

19. Climate Change

Introduction

Society will continue to rely on fossil fuels as an energy source for the foreseeable future. The consumption of these fuels results in the release of carbon dioxide and other greenhouse gases into the atmosphere. The general consensus of scientific opinion is that the world is getting warmer, causing its climate to change. Global temperatures are approximately 0.6 degrees Celsius higher now than they were in the early 1990s. While there is not unanimous agreement, there is now strong evidence that most of the warming observed is attributable to increased concentrations of greenhouse gases produced by human activities. As more gases accumulate in the atmosphere, the Earth gets warmer, resulting in rising sea temperatures and levels, the melting of glaciers and ice caps and greater extremes in weather patterns, such as more storms of greater intensity and longer droughts.

In Marlborough, NIWA predicts that the mean temperature will increase by approximately 1 degree by 2040 and 2 degrees by 2090. The climate is likely to become drier and the frequency of droughts is expected to increase. There is also a predicted increase in westerly winds, especially in winter and spring.

Section 7 of the Resource Management Act 1991 (RMA) requires the Council to have regard to the effects of these predicted climatic changes in exercising its functions under the RMA. Uncertainty about the nature of these effects at international, national and local level makes this a difficult task. Most projections are also long term and certainly beyond the ten year life of the Marlborough Environment Plan (MEP). Taking all of this into account, the provisions of this chapter focus on applying the best available information to enable people and communities to respond to the adverse and positive effects created by climate change.

Issue 19A – Climate change has the potential to affect Marlborough’s natural and physical resources and the ability of people and communities to use these resources.

Marlborough relies on its natural and physical resources for its social and economic wellbeing and health and safety. The nature of many natural and physical resources and the ability to use them, especially land and freshwater resources, is dependent on climate. This makes Marlborough vulnerable to any long term changes in climate.

Primary industry makes a significant contribution to Marlborough’s economy and is vulnerable to changes in climate. Many primary industries rely on sufficient quantities of rainfall or freshwater in rivers and aquifers to supplement rainfall through irrigation. The various crops that are grown or the type of stock that is grazed reflects these climate variables. Predictions of higher temperatures, more extreme temperatures and reduced rainfall could therefore have a significant impact on rural land users through increased risk of drought and decreased water availability. Any decrease in water availability will also increase the competition for freshwater amongst existing users.

Marlborough’s natural ecosystems could also be vulnerable to the effects of climate change. Indigenous terrestrial, aquatic and marine species could respond to increased temperatures and drier conditions by shifting to more suitable climatic zones. Any inability to move may have significant consequences for the long term viability of affected indigenous species, especially plants.

However, climate change may create new opportunities. Plant growth could improve due to longer growing seasons and rising carbon dioxide levels. Warmer temperatures and decreased frost risk may enable new crops to be established; for example, Marlborough may become more suited to growing red wine grape varieties. Changes in climate may also create the opportunity to develop new ways to produce renewable energy.

The public health effects of climate change include warmer winters, which may alleviate cold related illnesses and death. This would have the added advantage of reducing energy consumption during the winter months. In contrast, hotter summers may cause heat stress while drier and windier conditions could create more dust and affect sufferers of respiratory disease. Windier conditions will also create additional challenges for the use of agrichemicals in the rural environment.

Communities may enjoy the health benefits of warmer winters, but warmer temperatures may also have significant biosecurity implications. Sub-tropical diseases may become a problem if carrier insects become established. Rising average temperatures could lead to the wider establishment and spread of new and/or existing pest plants, increased abundance of animal pests and greater survival of a range of insect pests.

The predictions of climate change at a national level involve significant uncertainty and little work has been undertaken to apply these national predictions to Marlborough's climate. This makes the task of responding to the effects of climate change in Marlborough difficult. This situation is complicated further by the fact that New Zealand and Marlborough are subject to natural climate variations associated with La Nina/El Nino and the Interdecadal Pacific Oscillation. These natural variations will be superimposed on human-induced long term climate changes.

[RPS, R, C, D]

Objective 19.1 – Mitigation of and adaptation to the adverse effects on the environment arising from climate change.

