

# Proposed Marlborough Environment Plan

## Topic 16: Climate Change

<b>Hearing dates:</b>	19 – 20 February 2018
<b>S42A Report Writer:</b>	David Jackson
<b>Conflicts of Interest:</b>	Commissioner Kenderdine
<b>Interim decision:</b>	None

*(Note: A list of conflicts of interest which arose during the process are available to view on the Marlborough District Council Website)*

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**List of Abbreviations**

DAPP	Dynamic adaptive pathways planning
IPCC	Intergovernmental Panel on Climate Change
LTP	Long Term Plan
MDC	Marlborough District Council
MfE	Ministry for the Environment
NESPF	National Environmental Standard for Plantation Forestry
NIWA	National Institute of Water and Atmospheric Research
NPSWF	National Policy Statement for Freshwater Management 2014
NZCPS	New Zealand Coastal Policy Statement 2010
PMEP	Proposed Marlborough Environment Plan
RCP	Representative Concentration Pathways
RMA	Resource Management Act 1991
SLR	Sea level rise

**Submitter abbreviations**

AQNZ	Aquaculture New Zealand
CKM	Climate Karanga Marlborough
Forest & Bird	Royal Forest and Bird Protection Society NZ
FNHTB	Friends of Nelson Haven and Tasman Bay Incorporated
KCSRA	Kenepuru and Central Sounds Residents' Association
MFA	Marine Farming Association Incorporated
Ngāti Kuia	Te Runanga O Ngati Kuia
Nelson Forests	Nelson Forests Limited
NMDHB	Nelson Marlborough District Health Board
NZDF	New Zealand Defence Force
NZTA	New Zealand Transport Agency
Te Ātiawa	Te Ātiawa o Te Waka-a-Māui

## Structure of Decisions

1. It is important that the topic decision is read as a whole together with the tracked change version of the Plan. The decision on each topic contains the reasons for the Panel's decisions. These comprise either adoption of the reasoning and recommendations of the original Section 42A Report or the replies to evidence, or a specific reasoning by the Panel<sup>1</sup>.
2. The tracked change version of the relevant PMEP provisions forms an integral part of the decision. The source of the change in terms of the topic that the subject matter was dealt with is clearly identified in the track changes version of the plan. This records all amendments (additions and deletions) to the notified PMEP provisions made by the Panel.
3. Where the PMEP provisions **remain as notified**, it is because:
  - (a) The Panel has decided to retain the provision as notified for reasons set out in this decision; or
  - (b) The Panel adopted the reasoning and recommendation of the Section 42A Report Writer to retain the provision as notified as recommended in the Reply to Evidence; or
  - (c) The Panel adopted the reasoning and recommendation of the Section 42A Report to retain the provision as notified in the original Section 42A report.
4. Where there is a **change to a provision** within the plan it is because:
  - (a) The Panel has amended a provision for reasons set out in this decision in response to a submission point which the Section 42A report writer(s) does not recommend in their reports; or
  - (b) The Panel adopted the reasoning and recommendation of the Section 42A Report Writer to change the provision to that recommended in the Reply to Evidence; or
  - (c) The Panel adopted the reasoning and recommendation of the Section 42A Report Writer to change the provision to that recommended in the original Section 42A report; or

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<sup>1</sup> (The only exception to that approach relates to the Noise section of the Nuisance topic where the reasoning and recommendations in the responses to Minutes 54 and 59 may have been adopted, rather than the reasoning and recommendations in the Section 42A Report or the Reply to Evidence report. The reasons for that difference in that topic are dealt with in detail at the commencement of the Noise section of the Nuisance topic decision. In respect of that topic the approach to understanding of the individual submission point decisions addressed in paragraphs 13.3 to 13.5 below should be adjusted accordingly to apply references to the Section 42A Report and/or Reply to Evidence in those paragraphs as being references to the responses to Minutes 54 & 59 for that Nuisance topic.)

- (d) A consequential change has been necessary following on from a decision in either a), b) or c).
5. Where there is a **different recommendation** between the Section 42A Report and the Reply to Evidence (i.e., the recommendation by the Section 42A report writer(s) has changed as a result of hearing the evidence of submitters), unless the Panel decision specifically adopts the original report's reasoning and recommendations, the reasoning and recommendations in the (later) reply to evidence has been adopted and it must be taken to prevail.
  6. There are limited circumstances where the Panel has taken the opportunity to give effect to national policy statements or implement national environmental standards. Where this occurs the relevant decision clearly sets out the nature of the change and the reason for the change.
  7. Finally, there are limited circumstances where the Panel has decided that **alternative relief** is more appropriate than that requested by the submitters, but still within the scope of the relief sought. This is recorded in the Panel's decision.

## Overall Introduction

8. Earth's climate is changing, mostly due to emissions of greenhouse gases from human activities, such as burning fossil fuels (for example, coal and oil), agriculture, and deforestation (where large areas of trees are cleared). The greenhouse gases we emit include carbon dioxide, methane and nitrous oxide. They warm the Earth, and one of the major, and most certain consequences of warming, is sea level rise.<sup>2</sup>
9. The MDC is required to give particular attention to the effects of climate change through s 7 (i) RMA.<sup>3</sup>
10. Specific provisions within the New Zealand Coastal Policy Statement 2010 (NZCPS) also require those exercising functions and powers under the RMA to:
  - identify coastal hazards over at least 100 years, giving priority to identification of areas of high risk;
  - have particular regard to the effects of climate change on all such areas;
  - take into account national guidance and the best available information on the likely effects of climate change on the region or district.<sup>4</sup>

### Marlborough submitters and their concerns

11. The submissions of most participants and their requested amendments to the notified Chapter 19<sup>5</sup>, offered thoughtful observations and suggestions to the existing PMEP provisions which have resulted in change. The participants, with the exception of very few, sought more emphasis to be given to the seriousness of the threats from climate change; and for the PMEP to better reflect the findings identified in the most recent predictions in publications, not only from the Intergovernmental Panel on Climate Change (IPCC),<sup>6</sup> but also from MfE.<sup>7</sup> This MfE report identifies climate change projections for the various regions of New Zealand, including Marlborough. Using the NIWA supercomputer, for atmospheric projections, MfE detailed that

<sup>2</sup> Ministry for the Environment (2017) Preparing for Coastal Change: A Summary of Coastal Hazards and Climate Change Guidance for Local Government, Introduction, page 4.

<sup>3</sup> See Appendix 1 to this chapter for the legal provisions relating to climate change.

<sup>4</sup> Ministry for the Environment (2017) Coastal Hazards and Climate Change: Guidance for Local Government, 3<sup>rd</sup> Edition. Since 2001 the Ministry has provided guidance on how to adapt to the risks from coastal hazards caused by climate change. This 2017 edition is a major revision of the 2008 Guidance. It updates scientific understanding, legal framework, risk and vulnerability and collaborative approaches to engaging with communities. The Guidance supports local government in its complex role on this issue.

<sup>5</sup> Section 42A Report on submissions and further submissions. Topic: Climate Change, 13 November 2017.

<sup>6</sup> Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report 2014 (IPCC 5<sup>th</sup> assessment).

<sup>7</sup> Ministry for the Environment (2016) Climate Change Projections for New Zealand. Atmospheric projections based on simulations undertaken by the IPCC Fifth Assessment, Mullan B, Sood A, Stuart S, National Institute of Atmospheric Research, Wellington.

New Zealand’s regional climate models predict an ‘... *unprecedented level of detail and robustness in the information provided*’.

12. The latest MfE Coastal Hazards and Climate Change guidance document<sup>8</sup> (the 2017 Guidance), which updates the 2008 Guidance, has overtaken the uncertainty of aspects of climate change, earlier identified in the PMEP as notified, requiring ‘catch up’ for all involved in the PMEP.
13. A component of Climate Karanga Marlborough’s (CKM) presentations to the PMEP process, was the expert contribution from Professor James Renwick and Dr Judy Lawrence, both experts in different aspects of climate change developments, who appeared before the Panel in February 2018. This decision reflects the evidence of both which the Panel found to be persuasive.
14. What follows is the Panel’s assessment of the various provisions of the PMEP against that evidential background. These reflect in part the updates that occurred throughout the Section 42A Report, the Addendum to the Section 42A Report (November 2017), and Reply to Evidence by the report writer (March 2018).
15. What have been helpful are the explanations at the beginning of the Section 42A Report, the Addendum and Reply to Evidence of the various updates that have occurred in the science, as well as the technical planning publications on climate change since the PMEP was notified.
16. The report writer fulfils the NZCPS Policy 24(1)(h) requirements for the identification of coastal hazards and climate change ‘*taking into account national guidance and the best available information on the likely effects of climate change on the region or district*’.<sup>9</sup> We note that scientific evidence is continually being updated. We also note that Table 11 and Table 12 of the 2017 Guidance have in their headings ‘approximate’ years, from possible earliest years of effect to latest, and ‘minimum’ transitional New Zealand-wide sea level rise values<sup>10</sup> as an indication that predictions may well change.
17. The Addendum to the Section 42A Report provides a summary of the planning implications that are created by the 2017 Guidance. It introduces ‘adaptive planning’ that differs from previous guidance editions and from current coastal hazard management practice in two specific ways:

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<sup>8</sup> *Coastal Hazards and Climate Change: Evidence for Local Government 3<sup>rd</sup> Edition*, Addendum to Section 42A Report dated 13 November 2017 on submissions and further submissions topic: Climate Change, pages 7-11.

<sup>9</sup> NZCPS (2010), page 23.

<sup>10</sup> See 2017 Guidance, pages 107-108.

- how it deals with uncertainty and risk; and
  - how it places community engagement at the centre of decision-making.
18. The dynamic adaptive pathways planning approach (DAPP) ‘identifies ways forward (pathways) despite uncertainty, while remaining responsive to change should this be needed (dynamic)’.<sup>11</sup>
19. The report writer’s Section 42A Report Addendum reflects not only the advice supplied in the 2017 Guidance but the updated science (available in Professor Renwick’s evidence). It also focuses on the DAPP approach as the preferred method for planning in an uncertain world (see the evidence of Dr Lawrence).

### **Climate Change Experts**

20. Professor James Renwick is an international atmospheric climate change scientist and a lead author on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report.<sup>12</sup> He is the current Co-Chair of the Scientific Steering Group Climate Change and Cryosphere project (World Climate Research Programme 2017), as well as being the holder and recipient of many other positions and distinctions.
21. Dr Judith Lawrence is a Senior Research Fellow of the New Zealand Climate Change Research Institute, Victoria University, and Director of PS Consulting Limited. Dr Lawrence has 40 years’ experience in New Zealand and internationally, working in the fields of resource management, hazards management and climate change. She co-authored the revised MfE publication of Coastal Hazards and Climate Change Guidance (2017). She is currently Co-Chair of the Government’s Climate Change Adaptation Technical Working Group assessing adaptation options available to New Zealand over the next 100 years.<sup>13</sup>

### **The Science**

22. The evidence provided by Professor Renwick describes the consensus of the global scientific community on the causes and effects of climate change, and time frames for effectively mitigating those effects. The following is a brief summary of that evidence.<sup>14</sup>

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<sup>11</sup> Section 42A Report, paragraphs 26-27.

<sup>12</sup> IPCC 2010-2013, page 4.

