

WELLINGTON REGIONAL CLIMATE CHANGE RESPONSE

# Technical Background Information

June 2009



# Introduction

This document provides technical background information relating to the [Wellington Regional Climate Change Response: Discussion document for Territorial Authorities and Greater Wellington](#), either in summary form or as a link to the source material. In the interests of sustainability, it is published on the Web only. The document is hosted on the Greater Wellington Regional Council's website but is produced by the regional Emissions Reduction and Adaptation Working Group which has representatives from Greater Wellington Regional Council, Hutt City Council, Kapiti Coast District Council, and Wellington City Council. Some limited input has also been received from the three district councils in the Wairarapa.

Where links to other websites are included, no responsibility for the content of those websites is accepted. Further, the provision of links to documents and websites should not be interpreted as agreement with or endorsement of their contents or views: these links are provided without prejudice to give access to scientific or other data in order to inform the Wellington region's local government officers' discussions on climate change.

The full document comprises 55 pages – please consider the environment before printing it out either in full or in part.

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# 1. Background

## 1.1 The Region: geographical, socio-economic and political overview

*Geography and weather:*

- [Boundary map of the Wellington region](#)
- [Topographic maps](#)
- Satellite images are available from the [Google maps website](#)
- More information on climate is provided by [NIWA](#)

*Socio-economic picture:*

[More statistical information about the Wellington region](#)

## 1.2 A regional approach

The nine councils governing the Wellington region are:

### Regional Council

- [Greater Wellington Regional Council](#)

### City Councils

- [Hutt City Council](#)
- [Porirua City Council](#)
- [Upper Hutt City Council](#)
- [Wellington City Council](#)

### District Councils

- [Carterton District Council](#)
- [Kapiti Coast District Council](#)
- [Masterton District Council](#)
- [South Wairarapa District Council](#)

### 1.3 Communities for Climate Protection – New Zealand (CCP-NZ)

The Communities for Climate Protection – NZ programme is an initiative of the International Council for Local Environmental Initiatives – [ICLEI Oceania](#)

Information on CCP-NZ can be found on [ICLEI Oceania's website](#)

Each milestone in the programme has an internal corporate component and a community component. The following table indicates which milestone each participating council in the region has achieved.

Council	Milestone
Greater Wellington Regional Council	1
Carterton District Council	3
Kapiti Coast District Council	3
Hutt City Council	New participant
Masterton District Council	3
Poirura City Council	1
South Wairarapa District Council	3
Wellington City Council	3

## 2. Climate Change – Background and Science

A good definition and description of what climate change is can be found on [the government's climate change website](#).

[A good "beginners' guide" explanation](#) of various climate change processes, effects and evidence can be found on the BBC website.

Some interesting material on the debate between "sceptics" and "alarmists" (to use the authors' terms) can be found on Gareth Morgan and John McCrystal's [Poles Apart website](#). Their book, *Poles Apart: Beyond the Shouting Who's Right About Climate Change*, gives a detailed description of the theory of global warming and how the climate system works accessible to a layperson. It also attempts an up-to-date and unbiased description of the points of view of both sides of the climate change debate.<sup>1</sup>

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<sup>1</sup> Published by Random House, New Zealand, 2009. ISBN 978 1 86979 045 5

Other technical information can be sourced from the following websites:

### ***National***

- [Central government's climate change website](#). This site has guidelines for local government including planning checklists.
- [NIWA National Climate Centre](#)
- [Ministry of Agriculture and Forestry](#) – this site includes information on forestry and sustainable land use

### ***International***

- [The Intergovernmental Panel on Climate Change's 4<sup>th</sup> Assessment Report \(IPCC AR4\)](#)

