

Climate Change Effects and Impacts Assessment

A guidance manual for
Local Government in New Zealand

May 2004

superseded information

This Guidance Manual was prepared by scientists, planners and engineers from NIWA, MWH NZ Ltd and Earthwise Consulting Ltd, in consultation with a range of people from local government organisations. It follows a specification prepared by the Climate Change Office of the Ministry for the Environment.

As explained in the report, developing projections of future climate changes is still subject to significant uncertainty. The authors have used the best available information in preparing this report, and have interpreted this information exercising all reasonable skill and care. Nevertheless none of the organisations involved in its preparation accept any liability, whether direct, indirect or consequential, arising out of the provision of information in this report.

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Executive Summary

This document provides guidance on identifying and assessing likely future regional and local effects of climate change across New Zealand. It is designed to help local government identify and quantify opportunities and hazards which climate change poses for their functions, responsibilities and infrastructure.

Climate-related risks are not new to New Zealand local government planners and resource and hazard managers. Climate change will, by and large, not create new risks, but may change the frequency and intensity of existing risks and hazards, as well as introducing some long-term shifts in climate regimes across the country. Adapting to long-term climate change will also contribute to our resilience to natural fluctuations in climate, such as the El Niño which often leads to dry conditions in eastern parts of New Zealand. Planning to address the effects of climate change is most likely to be effective and cost-efficient if it is integrated into local government's standard work programme, rather than treated in isolation.

Local government is responsible for a range of functions which may be affected by climate change, under the Local Government Act 2002, the Resource Management Act 1991, and other legislation. For regional councils these functions may include management of regional water, air and land resources, biosecurity, natural hazards management, emergency management, and regional land transport. For city and district councils they include land-use planning and decision-making, building control, emergency management and provision of infrastructure and community services. Local authorities own community assets which may be vulnerable to climate change effects.

In 2001 the Intergovernmental Panel on Climate Change identified “new and stronger” evidence that most of the warming observed over the past 50 years can be attributed to human activities that have increased greenhouse gas concentrations in the atmosphere. The IPCC concluded that observed changes in regional climate have affected many physical and biological systems, and pointed to preliminary indications that social and economic systems have also been affected. Further climate changes are inevitable, even if co-ordinated international actions are taken to reduce emissions, because of the inertia in the climate, economic and social systems.

Councils and communities should therefore be giving serious consideration to the potential future impacts of climate change on their functions and services. Of particular importance are infrastructure and developments that will need to cope with climate conditions in 50 to 100 years' time. Examples include stormwater drainage systems, planning for irrigation schemes, development of low-lying land already subject to flood risk, and housing and infrastructure along already eroding coastlines. Climate change may also bring opportunities, for example for growing new horticultural crops in a particular area, to which councils may wish to pay attention.

Guidance Manual contents and use

This Guidance Manual provides projections of future climate change around New Zealand, and information on how these compare with present climate extremes and variations. It identifies potential effects on local government functions and services, and outlines methods for assessing the likely magnitude of such effects. The note then explains how this information can be applied to assess the risk associated with various climate change impacts, and provides guidance on incorporating climate risk assessment into local government regulatory, assessment and planning processes.

Most users of this Guidance Manual will not wish to read it from cover to cover, but will concentrate on the parts which help them deliver on their own responsibilities. To help users find the information relevant to their needs, Chapter 1 provides some “roadmaps” which set out the steps involved in typical assessments and show where to find key guidance for these steps. Chapter 1 also summarises key issues for councils and begins to outline approaches to be taken for identifying effects and adapting to changes. An incremental approach to risk assessment is recommended, beginning with an initial screening assessment. This uses simple initial estimates of how relevant climate factors may change, together with expert judgement or simple calculations of likely impacts of these changes, to test the significance of the changes for a council’s activities. Further detailed analyses are only justified if these screening studies suggest a material impact is possible. This screening approach can be applied to a particular function, asset or activity, or it can be applied right across a council’s activities.

Councils already address extreme weather events and climate variations as they develop plans and provide services. It makes good sense to consider climate change effects as part of these existing regulatory, assessment and planning activities. It is not necessary or even advisable to develop a whole new set of procedures for dealing separately with impacts of climate change, but it is vital to integrate climate change into standard considerations to ensure council activities are “future-proofed” and remain sustainable for future generations.