<sup>13</sup> CKM, Dr Judith Lawrence Statement of Evidence 1 February 2018 page 11 summarises *What it took to catalyse adaptive planning and the lessons learned: Lawrence and Haasnoot (2017). The approach has been applied in the Netherlands (Haasnoot et al, 2013) Bangladesh, UK Thames River Management (Ranger et al 2013), in US (Florida) for sea level rise and urban inundation; (Obeysekera, 2017) Australia, Natural Resource Management (Bosomworth et al, 2017; Wise et al, 2014) ; England (Petr and Ray, 2017) for forestry management.*

<sup>14</sup> Prof James Renwick, Statement of Evidence 19 February 2018, pages 3-14.



23. Climate change is assessed on the basis of two futures: low carbon (no more than 2 degrees warming) and high carbon (3-4 degrees plus). These findings are from the 2018 Assessment Report of the Intergovernmental Panel on Climate Change.
24. Evidence shows anthropogenic climate change is clear and unequivocal. Atmospheric CO<sup>2</sup> levels have increased 40% since pre-industrial times and are at the highest level in 3 million years.
- Total radiative force is positive – Earth’s surface is absorbing more heat than what is emitted to space. The largest contributor to this is atmospheric CO<sup>2</sup>.
  - Atmospheric CO<sup>2</sup> has a lifetime of centuries to millennia. Policies need to be assessed not on the rate of emissions but on the total cumulative amount.
  - Representative Concentration Pathways (RCPs) in the scientific literature illustrate an indication of a range of possible future emissions and their associated radiative imbalance.
    - RCP 2.6 is the low carbon future (no more than 2 degrees warming) which aligns with the Paris Agreement goal of well below 2 degrees pre-industrial warming and is the only RCP to consider mitigation.
    - RCP 8.5 is the high carbon future (3 to 4 degrees of warming this century) which proceeds on a ‘business as usual’ scenario throughout the 21<sup>st</sup> century where fossil fuels are consumed using present-day patterns – adopting no mitigation efforts – and assumes continued increases of emissions through to 2100. This will cause species extinction, food insecurity and limited potential for adaption.
  - Warming will continue beyond 2100 for all RCPs (it is likely that only RCP 2.6 will result in warming of less than 1.5 degrees). Warming is likely to exceed 2 degrees celsius for RCP 6.0 and RCP 8.5, and more likely than not to exceed 2 degrees celsius for RCP 4.5.
  - From 2015 to 2017, global average temperatures have been the highest on record. In 2016 temperatures exceeded 1.2 degrees above pre-industrial levels.
25. Furthermore, it is very likely that the Arctic sea ice cover will continue to shrink and thin, and that Northern Hemisphere spring snow cover will decrease during the 21<sup>st</sup> century as global mean surface temperature rises. Global glacier volume will further decrease.
26. A large fraction of anthropogenic climate change will be irreversible unless net carbon removal technologies are employed (15-40% of emitted carbon will be in the atmosphere for

1000+ years). The ocean also has already absorbed about 30% of the emitted anthropogenic CO<sub>2</sub>, causing ocean acidification to accelerate.

### **Global Sea Level Rise**

27. Potential sea level rise (SLR) is based on different RCPs and assessed relative to the base 1986-2005 period:
- RCP 2.6 – 2081-2100 period: 0.26m-0.55m rise
  - RCP 8.5 – 2081-2100 period: 0.45m-0.82m rise.

There are a number of tipping points which, if reached, will cause abrupt and irreversible damage.

28. The Arctic Sea Ice Summary identifies 'marine ice sheet instability' as one of these threats. This term refers to the shutting down of the deep sea circulation where the release of methane from thawing permafrost will be a likely tipping point that will occur this century. If the phenomenon known as marine ice sheet instability occurs it would bring about several metres of SLR over coming centuries. This being the case, estimates of the upper limits of SLR this century would need to be raised significantly upwards. If marine ice sheet stability is disturbed then this figure could still be as high as 1.8-2.9 metres by 2100.<sup>15</sup>

### **New Zealand**

29. Average temperatures in New Zealand have increased by approximately 1 degree since pre-industrial times, in line with global mean change and continued warming is virtually certain. An increase in mean temperatures of 0.7 to 1.0 degree is likely by the 2040s and 0.7 to 3.0 degrees by the 2090s.
30. There has been an increase in droughts and floods, storm surges and landslides and the proliferation of these non-uniform events will become very likely (99% probability).
31. The largest projections identified in mean annual wave heights (expressed in percentage terms) were between  $\pm 10$  percent, with the highest increases projected for the tropical Pacific and Southern Ocean. The mean annual wave height in the Southern Ocean will increase largely in winter months. Wave climate in waters around Australia and New Zealand are expected to increase slightly by 2070-2100. Some small increases are expected in the swell exposed west and south coasts of New Zealand in line with the results for long term values.<sup>16</sup>

<sup>15</sup> CKM, Professor James Renwick, Statement of Evidence 19 February 2018, bullet point 9, page 3.

<sup>16</sup> 2017 Guidance: 582 Wave Projections for the Pacific and New Zealand, page 113.

32. Below provides a glance at what New Zealand could expect for both a low carbon future (RCP 2.6) and a high carbon future (RCP 8.5).

**Low Carbon Future**

- Another 1 degree temperature increase this century.
- Eastern and northern regions will get drier, resulting in more droughts.
- Western regions will get wetter, resulting in more floods.
- SLR (relative to 1986-2005 levels) – 2100: 0.46 metres on average; 2150: 0.69 metres on average.

**High Carbon Future**

- Another 2.5-5 degrees temperature increase this century.
- Eastern and northern regions will see a 10% decrease in annual rainfall.
- Western regions will see a 10% increase in annual rainfall.
- SLR (relative to 1986-2005 levels) – 2100: 0.79-1.05 metres; 2150: 1.41-1.88 metres.

In summary, ‘the wet get wetter’ and ‘the dry get drier’.

33. In both futures there will be increased ocean acidification, but to a larger extent under the high carbon future, as global warming increases the uptake of carbon by the ocean.<sup>17</sup>

**Implications for Marlborough**

34. The MfE Report<sup>18</sup> addresses the following implications of a high carbon future for Marlborough.
- Continued increase in ‘hot days’ above 25°C by a factor of 4.
  - Increased drought risk – double the 1995 rate by 2090. This will cause water shortages, increase in irrigation needs and increased risk of wildfires. Droughts are expected to increase in frequency and intensity over time.
  - Increased extreme rainfall events.
  - 30-80% decrease in frosts.
  - SLR: nearly 2.0m by 2150.<sup>19</sup>

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<sup>17</sup> As noted elsewhere in this chapter, this will result in the significant impairment of key species (such as mussels) to form carbonate shells.

<sup>18</sup> <http://www.mfe.govt.nz/climate-change/how-climate-change-affects-nz/how-might-climate-change-affect-my-region/marlborough>

35. Coastal roads and infrastructure will face significantly increased risk from coastal erosion and inundation. Every 10 cm rise triples the risk of coastal inundation.<sup>20</sup>
36. There will be increased biosecurity risks and an increase in food and waterborne diseases; as well as increased respiratory illness, infectious disease, heart disease, stroke and mental health disorders.

### **Scientific Consensus on the Required Mitigation**

#### **Cumulative CO<sup>2</sup> emissions required to keep temperatures below 2 degrees**

37. The Working Group III of the IPCC of the Fifth Assessment Report provides a summary in Table SPM.1 illustrating the likelihood of staying below certain CO<sup>2</sup> thresholds. Proceeding on RCP 2.6 it would be more unlikely than likely for temperature rise to stay below 1.5 degrees, but it is likely to stay below 2 degrees. By comparison, proceeding to RCP 8.5, it is unlikely to stay below even 3 degrees, and even remaining below 4 degrees is more unlikely than not.<sup>21</sup>
38. This illustrates the need for significant reductions (mitigation), occurring globally, to occur now. Rockstrom et al suggest the halving of global emissions each decade starting in 2020.<sup>22</sup>

#### **Recent Developments in Scientific Knowledge**

39. Further research on the contribution of Antarctic ice sheet melt on the effects of SLR has been conducted. RCP 2.6 is the only pathway likely to result in minimal ice sheet melt.
40. Research on SLR has discovered that the upper-bounds estimates of SLR are 'implausible under current understandings'.<sup>23</sup>

#### **Planning**

41. The evidence submitted by Dr Lawrence complements that of Professor Renwick and addresses four main issues:
  - The characteristics of climate change impacts relevant to the PMEP, being time frame issues, uncertainty, changing risk profiles and the implications these have on planning.
  - The mandate for the risk-based approach in the RMA and the NZCPS.
  - Application of the revised MfE Coastal Hazards and Climate Change Guidance 2017.

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<sup>19</sup> CKM, Professor James Renwick Statement of Evidence, 19 February 2018, page 5.

<sup>20</sup> CKM, Professor James Renwick Statement of Evidence, 19 February 2018, page 6(d).

<sup>21</sup> CKM, Professor James Renwick Statement of Evidence, 19 February 2018, page 9.

<sup>22</sup> CKM, Professor James Renwick Statement of Evidence, 17 November 2017, page 12 citing Rockstrom I, Gaffney O, Rangili J, Meinshausen M, Nakicenovic N and Schellnhuber H (2017 A road map for rapid decarbonization. *Science* 355 (6331), 1269 (1271) doi:10.1126/science.aah3443. (See Appendix page 12.)

<sup>23</sup> CKM, Professor James Renwick Statement of Evidence, 19 February 2018, page 13.

- Other potential impacts of climate change across the region relevant to the PMEP.
42. In addressing the first issue, Dr Lawrence emphasises that analysing, characterising and dealing with uncertainty is fundamental to decision-making on climate change. Uncertainty cannot be used as a reason for delaying action on risks – waiting for certainty is not a prudent approach and this should be made clear by the MDC.
43. Dr Lawrence identifies that the 2017 Guidance outlines four elements that support development and implementation of planning strategies in a manner that mitigates this uncertainty over long time frames by identifying:
- different levels of uncertainty, including statistical and scenarios
  - community engagement
  - Dynamic Adaptive Pathways Planning (DAPP)
  - a monitoring programme with early signals and triggers (decision points).
44. These approaches are embodied in the NZCPS’s ‘precautionary principle’<sup>24</sup> (Article 3.3 of the UNFCCC) and the risk-based approach of the earlier 2008 MfE Guidance. The 2017 Guidance, however, provides the DAPP approach for managing uncertainty and changing risk profiles over at least 100 years.<sup>25</sup> This requires consideration of climate change risks to be incorporated into decisions made now, but in a way that retains flexibility (in adjusting to changes before climate change effects became unmanageable). Designing and monitoring signals and triggers for such adjustments should therefore be incorporated into the PMEP. Actions on adaptation can be taken in an anticipatory manner if a risk-based approach is used.<sup>26</sup>
45. The implications of this new DAPP approach by which councils are recommended to address the challenges of climate change and its implications, are set out in the 2017 Guidance. The 2017 Guidance outlines a 10 step decision process, to clarify the necessary steps for developing climate change adaptation strategies with community collaboration at its heart.

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<sup>24</sup> NZCPS (2010) Policy 3 – Precautionary Approach (to the use and management of coastal resources), page 12.

<sup>25</sup> NZCPS (2010) Policy 24(1) identification of coastal hazards, Policy 25(a)-(f) subdivision use and development in areas of coastal hazards risk, Policy 27(1) and (2) strategies for protecting significant existing development from coastal hazard risk.