## **2.1 Regional climate change impacts**

### **2.1.1 Temperature changes**

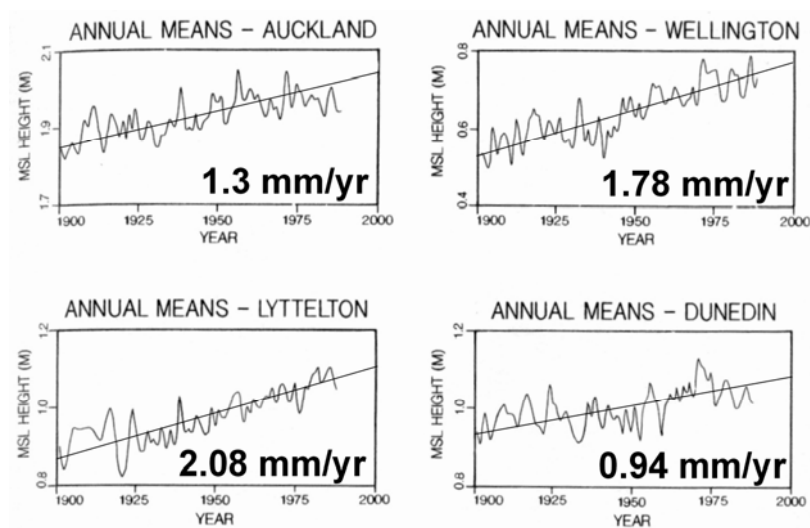
As with the rainfall changes information, this interpretation has been reviewed by NIWA and is based on information from the Ministry for the Environment including data supplied by NIWA. [Useful maps and tables](#) are available.

### **2.1.2 Sea level rise**

Analysis of tide gauge records from around the world shows that over the last 150 years, sea level has risen at an average rate of 1.0-2.0 mm/yr or a total of 0.15-0.30 m. This is a significantly faster rate than at any stage in the past 1000 years. Measurements from the 20th Century alone, indicate that the rise has been in the upper end of this average at  $1.7 \pm 0.2$  mm/yr. Over the period 1961-2003 the rate was 1.8 mm/yr with a range of 1.3-2.3 mm/yr. In the decade from 1993 to 2003 the rate was faster still, rising at around 3.1 mm/yr with a range of 2.4-3.8 mm/yr. In addition, satellite measurements have provided high quality measurements of sea level, to an accuracy of several millimetres, with nearly global coverage since 1993. The data indicates that there has been a small but significant acceleration during the second half of the 20<sup>th</sup> century. It is unclear whether this recent increase reflects normal variability or an increase in the measured long term trend. Nevertheless, there is a high level of confidence that the rate increased from the 19th to the 20th Century.

Sea levels have been recorded on tide gauges at ports around New Zealand for over 100 years. The earliest records come from Wellington Harbour and date back to 1891. The records show that since measurements began, sea level has been rising around New Zealand at a rate of  $1.6 \text{ mm/yr} \pm 0.2 \text{ mm/yr}$ , with a range of 1.30-2.08 mm/yr. The rate for Wellington is 1.78 mm/yr. This is in line with measured global sea level rise. The measured increases in mean sea level from the four ports are summarised in Figure 1.

Figure 1. Summary of sea level rise from four ports around New Zealand, including latest means up to 2002.



In 2007, the IPCC released its fourth report on climate change. A range of scenarios were used in the Fourth Assessment Report (AR4) to project sea level rise. They all point to continued sea level rise over the next century and indicate that we can expect sea levels to increase in the range 0.18-0.59 m by 2100. Table 1 provides a summary of the low, medium and high range estimates that appeared in the 4AR report.

Summary of IPCC sea level rise scenarios to 2100 from the AR4 (2007)

Low	Mid	High
0.18-0.38 m	0.21-0.48 m	0.26-0.59 m

The range in the IPCC 4AR estimates in this table arises from different greenhouse gas emissions scenarios for the period to 2100. As noted in the Discussion Document, these projections do not include rapid ice melt scenarios (e.g. Greenland/West Antarctic Ice Sheet) or feedback mechanisms such as ice loss that leads to enhanced solar radiation absorption (ice is extremely reflective), that causes more warming and in turn more ice loss. At the time the AR4 was published, the science regarding these mechanisms was not fully established in the international literature and the IPCC was reluctant to include them in the AR4.

