makers, and
- strengthen connections and share information across councils.

4.5.2 A combined, collaborative approach between local government and central government

While each region, district and community will have its own particular concerns, needs and priorities, it will be important for all branches of government to work together, share information and align initiatives under a 'whole of government' approach for efficiency and maximum practical effectiveness.

It will be crucial to ensure strong and timely channels for central government to have information and feedback from local government on the implications of climate change for regions, districts and communities, and for business and sectors where the local impacts may vary across the country. This will be especially important in relation to developing central government direction (legislation, policy or regulations),[51] in determining New Zealand's INDC (emissions targets) and in the review of the NZ-ETS.

A joint approach to addressing issues and respective responsibilities with the insurance industry would advantage both central and local government as well as the industry itself. This would help to ensure that consistent messages are sent to developers and the public.

Where central and local government roles are contiguous or aligned, the foreseeable effects of changing climate should be given priority. For example, the location and design of central government-funded long life infrastructure should recognise the requirement for adaptive management and the need to be fit for purpose into the future.[52]

4.5.3 Maximum certainty in the legislative and regulatory contexts

The 2015 *RMA* review includes the stated intention to provide a stronger requirement for addressing the risk from natural hazards. Other areas where it will be helpful for central government to provide as much clarity as possible (given the inherent uncertainties and unknowns of climate change and its future impacts) include:

- a clear quantitative statement for sea level rise, either in the form of a National Environmental Standard that is a time related elevation or a formula for derivation of an appropriate planning level

51 For example the 2010 Resource Management (Discount on Administrative Charges) Regulations have the effect of negating the possibility of an integrated and collective review of water allocation approvals (consents) in large Freshwater Management Units. Another situation is the identification of Special Housing Accords in areas that are projected to become future hazard zones.

52 An example is the location, design and construction of coastal sections of Roads of National Significance which should recognise not only the projected increase in the sea level over the life of the infrastructure and surrounding developments but also the increased flooding and associated elevation of groundwater with sea level rise.

- guidance to regional councils on how to have particular regard to the foreseeable effects of climate change when setting environmental flows and limits for Freshwater Management Units (NPS-FM 2014) and for setting water quality objectives for the same
- the proposed National Policy Statement for Biodiversity, so that the opportunity for using biodiversity offsets is given statutory backing[53], and
- nationally determined criteria for prioritised protection could be useful (similar to the Roads of National Significance).[54]

Until central government establishes a clear quantitative standard that has the weight of a regulation, central government could contribute to the costs for councils of determining and defending local sea level projections.

Central government support would also help to clarify the legal position with respect to the use and ownership of land inundated by rising sea levels. It is recognised that once waters rise to the extent that land is below mean high water spring tides, the land falls within the Coastal Marine Area, and would be subject to the provisions of the relevant regional coastal regional plan, including rules. The question needing resolution is whether this would extinguish existing use rights that previously applied to the land.

Spatial plans are one useful and appropriate means to identify:
- likely hazard zones for information that may not yet reach a regulatory threshold for action and therefore be covered in a RMA plan and
- areas for assisting the migration or transition of indigenous biodiversity from areas at risk from climate change to more suitable habitat areas.

Where spatial plans exist, it could be useful if there was a requirement for decision-makers to give them due regard.[55] This would enable integration of *RMA* plans and spatial plans developed pursuant to the *Local Government Act* in support of climate change response initiatives.

4.5.4 Communications and engagement with communities

Central government and councils need to work closely together to develop and disseminate consistent, trusted, locally relevant multimedia messaging not only of the issues but also with opportunities for local solutions.

Regional councils, as the lead agencies for the control of the use of land for natural hazards, can work together to develop software to consistently portray the projected coastal flooding potentials of coastal settlements in a manner that is easy to comprehend and compare between locations and across regional boundaries. Collaboration will be more efficient and make the best use of limited nationally available expertise. Central government could contribute to the costs of setting up and maintaining appropriate information systems and communications campaigns, and help to coordinate the contributions of other key parties including science researchers, sector groups and technology innovators.