The contents of individual chapters of the Guidance Manual are now outlined:

Projections of future New Zealand climate change (Chapter 2)

The Intergovernmental Panel on Climate Change in its Third Assessment Report (2001) projects a global temperature increase of between 1.4°C and 5.8°C by 2100. Chapter 2 summarises results from “downscaling” these global projections to New Zealand. Temperature changes here are expected to be less than the global average, as a result of a lag in warming of the oceans surrounding New Zealand. Tables in Chapter 2 and Appendix 3 break down these projected changes by regional council area and provide quantitative estimates along with the range of uncertainties. The broad expected pattern of change is:

- increased temperatures (with greater increases in the winter season, and in the north of New Zealand)
- decreased frost risk but increased risk of very high temperatures
- stronger west-east rainfall gradient (wetter in the west and drier in the east)
- increased frequency of extreme (heavy) daily rainfalls
- increased sea level
- increased westerly winds.

Projected New Zealand changes cover a wide range, reflecting the diverse range of greenhouse gas emission scenarios used by the IPCC and also climate model uncertainties. *Mid-range projections* in *annual-average* temperature and precipitation are:

- temperature increase of 0.6 to 0.7°C from 1990 to 2030s (45-year change), and 1.6 to 2.0°C from 1990 to 2080s (95-year change)
- rainfall change between about –5 to +5% from 1990 to 2030s, and about –10 to +15% from 1990 to 2080s (the sign and amount varies around the country).

The projected range of possible sea level changes around New Zealand by 2100, corresponding to the full IPCC global temperature projection range, is 9–88 cm.

Relationship to current climate change and variability (Chapter 3)

New Zealand climate varies naturally from year to year and from decade to decade. In individual years, annual New Zealand-wide temperatures can deviate from the long-term average by up to 1°C (plus or minus), whereas regional precipitation can deviate by about 20% (plus or minus). The sign of the deviation will depend on whether it is a La Niña or El Niño year, and will also depend (for precipitation) on geographic location. (Details can also vary a lot from event to event.) New Zealand also experiences decadal climate variations, related to a Pacific-wide natural feature called the Interdecadal Pacific Oscillation (IPO). Research is still in progress on how predictable the IPO and its local climatic impacts are. This research suggests we recently moved into a negative IPO phase which could last for the next 20–30 years. This is likely to favour reduced westerlies and southwesterlies, rainfall reductions in the southwest of the country but increases in the northeast, and an increased rate of air temperature and sea-level rise.

These natural variations will continue to impact New Zealand climate through this century, and will be superimposed on the human-induced long-term climate change trend. This combination of underlying mean climate (with appropriate global warming adjustments) plus natural variations will give us the extremes which future New Zealand society will have to adapt to.

The sizes of current natural perturbations of the climate about the long-term mean are comparable to the mid-range projected human-induced changes we might expect over 30–50 years. This means that what currently is an unusually warm year could be the norm in 30–50 years, while an unusually warm year in 30–50 years' time is very likely to be warmer than anything we experience at present.

Effects on local government functions and services (Chapter 4)

Studies already carried out in New Zealand show that climate changes of the magnitude projected in this report for the 2030s and 2080s could have significant effects on various council functions and activities. These effects will often be different in different parts of the country, and may be negative, positive or mixed. For example, increasing temperatures may make some parts of the South Island more suitable for horticultural development, which in turn may place increasing demands on water for irrigation. The availability of water for irrigation may itself be affected by climate changes.

The range of local and regional functions, services and activities on which climate change could *potentially* impact (Table 4.1) is wide, including strategic and land use planning, water supply and irrigation, stormwater and flood management, roading, coastal infrastructure, management of terrestrial and aquatic ecosystems, civil defence and emergency management, and biosecurity. Chapter 4 provides information and guidance that will help individual councils identify which of their functions *will* be materially affected. It summarises data, sources of information, models, and specialist expertise available in New Zealand. It also provides some examples of work that some local authorities have already undertaken.

Developing scenarios for use in effects assessment (Chapter 5)

A definitive quantitative prediction of exactly how much a particular climatic element (e.g. heavy rainfall intensity) will change over coming decades is not feasible. This is because rates of climate change will depend on future global emissions of greenhouse gases, which in turn depend on global social, economic and environmental policies and development. Incomplete scientific knowledge about some of the processes governing the climate, and natural year to year variability, also contribute to future uncertainty.

This leads to “scenario analysis” as an appropriate tool for assessing likely effects of climate change. Climate, social and economic scenarios are formulated which span the likely range of future conditions. These are used together with expert knowledge and models of the sensitivity of natural or managed systems to climate, to deduce a range of possible climate impacts on selected council activities and functions.

The first recommended step is an initial screening assessment for a particular council function, activity or asset. This uses simple initial estimates of how much relevant climate factors may change (usually either a single mid-range value, or a plausible upper and lower end of the scale), together with expert judgement or simple calculations of likely impacts. Further detailed analyses are only justified if the screening assessment suggests a material impact on the activity or service is possible, for at least the upper end of the scale of potential future changes.