Greater Wellington recently commissioned NIWA to model extreme water events in Wellington Harbour, based on historic storm events and the tide gauge record. The estimated 1% AEP (1:100 yr event) is expected to produce a storm tide (storm surge + high tide) level of 1.32 m above mean sea level. Using this level, modelling was performed on the projected sea level rise scenarios. By 2090 we may expect a 100 yr storm to produce storm tides in the range of 1.93-2.22 m, using the 0.5 and 0.8 m levels recommended in the MfE Coastal Hazards and Climate Change report.

Source: Dr Iain Dawe, Natural Hazards Analyst, Greater Wellington Regional Council

A recent article by Andy Reisinger, Senior Research Fellow in the Climate Change Research Institute within the School of Government at Victoria University of Wellington, discusses the implications of recent scientific research (i.e. published since the IPCC AR4) for climate policy response<sup>2</sup>. He focuses particularly on two areas where significant advances in the science have occurred in recent years – the risk of an accelerated rise in sea level from the loss of polar ice, and evidence that the window of opportunity to stabilise greenhouse gas concentrations at low levels is closing rapidly. The article is entitled *Closing Windows and Opening Flood Gates: Recent Climate Change Science and Implications for Climate Policy* and can be [downloaded in PDF](#). Scroll down to find the article. The sections headed *Opening floodgates: recent studies relating to sea level rise* and *Implications of sea level rise uncertainties for policy responses* are particularly relevant to sea level rise and our thinking about it.

### 2.1.3 Rainfall changes

The interpretation in the main documents has been reviewed by NIWA and is based on information from the Ministry for the Environment including data supplied by NIWA. [Useful maps](#) can be found on the Ministry's website.

### 2.1.4 Storms

The information in the Discussion Document was supplied by NIWA. Work is currently being done to better understand the likely changes to storms at a regional level under the various climate change scenarios.

## 3. Roles and Responsibilities

### 3.1 The legislative framework in relation to climate change

View [guidelines for councils](#) on which sections of the Resource Management Act 1991 (RMA) the Ministry for the Environment sees as relevant to climate change.

The fairly comprehensive [Ministry for the Environment \(MfE\) planning guide](#) for local government can be found on the Ministry's website. Pages 16 to 20 are useful for understanding the ministry's interpretation of the legislative requirements at a high level.

The MfE has produced a [specific Long Term Council Community Plan planning guide](#).

### 3.2 Central government policy framework

The current central government has confirmed its policy target of 50% reduction of emissions by 2050 on 1990 levels<sup>3</sup>. As details of implementation have not yet been announced, we have worked from the previous government's action plans for various sectors, which are generally less ambitious than a 50%

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<sup>2</sup> Reisinger, A (2009) 'Closing Windows and Opening Flood Gates: Recent Climate Change Science and Implications for Climate Policy', Policy Quarterly, 5 (2), pp 45-51

<sup>3</sup> Speech by Nick Smith, Minister for Climate Change Issues, to NZ Climate Change Centre's Conference on Adaptation: Managing the Inevitable, 20 May 2009.

reduction on 1990 levels by mid century. We have made the assumption that even if these particular measures are discontinued, a comparable set of initiatives will be announced to deliver on the stated 50% target.

Existing policies which relate to the climate change area and websites where they can be found are:

- [The Emissions Trading Scheme](#)
- [The NZ Energy Strategy](#)
- [The NZ Energy Efficiency and Conservation Strategy](#)
- [The NZ Transport Strategy](#)
- [The NZ Waste Strategy](#)
- [The NZ Coastal Policy Statement](#) (under review by a Board of Inquiry, but will have a significant impact on planning responsibilities for adaptation)
- [A National Policy Statement on Flood Risk](#) (under development)
- [A National Policy Statement for Freshwater](#) (currently with a Board of Inquiry)

### **3.3 Local authority functions with implications for climate change**

#### **3.3.1 Greater Wellington Regional Council**

Policies and Plans relevant to climate change are as follows:

- [Regional Land Transport Strategy](#) and related implementation plans.
- [Regional Policy Statement](#) and [dependent Plans](#). The Regional Policy Statement produced under the Resource Management Act (RMA) by the Greater Wellington Regional Council is currently community consultation phase. Its relevant sections for climate change are included in an appendix to this document. Territorial authorities must give effect to the policies in the Regional Policy Statement through their District Plans.
- [Wellington Regional Strategy](#). *It should be noted that this Strategy is not "owned" by GW but is a shared development of all the councils in the region.*

#### **3.3.2 City and district councils in the region – existing functions**

Details on district plans and other plans and policies of the individual territorial authorities can be found through their websites – addresses in Section 1.1.