<sup>26</sup> CKM, Dr Judith Lawrence Statement of Evidence, February 2018, page 16.

46. Figures 1, 2 and 3 from the 2017 Guidance<sup>27</sup> are included to explain the 10 step decision process for developing adaptation processes. Dr Lawrence identifies that at the heart of the process for the community is Step 3 where it can identify what matters most to them, and is the collaborative process that can elicit options and adaptive pathways for addressing the priorities in the region. This provides a way of making adaptation to climate change more manageable, addresses the uncertainties and to gain a degree of community consensus for actions starting now and continuing over time.

### **Global Warming**

47. 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.
48. The timetable for achieving meaningful reduction in carbon is disturbingly short and informs the PMEP's future provisions. An example of the shift in statistics that occurs in analysis of climate change occurs at the outset from submissions.
49. The report writer accepted the change in the Introduction that global average is now more than 1 degree Celsius higher than pre-industrial temperatures, as a better reflection of Professor Renwick's evidence and a change that has occurred since the PMEP was notified. The Panel agrees.
50. A submitter<sup>28</sup> sought to amend the reference in the Introduction explanation to the words 'Global average temperature is now more than 1 degree Celsius higher than pre-industrial temperatures'.
51. Several submitters<sup>29</sup> also support in part the Introduction to Chapter 19. But they are concerned that the words used do not fully reflect the scale and urgency of the problem and understate the amount of warming that has occurred because of a misleading baseline in the PMEP.<sup>30</sup> They are also concerned at the use of the term 'While there is not unanimous agreement' as to the anthropogenic cause of warming from increased levels of greenhouse gases – they assert it is overstated. They are further concerned to not only have the word

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<sup>27</sup> 2017 Guidance, pages 14, 17 and 27.

<sup>28</sup> Peter Deacon (89.2).

<sup>29</sup> CKM (1059.1), Helen Ballinger (351.44), Peter Deacon (89.1).

<sup>30</sup> CKM (1059.1), Helen Ballinger (351.44), Peter Deacon (89.1), FNHTB (716.176).

‘uncertainty’ removed from the Issue 19A description, but particularly the word ‘potential’ in the heading.<sup>31</sup> These submitters provided a marked-up version of the Introduction to explain the nature of their concerns outlined in the Section 42A Report.<sup>32</sup>

52. Other submitters seek: the dates of Marlborough climate change forecasts be changed from 2040 and 2090 to 2060 and 2116 to reflect the 100 year time horizon in the NZCPS. They say the projections discussed in the Introduction are just part of setting the scene;<sup>33</sup> the Introduction should reflect the fact that climate change is the biggest global health threat in the 21<sup>st</sup> century – this needs a reflection in the Introduction;<sup>34</sup> the Introduction is misleading – the Panel is entitled to rely on official New Zealand Government and IPCC reports for its factual basis.<sup>35</sup>
53. As to the projections to the ten year life of the plan, the PMEP states in the Introduction: ‘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.’
54. In discussing the Introduction, last paragraph, Dr Lawrence observes that in summary:
- The impacts of global warming will emerge in different ways and have different levels of uncertainty.
  - It will encompass slow sea level rise accompanied with rising groundwater levels.
  - There will be widening climate variability – drought, increased pluvial flood frequency.
  - There will be extremes – coastal storm surge and inundation.
  - Surprises and impacts of accelerated sea level rise.
  - Continued impacts of all of the above.
  - Cascading impacts from sector to sector into other sectors and socio economic systems such as the provision of water services and health services.<sup>36</sup>

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<sup>31</sup> CKM (1059.1), Helen Ballinger (351.44), Peter Deacon (89.1), FNHTB (716.176).

<sup>32</sup> Section 42A Report, pages 33-35.

<sup>33</sup> FNHTB (716.176).

<sup>34</sup> NMDHB (280.37).

<sup>35</sup> Davidson Family Trust (934.1).

<sup>36</sup> This concern arose in part because Dr Lawrence’s original evidence was written in response to the notified PMEP and not some of the recommendations made in the Section 42A Report in response to the release of the 2017 Guidance.

55. In the coastal environment, the number of residential, commercial and marine activities exposed to climate change effects, and further compounded by natural hazards, would increase the pressure on the Council and costs of adjustments to sea level rise when inundation and coastal flooding increases. Issues such as stormwater debris and sedimentation systems during high intensity rainfall or intense dry periods need to be addressed. Storm water impacts, in the context of health issues, from contamination during high intensity rainfall, will require further attention.
56. In the rural environment, intense rainfall, wind speed, drought and fire events will lead to land use change, sedimentation, sludge, culvert maintenance and an increased demand for water resources across the whole region.<sup>37</sup>
57. Sea level rise is virtually certain until mid-century but, depending on the behaviour of the polar ice sheets and how quickly carbon emissions can be resolved, its rate and magnitude is uncertain beyond that. The Marlborough coastline is long and exposed to the effects of sea level rise, inundation and flooding over short and long terms. But uncertainty is not a reason for delay in addressing risks for climate change.<sup>38</sup>

#### **Section 42A Report**

58. The issue of the PMEP initially underplaying climate change was raised by numerous submitters, and the submission of James Wilson, a member of CKM,<sup>39</sup> provided scope for the report writer to assess the changes sought. The report writer considers that the change identified by Mr Deacon is a better reflection of the change that has occurred, and this was confirmed by Professor Renwick's evidence.<sup>40</sup>
59. The Section 42A Report acknowledged it is reasonable to remove the words 'will continue to rely' and 'for the foreseeable future' from the Introduction. It also supports the removal of the words 'While there is not unanimous agreement' from the first paragraph in the Introduction about the human contribution to global warming. The IPCC Fifth Assessment Report concludes that it is 95-100% likely that human influence has been the dominant cause of warming since mid-20<sup>th</sup> century. It is therefore recommended that it is sufficient to simply start the sentence in the first paragraph with 'There is now strong evidence...'

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<sup>37</sup> CKM, Dr Judith Lawrence, Evidence, page 16.

<sup>38</sup> CKM, Dr Judith Lawrence, Evidence, page 3.

<sup>39</sup> CKM, James Wilson (139.1).

<sup>40</sup> Section 42A Report, Reply to Evidence, page 1.



60. It is also acknowledged that the Introduction could be improved by amending unnecessary assumptions about future behaviour, and by updating the current statistics to be consistent with the latest IPCC findings. It is noted that CKM also seeks to add to the Introduction<sup>41</sup> ‘... that the long-term effects of global warming are likely to outweigh any regional short-term benefits that may occur’ to the current sentence which refers to responding to ‘the adverse and positive effects created by climate change’.
61. Finally, it is recommended to include reference to livestock farming in the Introduction as this sector contributes approximately 48% to New Zealand’s cumulative emissions.<sup>42</sup>
62. The Panel agrees with the evidence of Dr Lawrence, and agrees with the Section 42A Report, that there is a need to emphasise the urgency of the matter and amend the uncertainty as follows by accepting the amendments sought by the submitters.<sup>43</sup>

### Decision

63. The Introduction to Chapter 19 is amended to read:

*Society ~~will continue to rely~~ currently relies on fossil fuels as an energy source ~~for the foreseeable future~~ but needs to find alternatives as quickly as possible. The consumption of these fuels ~~results~~ and livestock farming are the two major contributors to the large increase in the release of carbon dioxide and other greenhouse gases into the atmosphere over the last 150 years. 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~~ Global average temperature is now more than 1 degree Celsius higher than pre-industrial temperatures. To prevent dangerous and potentially irreversible impacts of climate change, the rise in global temperatures must be kept to less than 2 degrees Celsius above pre-industrial levels. ~~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.*

<sup>41</sup> Section 42A Report, Reply to Further Evidence, page 3 following Mr Wilson’s detailed submission ‘Raise the profile of Global Warming and Climate Description within the Environment Plan’.

<sup>42</sup> Section 42A Report, page 34.

<sup>43</sup> Section 42A Report, Reply to Evidence, pages 17-19.

*In Marlborough, ~~NHWA predicts~~ it is predicted that the mean temperature will increase by approximately 1.0-1.0 degrees by 2040 and 2.0-3.0 degrees by 2090 above 1995 levels. 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 ~~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). While there is now a state of scientific certainty regarding the facts of climate change, the exact nature of these effects will always involve a degree of uncertainty, given the timeframe, the range of factors involved and the complexity of global weather systems, as well as the extent that the global community reduces greenhouse gas emissions. However, there is strong national guidance providing for an adaptive management approach that allows uncertainty to be addressed and flexibility in adapting as more information becomes available. 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 and any beneficial effects that may arise. It is noted that the adverse long-term effects of global warming are likely to outweigh any regional short term benefits that may occur.*

## 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.**

64. Marlborough relies on its natural and physical resources for its social and economic wellbeing and these resources, especially land and freshwater, are dependent on climate. This makes Marlborough vulnerable to any long term changes in climate.<sup>44</sup>
65. Several submitters<sup>45</sup> support the Issue 19A statement and most of the explanation. However, they seek:
- The fourth paragraph, regarding potential agricultural benefits, be moved to the end of the explanation section.

<sup>44</sup> PMEP Issue 19A, first paragraph 19-1.

<sup>45</sup> CKM (1059.19), Peter Deacon (89.2), Helen Ballinger (351.46), Marion Harvey (230.1) and FNHTB (716.77).

- The final paragraph regarding the uncertainty associated with climate change predictions be deleted, as the submitters fear that use of the word ‘uncertainty’ may result in inaction.
  - Recognition that decreased water supply would cause increased competition between existing users, and also between existing users and values.
  - Increased emphasis on the seriousness of threats from climate change and the recognition of more recent predictions and models produced by MfE and NIWA.
66. Several submitters specifically seek recognition of the potential adverse effects on mental health, potential injury from extreme weather events (droughts/floods/fires), and recognition of changing insect-borne disease patterns. CKM raises the issues of spread of pest and plants.<sup>46</sup>
67. MFA and AQNZ seek to include ocean acidification generally in Chapter 19, under Issue 19A, and also that the objective should include reference to ocean acidification.<sup>47</sup>

#### **Section 42A Report**

68. The Section 42A Report accepts many of these submissions and recommends that the last paragraph in Issue 19A should be amended, as it is no longer an accurate reflection of the state of knowledge regarding potential climate change effects in New Zealand. Ambiguity arises as the wording does not depict uncertainty in greenhouse gas emissions level predictions but rather the policy decisions that governments and communities will choose. This paragraph is recommended to be amended, rather than deleted, to reflect the certainty in predictions and models in light of the recent IPCC and MfE reports.
69. The fourth paragraph is recommended for retention at its location as notified because moving it to the end of the section, as requested by three submitters, would cause it to become an odd outlier. Instead a qualifying statement should be added to provide stronger emphasis to the negative impacts of climate change. A statement regarding the potential for increased competition for water and also the possible health implications associated with climate change is also recommended to be included in the explanatory section.
70. The Section 42A Report recommends declining AQNZ and MFA’s submission on the grounds that ocean acidification is recognised as a potential effect of what is normally recognised as climate change. The report writer nevertheless sees merit in at least referring to ocean

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<sup>46</sup> NMDHB (280.28), Peter Deacon (89.2), CKM (1059.19).