Chapter 5 provides guidance on undertaking scenario analyses, including tables of values and sources of climatic information for use in both screening and more detailed studies. Examples are provided covering water resources (Southland), changes in agricultural water usage and resources in three river catchments (Rangitata, Motueka and Tukituki), and effects on stormwater and wastewater systems (North Shore City).

Risk assessment (Chapter 6)

Local government organisations have to make long-term decisions for the community, including decisions on asset management and planning. Resources are often limited, and priorities must be set for where to apply them. Risk assessment methodology provides a systematic process for identifying risks associated with climate change, comparing them against other risks, prioritising them, and developing adaptation plans or making specific decisions. Chapter 6 describes the overall risk assessment process in the context of climate change, outlining methods which are already familiar to most local authorities, with the addition of a screening level assessment for an issue first to indicate whether a full risk assessment is warranted.

Integrating climate change risk assessment into council decisions (Chapter 7)

Chapter 7 describes how to incorporate knowledge about climate change risks and opportunities into council planning. Key principles for local government to keep in mind when dealing with climate change effects include: sustainability; the needs of future generations; avoidance and mitigation of adverse effects; a cautious or precautionary approach; prudent stewardship and kaitiakitanga; consultation; financial responsibility and liability.

Case law which has developed to date, particularly through the Resource Management Act, covers the following issues of relevance to local authorities:

- recognising the reality of climate change
- clarifying the respective roles of regional and territorial authorities
- indicating principles of hazard avoidance
- indicating time scales over which to consider effects
- clarifying the relationship between resource and building consents.

Chapter 7 describes the relevance of climate change to local government management and planning responsibilities, and discusses existing use rights, resource consent decisions, and building consents. It recommends long term monitoring of climate change and its effects, as a basis for ongoing adaptation to change. A checklist is provided (Appendix 5) for addressing climate change in plans developed under the Local Government Act 2002, the Resource Management Act 1991, the Civil Defence and Emergency Management Act 2002, and other legislation.

This final chapter is particularly important, since the Guidance Manual will only have succeeded if councils build consideration of climate change effects into policy development and decision-making for relevant functions and services.

Superseded information

Chapter 1: Introduction

1.1 Local government and climate change

Climate change effects due to the increase in greenhouse gases in the atmosphere will be felt over time at regional and local levels, differently in different parts of New Zealand.

Following Agenda 21¹ and sustainable development principles, local authorities are best placed to plan for the region-specific effects of climate change and to help implement community adaptation to climate change, while central government addresses the causes of climate change in an international context.

In the last decade there has been a rapid growth in understanding of both the cause and impacts of climate change due to human-induced greenhouse gas emissions. Local authorities need to keep aware of these changes so that they can plan adequately for their own communities' needs, and avoid liability for decisions where climate change may result in subsequent costs in the private sector.

Local government has a range of functions and responsibilities relating to managing climate change effects under the Local Government Act 2002, the Resource Management Act 1991 and other legislation. For regional councils these may include management of water resources, air resources and land resources where there are regionally significant management issues, biosecurity, natural hazards management, emergency management, and regional land transport. For city and district councils they include land-use planning and decision-making, building control, emergency management, and provision of infrastructure and community services. As well as an overall planning and management role, both regional and district councils own community assets (such as stormwater systems, water supply, or council-owned roads and bridges) which may be vulnerable to climate change effects.

An informed, considered and proactive approach to climate change issues must be built in to many areas of council planning and decision-making if risks and costs are to be minimised, and benefits are to be maximised.

Early planning may not only prevent a community from being locked into an inflexible response but may also result in considerable savings if remediation work is avoided.

While central government continues to steer the national response to climate change, the range of local government legislation will continue to involve councils in planning for the effects of climate change on their communities. Local government can also facilitate local and regional reductions of greenhouse gas emissions. This Guidance Manual concentrates on how climate affects local government activities, but parallel work is in progress for councils to contribute to emission reductions (Communities for Climate Protection).

¹ See Glossary.

1.2 Who is the Guidance Manual for?

Everyone has a stake in climate change, but this Guidance Manual is particularly directed at people who advise local government decision-makers. These are most likely to be:

- strategic and policy planners who need to evaluate and advise on long-term strategies and policy for the district and region
- asset managers charged with planning future asset needs for communities and resolving existing and emerging problems
- engineers charged with designing infrastructure which is adapted to meet foreseeable risks
- people handling resource, and in some cases, building consent applications
- people responsible for council databases, particularly those providing information on hazards and risks to private landowners and other agencies
- those responsible for emergency management and “lifelines”.