## **4. Wellington region greenhouse gas emissions**

The previous regional inventory of GHG emissions was based on data supplied by ICLEI through its CCP-NZ programme (see Section 1.3). The population data was derived from the 2001 NZ Census and the inventory did not (on the instructions of central government) include agricultural emissions or forestry sequestration figures. Nor did it include aviation fuel emissions.

In initiating this planning exercise for the response to climate change, the regional Emissions Reductions and Adaptation Working Group rapidly became aware that a robust and well-targeted plan for reducing GHG emissions would require updated population data. Some councils also felt that they could and should share some of the responsibility for managing emissions relating to agriculture and aviation, that local government efforts could potentially provide good support to central government initiatives in these areas.

Lastly, councils in the region hold considerable reserve lands, some of which are already devoted to forestry or are being allowed or encouraged to revegetate naturally. We believe that good management of these holdings and support for private forest owners is a proper concern of councils in responding to climate change.

As a result of these concerns, the Working Group sought an updated inventory. An inventory for 2006/07 established by Landcare Research Ltd with peer review and input from NIWA was adopted and recommended to the various councils in the region. All the 8 councils which participate in CCP-NZ have agreed to use that inventory for the purposes of developing this shared regional response to climate change. The inventory provides a regional community inventory as well as broken down to city and district level. Upper Hutt City, which does not participate in CCP-NZ, has been provided with its inventory and briefed on its analysis.

The full regional inventory can be accessed at [www.gw.govt.nz/erawg](http://www.gw.govt.nz/erawg). Sources for the emissions factors and underpinning data used are included.

## 4.1 Regional GHG emissions profile

### Emissions categories

The IPCC categories are used for this inventory – energy, waste, industrial processes and agriculture. For the purposes of targeting emissions reduction initiatives, the energy category has been further broken down into electricity, coal, natural gas, aviation fuel and land transport (petrol, diesel and LPG) emissions. For details on the separate figures for petrol, diesel and LPG, see the inventory at [www.gw.govt.nz/erawg](http://www.gw.govt.nz/erawg).

*Electricity* – all electricity used in the region by households as well as commercial and industrial sectors. This includes electricity used in transport in the region by trolley buses and by 75% of the rail transport. Work is needed to identify the figures for these transport uses so that fully accurate figures can be derived for transport emissions although it is believed that they do not make a very significant contribution to the electricity emissions total.

*Coal* – all coal used in the region. Coal emissions produced in the generation of electricity (outside the region) are included in the figures for electricity. Coal use is apportioned on a population basis, i.e. a national average consumption per head is applied to the population numbers for the region.

*Natural gas* – reticulated natural gas. As for coal, gas use is apportioned on a population basis but only in the areas where natural gas is available i.e. Hutt City, Kapiti Coast, Porirua City, Upper Hutt and Wellington City.

*Aviation fuel* – figures based on all aviation fuel sold in the region. As the overwhelming majority of this fuel is used through Wellington Airport, the inventory attributes all but a very small fraction of aviation emissions to Wellington City when it comes to analysing the emissions at a city and district level. However, the Working Group recognises that, in fact, all regional residents contribute to this figure.

*Land transport* – figures based on petrol, diesel and LPG sales. It is recognised that some transport fuel purchased in the region will actually be used outside the region's boundaries. Equally, however, fuel bought outside the region is combusted inside the boundaries and we have assumed that these two figures cancel each other out. This method of calculating GHG emissions from transport fuels was preferred over the vehicle kilometres travelled (VKT) method as the emissions factor per litre of fuel is agreed whereas different vehicles have differing emissions rates per kilometre depending on a number of factors from driving technique to engine size.