53 Currently the guidance material relates only to a proposed National Policy Statement which is extremely weak and solutions are currently only achieved in an ad hoc manner.

54 t is recognised that most of the current flood protection schemes designed to allow development of low lying areas and protection of coastal and riverside communities were, back in the day, built with national funds. These schemes are maintained locally; however some may need to be relocated, upgraded or rebuilt to a level and at a cost that exceeds the local capacity to fund. In such cases it would be useful to know that there is either a national priority list or criteria that would allow a partnership approach between central and local government. Such a prioritised list would assist decision makers determine which areas are protected with engineered solutions and which are to have exit strategies developed.

55 This is already the case with the decisions made by the Hearings panel with respect to the Auckland Council's Unitary Plan, as they are required to have regard to the statutorily required Auckland Plan.

5 CONCLUSIONS

The main statutory role of local government with respect to climate change comes from the *Resource Management Act* and sub-ordinate national policy statements. The role can be liberally interpreted as helping communities to adapt to the foreseeable effects of changing climate. This is a complementary role to that of central government for setting national greenhouse gas emissions targets and developing the market mechanisms to achieve these.

New Zealand can expect changes in weather extremes, variability and intensity as a result of climate change, along with increasing sea levels and increasing temperatures.

The local government sector, along with all other enterprises that have any relationship to the use and development of natural resources, will need to factor in the effects of climate change as a standard component of all business decisions into the future.

The role of the local government sector into the future could be as a trusted broker of quality information on the projected site specific effects of climate change and to work with others to help communities in their adaptation process. This will involve the transition of communities currently not well adapted to the projected changes and to ensure that future generations are not placed in danger or incur unaffordable costs as a result of decisions made today with respect to the design and location of publicly owned infrastructure.

A collaborative partnership approach with central government will be essential for this vision to be achieved, as it will require a 'whole of government' approach in the widest sense.

GLOSSARY OF ACRONYMS

CDEM Act	*Civil Defence and Emergency Management Act 2002*
CO_2	carbon dioxide
CoP	Conference of Parties
GHG	greenhouse gases
GPS	Global positioning system
HAT	Highest Astronomical Tide
ICNZ	Insurance Council of New Zealand
INDC	Intended Nationally Determined Contributions (for reducing emissions)
IPCC	Inter-Governmental Panel on Climate Change
LGA	*Local Government Act 2002*
LiDAR	Light Detection And Ranging (remote sensing technology)
MHWS	Mean High Water Spring
NASA	(US) National Aeronautical and Space Administration
NOAA	(US) National Oceanic and Atmospheric Administration
NPS-FM	National Policy Statement for Freshwater Management 2014
NZCCC	New Zealand Climate Change Centre
NZ-ETS	New Zealand Emissions Trading Scheme
PCE	Parliamentary Commissioner for the Environment
RMA	*Resource Management Act 1991*
SIG	Special Interest Group (local government sector)
SNA	Significant Natural Area
SOLGM	Society of Local Government Managers
TAG	Technical Advisory Group (local government sector)
UNFCC	United Nations Framework Convention on Climate Change
WMO	United Nations World Meteorological Organisation

ATTACHMENT ONE:

Changing climate and rising seas: Understanding the science November 2014

I first heard about climate change in 1979 sitting in a lecture theatre at the University of California, Berkeley. In the same year, the Shah of Iran fled his country, exports of oil from the Middle East fell, and the second oil crisis began. In a world focused on securing supplies of oil, few were aware that the First World Climate Conference had been held in February that year. I clearly recall the professor delivering the lecture saying it was possible that our biggest problem in the future would not be energy security, but rather the carbon dioxide emitted from burning oil and other fossil fuels.

That possibility has become reality. The warming of the planet following from rising concentrations of heat-trapping carbon dioxide and other greenhouse gases in the atmosphere has indeed become the big problem.

During my seven years as Commissioner, I have consistently said that climate change is the biggest environmental issue we face. This investigation has provided an opportunity to develop a deeper understanding of what is causing climate change and one of its major and most certain impacts – the rising level of the sea. The aim of this report is to share that understanding with others to provide a basis for public engagement and policy development.