Others, including councillors, consultants and community agencies will also find a wealth of useful information, adaptable to a wide range of uses, in this Guidance Manual.

1.3 Using the Guidance Manual

Understanding climate change, how it may affect different parts of New Zealand, and how to go about identifying and addressing local effects, is complex. Different people in local government have different needs.

The Guidance Manual is designed to provide comprehensive information to local government. Most users will not wish to read it from cover to cover, but will concentrate on the parts that help them deliver on their own responsibilities. To help people navigate through the Guidance Manual and find the aspects of most importance to them, we have:

- set out in Table 1.1 key questions that local government people ask, and identified the chapter in which the question is answered
- set out in the flow chart in Figure 1.1 a “roadmap” for those who need guidance on how to apply climate change information to a specific issue, problem or responsibility
- set out in the flow chart in Figure 1.2 a “roadmap” for those who wish to use the Guidance Manual to assist with overall policy development and planning.

Those who want to know more have the opportunity to access the most current scientific and practice information available on the subject though reading the whole Guidance Manual, along with other material referred to in Table 4.4 and in the References to the Guidance Manual.

The Guidance Manual will help local authorities to identify, scope and respond to climate change in their areas. It also sets out local government’s responsibilities under a range of legislation. The Guidance Manual does *not* provide simple standard solutions for specific situations, since each region, district and community will have its own issues and priorities. Instead it provides examples and some suggestions, but expects that local authorities and communities will develop diverse and creative adaptive responses to climate change over time. This approach respects the diversity of social, economic and physical situations around the country and the mandate of local government.

Box 1.1: Managing climate change assessment

Climate change issues can be broken down into manageable pieces and dealt with as part of normal council planning and management activities. The approach for considering climate change effects on a particular council function or asset (e.g. stormwater drainage systems) is illustrated in Figure 1.1, and includes the following common-sense steps.

- Consider whether the particular function or service is important to your council and influenced by climate. Don't waste effort on low priority issues.
- Pay particular attention to long-lived infrastructure and developments that will need to cope with climate conditions in 50–100 years' time.
- Start with an initial "screening" assessment, using simple estimates of how climate factors relevant to a particular function may change, and expert judgement or simple calculations of likely impacts of these changes.
- It is only necessary to embark on a more detailed study of climate change effects on the function or activity, utilising more staff or consultant time, if the screening assessment indicates possible problems or opportunities.

Granted, there are uncertainties, but there are also increasingly robust findings about the direction climate change effects will take. This Guidance Manual provides ranges (low and high limits) for the expected magnitudes of many of the most important climate changes. These ranges can be used to develop scenarios for climate impacts. The projected range of impacts can be taken into consideration now, when you are designing long-lived infrastructure or planning land use. This will often be less expensive and disruptive than trying to remedy ignored problems later. And it will usually have the added advantage of making the council's activities and the community more resilient to present climate extremes.