*Waste* – both liquid and solid waste emissions are included in this figure. Emissions factors have been used derived from national average efficiency ratings for waste disposal at different types of facilities. Actual emissions from individual facilities may vary considerably.

*Industry (industrial processes)* – according to the National Inventory Report, there are no significant emitters of industrial CO<sub>2</sub> within the Wellington region and therefore industrial CO<sub>2</sub> emissions are excluded from this inventory. There are however industrial emissions of SF<sub>6</sub>, HFCs and PFCs which are not attributable to regions because they occur equally across the entire country. Some examples of this are mobile air-conditioners, stationary refrigeration and asthma inhalers. These emissions are known at a national level and are allocated to Wellington on a per capita basis.

*Agriculture* – includes methane, nitrous oxide and carbon dioxide emissions resulting from agriculture.

## Sequestration

With regard to forestry, the inventory only accounts for sequestration in exotic plantations, and exotic and indigenous regenerating scrub of fairly narrowly-defined types. Sequestration rates for different age classes of radiata pine, ranging from 0.5t/ha to 42t/ha, are known and used. There is a great deal of scientific debate over sequestration rates for indigenous forest cover and for old growth forests. The inventory has adopted the conservative approach of applying a zero rate to all indigenous forest except manuka/kanuka scrub. In the case of manuka/kanuka, the lowest scientifically established rate of 1.9 C tonnes/ha/year has been used.

This conservative approach means that, for example, the 20,000 ha of regenerating native bush on the eastern Hutt hills is not included as it contains a mix of species which disqualify it from the national databases. Nor is the considerable area under forest in the Tararua, Rimutaka and Haurangi Forest Parks included although there is some suggestion that [old growth forest may not necessarily be in a steady state with regard to carbon sequestration](#). However, further research is needed before data is available which is reliable enough to include in inventories of this type.

### 4.2 Regional GHG emissions profile: sources

The regional greenhouse gas inventory provides detail on the sources of greenhouse gas for the region. It can be accessed at [www.qw.govt.nz/erawg](http://www.qw.govt.nz/erawg).

[Information on trends for emissions from transport](#) is compiled annually by MfE. MfE also reports on [trends in total GHG emissions at a national level](#).

### 4.3 Regional GHG emissions per capita

It is interesting to note how our per head carbon footprints stacked up in the region in 2006/07. The national per head comparisons in the main document were derived by taking the MfE figures for total emissions in 2006 and dividing by the 2006 Census total population figures.

Our *total* emissions on an average per head basis for the region were calculated as shown in the following table.

Total emissions	Emissions net of forestry sequestration	Total population	Per cap emissions gross (CO <sub>2</sub> e t)	Per cap emissions net (CO <sub>2</sub> e t)
3,813,520	2,715,850	448,956	8	6

An average of tonnes of CO<sub>2</sub>e per head broken down *by source* is seen in the following table

Per cap CO2e t <i>agriculture</i>	Per cap CO2e t <i>energy</i>	Per cap CO2e t <i>industry</i>	Per cap CO2e t <i>waste</i>
2.4	5.0	0.1	0.5

#### 4.3.1 Global comparisons

The international data in the graph in the Discussion Document was largely sourced from the [Garnaut report to the Australian Treasury](#).

### 4.4 Regional “Business as Usual” Emissions Forecast for 2026

The region’s population is predicted to grow from 448,959 in 2006 to somewhere between 500,000 and 545,000 by 2026. New Zealand’s per capita greenhouse gas emissions have been rising steadily since 1990 at roughly 5% above the population growth rate in the 16 years between 1990 and 2006.

If the region were to do nothing about its emissions and simply continue on this trajectory, our total emissions in 2026 would be somewhere between 4.3M t CO<sub>2</sub> e and 4.7M t CO<sub>2</sub> e depending on the rate of population growth.

In order to calculate this range, we have used widely accepted growth forecasts for population and added between 6% and 7% to reflect the national emissions growth trajectory of the 1990-2006 period extrapolated in a straight line over the next 16 years. The graph below illustrates the two trajectories.