As my own understanding of the science has evolved through this investigation, my concern has grown. I had hoped to find greater reason for optimism, but unfortunately the opposite has occurred.

I had not, for instance, appreciated the strength of the positive feedbacks that are amplifying the warming. I had long known about the feedback from the loss of sea ice floating in the Arctic Ocean – when white reflective ice melts it becomes dark green seawater, absorbing much more of the Sun's heat. But I had not understood the far more powerful impact of increasing water vapour – as the atmosphere warms, more and more water evaporates and traps more and more heat.

The climate change that is under way will have many impacts. One of these – rising sea level – is already evident and is the focus of this report.

The sea has risen and fallen many times in the past as the Earth has moved in and out of ice ages. Whenever the Earth warmed, as it is doing now, seawater expanded, ice melted, and coastlines moved inland.

Over the last century, the average sea level around the world has risen by about 20 centimetres. The Intergovernmental Panel on Climate Change (IPCC) expects it to rise another 30 centimetres or so by the middle of the century and up to a metre or more by the end of the century.

There are three processes driving this rise – expanding seawater, retreating glaciers, and shrinking ice sheets. Thus far, the last – shrinking ice sheets – has contributed relatively little to sea level rise, but its potential is enormous.

Ice sheets are huge blankets of ice covering land sitting astride the polar continents. There are three – one covering Greenland, one covering West Antarctica, and the largest covering East Antarctica. The amount of ice in these ice sheets is so vast that were it all to melt, the sea would

rise about 64 metres. That is not going to happen any time soon. But it does mean that the stability of these ice sheets is of critical importance. The Greenland and West Antarctic ice sheets are now losing ice. Around much of Antarctica, floating platforms of ice known as 'ice shelves' act as retaining walls holding the ice sheets on the land. The collapse of some of the ice shelves along the Antarctic Peninsula is a warning sign. The Larsen B ice shelf, which was the size of Stewart Island, broke up in five dramatic weeks in 2002.

New Zealand has long had strong connections with Antarctica. Robert Falcon Scott sailed from Lyttelton on his ill-fated attempt to be the first to reach the South Pole, and many artefacts from that famous expedition are held in the Canterbury Museum. As a child growing up in Christchurch, I did not find the remains of Scott's beaten-up tractor very enthralling; now as an adult I am amazed by the risks they took in such a harsh environment.

In contrast with other polar explorers, Scott saw the main purpose of his expedition as scientific. One of his team commented: *"We were out for everything we could add to the world's store of knowledge about the Antarctic."*. Today, New Zealand scientists at Scott Base are playing a critically important role contributing to that knowledge. For instance, analysis of a recently drilled 750 metre deep ice core will help determine how sensitive the Ross Ice Shelf is to a warming climate.

The IPCC is inherently cautious since it relies on hundreds of scientists from many countries reaching consensus. The IPCC's prediction of a 30 centimetre rise in average sea level by the middle of the century is 'locked in' – it is expected to occur regardless of action taken to reduce greenhouse gas emissions. It is not until the second half of the century that the effect of any such action will be seen.

A 30 centimetre rise may not sound like much, but it will be disastrous for the millions of people in Bangladesh and other countries who live in low-lying river deltas. The continued existence of Pacific island nations such as Tuvalu and Kiribati is questionable. In New Zealand, the impact will be significant at a national level and potentially devastating for some land owners.

In some parts of the country, damaging coastal floods will become increasingly frequent. Many Aucklanders will remember the flooding of the Northwestern Motorway and some of the eastern suburbs three years ago when a storm surge coincided with a king tide. In April this year, another storm brought the sea into properties along Tamaki Drive.

Some areas of Christchurch have experienced an effective sea level rise of half a metre or more due to land dropping after the Canterbury earthquakes. Flood insurance has become harder to get and more expensive for some homeowners in the city. On the day I am writing this, the Insurance Council of New Zealand has released a 15-point plan on dealing with natural hazards, with the chief executive making special mention of sea level rise.