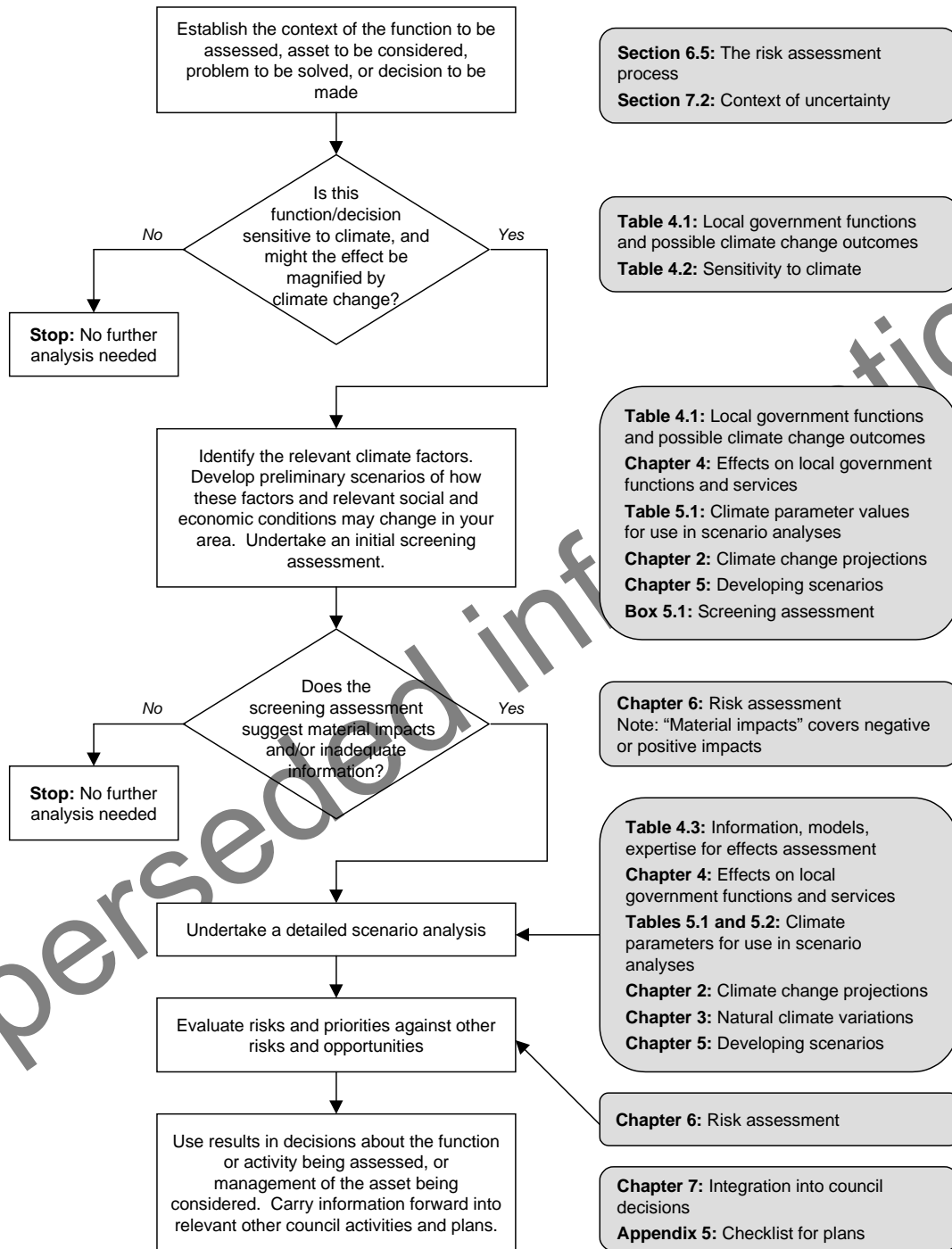
Table 1.1: Answering questions – information in each chapter

Questions	Chapter	Key audience
How will the climate change over time, and how can the effects be assessed?	Executive Summary	Everyone
Why should my council take any notice of and plan for climate change?	Executive Summary; Chapter 1: Introduction	Councillors, managers
Where do I start?	Chapter 1: Roadmaps	Managers, planners, consultants
How is the climate in our region or district likely to change due to global greenhouse gas emissions? What are the uncertainties?	Chapter 2: Projections of Future New Zealand Change; Appendix 3: Further details.	Council planners, engineers, consultants
How large will the expected human-induced climate changes in our region or district be, compared to the natural changes which occur now?	Chapter 3: Relationship to current climate change and its variability.	Council staff and consultants undertaking detailed planning and design work.
What functions and services undertaken by my council <i>might</i> be affected by climate change?	Chapter 4: Assessing effects – methods, data, sources of information.	Council planners and managers.
What methods and data sources are available for assessing likely effects?	Chapter 4: Assessing effects – methods, data, sources of information.	Staff and consultants undertaking planning and infrastructure design work

How should we develop future scenarios for use in (a) preliminary analyses and (b) detailed analyses of impacts?	Chapter 5: Developing the Scenarios	Staff and consultants undertaking planning, asset management and emergency management.
What climate change assumptions should be used in scenario assessments? What about the uncertainties?	Chapter 5: Developing the Scenarios (Tables 5.1, 5.2).	Staff and consultants undertaking planning, asset management and emergency management.
How are climate change risks estimated, and prioritised relative to other hazards?	Chapter 6: Risk assessment	Management and staff responsible for planning, asset management and emergency management.
How can climate change risk assessment be integrated into council decisions and plans?	Chapter 7: Integrating climate change risk assessment into council decisions; Appendix 5: Checklist for plans	Management and staff involved in district and regional planning and decisions on assets, and resource consent applications.
Isn't this problem too big or long-term for a council to tackle, given all the uncertainties?	Chapter 1: Introduction (Box 1.1)	Councillors, managers