For the sake of completeness, we have also graphed “actual” regional emissions in the period 1990 to 2006. These levels were established by assuming that the region’s contribution (as a percentage) to each of the sectors has remained constant. This allowed us to apply the same sector splits to the national totals established by MfE for each year in the period.

## 5. Reducing community emissions

### 5.1 Regional emissions: what do we need to do?

#### Transport

A lay-person’s explanation of the funding formula for **public transport** can be found on page 49 of a document available on the [Greater Wellington website](#).

Targets contained in the [2008 New Zealand Transport Strategy](#) relevant to climate change which local government can play a role in achieving are:

#### *Ensuring environmental sustainability*

- Halve per capita greenhouse gas emissions from domestic transport by 2040.

- Become one of the first countries in the world to widely use electric vehicles
- Reduce the kilometres travelled by single occupancy vehicles, in major urban areas on weekdays, by ten percent per capita by 2015 compared to 2007.

### *Improving access and mobility*

- Increase use of public transport to seven percent of all trips by 2040 (i.e. from 111 million boardings in 2006/7 to more than 525 million boardings in 2040).
- Increase walking, cycling and other active modes to 30 percent of total trips in urban areas by 2040.

### Non-transport energy

[The Energy Efficiency and Conservation Agency's recent report](#) on marine energy resources in NZ draws the conclusion that Cook Strait has the most promising resources. Indeed, if these resources can be exploited they offer huge potential.

### Agriculture

Agriculture produces several GHGs, most notably methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). Of these, methane and nitrous oxide are more serious contributors to global warming in NZ. This is a result of the high ratio of pastoral farming (sheep and cattle/dairy) to other forms. Sheep and cattle are ruminants which means that they convert highly fibrous material (grass etc) to protein (milk and meat) through enteric fermentation. As they chew their cud, they burp, releasing methane from the digestion process. At the other end, as all farm animals excrete waste they produce urea which contributes nitrogen to the nitrogen cycle.

In addition to the nitrogen contribution from farm animals, fertilizer also contributes to the nitrogen cycle, especially if more is used than is necessary for the purpose.

These two gases (methane and nitrous oxide) make a very significant contribution to global warming as their durability in the atmosphere is many times greater than that of carbon dioxide. Read a [discussion of their contribution to the problem](#).

See a recent (2 June 2009) [central government announcement](#) of funding for research into agricultural emissions.

Read [a fairly detailed explanation of the use and production of nitrous oxide in agriculture](#). Page 4 of this document has a useful graphic of the nitrogen cycle.

See a [proprietary discussion](#) of nitrification inhibitors which also includes a good graphic of the nitrogen cycle.

Download a [Worldwatch Institute report](#) on the potential for agriculture and forestry to contribute to carbon sequestration and reduction of CO<sub>2</sub> emissions through erosion control. The report costs US\$12.95 to download but the Summary can be read for free and gives a good indication of the general thrust of the report.

Some [NZ research](#) is being conducted which may in future offer hope for a technology to reduce methane production.

Read [a brief and interesting blog on methane reduction](#).

## 5.2 Reduction goals

By way of comparison, reductions goals set by other councils which participate in CCP-NZ are shown in the table below. All goals are based on a 2001 baseline year.

Council	Community emissions reduction goals
Carterton District	10% below by 2010 and 70% below 2001 by 2025
Kaikoura District	60% below by 2015
Kapiti Coast District	Stabilise at 2001 levels by 2010
Masterton District	70% below 2001 by 2025
South Wairarapa District	10% below by 2010 and 70% below 2001 by 2025
Taranaki Regional Council	Stabilise at 2001 levels by 2010
Waitakere City	15% per capita by 2010, 40% per capita (3 t per head) by 2021 and 80% per capita (1 t per head) by 2051

## 6. Emissions Reduction Action Plan

Initiatives have been included here for consideration by the councils in the region. This suite of suggestions has been developed by the regional Emissions Reduction and Adaptation Working Group based on two factors:

1. emissions sources which are a significant component of the regional total *and* which the councils have the ability to affect
2. mitigation initiatives which are known to have, or be very likely to have, a reasonable impact on the targeted emissions source

It is envisaged that different councils may implement different initiatives depending on their financial and other resources and on what is likely to be successful within their communities.