This objective focusses on actions that the community can take to reduce the potential for adverse effects on the environment caused by climate change and to respond to any effects that do occur. One of the difficulties is that there is inherent uncertainty regarding the likely local climate changes in Marlborough and therefore the exact nature of those adverse effects is unknown, making it particularly difficult to plan for climate change. Further research will assist in this regard. In the meantime, it is prudent to promote actions that offset carbon emissions and retain sufficient flexibility in the use, development and protection of natural and physical resources to enable resource users to adapt to a changing climate.

[RPS]

Policy 19.1.1 – Promote actions within Marlborough to reduce or offset carbon emissions.

Climate change is a global issue that New Zealand's central government is addressing at an international and national level. The RMA effectively excludes regional councils from the role of regulating emissions for climate change purposes (Sections 70A and 104E of the RMA). However, the Council can explore opportunities for supporting national policies and where appropriate promote methods that address climate change problems within New Zealand's national policy framework for climate change. For example, the Council could assess and then address the carbon footprint of delivering its own services to the community and encourage businesses to do likewise. This is one of many actions the Council could undertake to enable Marlborough's people and communities to play their part in responding to this global issue.

[RPS]

Policy 19.1.2 – Improve the community's understanding of the potential effects of climate change on the Marlborough environment.

Although there has been considerable research to predict long term climate change internationally and nationally, very few of the research findings have been applied directly to Marlborough's climate. This makes it difficult to establish the likely effects of climate change on natural and

physical resources and the ability of people and communities to utilise these resources. It is therefore desirable to investigate local climate change, especially as Marlborough contains two distinct climate zones: a wetter climate north of and including the Richmond Range and a drier climate south of the Richmond Range. The findings gained from research initiated through this policy can be applied to better understand the potential implications of climate change in a Marlborough context.

[R, C, D]

Policy 19.1.3 – Enable primary industries to adapt to the effects of climate change.

Farmers and foresters are inherently adaptable resource users and it is likely this will need to continue into the future as changes in climate begin to affect users' ability to utilise land and freshwater resources. Responses to increased temperatures and reduced water availability may require modifications to farming practices or diversification of crops or stock types. Increased temperatures and reduced frost risk may also create opportunities to produce crops not previously grown in Marlborough. Similar opportunities could exist for the aquaculture industry as a result of increasing sea water temperatures. As Marlborough's economy is based on these primary industries, it is important that such adaptations can be made.

[R]

Policy 19.1.4 – Take a precautionary approach to the allocation of additional freshwater resources and where freshwater has already been allocated, ensure that the allocation reflects the status of the resource.

Sustainable flow regimes established through previous resource management plans have been reviewed during the preparation of the MEP. This involved a review of the sustainable yield from Marlborough's rivers and aquifers to confirm appropriate levels of allocation to resource users. Historical flow and level records were utilised as part of this process, including data that has been recorded since the original plans were notified. This approach ensured that any influence of climate change on sustainable yield was taken into account.

Given the importance of freshwater to the social and economic wellbeing of Marlborough, consideration was also given to opportunities to provide additional access to freshwater resources. Appropriate caution was applied to this task as the opportunities enabled by the allocation may not be realised if climate change reduces sustainable yield in the future. Access to freshwater may become unreliable to the extent that people cannot make a return on the investments made. This risk should be considered in perspective, taking into account the variable nature of Marlborough's freshwater resources in response to natural climate oscillations.

This policy can be applied to the environmental data collected over the life of the MEP. In this way, the policy will also inform any subsequent review of the provisions contained in Chapter 5 - Allocation of Public Resources.

[R]

Policy 19.1.5 – Ensure that the freshwater that is available for out-of-stream use is allocated and used efficiently, by:

- (a) requiring that the rate of water use authorised by water permit be no more than that required for the intended use, having regard to the local conditions;
- (b) enabling the transfer of water permits between users within the same Freshwater Management Unit; and
- (c) enabling the storage of water for subsequent use during low flow and low level periods.

One of the significant risks of climate change locally is that Marlborough's climate may become drier, with drought periods becoming more frequent and longer in duration. If this happens, it is essential that available freshwater resources are allocated and utilised efficiently to ensure that the social and economic benefits that can be derived from the freshwater that is available are

maximised. The matters specified in (a) and (b) target efficient allocation and use of freshwater. The intent is to ensure that freshwater is not unnecessarily “locked up” in paper allocation when it could benefit existing or potential users.

If water availability declines over time due to reduced river flows or aquifer levels brought about by decreased rainfall, then storing freshwater would be an effective means of retaining reliability of supply. As set out in (c), this policy enables the taking of freshwater during periods of higher river flow. Stored water can then be used during periods of low river flow when access might otherwise be restricted.