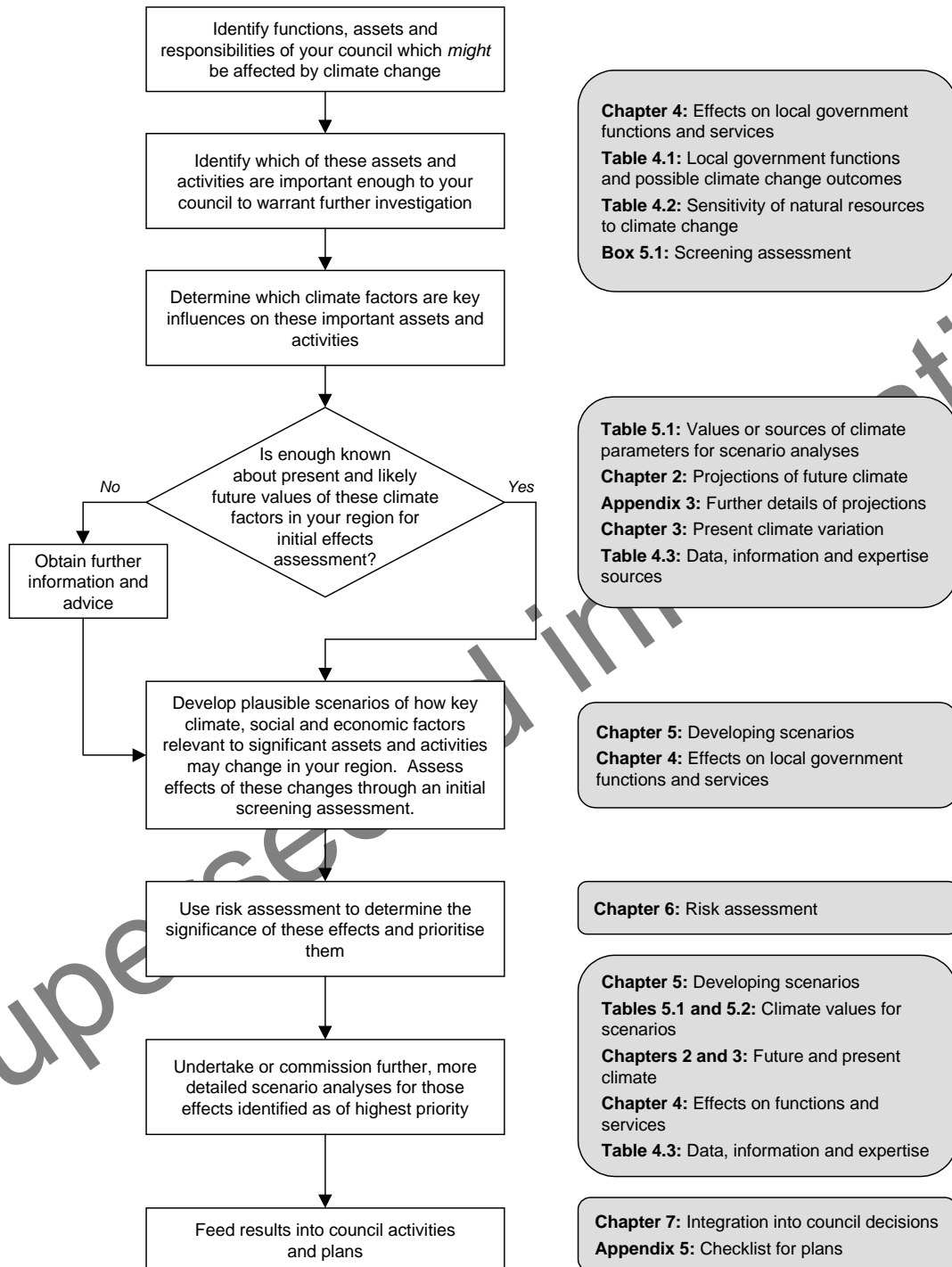
Superseded information

Figure 1.1: Assessing effects of climate change on a particular council function or responsibility



This “roadmap” is designed for people with specific issues for which climate and climate change play an important role. An example is an engineer charged with upgrading the stormwater drainage system for a city, who needs to use future rainfall projections to ensure the system will cope with the effects of climate change in 50 years’ time. The boxes on the right show where to find guidance for each step.

Figure 1.2: Identifying and prioritising climate change risks and opportunities across all council functions and responsibilities



This “roadmap” is for council staff or consultants tasked with identifying and prioritising climate change effects across a council’s operations. The boxes on the right show where to find guidance for each step.

1.4 Context

This Guidance Manual aims to help people identify effects of climate change for their area, and to take account of these effects in their planning and decision-making processes. The intent is to help councils get ahead and plan in a proactive way for climate change where necessary, rather than to wait for changes and then react to them. A reactive mode is likely to be more costly and disruptive to communities affected by climate change.