Once the councils have identified which initiatives to include in their own plans, a final set of emissions reduction goals for the region and a final Regional Climate Change Response Plan will be developed.

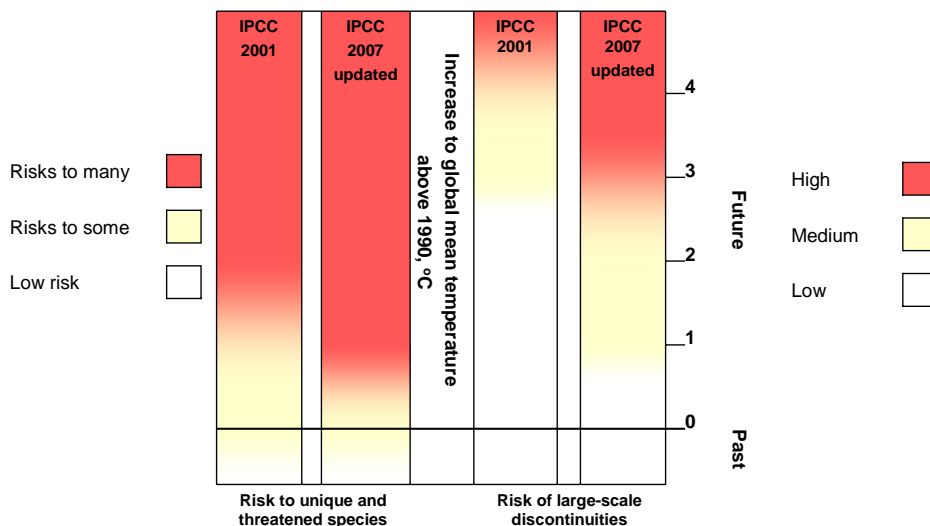
## 7. Adaptation Action Plan

A very useful discussion of the concept of **socio-ecosystem resilience** with illustrative case studies is contained in *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*, edited by Brian Walker and David Salt of the Australian CSIRO, ISBN 9781597260930. It can be [ordered online](#). The authors are part of the [global Resilience Alliance](#) which also publishes useful papers and books relating to sustainability. The Alliance argues that there is no ecosystem left on Earth which is not affected by human activity, hence their coining of the term “socio-ecosystem”. They believe that both social systems and so-called “natural” ecosystems must be considered and addressed in an integrated way.

There has been a recent attempt (Smith *et al.*, 2009, Pro.Nat.Acad.Sci) to update the level of risks for some of the areas of **vulnerability and adaptive capacity** contained in the graph which is on page 49 of the main document. Graeme Pearman, Honorary Senior Research Fellow, Monash University has assembled the following graph based on that up-dated work which shows that, if anything, risk is perceived now to occur at lower temperature increases than in the relatively recent past.

### Updated reasons for concern- urgency

Based on Smith *et al.*, 2009, Pro.Nat.Acad.Sci



Look at an interesting example of [the effectiveness of riparian planting and management regimes](#) in a Waikato dairying catchment.