Councils are obliged under law to plan and prepare for the impacts of a rising sea. But it is far from easy to introduce changes that may lower the value of people's homes or restrict development along sought-after coastal areas. In August 2012, the Kapiti Coast District Council put coastal erosion risk on the Land Information Memorandum (LIM) reports of 1800 houses, which was challenged by those who were affected. Such conflicts are understandable and inevitable.

The President of Local Government New Zealand, Lawrence Yule, has called for greater direction from central government. *"Without any central government directive it is quite difficult for councils to do what effectively might be the right thing for the future, but is seen as being too aggressive for the people of the present."*.

It is not just private property that will be affected. Councils and central government will need to prepare for increased costs because some public infrastructure such as roads, waste water systems, and buildings will be affected by rising seas.

The impacts of sea level rise will vary from place to place. In 2015, I expect to release a second report on this topic. This will show in some detail which areas of the coastline around the country are most vulnerable to sea level rise and assess the risk to the infrastructure in those areas.

A rising sea will be with us for a long time to come – one way or another we will have to adapt. But how high and how fast the water rises will be influenced by the speed at which the world – including New Zealand – reduces greenhouse gas emissions over the coming decades.

Dr Jan Wright
Parliamentary Commissioner for the Environment

ATTACHMENT TWO:

Local Government Leaders' Position Statement on Climate Change

Climate Change Position Statement

This statement defines the position that councils have collectively adopted on climate change. We commit to playing our part in helping New Zealand face the climate change challenge. The key role we will play is to lead community responses to the risks and opportunities of climate change.

Councils provide a wide range of ratepayer funded services which will be impacted by climate change. These include stormwater management, flood control, biosecurity, land-use and transport planning, civil defence emergency management and water supply. Council services need to be future proofed and made resilient to the impacts of climate change.

We acknowledge that the evidence shows that climate change is occurring and that our understanding of climate change impacts in New Zealand will continue to grow. We will work with our communities to prepare for the future.

Our position on climate change

We recognise that we must respond to both the actual and potential physical impacts of climate change.

We understand that there are challenges, risks and opportunities for local communities in responding to and managing the impacts of climate change.

We recognise that action now will reduce the future threats and costs of climate change. We know we must plan ahead.

Solutions to climate change challenges will not be a matter of "one size fits all" and we recognise that climate change impacts on communities will vary around New Zealand.

Councils will individually show leadership and environmental responsibility by adopting mitigation and adaptation practices that fit with their community's needs and aspirations.

We have an active interest in shaping central government's mitigation policy. We will assist central government help local communities to prepare for climate change.

We will work with central government to make sure information and research is accessible to our communities. It should help them make informed choices about responding to climate change risks and opportunities.

Our position on adaptation to climate change

We have a responsibility to help our communities prepare for and to adapt to the physical effects of climate change.

We will build on the existing work of councils and communities – recognising that "business as usual" will not get us to where we need to be and that a community-wide effort will be needed to address the impacts of climate change.

Councils will support and actively engage with initiatives that provide guidance and expert advice on adaptation that can be applied at the regional and local level.

We will seek central government's support for the development of climate change information and modelling that delivers "local numbers" for local use.

We acknowledge that we will often need to lead on developing engineering and resilience responses to climate change impacts.

Councils will ensure that Resource Management and Local Government legislation is used to encourage adaptation to climate change – particularly when dealing with land-use change.

Our position on climate change mitigation

It is central government's role to engage internationally on climate change and to lead mitigation action on behalf of New Zealand.

We have an active interest in providing advice to central government on the local consequences of, and the opportunities presented by, international and national policies to reduce green house gas emissions.

Councils will choose their own mitigation projects to meet central government requirements and to assist in delivering New Zealand's emission reduction targets.

Councils will support individuals, communities and businesses to lower their emissions and will advocate for central government to develop tools that will assist the development of low carbon options for goods and services.