Local government already addresses many effects of extreme weather events and climate variations in planning and providing services. The Guidance Manual outlines how climate change effects can be addressed as part of these existing regulatory, assessment and planning activities. It does not recommend a separate set of processes for dealing with climate change effects and impacts.

The prime focus is climate change risk assessment. While options for adapting and responding to climate changes are mentioned in passing, detailed consideration of such options will be covered in specific Guidance Manuals to be developed later. The scope of this Guidance Manual is the whole range of climate change effects. Coastal effects are covered briefly, since they are the subject of a separate Coastal Hazards Guidance Manual.

Many of the effects of climate change will be negative. Some will be positive. The Guidance Manual tends to focus on the negative aspects, as planning now can help avoid direct and indirect costs in the future, and many of the costs will be borne by the community as a whole, for which councils have a particular responsibility. However, some parts of New Zealand will experience changes which, if planned for in advance, can result in positive outcomes for areas and communities. Opportunities to benefit from aspects such as the increased temperatures that some areas will experience, will be maximised if forward planning identifies and plans for such benefits. Integrated planning may well be needed as, for example, opportunities to grow new types of crops may be maximised if a community also plans ahead for the management of its water resources to meet the needs of new crops. However, the availability of water resources themselves may be affected by climate change, which must be taken into account in forward planning.

Councils' long-term planning responsibilities provide opportunities to develop integrated adaptive approaches to climate change.

1.5 Reasons for identifying climate change impacts and adapting to them now

There is new and stronger evidence that most of the warming observed over the past 50 years can be attributed to human activities that have increased greenhouse gas concentrations in the atmosphere. Observed changes in regional climate have affected many physical and biological systems, and there are preliminary indications that social and economic systems have also been affected. Reductions of greenhouse gas emissions, even stabilisation of their concentrations in the atmosphere at a low level, will neither altogether prevent climate change or sea-level rise, nor altogether prevent their impacts. This is because of the inertia of the earth's interacting climate, ecological and socioeconomic systems.

These statements were all made in 2001² by the Intergovernmental Panel on Climate Change (IPCC).³ Given these findings, the IPCC concluded that “*inertia in the climate, ecological and socioeconomic systems makes adaptation inevitable, and already necessary in some cases*”. The IPCC also stated that: “*in the presence of inertia, well-founded actions to adapt to or mitigate climate change are more effective, and in some cases may be cheaper, if taken earlier rather than later*”.⁴

There are many uncertainties in predicting future climate changes and their effects. These range from difficulties in predicting future greenhouse gas emissions (which depend on social and economic development around the world), through to scientific and modelling uncertainties. The usual approach to addressing these global uncertainties is by considering a range of scenarios, which span plausible future emissions and incorporate model uncertainty ranges. The IPCC did this by producing the Special Report on Emission Scenarios (SRES), which is described in more detail in Chapter 2.

Climate projections⁵ developed by the IPCC based on scenario analysis include:

- an increase in globally averaged surface temperature of 1.4°C to 5.8°C over the period 1990 to 2100 (for the SRES scenario range). This rate of warming is probably without precedent during at least the last 10,000 years
- both increases and decreases in annual rainfall (depending on location) of typically 5–20% at regional scales during the 21st century
- continued widespread retreat of glaciers throughout the 21st century
- a rise in global mean sea level of 0.09 to 0.88 m between 1990 and 2100
- a range of beneficial and adverse effects on both environmental and socioeconomic systems.

Projecting regional and local climate changes across New Zealand from these global projections requires further ‘downscaling’, since the global average does not necessarily apply to a given location in New Zealand. Chapter 2 summarises the region-specific climate projections across New Zealand associated with the IPCC emission scenarios. It explains that as well as uncertainties in global greenhouse gas emissions and concentrations, local and regional uncertainties also arise because of prediction differences between different regional climate models.

² Watson et al 2001.

³ This is the body established by the United Nations to organise impartial expert assessments of climate change knowledge.

⁴ Watson op cit.

⁵ In IPCC terminology, a *climate projection* describes a potential future evolution of the climate in response to an emission or concentration *scenario* of greenhouse gases and aerosols, and is often based on a simulation by a *climate model*.