# Appendix

## *Relevant proposed Regional Policy Statement objectives and anticipated environmental results*

Topic	Objective	Anticipated environmental results
<b>Energy, infrastructure and waste</b>	<b>Objective 9</b>  The region's energy needs are met in ways that: <ul style="list-style-type: none"> <li>(a) improve energy efficiency and conservation;</li> <li>(b) diversify the type and scale of renewable energy development;</li> <li>(c) maximise the use of renewable energy resources;</li> <li>(d) reduce dependency on fossil fuels; and</li> <li>(e) reduce greenhouse gas emissions from</li> </ul>	Regional and district plans contain policies that recognise the social, economic, cultural and environmental benefits of energy generated from renewable energy resources.
	The number and diversity of projects that generate energy from renewable energy resources in the region have increased.	
	By 2016, transport related carbon dioxide emissions, for the region, are below 1,065 kilotonnes per annum (2001 equivalent).	
	By 2016, at least 15% of the region's commuters walk or cycle to work.	
	By 2016, at least 21% of the region's commuters take passenger transport to work.	
	Travel demand management programmes are in place in a significant number of schools, business and other workplaces.	
	Twenty per cent of businesses have adopted sustainable business practices.	
	District plans contain policies to promote energy efficient subdivision or development, small scale renewable energy generation and provide for energy efficient alterations.	
	<b>Objective 11</b>  The quantity of waste disposed of is reduced.	The quantity of waste disposed to landfills is reduced by 20%.
	The quantity of material sent for recycling and composting is increased by 20%.	
	Twenty per cent of businesses in the region have adopted sustainable	

		business practices.
<b>Fresh water</b>	<b>Objective 14</b> Water is used efficiently and is not wasted.	There is an increase in water harvesting and water storage.
		The amount of water recycled and reused has increased and wastage has decreased.
		A regional plan contains policies, rules and/or methods that: (a) promote the efficient use of water; and (b) promote water harvesting, including off-line dams.
<b>Natural hazards</b>	<b>Objective 18</b> The risks and consequences to people, communities, their businesses, property and infrastructure from natural hazards and climate change effects are minimised are reduced.	District plans: (a) identify areas at high risk from natural hazards; and (b) contain policies and rules to avoid subdivision and development in those areas.
		There is no new subdivision and development in areas at high risk from natural hazards
	<b>Objective 19</b> Hazard mitigation measures, structural works and other activities do not increase the risk and consequences of natural hazard events.	There is no increased in the risk from natural hazards as a result of subdivision, use or development (including mitigation works).
		Where hazard mitigation measures are employed, there is a greater range of soft engineered measured used.
	<b>Objective 20</b> Community are more resilience to natural hazards, including the impacts of climate change, and people are better prepared for the consequences of natural hazard events.	Over seventy five per cent of the community surveyed has an understanding of the consequences from local natural hazards.
		Over seventy five per cent of the community surveyed is prepared for natural hazard events.
<b>Regional form, design and function</b>	<b>Objective 21</b> A compact well designed and sustainable regional form that has an integrated, safe and responsive transport network and: (a) a viable and vibrant regional central business district in Wellington city; 2. an increased range and diversity of activities in and	District plans: (a) Contain policies, rules and/or other methods that encourage a range of land use activities to maintain and enhance the viability and vibrancy of the regionally significant centres. (b) Identify and contain policies and methods to encourage

	<p>around the regionally significant centres ;</p> <p>3. sufficient industrial-based employment locations or capacity to meet the region's needs;</p> <p>4. urban development in existing urban areas, or when beyond urban areas, development that reinforces the region's existing urban form;</p> <p>5. strategically planned rural development;</p> <p>6. a range of housing (including affordable housing)</p> <p>7. integrated public open spaces;</p> <p>8. integrated land use and transportation;</p> <p>9. improved east-west transport linkages; and</p> <p>10. efficiently use existing infrastructure (including transport network infrastructure).</p>	<p>higher density and mixed use activities around key centres and locations with good access to the strategic public transport network.</p> <p>There is an increase in the density and mix of land use activities in and around the regionally significant centres.</p> <p>City and district councils have determined if they have key industrial employment locations, and if they have, they have been identified and protected in district plans.</p> <p>The percentage of residents who agree that "I feel a sense of pride in the way my city looks and feels" is:</p> <p>(a) Over 80% in Wellington city; and</p> <p>(b) Over 65% for the rest of the region's city's and districts.</p> <p>All new urban development is within the region's urban areas (as at February 2009); or in areas identified for urban development in a district growth frameworks or strategies; or in accordance with a structure plan.</p> <p>There is a positive trend towards the 'key outcomes' in the Regional Land Transport Strategy.</p> <p>All the 'Good regional form' actions identified in the Wellington Regional Strategy are implemented.</p>
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