ATTACHMENT THREE:

Insurance Council of New Zealand recommendations: Protecting New Zealand from natural hazards

Strategy and legislation

1. A strategy and co-ordination – establish a dedicated agency within the Department of the Prime Minister and Cabinet (DPMC) to oversee a co-ordinated strategy to reduce the impact of natural disasters before they strike.

2. Develop a national plan – draw on central, local and private sector interest to develop a national plan to make New Zealand better protected from natural hazards.

3. Legislative alignment – review legislation to ensure risk management of natural hazards is aligned and focused on reducing or avoiding natural hazard risks consistent with the strategy.

4. Take the long-view – require local authorities to deny consent applications where taking the long view shows risks from natural hazards will increase.

5. Plan to address local hazards – legislation should require local authorities to assess those natural hazard risks relevant to their locality and have infrastructure plans in place to address them.

6. Safer commercial buildings – make non-structural seismic restraints part of annual building inspections.

Information to make the right decisions

7. Science research – focus research spending to best inform risk reduction decisions.

8. High quality data – establish a high quality, national natural hazard database to inform decision-making such as the cost benefit trade-offs around risk reduction.

9. A hazard risk on every property – ensure there is publicly accessible information on the natural hazard risks every property in New Zealand faces.

10. Be clear what are acceptable risks – provide local government decision-makers with clear guidance about what can be considered acceptable risk from natural hazards.

11. Consistent approach across New Zealand – provide local government with a natural hazards identification template so there is a consistent approach is applied across the country.

12. Educate people – a public education programme to inform people about the natural hazards they face and the actions they or their community can take to minimise them.

Funding

13. Fund resilience – a commitment to long-term annual funding of initiatives to build resilience where the risk and investment trade-off justifies it.

14. Funding now saves bigger cost after an event – the cost of implementing adaptation measures is significant. There needs to be long-term, bi-partisan commitment to fund measure that build pre-disaster resilience.

Insurance

15. Keep insurance affordable and available for all – introduce comprehensive measures to reduce the risk of natural disasters and remove levies from insurance premiums to help keep the transfer of risk to insurance affordable

ATTACHMENT FOUR:

Sea level rise – issues for coastal communities, natural resources and ecosystems

Rising sea levels is one of the more certain outcomes of increased emissions of greenhouse gases. The science is grounded in physics, principally: as temperature increases, ice caps and glaciers melt and the resultant water drains to the sea; and as liquids warm they expand and as the seafloor is relatively impermeable, the result is an increase in surface level relative to land. To date these processes have resulted in 0.2m of observable sea level rise since 1900 (1.7mm per year).

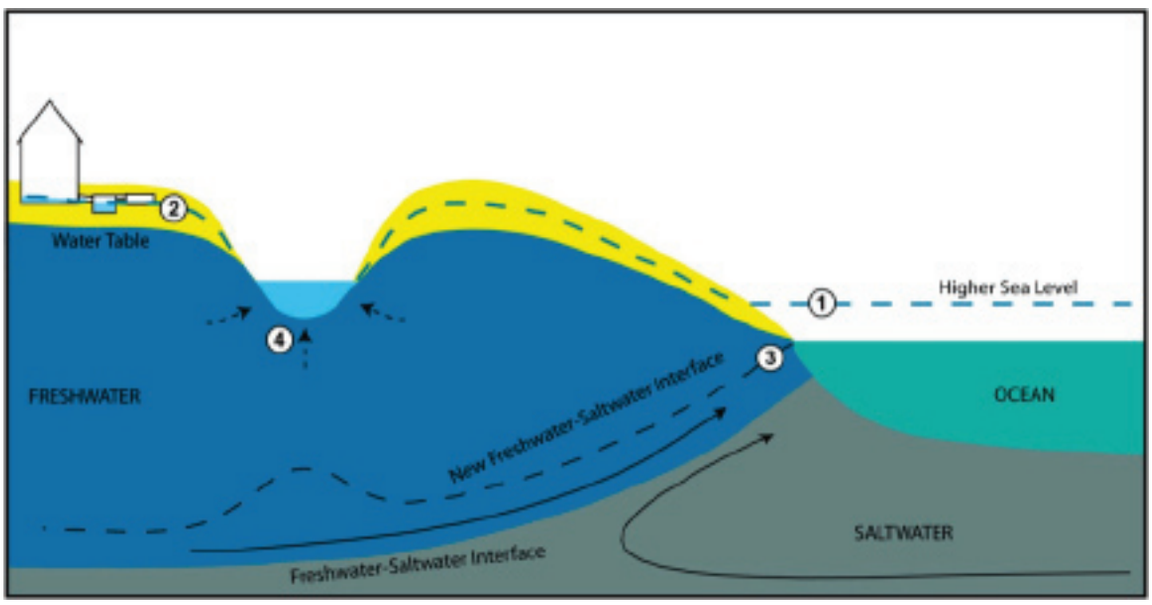
The source of ice is twofold – mountain glaciers and polar ice sheets. Glacial retreat in the New Zealand Southern Alps mirrors the global situation with nearly 80% loss of ice in the past 125 years and this is accelerating with 34% loss in the past 40 years[56]. This is observable and has global water availability implications over and above sea level rise. The contribution of polar ice sheets is more uncertain, but the implications are greater. The main sources of polar ice are Greenland and the East Antarctic and West Antarctic ice sheets. Uncertainty is related to the speed and magnitude of change, not of the potential contribution should they all melt. The volume of ice bound in the three polar ice sheets has the capacity to raise global sea levels an additional 64m should it all melt.