Given these uncertainties, it might be tempting to defer any actions to adapt to local climate change. This would be unwise, as New Zealand is already experiencing climate changes. These include a trend of increasing temperatures (about 0.7°C during the 20th century), a reduction in frost frequency over much of the country, retreat of South Island glaciers and snowlines and reduction of alpine snow mass, and a trend to rising sea level (estimated at 14–17 cm during the 20th century). Natural fluctuations in climate are also experienced from year to year and decade to decade, such as the changes in rainfall, droughts, sea level and coastal erosion associated with El Niño / La Niña conditions described in chapter 3. The wise approach is to take action now to identify and adapt to the significant effects of both natural climate variations and climate change. By ratifying the United Nations Framework Convention on Climate Change New Zealand has commitments to formulate and implement national and regional programmes containing “measures to facilitate adequate adaptation to climate change”.⁶

Despite uncertainties about the *magnitude* of regional climate changes, certainty is growing as to the *direction* of expected changes over the coming century. These directions include increasing temperatures over the whole country; annual average rainfall increases in the west of the country and decreases in many eastern areas; reductions in frosts; increasing risk of dry periods or droughts in some eastern areas; increased frequency of heavy rainfall events, and long-term increases in sea level.

The robustness of these findings, and the long-term and inexorable nature of climate changes, means that councils and communities do need to consider and plan for climate change. Of particular importance are infrastructure and developments with a long lifetime, which will need to cope with climate conditions in 50–100 years’ time. Examples include stormwater drainage systems, planning for irrigation schemes, development of low-lying land already subject to flood risk, and housing and infrastructure along already eroding coastlines. Remedying problems with long-lived infrastructure later on is often going to be more expensive and disruptive to communities than taking future changes into account at the planning and design stage.

1.6 Methods

The IPCC has developed a seven step methodology for conducting a climate change impact assessment. This is shown in Appendix 1. This Guidance Manual recognises that climate change response decisions do not take place in a vacuum, but need to be integrated with the whole range of other responsibilities and issues that local government in New Zealand addresses on an ongoing basis through recognised processes. In general terms, this guidance is consistent with the IPCC-recommended approach.

Risk assessment is central to the approach promoted in this Guidance Manual. We draw particularly on AS/NZS4360:1999 (Risk Assessment), SNZ HB 4360:2000 (Risk Management for Local Government), and the Ministry of Civil Defence and Emergency Management’s Guidelines for Developing a CDEM Group Plan (MCDEM DGL 2/02). These procedures are already well-known within local government, and allow effects of climate change to be considered as part of existing planning, assessment and regulatory activities.

⁶ This quote is from Article 4.1(b), United Nations Framework Convention on Climate Change.

Because climate change does not occur in isolation, this Guidance Manual strongly advocates the need to make planning for climate change an integral part of councils' standard work. Every function or service that relies on, or is affected by, climate parameters such as rainfall, sea-level or temperature, can potentially be affected by climate change. Standard methods used to consider the effects of climate on a council's responsibilities generally provide a good platform to consider the effects of climate change as well, and ensure that the consideration of climate change is done efficiently and at least cost while being relevant to the problem in question.

For climate change effects, the Guidance Manual suggests an additional "initial screening assessment" step in standard risk assessment procedures. Screening analysis uses simple initial estimates of how relevant climate factors will change, together with expert judgement or simple calculations of likely impacts of these changes, to test their significance for a council's activities. This approach can be applied either to one particular issue (such as the impacts of changed heavy rainfalls on stormwater systems), or to prioritising the relative importance of various climate change impacts. Further analysis for climate change is only needed when screening assessment suggests that there may be a significant issue, and/or there is clearly inadequate information to make a judgement based on a simple analysis.

A series of 'real life' case studies have been undertaken to 'pilot' this Guidance Manual. Reports from these studies provide examples that will be made widely available by the Ministry for the Environment for the use of local government, as part of a resource on emerging good practice in planning for climate change effects.

1.7 Summary

- Climate change is a real and internationally recognised outcome of increased amounts of greenhouse gases in the atmosphere. It will have effects over the next decades that are predictable with some level of certainty, but which will vary from place to place throughout New Zealand.
- The climate will also change from year to year and decade to decade due to natural processes. For example, some parts of the country often have dry summers and autumns when an El Niño climate pattern is present. Both natural fluctuations and human-induced climate changes need to be considered when developing adaptation plans and policies, rather than just "greenhouse warming" effects on their own.
- Councils already address extreme weather events and climate variations as they develop plans and provide services. Climate change effects need also to be considered as part of these regulatory, assessment and planning activities. It is not necessary to develop a set of procedures for dealing separately with effects and impacts of climate change - they can be built into existing practices.
- Over time, climate change responses will involve iterative planning processes, keeping up-to-date with new information, monitoring changes, and reviewing the effectiveness of responses.
- The response to climate change involves international, national, regional, district and community consideration and action. The Guidance Manual aims to assist local government in working with its communities and making appropriate decisions.