<sup>47</sup> Reply to Evidence under Issue 19A, page 2.

acidification, but in the discussion under Issue 19A (as this aspect of the issue is not discussed in the PMEP as notified).<sup>48</sup> He recommends adding to the third paragraph of the explanatory text the words ... Ocean acidification, as oceans absorb more carbon dioxide, may cause harm to marine ecosystems and affect fishing and aquaculture.

71. MFA considers in evidence that the report writer's recommendation still does not go far enough to address the issue and provides proposed wording in a tabled revision-marked paper:

*Marlborough's natural ecosystems could also be vulnerable to the effects of climate change and/or ocean acidification. Indigenous terrestrial, aquatic and marine species could respond to increased temperatures and drier conditions by shifting to more climatic zones. Any inability to move may have significant consequences for the long term viability of affected indigenous species, especially plants. Ocean acidification, as oceans absorb more carbon dioxide, may cause harm to marine ecosystems and affect fishing and aquaculture.*

72. In the opinion of the report writer, Counsel's proposed wording gives more information on the effects of ocean acidification, which goes beyond effects on aquaculture and includes effects on ecosystems and other fisheries. He therefore recommends the Section 42A Report wording remain.<sup>49</sup>
73. MFA nevertheless seeks that the words 'and ocean pH' be added to the last sentence of the first paragraph of Issue 19A. This is considered by the report writer as appropriate to read ... 'This makes Marlborough vulnerable to any long term changes in climate and ocean pH.'

#### **Consideration**

74. In relation to the AQNZ and MFA submissions, we recognise that in addition to climate change, a consequence of higher carbon dioxide levels in the sea is ocean acidification. Shells are predominantly calcium carbonate, which dissolve in acid. An increasing seawater acidity therefore has a direct effect on the ability of shellfish to form shells. In addition to obvious effects on shellfish, there is a potential for other species to be impacted as well. Although a serious potential threat to Marlborough's marine ecology, ocean acidification is not an effect of climate change and is therefore not addressed in this chapter.

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<sup>48</sup> Section 42A Report, page 17.

<sup>49</sup> Section 42A Report, Reply to Evidence, pages 2-3.

**Decision**

75. The explanatory text to Issue 19A is amended to read:

*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 and between extractive and in-stream values.*

*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~~. However, these benefits may be limited by negative effects of climate change such as prolonged drought or greater frequency and intensity of storms.*

*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. Climate change may also lead to more stress-related mental health effects from extreme weather events such as droughts, floods or fires as these can cause disruption to individuals and business, including in the primary sector.*

*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. Some of these insects, such as mosquitos, may be carriers of diseases which are currently not present in Marlborough, and which adversely affect human, animal or plant health.*

*~~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.~~ Climate models are improving and many more global model projections were available for the Fifth Assessment Report for the Intergovernmental Panel on Climate Change (IPCC) compared to the Fourth Assessment Report. The 2016 Ministry for the Environment report 'Climate Predictions for New Zealand' has drawn on this work, and as well as a detailed New Zealand regional climate model run on the NIWA supercomputer, to give a report with 'an unprecedented level of detail and robustness in the information provided'. The report notes that climate change effects over the next decades are predictable with some level of certainty. This situation is complicated ~~further,~~ however, 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.*

### **Objective 19.1**

**Mitigation of and adaptation to the adverse effects on the environment arising from climate change.**

76. Dr Lawrence challenges the PMEPs understating of the difficulties in addressing climate change in the second and third sentences of the explanation to the objective. She considers

that the PMEP overstates uncertainty and the difficulties in addressing climate change should be reworded and reworked across the PMEP.<sup>50</sup>

77. Several submitters seek the removal of the word 'offset' from the last sentence to the explanation and its replacement with the word 'reduce', believing that reducing emissions is the more effective approach.<sup>51</sup> Others support the objective and seek its retention as notified since they see it supporting the planting of trees.<sup>52</sup>

#### **Section 42A Report**

78. The report writer says that the significance of adverse effects relative to positive effects should also be illustrated.<sup>53</sup> The existing discussion of Issue 19A is said to imply that negative and positive effects are of equal likelihood and importance when they are not.
79. The original explanation to Objective 19.1 includes the observation that the exact nature of climate change is unknown, making it difficult to plan for its adverse effects. It contains the words '... it is prudent to promote actions that offset carbon emissions and retain sufficient flexibility ... to enable resource users to adapt to a changing climate.'
80. The report writer notes that exact wording changes were not included in Dr Lawrence's evidence but in view of the issue of underlying climate change was revised, the submission of James Wilson provides scope.<sup>54</sup>
81. The Section 42A Report identifies that, in the international agreements the report writer has seen, 'offsetting' is an allowable approach and that New Zealand has met some of its obligations through offsets. He admits the concept is controversial where verification from some regimes is difficult and outcomes questionable. But other offsets such as allowing scrub to revert to forest (or restoration of indigenous biodiversity) are legitimate approaches and have additional environmental benefits. The report writer also recommends amending the last sentence of the explanation to Objective 19.1 and acknowledges there is now certainty regarding the likely local climate changes in Marlborough.

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<sup>50</sup> CKM, Dr Judith Lawrence, Evidence, paragraphs 20-21.

<sup>51</sup> Peter Deacon (89.3), Helen Ballinger (351.46),

<sup>52</sup> Nelson Forests (990.257), MFA (962.116)

<sup>53</sup> Section 42A Report, Reply to Evidence: Peter Deacon (89.2), Marion Harvey (351.45), Helen Ballinger, CKM (1059.19).

<sup>54</sup> Section 42A Report, Reply to Evidence, page 3.

**Decision**

82. The Panel agree the PMEP understates the uncertainty of climate change, and it should be removed. The Panel also accepted the additional recommendations of the report writer and amended the text under Objective 19.1 to read as follows:

*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 t~~ There is inherent There is now scientific certainty regarding climate change. There remains, however, an inherent uncertainty regarding the exact nature and extent of likely local climate changes in Marlborough and their effects. While ~~and therefore the exact nature of those adverse effects is unknown, making it particularly difficult~~ it is still possible to plan for climate change. The planning however needs to be flexible and adaptive. Further research will assist in this regard, refining the potential impacts. In the meantime, it is prudent to promote actions that reduce and 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.*

**New Method - Carbon sequestration purposes**

83. Helen Ballinger suggested a method is required to acknowledge rules included in the PMEP enabling the planting of trees for carbon sequestration purposes.<sup>55</sup>

**Section 42A Report**

84. The report writer in traversing Government's climate change initiatives approves the submission to read: *Encourage tree planting in appropriate locations to assist with carbon sequestration.*

**Consideration**

85. The Panel notes that there are notified rules to enable the planting of carbon sequestration forestry. These rules place limits on both species and location. It would be appropriate for the recommended method to acknowledge these limits.

**Decision**

86. We also consider it appropriate that a new method is inserted before 19.M.8 relating to tree planting and subsequent methods be renumbered accordingly. New method 19.M.8 to read:

*Encourage tree planting of appropriate species in appropriate locations to assist with carbon sequestration.*

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<sup>55</sup> Helen Ballinger (351.52).



### Policy 19.1.1

#### Promote actions within Marlborough to reduce or offset carbon emissions

87. Policy 19.1.1 attracts the same concerns and submitters as Objective 19.1 with Forest and Bird<sup>56</sup> supporting the policy together with the benefits of permanent carbon sinks involving native species, and with NMDHB<sup>57</sup> seeking recognition of the MDC's encouragement of tree planting activities as a reminder to those seeking such an amendment.
88. Dr Renwick considers the policy should focus on promoting a reduction in emissions given the latest evidence that reductions are required. Peter Deacon also expresses these concerns.

#### Section 42A Report

89. The report writer agrees with the suggestion to include a preference in the policy for reductions in emissions rather than 'offsetting', bringing the wording in the policy into line with Method 19.M.1.
90. And as to submitters seeking to provide tree planting as a carbon sink,<sup>58</sup> the Government is establishing a Climate Commission which proposes to plant one billion trees over a 10 year period. MDC is now committed to a part in aligning with the NESPF programmes to achieve these goals.

#### Consideration

91. The Panel does not accept deletion of the word 'offset' as originally sought. It is also included in s 104(1)(a)(b) RMA where it is relevant to resource consents to offset or compensate for any adverse effects. By inserting the word 'reduce' in the policy it aligns with Professor Renwick's evidence that real reductions in emissions are needed 'to avoid dangerous climate change'.<sup>59</sup> The policy should also focus on promoting a reduction in emissions and only promote offsetting as a last resort.

#### Decision

92. Policy 19.1.1 is amended as follows:

*Promote actions within Marlborough to reduce ~~or offset~~ carbon emissions as the preferred option, with offsetting as a less favoured alternative.*

### Policy 19.1.2

#### Improve the community's understanding of the potential effects of climate change on the Marlborough environment.

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<sup>56</sup> Forest and Bird (715.30).

<sup>57</sup> NMDHB (280.39).

<sup>58</sup> Helen Ballinger (351.58).

<sup>59</sup> CKM, Professor James Renwick, Statement of Evidence, page 11, paragraph 3.

93. Several submitters seek changes to the explanatory statement and Anticipated Environmental Results to explain how it will be implemented (i.e. public outreach and education).<sup>60</sup> Another submitter is concerned that there is a lack of detail on how this policy would be put into practice and requires a clear action plan.<sup>61</sup> Others ask for a Climate Change Advisor and others a reference to ocean acidification.<sup>62</sup>

#### **Section 42A Report**

94. The recommendation from the Section 42A Report initially was that the policy remains unchanged but that a Climate Change Advisor position be pursued through the Annual and Long Term Plan process to improve the community's understanding of the issue.<sup>63</sup>
95. The report writer's viewpoint was that the community engagement approach (DAPP) could also be part of the way of involving the community and helping it gain a better understanding of climate change and its effects. He therefore recommends the following amendment at the end of the explanation to read:<sup>64</sup>

*The Council will also use a collaborative engagement process involving the community to help define and understand coastal hazards and climate change, based on the Ministry for the Environment guidance for local government 'Coastal Hazards and Climate Change' 2017.*

#### **Decision**

96. Given the prominence of the DAPP process in the 2017 Guidance, the Panel accepts this addition to the policy to read as set out above.

#### **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.**

97. Several submitters support the policy as notified. Two submitters seek deletion of the policy.<sup>65</sup> They consider the policy is already addressed in Chapter 5 Allocation of Public Resources. Another seeks that the policy could be improved by adding at the end the words 'and the effects on both extractive and instream uses and values'.<sup>66</sup> In terms of the latter, trout in particular have limited ability to adapt to increased water temperature. Another submitter

<sup>60</sup> Peter Deacon (89.5), Helen Ballinger (351.48), CKM (1059.4).

<sup>61</sup> Bill McEwan (259.1), Birte Flatt (478.1).

<sup>62</sup> AQNZ (401.180), MFA (426.188).

<sup>63</sup> Section 42A Report, Reply to Evidence, Climate Change, page 5.

<sup>64</sup> Section 42A Report, Reply to Evidence, pages 5 – 6.

<sup>65</sup> Federated Farmers (425.343) and Trustpower (1201.114).