The matters set out in (b) and (c) will result in more resilient communities as they reduce the vulnerability of resource users to decreased freshwater availability brought about by climate change. More details on the policy responses set out in (a) to (c) are contained in Chapter 5 - Allocation of Public Resources.

Methods of implementation

The methods listed below are to be implemented by the Council unless otherwise specified.

[RPS]

19.M.1 Council carbon footprint

Investigate Council operations to establish their carbon footprint; set goals for reducing carbon emissions and develop an action plan to reach those goals.

[D]

19.M.2 Marlborough Regional Land Transport Plan

Consider, in the review of the Marlborough Regional Land Transport Plan, provisions to reduce emissions of greenhouse gases.

[D]

19.M.3 Marlborough Walking and Cycling Strategy

Maintain, implement and review the Marlborough Walking and Cycling Strategy to promote modes of transport that do not rely upon fossil fuels.

[R, C, D]

19.M.4 Research

Apply the findings of international and national climate change research to Marlborough's environment to the extent that is possible. The findings can then be applied to determine and better understand the implications of climate change.

[R, C, D]

19.M.5 Information

Share the findings of research on climate change in Marlborough and the implications of these predictions with the community. This will help to allow people to take action to prepare for those implications and therefore reduce the adverse effects of climate change.

[R]

19.M.6 Regional rules

Rules will establish sustainable levels of freshwater allocation that take into account the effects of climate change on river flows, aquifer levels and the resulting sustainable yield from those freshwater resources.

Enable the taking of surface water for storage purposes through the application of a controlled activity rule to the abstraction.

[D]

19.M.7 District rules

Apply a range of permitted activity rules to farming and forestry activities. Use broad definitions of “farming” and “forestry” so that farmers and foresters are able to modify farming practices and diversify or change crop/stock types in response to changes in climate.

Enable the creation of permanent carbon sinks through the application of appropriate rules.

Issue 19B – Climate change could affect natural hazards and create a coastal inundation hazard associated with sea level rise.

The predictions of climate change include predictions of more extreme weather events. For the east coast of the South Island, including Marlborough, this means drier conditions and an increase in the incidence of drought. Drier conditions will also increase the risk of fire. Climate change may also result in a change in the frequency of extreme rainfall events. Any increase in frequency in such events could lead to more frequent and severe flooding.

In rural areas, if extreme events such as droughts and floods become more severe and frequent, costs associated with dealing with stock losses, increased soil erosion and damage and disruptions to farm operations would be expected to increase. To date, there is no indication that severe Marlborough rainfall events are increasing, though average global temperatures have clearly risen over the last ten years.

Global warming is expected to result in a rise in sea level due to thermal expansion of ocean water and melting of glacial and polar ice. Sea level is predicted to rise around 0.18 to 0.59 metres by 2090. This rise potentially increases the risk of inundation at the coast. Coastal erosion could also become more prevalent, increasing the need for coastal protection measures. Along the coastal margin of the Wairau Plain, the level of the Wairau River bar and river mouth efficiency has far greater influence on the potential for inundation than the projected sea level rise. Further south, the topography and lack of settlement minimises any inundation risk. However, the risks are far greater in the Marlborough Sounds where settlement and associated infrastructure (especially means of access, such as jetties and access tracks) tend to be located in the coastal environment and near the water edge.

More frequent extreme weather events would also pose a significant risk to regionally significant infrastructure such as buildings, roads, water, sewerage, electricity transmission and communication systems.

[RPS, R, C, D]

Objective 19.2 – Avoid and mitigate the adverse effects of natural hazards influenced by climate change.

Provisions elsewhere in the MEP seek to avoid and mitigate the adverse effects of natural hazards. This objective recognises that the severity and/or frequency of those natural hazards could potentially increase as a result of climate change. In these circumstances, any additional adverse effect should likewise be avoided or sufficiently mitigated.

While it could make existing natural hazards worse, climate change in itself creates a new hazard in sea level rise. It is appropriate that the adverse effects of sea level rise and the associated inundation of land are avoided and mitigated given that these adverse effects are permanent.

[R]

Policy 19.2.1 – Monitor flood hazard on an ongoing basis.