In its recently published 5th Assessment Report, the IPCC provided more certainty to the medium term projections (mid century) that global sea levels will rise an additional 0.3m and that this is locked in as a result of current climate conditions and global emissions profiles. That is, there is nothing that can be done to stop this from happening and that the only response available to communities is one of adaptation. The rate of sea level rise for the remainder of the century and beyond depends on the effectiveness of the global community in reducing greenhouse gas emissions. The IPCC projects a 1m sea level rise by the end of the century based on a rising emissions scenario.

Coastal inundation occurs now in many places around the region under king tide and storm surge conditions. These will occur more frequently as base sea levels rise, with current rare or infrequent events happening on a more regular basis.

56 From an estimated snow pack of 170Km3 in 1890s to 54.5Km3 in 1976 and 36.1 Km3 in 2014 http://theconversation.com/new-zealands-southern-alps-have-lost-a-third-of-their-ice-28916

Sea level rise is not confined to increases in frequency and extent of coastal inundations, it also affects groundwater levels in coastal aquifers (1) as shown in the following diagram:



US Geological Survey website[57]

This has the effect of:

- ncreasing the water table that may adversely affect the structure, usability and integrity of buried infrastructure, especially relevant to public three waters services and to private septic tanks (2);
- potentially affecting the foundations to infrastructure such as highways, rail and flood levees;
- potentially increasing liquefaction risk;
- potentially leading to a landward and upward shift in the position of the freshwater/ saltwater interface (3) which could Increase the area of salt waters inundation; and
- where streams are present, an increase in the water-table elevation may also increase ground-water discharge to streams and result in local changes in the underlying freshwater-saltwater interface (4).

While the effects of projected sea level rise on high energy ocean beaches often command press headlines due to the dramatic nature of the impacts, the effect on estuaries is particularly pertinent as these are typically low energy environments which are not subject to the effects of wave run up, and by future projected changes in wave climate. They do, however, reflect the ambient tidal range at the time and also the air pressure element of storm surge. It is in these sheltered environments that the raised water table can have the most geographically widespread effects. This is because unlike a beach situation where the land/marine interface is typically focused on the dunes system and measured in metres, estuaries typically grade into gently sloping flood plains with little variation in topography measured in kilometres. It is in these environments, the raising of groundwater levels can:

- alter surface water drainage patterns affecting existing land use and the infrastructure in place to protect it;
- have water quality implications by pushing the saltwater 'wedge' upstream in rivers with potential implications for water supply infrastructure; and
- reduce intertidal habitat with associated implications for coastal fisheries. This may not be too much of an issue where the intertidal zone is allowed to migrate inland.