<sup>66</sup> FNHTB (716.181).

identifies that the policy does not include mention of climate change and does not reflect the intent in the explanatory text.<sup>67</sup>

#### **Section 42A Report**

98. In the report writer's opinion the policy should remain, for it provides additional guidance in the Plan on water allocation specific to climate change and its potential implications and guidance that is not reflected in Chapter 5. He notes that Policies A1 and B1 NPSFW require regional councils when making changes to plans to have regard to 'the reasonably foreseeable impacts of climate change'.
99. On the other hand, the proposed addition of FNHTB would improve the guidance in the policy. The current wording, where it relates to freshwater already allocated, seeks to 'ensure that allocation reflects the status of the resource'. Allocation status of a resource is the terminology used in Chapter 5 and relates to a business-as-usual allocation judgement, not a precautionary approach, to reflect the additional effects of climate change. The change provides guidance as to the effects considered rather than just the allocation of the resource.<sup>68</sup>
100. Trustpower's witness considers the policy should be amended to reflect results of sustainable yield if her interpretation of the explanation is covered with wording identified. The report writer, however, identifies in the first paragraph of the policy that climate change was factored into the sustainable yield of factors used to set into parameters within the PMEP. In the second paragraph, caution is needed if climate change reduces sustainable yield further than forecast.
101. And the last paragraph indicates that the policy can be applied to environmental data collected over the life of the PMEP and inform any subsequent review of Chapter 5 provisions.
102. Nevertheless, the report writer is happy to insert reference to climate change.

#### **Decision**

103. Policy 19.1.4 is retained but amended for the reasons given in both FNHTB and Trustpower's submissions as follows:<sup>69</sup>

*Policy 19.1.4 - Take a precautionary approach to the allocation of additional freshwater resources taking into account the foreseeable impacts of climate change and where*

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<sup>67</sup> Fonterra (1251.55).

<sup>68</sup> Section 42A Report, pages 20-21.

<sup>69</sup> Section 42A Report, Reply to Evidence, page 7.

*freshwater has already been allocated, ensure that the allocation reflects the status of the resource and the effects on both out-of-stream and instream uses and values.*

### **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.
104. Two submitters to this policy consider that (c) is ambiguous because it misses out high flows;<sup>70</sup> two others consider the policy focuses on water allocation and does not fit comfortably with Chapter 19.<sup>71</sup> Two seek that the policy should be deleted.<sup>72</sup>

### **Section 42A Report**

105. The report writer details the differences between Policies 5.4.4 and 5.4.5 (which encourage the use of streamlined transfer of water permits); Policy 5.7.3 which requires rate of water to match intended use in irrigation takes; and Policies 5.8.1 and 5.7.11 which encourage water storage.
106. This is not duplicated with Policy 19.1.5 although they mention storage, water permit transfer and water take. The report writer points out the policy provides an additional lens through which water allocation is viewed to take account of climate change and when adapting to it. It groups together a number of approaches to ensure out-of-stream water use is allocated and used efficiently within the context of adopting and mitigating the effects of climate change.<sup>73</sup>

### **Consideration**

107. It became apparent to the Panel in considering the submission points on policies 19.1.4 and 19.1.5 that the effect of climate change on catchment yield/aquifer level should also be recognised in Chapter 5 in particular where climate change may influence the environmental flows and levels contained in Appendix 6. For this reason, the Panel has also chosen to include additional text in the introduction to Chapter 5 to reinforce this cross-reference.

### **Decision**

108. For the reasons given, Policy 19.1.5 is amended as follows:

<sup>70</sup> Helen Ballinger (351.51) and Climate Karanga (1059.7).

<sup>71</sup> Warwick Lissaman (255.7) and Te Ātiawa (1186.100).

<sup>72</sup> Federated Farmers (425.344) and Trustpower (1201.115).

<sup>73</sup> Section 42A Report, Reply to Evidence, pages 9-10.

*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 during periods of high river flow for subsequent use during low flow and low level periods.*

109. The introduction to Chapter 5 has the following addition:

*The environmental flows and levels set in accordance with the provisions of Chapter 5 are based on hydrological records collated up to the notification of the PMEP. If data collected over the life of the Plan demonstrates that catchment/aquifer yield has changed as a result of climate change, then there may be the need to review the environmental flows and levels contained in Appendix 6. Any change to the operative environmental flows and levels deemed necessary as a result of the review will be made via plan changes.*

#### **Method 19.M.1 Council carbon footprint**

110. Several submitters variously seek additional wording to tie the goals for emission reductions to those of the national reduction targets.<sup>74</sup> In evidence, Peter Deacon considers that Method 19.M.1 should take into consideration the zero emissions target, announced by the Government in 2018, when planning and implementing changes to its own operations in order to support the national target.

#### **Section 42A Report**

111. The Section 42A Report identifies there is merit in the MDC having regard to the national targets when setting carbon reduction goals and its action plan.<sup>75</sup> This allows it to recognise that its regional, and sector, carbon footprints may be different from those at national level. It is recommended that Method 19.M.1 be amended to read: ‘... set goals for reducing carbon emissions *having regard to New Zealand’s national emissions reduction targets* and develop an action plan to reach these goals’.

112. This additional suggestion was rejected by the report writer as he considers this concern is already adequately addressed by the Section 42A Report recommendation. National targets

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<sup>74</sup> Peter Deacon (89.7), Helen Ballinger (351.52) and CKM (1059.8).

<sup>75</sup> Section 42A Report, pages 22-23.

relate to greenhouse gases in general not just carbon emissions as included in the Council’s operation plan for its own operations. The submission is seen to have merit, however, with regard to the national targets when setting their carbon reduction goals.

113. In the light of the importance of monitoring, the MDC sought the addition of a new AER as follows:

*There is a reduction in the carbon footprint of the Marlborough District Council’s operations.*

*Monitoring effectiveness: Council report establishing existing carbon footprint and subsequent reports on reductions achieved.*

**Decision**

114. The Panel accepts the recommendations of the report writer as set out below:

*19.M.1 Council carbon footprint*

*Investigate Council operations to establish their carbon footprint; set goals for reducing carbon emissions having regard to New Zealand’s national emissions reduction targets and develop an action plan to reach those goals.*

115. The Panel accepts that request for the new AER. It links back to the Council’s own approach to addressing its own carbon footprint.

<i>Anticipated environmental result</i>	<i>Monitoring effectiveness</i>
<p><u>19.AER.4</u></p> <p><i><u>There is a reduction in the carbon footprint of the Council’s operations.</u></i></p>	<p><i><u>Council report establishing existing carbon footprint of its operations and subsequent reports on reductions achieved.</u></i></p>

*19.M.2 Marlborough Regional Land Transport Plan*

*Consider, in review of the Marlborough Regional Transport Plan, provisions to reduce emissions of greenhouse gases taking into account the climate change provisions of the MEP.*

*19.M.4 Research*

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

## Climate Change and Sea Level Rise

### Issue 19B

#### Climate change could affect natural hazards and create coastal inundation hazard associated with sea level rise.

116. Under this heading, a number of submitters support the issue statement in part, but seek changes to the explanatory statement. They variously seek: removal of the word ‘potentially’ from the third sentence of the third paragraph of the explanatory statement, as inundation will undoubtedly occur as a result of sea level rise; inclusion of a statement that land subsidence in the Sounds is adding to the rate at which relative sea level rise is experienced; oppose the issue statement, considering it as too limited, deletion of the words ‘and create a coastal inundation hazard associated with sea level rise’ would be more appropriate; coastal inundation is only one of the effects of sea level rise, others are increased risk of landslides, damage from waves as well as effects on natural values including mitigation by sea walls; and a further issue statement is needed to give effect to NZCPS Policies 14 (Restoration) and 26 (Defences against natural hazards).<sup>76</sup>
117. Dr Lawrence however, under the heading ‘Implications for the MEP’, points out that it is quite clear that sea level rise will affect coastal structures, reclamations, ports and marinas with coastal inundation, storm surge and coastal flood events.<sup>77</sup> The Marlborough region with its long coastline will be exposed to the effect of sea level rise, inundation and flooding events over the short and medium terms. Dr Lawrence also agrees with the Section 42A Report that the lower Wairau area and around the Wairau lagoons are likely to be exposed to similar effects, and this is where the MDC’s sewage ponds are located. The extent of sea level rise will also depend on local geology and hydrology.
118. Dr Lawrence considers that the text in paragraph three of the explanatory statement of Issue 19B could be more definitive, with the following amendments:

*... Global warming is raising 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 in areas will become more prevalent, increasing the demand for coastal protection measures ...*

<sup>76</sup> Peter Deacon (89.11), Helen Ballinger (351.57), CKM (1059.14), Judy and John Hellstrom (688.173), FNHTB (716.183).

<sup>77</sup> CKM, Dr Judith Lawrence, Evidence, paragraphs 6 and 12.

119. It is Dr Lawrence's evidence, however, that while the PMEP used the 2008 Guidance to inform the sea level provisions (because when they were written the 2017 Guidance was not available) it was not applied correctly in the Section 42A Report. This came about by not assessing a baseline value of 0.5m relative to the 1980-1999 sea level average along with the recommendation in assessment of potential consequences of a mean sea level rise of at least 0.8m relative to the 1980-1999 average.
120. If the sea level rise allowances are recalculated by assessing this, allowance for sea level rise becomes 1 metre as the minimum level for planning and decision purposes rather than the 0.67m figure recommended in the Section 42A Report.
121. As a result, Dr Lawrence recommends that Council use Table 10 of the 2017 Guidance to set a planning allowance, in conjunction with Table 12 in the 2017 Guidance for activities. Application of the guidance means providing an allowance of 1.52 metres sea level rise at approximately 2130.<sup>78</sup> The PMEP should therefore be changed to reflect the correct minimum allowance of sea level rise as 1.52 metres by 2130.

#### **Section 42A Report**

122. Policy 19.2.2 addresses long-term sea level rise and the effects of storm surge. Also, Method 19.M.4 deals with research to understand the areas along the coast that are likely to be affected by sea level rise. The report writer considers that a minor change to the wording of the existing issue statement, along with providing more explanation, is the most appropriate relief. In addition, changes to Policy 19.2.2 and Method 19.M.4 would also provide some further relief.
123. The report writer accepts that the issue relating to the coastal impacts of climate change involves more than just sea level rise. Storm surges affect inundation and can be a function of both higher sea levels and at times potentially more extreme storms, and some of the risks to natural values. The report writer supports this concept being introduced into the explanatory statement.
124. The report recommends that the word 'potentially' is removed, as it is redundant. Further, land subsidence is considered a relevant issue when combined with climate induced sea level rises and should be included in the explanatory section.
125. The report says a new Issue statement to give effect to NZCPS Policies 14 and 26, however, would be too general to include: hence deletion of the current text would not be appropriate.

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<sup>78</sup> CKM, Dr Judith Lawrence, Evidence, page 5, paragraph 24.



To address the fact that sea level rise is not the only coastal impact of climate change further explanation of other impacts would have to be included.

126. In the report writer's Addendum<sup>79</sup> the report writer supports the changes and recommends that Issue 19B<sup>80</sup> be retained as notified with suggested amendments as follows:

*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 0.55 to 1.36 metres by 2090 2120.<sup>[1]</sup> 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, both of which can have adverse effects on natural values. 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. Where land is subsiding, the adverse effects of sea level rise from climate change can be accelerated.*

*Footnote [1]: Table 10, Coastal Hazards and Climate Change: Guidance for Local Government, 3rd Edition. Ministry for the Environment, December 2017. Consideration*

127. The Panel considers the explanation is too limited and includes inaccuracies. It needs to incorporate the changes as set out in the evidence of Dr Lawrence (who uses a sea level rise of 1.52m at 2130 in comparison to the report writer who uses a sea level rise of 1.36m at 2120).
128. And the extension of that same paragraph with the sentence: Where land is subsiding, the adverse effects of sea level rise from climate change can be accelerated.<sup>81</sup>
129. Otherwise Issue 19B is retained as notified.