The magnitude and incidence of flooding may increase in response to climate change, particularly the predictions for more severe rainfall events. Policies in Chapter 11 - Natural Hazards establish a framework for reducing the risk of flooding to adversely affect communities. This is achieved by mapping the known and predicted flood risk areas and applying appropriate management to activities within those mapped areas. If climate change does result in increased magnitude or incidence of flooding, then this information will be collected and used to inform the review of the existing management framework. In response, it may be necessary to change and/or increase the boundaries of the flood hazard overlay in the MEP. Any such changes would have to pass through the First Schedule process of the RMA. Policy 11.1.16 in Chapter 11 - Natural Hazards provides more detail on this matter.

[R, C, D]

Policy 19.2.2 - Avoid any inundation of new buildings and where appropriate infrastructure within the coastal environment by ensuring that adequate allowance is made for the following factors when locating, designing and/or constructing any building or infrastructure:

- (a) rising sea levels as a result of climate change of at least 0.5 metres relative to the 1980-1999 average; and
- (b) storm surge.

In 2013, the International Panel on Climate Change determined that it is very likely that the rate of global mean sea level rise during the twenty-first century will exceed the rate observed during 1971– 2010 due to increases in ocean warming and loss of mass from glaciers and ice sheets.

The Ministry for the Environment advises local government (for planning and decision timeframes out to 2090-2099), to plan for a sea level rise of 0.5 metres relative to the 1980-1999 average as a base value but that assessments be made of potential consequences from a sea level rise of up to 0.8 metres.

Although the life of the MEP is only ten years, buildings have a minimum design life of 50 years and property titles have an indefinite life. It is therefore important that any new building is located, designed and/or constructed having regard to the long term risk of inundation as a result of sea level rise. This approach is also appropriate to infrastructure located in the coastal environment that is not intended by design to be subject to inundation. The Ministry for the Environment advice has been utilised to establish the increase in sea level to be applied.

Storm surges occurring in response to low-pressure weather systems can cause higher than normal sea levels and inundation of low lying areas. This hazard increases with increasing sea levels, so any risk assessment made in accordance with this policy should also take into account the potential additive effects of storm surge on top of sea level rise.

This policy will be applied to the determination of resource consent applications. Rules elsewhere in the MEP require buildings to be set back from the coastal marine area. This in itself will act to protect buildings from the adverse effects of sea level rise and/or storm surge. However, when applications are made to establish a building within this setback, then the policy will be able to be applied.

Methods of implementation

The methods listed below are to be implemented by the Council unless otherwise specified.

[R, C, D]

19.M.8 Research

In order to plan for the effect of sea level rise, it is necessary to understand the areas along the Marlborough coast that are likely to be affected by inundation in the long term. The Council will undertake an investigation to establish the extent and nature of the inundation hazard using the International Panel on Climate Change’s most recent projections of sea level rise.

[R, C, D]

19.M.9 Monitoring

The Council will continue to monitor water levels and flows in Marlborough’s rivers. This will provide information on the magnitude and frequency of flood events over time and will allow changes in flood risk to be identified and evaluated.

[D]

19.M.10 District rules

Use rules to establish buffers between buildings and infrastructure and the coastal marine area. The horizontal setback created will reduce the potential for structures and infrastructure to be inundated until the research outlined above is completed. The research may prompt the need for additional district rules in certain locations to ensure Policy 19.2.2 continues to be met.

Anticipated environmental results and monitoring effectiveness

The following table identifies the anticipated environmental results of the climate change provisions of the MEP. Unless otherwise specified, the anticipated environmental results are ten year targets. For each anticipated environmental result, a series of indicators will be used to monitor the effectiveness of the climate change provisions.

Anticipated environmental result	Monitoring effectiveness
<p>19.AER.1</p> <p>The community’s understanding of the effects of climate change and sea level rise improves over time.</p>	<p>The results of research into the local effects of climate change and sea level rise are reported to the Council.</p> <p>Environmental data, including climate and flooding, is collected and reported to the Council to establish long term trends.</p>
<p>19.AER.2</p> <p>Primary producers are able to adapt to the effects of climate change.</p>	<p>Monitoring of land use and land use change establishes changes in crop type.</p>
<p>19.AER.3</p> <p>Buildings and infrastructure established after the notification of the MEP are not inundated by the sea.</p>	<p>Reports of inundation and/or damage to buildings and/or infrastructure.</p>