57 http://wh.er.usgs.gov/slr/coastalgroundwater.html

This latter effect has particular relevance to the land currently above the tidal influence of rivers discharging into estuaries and harbours. In the specific case of the Hauraki Plains, the combination of land drainage, active peat mining and current pastoral land use have resulted in a lowering of ground levels by as much as 6m such that about 240km2 are now below high tide level. This will only increase as sea levels rise with increased expectations on the structure and integrity of flood protection schemes to safeguard the status quo over the coming century. With a projected 1m increase in sea level by 2115, the area below mean high water spring tide level will be 450km2.

There may be an additional expectation by affected communities to defend property using engineering solutions of levees, control structures and pumps. However, this would come at the expense of preventing the full expression of intertidal transition zones and could be expected to have implications for the viability of coastal fisheries.

The recent subsidence of liquefaction-prone suburbs in Christchurch has given an appreciation of the flooding implications of a 0.5m sea level rise on developments many kilometres from a beach. In this case the land has subsided 0.5m in relation to existing sea levels and groundwater and drainage patterns have been altered such that surface waters are no longer able to drain to the estuary.

The temptation to focus on the natural hazard implications to residential developments on high energy shores (beaches) potentially undervalues the role of the region's estuarine systems as the interface and the buffer of land derived influences on the marine environment. The effects of sea level rise on the nation's sheltered shores can be expected to have ecological and consequential biodiversity impacts beyond the immediate location.

One of the difficulties of addressing sea level rise and selecting management options is the uncertainty with the timing of projected sea level increases. The fact that sea levels have risen and will rise further is known, however, the selection of appropriate (and acceptable) management options will depend on a better understanding of when the changes will occur. This affects budgeting for adaptation actions.

The only sustainable long term solution to the effects of sea level rise is retreat from existing development areas prone to inundation and to ensure that all new development and infrastructure address the effects of projected sea level rise. In many developed areas or productive rural areas such as the previous Hauraki Plains example, retreat is likely to be a significant issue and will require careful consideration.

Impact reduction measures such as engineered protection structures will only provide a short term respite from coastal inundation/erosion effects, but can be useful to 'buy time' until a long term strategy can be developed, agreed and implemented. Any such engineered solutions should ideally be 'soft', that work with the natural environment with minimal adverse effects. However, such 'soft' structures are likely to have some limitations to the effectiveness of the protection.

Hard engineered structures are likely to be required where significant development/infrastructure needs protection to a higher standard than soft options. Again, these hard structures can only be considered a short term solution until a long term solution is implemented.

ATTACHMENT FOUR:

Implications for businesses and the insurance industry

Businesses

The business case for mitigation of greenhouse gas emissions is compelling, contributing to market positioning and reduction of energy related costs with an immediate benefit to the financial bottom line. In recent years, the costs of extreme weather events have impacted business, including the insurance industry, severely. It is now becoming imperative to reduce business risks to extreme weather through climate adaptation action.

The business case for climate adaptation comes not only from the primary effects of a changing climate and exposure to extreme weather events but also the liability of carbon intensive industries to regulatory costs. It is also driven by the actions of investors seeking to insulate themselves, and is particularly applicable to the reinsurance industry and to pension fund managers.

The global nature of business has highlighted the vulnerability of international supply chains, where different types of business may through co-location in hazardous areas find themselves subject to the same extreme weather risks. A recent example is the July 2011 flooding in Thailand which caused significant economic damage to computing electronics and vehicle manufacturing. Particularly hardest hit companies included those involved in electronics (such as Apple and Toshiba) and vehicles (for example, Toyota suffered disruption of vehicle production for Australia, Europe and South America).