#### **Decision**

130. The explanatory text to Issue 19B is amended as follows:

*... Global warming is ~~expected to result in a rise in~~ rising sea level due to thermal expansion of ocean water and melting of glacial and polar ice. Sea level is predicted to rise 0.55 to 1.52*

<sup>79</sup> Addendum to Section 42A Report, Paragraph 52

<sup>80</sup> Erroneously referred to in paragraph 52 of the report as Issue 4A

<sup>81</sup> Section 42A Report, Reply to Evidence, page 12. Judy and John Hellstrom (688.17).

~~around 0.18 to 0.59 metres by 2090~~ 2130. This rise ~~potentially~~ increases the risk of inundation at the coast. Coastal erosion ~~could also~~ in areas will become more prevalent, increasing the ~~need~~ demand for coastal protection measures, both of which can have adverse effects on natural values. 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. Where land is subsiding, the adverse effects of sea level rise from climate change can be accelerated.

### 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 1980–1999 average; and  
 (b) Storm surge.

131. FNHTB<sup>82</sup> oppose the policy as they consider it does not give effect to the NZCPS. It seeks instead that the policy is replaced with one that requires any new development to avoid coastal hazards and take into account at least a 100 year time frame having regard to the NZCPS policies, in particular Policy 24(1)(a)-(h).

132. Ngāti Kuia<sup>83</sup> and Federated Farmers<sup>84</sup> support the policy in part and variously seek:

- A more conservative allowance of one metre for sea level rise over 100 years.
- A focus on habitable buildings where there is a risk to human life, not simply any building (for example, farm sheds and other ancillary buildings).
- Deletion of ‘and where appropriate infrastructure’ for similar reasons.

133. KCSRA<sup>85</sup> support Chapter 19 in part. It is concerned, however, that Policy 19.2.2 relates only to avoiding and locating new buildings and infrastructure within the coastal inundation area. It considers that a new policy should be provided so as to define steps to protect or replace existing infrastructure such as roads in the context of coastal hazard and sea level rise – an issue we address under an additional Policy later in this topic decision.

<sup>82</sup> FNHTB (716.185).

<sup>83</sup> Ngāti Kuia (501.82).

<sup>84</sup> Federated Farmers (425.346).

<sup>85</sup> KSCRA (869.32).

**Section 42A Report**

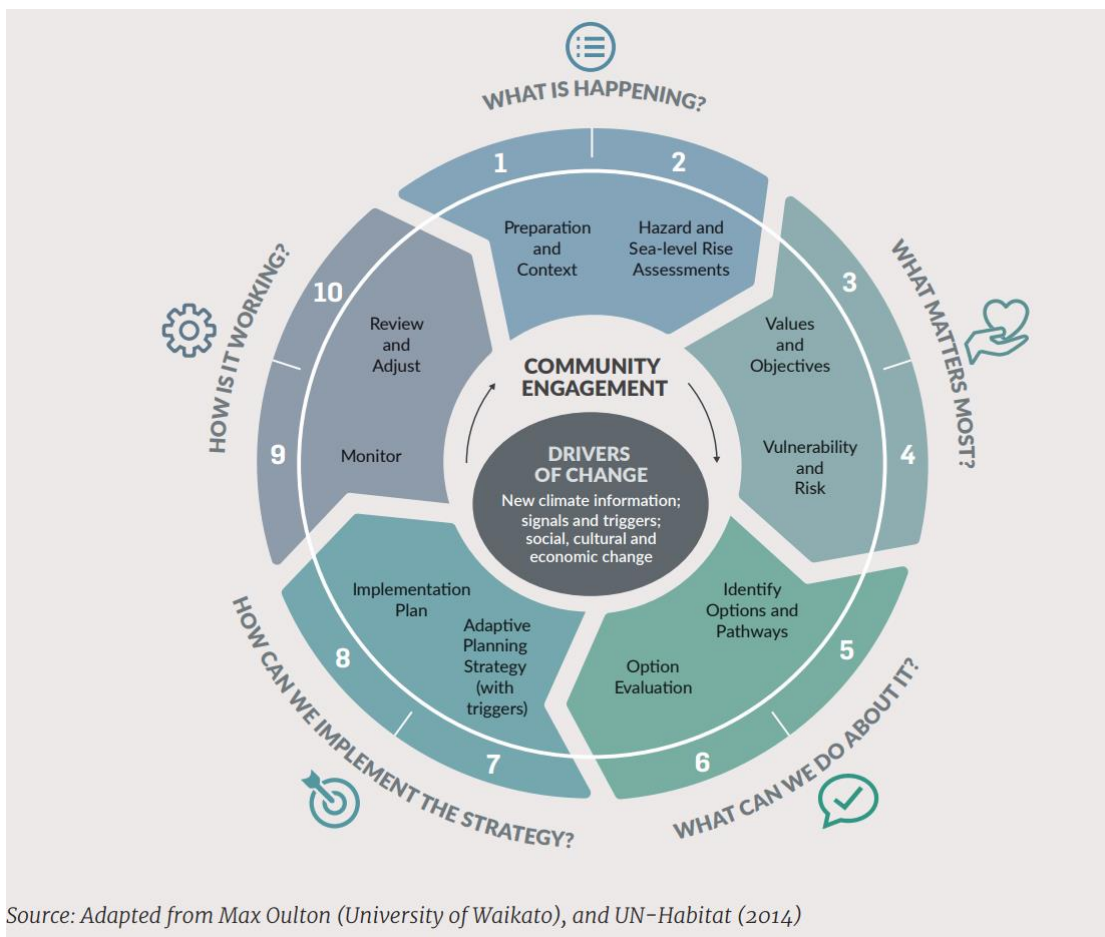
134. Following the release of the 2017 Guidance document, the writer of the Section 42A Report considered that further amendment to his initial recommendations on Policy 19.2.2 is required to bring the PMEP to align with its findings and recommendations.
135. In order to determine scope to make required changes, the report writer advised that FNHTB, in its initial submission,<sup>86</sup> had opposed Policy 19.2.2 as it did not give effect to the NZCPS (2010) Policy 24: Identification of coastal hazards. Consideration of this policy also brought into consideration other relevant policies of the NZCPS and Objective 5, which require that decision-makers ensure that coastal hazard risks, taking into account climate change, are managed (by locating new development away from areas prone to risk and considering responses including managed retreat for existing development).
136. The submission around non-habitable buildings and services infrastructure is not supported in the Section 42A Report as it removes important guidance on coastal locations. Restriction of non-habitable buildings would exclude commercial buildings, commercial centres and industrial centres. These could otherwise be located in areas subject to sea level rise.
137. Excluding infrastructure from the policy would also remove important guidance as to the location of infrastructure relative to coastal inundation. It is prudent to have regard to sea level rise and storm surge risk when decisions are made on the location and design of new infrastructure, since these developments can often be multi-million dollar community investments. Finally, buildings (whether habitable or not) and vulnerable infrastructure if allowed to establish within identified future inundation areas, and this occurs, can have effects on natural character and coastal processes (if buildings (and roads) are destroyed) or lead to pressure for coastal defence works to protect the infrastructure. The changes sought are not supported in the report.<sup>87</sup>
138. With regard to NZCPS (2010), the PMEP contains three provisions seeking to give effect to the precautionary approach as required in implementing Policy 24. These are the explanation to Policy 19.2.2 (which requires buildings to be set back from the Coastal Marine Area); Policy 19.2.2 itself (which operates as a guide for building applications within the setback) as well as construction of infrastructure in the coastal environment; and amended Method 19.M.9 (which provides an investigation process for defining the extent and nature of the inundation hazard).

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<sup>86</sup> FNHTB (716.185).

<sup>87</sup> Section 42A Report Addendum, pages 16-19 and 29-30.

139. The report writer agrees the explanation to Policy 19.2.2 should be based on a timeframe of at least 100 years.<sup>88</sup> The current time frame in the policy is only 75 years and this does not give effect to the NZCPS (Policy 24(1)). This change will result in adjustment of the sea level figure provided by MfE to reflect the longer timeframe and a further explanatory statement depicting how the amended figure is derived.
140. The 2017 Guidance draws on the relevant NZCPS requirements around coastal hazards, their identification, location and management and use provisions to transition to the dynamic adaptive pathways planning approach. Until this approach is finalised, interim guidance on minimum sea level rise allowances and scenarios is required. These are set out below and constitute the basis for further amendment to Policy 19.2.2 as analysed and set out in the Section 42A Report.



**Figure 1** The 10-step iterative decision cycle in the revised 2017 NZ coastal guidance, grouped around five questions that frame each stage in the process (Source: (Ministry for the Environment, 2017). Adapted by the Ministry for the Environment from (UN-Habitat, 2014).

<sup>88</sup> NZCPS (2010) Policy 24(1) requires identification of areas of high hazard risk 'over at least 100 years'. The NZCPS (2010), Policy 24(1) identification of Coastal Hazards.

141. Figure 1 describes the dynamic adaptive pathways planning approach (DAPP) provided in the 2017 Guidance. At its heart, as identified by Dr Lawrence, is community engagement which is critical to the process:

*The Dynamic Adaptive Pathways Planning (DAPP) approach (Haasnoot et al)<sup>89</sup> is an exploratory model-based planning tool that helps design strategies that are adaptive and robust over different scenarios of the future. It has been developed as an analytical and assessment approach for making decisions under conditions of uncertainty. Effective decisions must be made under conditions of unavoidable uncertainty (Dessai et al, 2009).*

*In the context of rising sea levels, where conflicting values prevail for coastal areas, the consequences of decisions can be profound, and may be impossible to reverse. This will result in activities that are locked-in to the place and space, thereby reducing the ability of decision-makers to adapt to future conditions. Costly adjustments that have distributional consequences on different groups within society may result.*

*The DAPP therefore focuses on keeping multiple pathway options open into the future – these help alleviate irreversible decisions and reduce the risk of being wrong when making decisions in the present. It does this by making transparent future actions that can be taken, should actions today prove insufficient to meet objectives.*

*The DAPP approach can also be used to facilitate iterative decision-making involving both decision-makers and stakeholders. The DAPP approach has been used increasingly for implementing climate-resilient pathways for water management in situations of uncertainty; its application to a problem of compounding coastal hazard risk resulting from sea-level rise is particularly helpful for decision makers.*

*Within the DAPP, a plan is conceptualized as a series of actions over time (pathways). The essence of the approach is the proactive planning for flexible adaptation over time, in response to how the future actually unfolds. The DAPP approach starts from the premise that policies/decisions have a design life and*

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<sup>89</sup> Based on two complementary approaches for designing adaptive plans: ‘Adaptive Policymaking’ and ‘Adaptation Pathways’, which Haasnoot et al (2013) originally called ‘dynamic adaptive policy pathways’. Here the term Dynamic Adaptive Pathways Planning is used.

*might fail as the operating conditions change (Kwadijk et al, 2010).<sup>90</sup>*

142. The process anticipates the inevitable adverse effects on communities by linking transitional sea level rises to the scale or type of development; the MDC is thus given the ability to avoid increasing exposure to coastal hazards – a requirement of the NZCPS Policy 24(1)(h). These transitional sea level rise allowances set out in Table 12 are:

- A Coastal subdivision, greenfield developments and major new infrastructure – avoid the hazard risk by using SLR over more than 100 years and H+ scenario**
- B Changes in land use and redevelopment (intensification) – adapt to hazard by conducting a risk assessment using a range of scenarios and using the pathways approach**
- C Land use planning controls for existing coastal development and assets planning – use of single values at local/district scale until DAPP is undertaken**
- D Non-habitable short lived assets with a functional need to be at the coast, and either low consequence or readily adaptable (including services) – 0.65m sea level rise.<sup>91</sup>**

### Consideration

143. Dr Lawrence recommended using Table 10 of the 2017 Guidance to set out a planning allowance until the DAPP processes can be applied using the four RCP scenarios *in conjunction with Table 12 in the 2017 Guidance for Activities A*. ‘For the life of the PMEP at approximately 2130 gives a minimum allowance of 1.52 metres.’ This would amend the recommendation given in the original Section 42A Report for Policy 19.2.2.<sup>92</sup>
144. Table 12 identifies minimum transitional New Zealand-wide SLR allowances for use in planning instruments where a single value is required at a local/district level while in transition towards adaptive planning pathways planning.
145. Category A gives a description for coastal subdivision, greenfield developments and major new infrastructures and a transitional response which requires avoiding hazard risk by using sea level rise over more than 100 years in the H<sup>+</sup> scenario. Category B is where intensification of existing development is inadvisable. Category C generally concerns existing infrastructure. Category D deals with non-habitable short lived assets where consequences are low.
146. The Panel queried why the four RCP scenarios of New Zealand-wide regional sea level rise projections for use with the 2017 Guidance included extensions to the H<sup>+</sup> 2150 based on Kopp et al (2014).

<sup>90</sup> Statement of Evidence by Judith Helen Lawrence on behalf of Climate Karanga Marlborough, 1 February 2018, Appendix 1 Dynamic Adaptive Pathways Planning Approach, page 21.

<sup>91</sup> 2017 Guidance, Table 12 Minimum transitional New Zealand-wide SLR allowances and scenarios for use in planning instruments where a single value is required at a local/district scale while in transition towards adaptive pathways planning using the New Zealand-wide SLR scenarios, page 108.

<sup>92</sup> Guidance 2017, pages 107-108.

147. The 2017 Guidance document identifies that no further extrapolation of the IPCC beyond 2120 (the minimum requirement) is possible (for the scientists to model appropriately), hence the rate of rise for the Kopp 4 median projections (50<sup>th</sup> percentile) for RCP2.6, RCP4.5 and RCP8.5 H<sup>+</sup> are shown as dashed lines from 2130 to provide extended projections to 2150. All scenarios include a small sea level rise offset from the global mean SLR for the regional sea around New Zealand.<sup>93</sup>
148. RCPH<sup>+</sup> is a reminder that sea levels will keep rising after 100 years, irrespective of actual future greenhouse gas emissions. It is a stress-tested scenario used by US Army Corp of Engineers 2014, National Research Council 2012, US Department of Transportation 2014, and UK (Lowe et al) for critical infrastructure.
149. Dr Lawrence's opinion is based on the application of s 6(h) RMA and the management of significant risks for subdivision, greenfield development and the guidance given in the NZCPS. Objective 5 (locating new development away from areas at risk from coastal hazard risk and climate change) is also referenced.<sup>94</sup>
150. The Panel also queried a transitional provision in the 2017 Guidance category B 'Changes in land use and redevelopment (intensification) – adapt to hazard by conducting risk assessment using a range of scenarios and using the pathways approach'.
151. The words 'a range of scenarios', whether RCP4.5 median or RCP8.5 median, does not provide the certainty required by decision makers as do those set out in categories C and D for hazard risk and vulnerability. We note that the 2017 Guidance identifies that where intensification is inadvisable (category B) no transitional value is provided. It is not provided 'as this could create future path dependency and avoidable increase in future risk if a higher SLR occurred'.<sup>95</sup> But the heading to Table 12 of the 2017 Guidance refers to a 'single value' for category B while in transition towards adaptive planning use.
152. One of the concerns held by the Panel is that if a range of options is not fully explored with input from all sectors of the community, when it comes to resource consent applications in

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<sup>93</sup> The largest projections identified in mean annual wave heights (expressed in percentage terms) were between  $\pm 10$  percent, with the highest and best use increases for the tropical Pacific and Southern Ocean. The mean annual wave height in the Southern Ocean will increase largely in winter months. Wave climate in waters around Australia and New Zealand are expected to increase slightly by 2070-2100. Some small increases are expected in the west and south coasts of New Zealand.

<sup>94</sup> We note that as identified by Dr Lawrence, Section 13 Use of Coastal Environment is a context setting section for the whole region. As noted earlier, a cross-reference to the climate change chapter in the PMEP would signal relevant impacts and risks the region faces from climate change.

<sup>95</sup> 2017 Guidance, pages 111-112. Also Chapters 9 and 10.

the future then consents may be held accountable for either too little protection or too much. This is where a staged approach may be the best option, also advised in the 2017 Guidance.

153. Dr Lawrence makes the point that on current projections it becomes increasingly important that areas already at risk from the effects of climate change are not made more so by increasing exposure to the community and assets. The results have the potential to be extremely costly (both to the community and MDC) as ongoing sea level rises and frequency of high intensity rainfall increases. Dr Lawrence stresses the meaning of 'effect' under the RMA has particular relevance to the changing risk conditions that are evolving for the 'effects of climate change' (see s 7(i) RMA) and the definition of effects under s 3 RMA which includes cumulative effects arising over time regardless of scale, intensity, duration or frequency. This reference to 'cumulative effects' should be mentioned in the top level policy (as it will be at the district level resource consents).
154. To reflect the Panel's concerns about the application of a single value to SLR for intensification until the adaptive pathways approach was complete, we drew attention to the report writer about its lack of certainty in the planning context.<sup>96</sup> Intensification of existing development is more problematic than that identified in categories A, C and D, as it is essentially an amalgam of new and older development together with the infrastructure that services an area against a background of rising sea levels.
155. On the advice of MfE and the authors of the 2017 Guidance, the Panel was advised through the memorandum from the report writer, that the inclusion of category B in Table 12 as having a single value for sea level rise, is a mistake. The revision of the penultimate draft in 2017 of the Guidance introduced a new category for sea level rise to the existing three by separating out greenfields developments (and major new infrastructure) from intensification of existing development. Table 12 as an oversight does not accurately reflect this.<sup>97</sup>
156. The recommendation of the report writer against this background is to have a set figure from the guideline in Table 10 (a SLR of 1.52m for the H<sup>+</sup> scenario and 1.18m for RCP8.5) but with the option to vary this approach if the proponent of the development undertakes a DAPP approach in accordance with the guidelines and that is acceptable to the Council.
157. This approach, in the report writer's opinion, would give the developers and the public the certainty and simplicity of a figure but the ability to look at modifying that approach if they

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<sup>96</sup> Minute 27 of the Hearing Panel to David Jackson, Reporting Officer, dated 24 May 2018.

<sup>97</sup> Memorandum to Chair and Members, Hearing Panel, David Jackson, Reporting Officer, 2 July 2018.



wish to spend the time of undertaking a DAPP. In the transition period which category B is designed to provide certainty for, the Panel considers it is unlikely a DAPP could be realistically achieved and prefers the certainty of the 1.52m H+ scenario.

158. Such a policy for Category B might be as follows:

*(b) Changes in land use and redevelopment (intensification) – use a minimum 1.52m sea level rise using the range of scenarios and a dynamic adaptive pathways planning approach; use of minimum 1.52m sea level rise, or a level set by conducting a risk assessment using the range of scenarios and a dynamic adaptive pathways planning approach at a scale appropriate to the proposed development.*

159. We note that Dr Lawrence had earlier recommended using Table 10 of the 2017 Guidance in conjunction with Table 12 for Table A in the 2017 Guidance. At approximately 2130 this would give a minimum allowance of 1.52 metres. This is for an H<sup>+</sup> scenario.

#### **Timing**

160. Dr Lawrence also considered that Policy 19.2.2 (as recommended in the Reply to Evidence<sup>98</sup>) should be amended further to clarify when application of the 100-year timeframe should be considered. She considers it should be from the end of the life of the plan, not the start (when notified).

161. The report writer advises he does not consider that tying the timeframe to the end of a plan's life is appropriate, as this is very uncertain; rather, it is better the forecast be from the time the proposal is planned to be built/developed. This gives a definable starting point and allows for situations where developments may obtain any lag between statutory approvals and commencement of works. The final sentence in the policy should be amended to clarify this by adding:

*Dynamic adaptive pathways planning approach, and the climate change/sea level rise scenarios in clauses (a) and (b) [of the policy], are as defined in 'Coastal Hazards and Climate Change: Guidance for Local Government', Ministry for the Environment, December 2017. Sea level rise figures, and scenarios/forecasts, are applied from the year in which the development is planned to occur.*

162. The Section 42A Report recommended that Policy 19.2.2 is deleted and replaced entirely<sup>99</sup> but the report writer's response to Minute 27 was that a single figure approach for Category B

<sup>98</sup> Section 42A Report, Reply to Evidence, Climate Change, page 13.

<sup>99</sup> FNHTB (716.185), Ngāti Kuia (501.82).

was preferable for the transition period but the Panel may wish to consider leaving open the option of a DAPP for a developer. The Panel did not agree with that option.

### Decision

163. The Panel agrees for the reasons given. The replacement recommendation which the Panel accepts is as follows:<sup>100</sup>

Policy 19.2.2 - For planning and development in the coastal environment the following sea level rise allowances and scenarios must be used (until a dynamic adaptive pathways planning process is completed) to assess and manage potential coastal hazard risk:

- (a) Coastal subdivision, greenfield developments and major new infrastructure – use a minimum 1.52m sea level rise; and;
- (b) Changes in land use and redevelopment (involving intensification or use of land beyond the existing footprint of built development or structures) – use a minimum 1.52m sea level rise; and;
- (c) Existing coastal development and assets within their existing footprint – use a minimum 1.0m sea level rise; and
- (d) Non-habitable short-lived assets with a functional need to be at the coast, and which either have low consequences or are readily adaptable (including services) - use a minimum 0.65m sea level rise.

Dynamic adaptive pathways planning approach, and the climate change/sea level rise scenarios are described in “Coastal Hazards and Climate Change: Guidance for Local Government, Ministry for the Environment, December 2017”

164. Consequential changes in response to the submissions of FNHTB and Ngāti Kuia,<sup>101</sup> are accepted to the extent that the explanation to Policy 19.2.2 is amended as follows:

~~In 2013, the~~ International Panel on Climate Change has 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 use a ‘dynamic adaptive pathways planning’ approach to considering the effects of climate change, and managing and adapting to it and the hazards risk from plan for a sea level rise and climate change. The approach provides flexibility that

<sup>100</sup> Section 42A Report, Reply to Evidence (Addendum, page 18).