The response from businesses is rational, an increasing integration of climate adaptation strategies into core business planning. A recent article[58] by Standard and Poors in *Fortune Magazine* linked the quality of business adaptation to the cost of finance:

> *"The investment community – along with regulators – has woken up to this threat. It is demanding more information from companies about their exposure to climate events, as well as the prospective cost of their carbon emissions."*
>
> *"A wide range of businesses – not just insurers and carbon intensive corporations – are being pressed to demonstrate how they are managing these long-term issues. Their future cost of capital will in part hinge on the answers they give."*
>
> *"Business leaders should acknowledge that climate risk and carbon liabilities are here to stay and, in all probability, set to grow. If they cannot demonstrate effective assessment and management of these short-term and long-term liabilities, their creditworthiness may suffer and their financing costs will rise."*
>
> Neeraj Sahai; President of Standard and Poors Rating Services 09 July 2014

Investors looking for low risk, long term returns, such as pension fund managers, illustrate an emerging consciousness within the business and investment community. Pension funds typically have liabilities stretching out decades into the future and are a dominant part of the investment sector with estimates of US$28 trillion in assets.

58 *Fortune Magazine*: "Climate change: What are the risks to corporations?" http://fortune.com/author/neeraj-sahai/

Insurance industry

There is a tendency, when faced with challenging issues, to look beyond regulatory mechanisms to market solutions and in the case of increasing and more extreme weather events, the insurance industry is the first call. The role of the insurance industry and its capacity to address climate change impacts, including sea level rise, have been the subject of many newspaper columns, scholarly articles, blogs, books and conferences in response to the increased cost of extreme weather events this century.

It is relevant to note that insurers are private businesses, not charities, and if they cannot make money underwriting risks, they will stop doing it.[59] This has happened internationally with coastal insurance difficult to get in the USA and in Canada where flooding has become the largest single category of property losses. Most Canadian insurance companies no longer offer overland flooding insurance as part of their standard packages.

The insurance business is reactive in that risk profiles are calculated from past events with some additional proportion. Annual premiums generally follow this approach. The sector would only walk away from insuring a hazard once it becomes almost a certainty (understood to be a 1 in 10 chance). This is undesirable for two reasons: the business is no longer available to the company and investors, and in the event of a loss, the costs of recovery are transferred to the public sector.

The following[60] illustrates the unsuitability of traditional insurance mechanisms for longer-term foreseeable hazards such as sea-level rise:

> *"Two preconditions for insurability of disasters are the unpredictability of a specific event, which means that losses occur suddenly and cannot be foreseen; and the ability to spread the risk over time, regions and between individuals/entities. For two of the already ongoing changes caused by global warming, that is, sea-level rise and desertification, the insurability criteria cannot be fulfilled. Both processes are slow and continuous changes that potentially affect the population of one or more countries.".*
>
> Munich Climate Insurance Initiative (MCII) June 2009

The limitations of insurance mechanisms include an annual contract with the insured, leaving no real indication of possible future changes in price and whether or not the cover will be available over the design life of the insured entity. The insurance cover is limited to the contract and generally includes the damage or loss of the building/contents, not the value of the land the building is built on. The insurance company would typically be interested in the financial liability it has sustained and would not have an interest in the ability of the insured to move on, leaving the decision to move on or rebuild one for the insured. It is noted that in many cases, the option of moving from a hazard area may not be available.

A change in design may be the only solution, but this may not be affordable as the insurance payout would need to cover demolition of the damaged structure as well as design and construction of a new one.

These constraints are already recognised by the Insurance Council of New Zealand, and in November 2014, after the experience of the Canterbury earthquakes, it delivered an action plan[61] with 15 recommendations that call on other sectors to join with the industry to address risks. A summary of the ICNZ recommendations is attached to this report as Attachment 1.3 (above).

59 Dianne Saxe & Meredith James LexixNexis Legal Newsroom http://www.slaw.ca/2013/08/16/your-uninsurable-home-what-is-climate-changes-wild-weather-doing-to-insurance/

60 Adaptation to Climate Change: Linking Disaster Risk Reduction and Insurance: Munich Climate Insurance Initiative (MCII), 6 June 2009 http://unfccc.int/resource/docs/2009/smsn/ngo/163.pdf

61 ICNZ 04 November 2014 http://www.icnz.org.nz/action-required-to-protect-new-zealand-from-natural-hazards-impact/

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