<sup>101</sup> FNHTB (716.85) and Ngāti Kuia (501.82).

allows an agreed course of action to be changed if the need arises. 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.

Until the adaptive pathways planning is undertaken, the Ministry for the Environment guidance is to use interim sea level rise allowances and scenarios, depending on the type of activity. This advice, for four categories of activity, is reflected in Policy 19.2.2. The allowances are based on Table 10 and Table 12 of the guidance which provides for three minimum transitional sea level rise allowances and scenarios. Also, the decadal increments for sea level rise over the next 100 years are not equal, but get larger under the H+ scenario further into the future.

The Council has chosen to specify a single values for Category A and Category B activity of 1.52m (unlike the guidance) in order to provide certainty to resource users: ~~1.52 metres for Category A activity and 1.18 metres for Category B activity~~ 1.52 metres is the H+ scenario for greenfield development and new infrastructure in 2130. ~~1.18 metres is the RCP8.5 M scenario for land use change/intensification in 2130.~~ The minimum sea level rise allowances in (a) and (b) therefore provide a 100 year allowance for that type of activity proposed during the life of the MEP.

Although the life of the MEP is only ten years, buildings have a minimum design life of 50 years and new subdivisions and property titles have an indefinite life. Equally, new infrastructure can be long-lived, and involve multi-million-dollar community investment. The policy reflects the different timeframes, and increases of sea level – and the different risk involved – associated with various types of development. It also recognises that a different approach is possible with new compared to existing development. 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. For example, development under (a) and (b) both involve multiple (and potentially numerous) properties. In these circumstances, given the scale of development, and therefore the scale of the investments being made, it is necessary and appropriate to take a precautionary approach to planning for sea level rise for new or intensification development. In contrast, development under (c) is more likely to involve an existing individual property and, as the development already exists, it is acceptable to plan for a lower level of sea level rise.

~~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, plan changes and designations. 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.*

### **[New] Policy 19.2.3**

165. Several submitters support Chapter 19 in part but also sought additional policies relating to: the installation, operation and utilisation of alternative energy sources that do not emit greenhouse gases; the promotion of plantation and carbon sequestration forest planting; the protection or replacement of existing infrastructure (such as roads) in the context of sea level rise and coastal inundation.<sup>102</sup>

#### **Section 42A Report**

166. The Section 42A Report initially recommended that the PMEP should be retained as notified with no additional policies. Chapter 18 for example contains policies that promote renewable energy and carbon sequestration forestry so additional policies on those issues are not considered necessary.
167. It is also initially pointed out in the Section 42A Report that the PMEP has little influence over existing infrastructure because it is owned by independent companies. Method 19.M.8 does however require areas subject to risk of future inundation (and the infrastructure in these areas) to be defined. It was considered the best way to manage risks to existing infrastructure was considered to be via various Asset Management Plans as these provide strategies, timeframes and financial resources to address the risk.

#### **Reply to further evidence**

168. Mr Caddie, on behalf of KCSRA, did not favour the original Section 42A Report response limiting MDC to research, together with the LTP and Annual Plan processes, as to what steps needed to be taken either to review what the Council needs to either protect or renew existing infrastructure in the context of sea level rise and coastal hazard. He was concerned about the practicality and lack of policy support for the relevant method (19.M.8 Research) as

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<sup>102</sup> Te Rūnanga o Ngāti Kuia (501.80), Nelson Forests (990.259), KCSRA (869.42).

well as the need to give effect to the NZCPS. Mr Caddie proposed: 'Identify Council infrastructure (for example, roads) where the coastal environment is under threat of inundation from rising sea levels and associated storm surges and take steps to avoid or mitigate the adverse effects of such outcomes on the use and availability of that infrastructure.'

169. While this submission was initially rejected by the report writer, as advised to the Panel, the Addendum to the Section 42A Report after the release of the 2017 Guidance provided scope to give effect to KCSRA's suggested policy. Peter Deacon's original submission on Objective 19.2<sup>103</sup> provided that scope to investigate where and how the effects of sea level rise will be felt in Marlborough, and into what measures are needed to futureproof communities and create resilience to sea level rise.
170. On this issue, the report writer reflected that Policy 19.2.2 is an interim approach only, and Mr Caddie's proposed Policy 19.2.3 would therefore form part of the DAPP approach outlined in the revised Guidance. The DAPP process involves a high level of community engagement and ownership, including the community defining what matters to them, and options to address the effects on things that matter.

#### **Consideration**

171. In the process of addressing Mr Caddie's argument, the report writer and the Panel queried why focus on the Council's infrastructure but not other infrastructure owned by the NZTA, KiwiRail and wharves, jetties or community facilities, even if not owned by the MDC.
172. We accept most of the report writer's amended recommendations in the light of all the further evidence identified. The intent of this new policy is wider than just existing Council infrastructure and he identifies the relevant policies of the NZCPS (2010) which require such assessments.
173. The amendments we considered were to refer to 'communities' at the end of the policy (as opposed to repeating areas, assets and infrastructure), and the first and second sentences of the recommended explanation to be modified to refer to policies of the NZCPS.

#### **Decision**

174. A new policy is inserted as 19.2.3 as follows:

*Using a collaborative community engagement model, identify and prioritise areas, assets and infrastructure (eg roads) where the coastal environment is under threat of inundation from*

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<sup>103</sup> Section 42A Report citing Peter Deacon (89.12), page 27.

rising sea levels and associated storm surges. Using that process, develop an implementation plan to avoid or mitigate the adverse effects of inundation on the community.

175. And the explanation to the new policy will read:<sup>104</sup>

Policy 24(1) of the New Zealand Coastal Policy Statement requires identification of areas 'potentially affected' by coastal hazards and climate change' (and Policy 25 and Policy 27 of the NZCPS) 'likely to be affected and developing strategies for reducing risk. Policy 19.2.2 in the MEP provides interim guidance on coastal hazards 'until a dynamic adaptive pathway planning process is completed'.

This policy sets out the process to be applied in the 'dynamic adaptive pathways planning' (DAPP). The DAPP process, and the community engagement that is integral to it, is described in the 'Coastal Hazards and Climate Change: Guidance for Local Government', Ministry for the Environment, December 2017.

176. The methods listed are included in the PMEP with minor amendments accepted as suggested by the submitters and the Section 42A Report.

19.M.89 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 and storm surge in the long term, and those that are most valued by the community, including iwi. 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.10 Community engagement and evaluation

The Council will lead a process to evaluate and identify the areas, assets and infrastructure valued by the community but also likely to be inundated by sea level rise and associated storm surges. An action plan will be developed with the affected communities using the engagement process in the Ministry for the Environment guidance. This involves using the 10 step decision cycle for long term strategic planning and decision making for coastal areas set out in Figure 6.1

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<sup>104</sup> NZCPS (2010) Policy 25 Subdivision, use and development in areas of coastal hazard risk, page 24.

[R, C, D]

*19.M.910 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.1011 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 and community engagement outlined above is completed. The research and community engagement 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**

**New AER**

- 177. Dr Lawrence affirms inclusion of a statement regarding monitoring of environmental results and the effectiveness of the PMEP to include natural hazards and climate change effects.
- 178. The Panel considered that it was important to ensure the DAPP process was completed during the life of the Plan. A new 19.AER.4 is proposed to ensure that occurs.

**Decision**

- 179. A new 19.AER.4 is inserted as follows:

19.AER.4

*The community is involved in planning for the consequences of inundation from sea level rise and associated storm surge.*

*Monitoring Effectiveness: The 10 step community engagement and evaluation process set out in Policy 19.2.3 and Method 19.M.9 is completed.*

**Location and Profile of Chapter 19**

- 180. A number of submitters<sup>105</sup> support the profile of a separate chapter on climate change in part and variously seek:

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<sup>105</sup> James Wilson (139.1), Roger and Leslie Hill (378.1), Birte Flatt (478.1), Bill McEwan (2591), Hugh Steadman (427.1), Pamela Nichols (309.1) and Te Runanga of Toa Rangatira (1663).

- Climate change to be recognised as a much higher priority. This could be achieved by moving the chapter to the start of the MEP or by integrating climate change provisions throughout other chapters.<sup>106</sup>
- Further emphasis of the disruptive and potentially exponential effects of climate change.

181. A number of submitters seek to stress the importance of climate change and have it moved up in the hierarchy of chapters.

#### **Section 42A Report**

182. The Section 42A report writer considers there is not only one correct way to address climate change within a planning document. It flows more logically from the processes of identifying resource management issues and then developing objectives, policies and methods to address these.

183. The report concludes by recommending that Chapter 19 remain as notified, but with cross-referencing and other amendments supported in this report. Placing the provisions in a separate chapter highlights that it is a significant issue and reduces the risk of climate change effects being de-emphasised (that is, if provisions were to be scattered throughout the document). The climate change provisions could, however, be strengthened by an increased emphasis on the disruptive and exponential effects as submitted above.

#### **Consideration**

184. The Panel considered whether the Climate Change chapter should be retained where it is located, merged into the Natural Hazards chapter, or moved. Our consensus is that the issue of climate change is so important it should be located to an earlier chapter in the PMEP.

185. We considered that relocating Chapter 19 in proximity with Chapter 7 'Natural Hazards' is more appropriate due to its close association with that topic in NZCPS Policy 24(1)(a)-(h). Natural hazards and climate change have inter-related connections but require separate identification for other independent issues that arise. The seriousness of the issue for New Zealand and Marlborough is identified throughout Professor Renwick's scientific evidence and experience, and the adaptive measures identified by Dr Lawrence in her evidence addressing how communities may adapt to its effects if mitigation measures to restrict growth of carbon are unsuccessful.

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<sup>106</sup> Such as Chapter 8 Indigenous Biodiversity, Chapter 13 Use of the Coastal Environment.



186. We note better integration of climate change throughout the PMEP also comes up in the evidence of Dr Lawrence who suggests Chapter 13 Use of the Coastal Environment is a context setting for the whole region and cross-referencing to climate change in specific Issue 13D, Objective 13.5 and Policy 13.5.7 (with other references) would provide a more robust statements for the climate change issue.<sup>107</sup> The Panel accepts this method of integrating the issue into other chapters because of its significance.

**Decision**

187. The Panel shifted the position of Chapter 19 Climate Change in Volume 1 of the PMEP to Chapter 6.

188. As will be addressed in other topic decisions, several other chapters will also be repositioned. These include Chapter 11 Natural Hazards moving to the Chapter 5 position, with cross referencing to the Use of the Coastal Environment chapter. Also Chapter 5 Allocation of Public Resources to move to immediately before the Use of the Coastal Environments chapter. As a consequence of these re-arrangements, numbering within chapters will change in accordance with these amendments.

189. For clarity, the table of contents for Volume 1 will appear as follows:

1. Introduction
2. Background
3. Marlborough's Tangata Whenua Iwi
4. Use of Natural Resources
5. Natural Hazards
6. Climate Change
7. Natural Character
8. Landscape
9. Indigenous Biodiversity
10. Public Access and Open Space
11. Heritage Resources and Notable Trees
12. Urban Environments

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<sup>107</sup> CKM, Dr Judith Lawrence, Evidence, paragraph 21d.

13. Allocation of Public Resources
14. Use of the Coastal Environment
15. Use of the Rural Environment
16. Resource Quality (Water, Air, Soil)
17. Waste
18. Transportation
19. Energy