

## Submission on the inquiry into climate change adaptation

14 June 2024

To: Finance and Expenditure Committee  
Parliament Buildings  
Wellington

Submitted online.

Appendices:

- (1) Submission on the Proposed National Policy Statement for National Hazard Decision-making (attached)
- (2) Forest & Bird - Making Room for Rivers (linked)<sup>1</sup>
- (3) Forest & Bird - Every Wetland Counts (linked)<sup>2</sup>
- (4) Forest & Bird - Climate Change and Introduced Browsers reports (linked)<sup>3</sup>

### Submitter details

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<sup>1</sup> <https://www.forestandbird.org.nz/resources/tukua-nga-awa-kia-rere-making-room-rivers>

<sup>2</sup> [https://www.forestandbird.org.nz/sites/default/files/2022-02/Every%20Wetland%20Counts%20brochure\\_1.pdf](https://www.forestandbird.org.nz/sites/default/files/2022-02/Every%20Wetland%20Counts%20brochure_1.pdf)

<sup>3</sup> <https://www.forestandbird.org.nz/resources/climate-change-and-introduced-browsers>

## INTRODUCTION

1. Forest & Bird is Aotearoa New Zealand’s largest and longest-serving independent conservation organisation. We outlined our purpose and role in conservation and environmental change in paragraphs 1-8 of our submission on the ‘Inquiry into community-led retreat and adaptation funding’ in 2023 (our 2023 submission). We refer the committee back to our submission for this introduction.
2. Forest & Bird has a particular interest in this inquiry. The evidence used, decisions made, and any direction given, or recommendations made relating to emissions reduction, land cover and use, resource management, conservation and ecosystem services, and infrastructure have a large bearing on the achievement of our priorities and the protection and restoration of nature. This in turn has an impact on the collective wellbeing of New Zealanders.
3. Forest & Bird has been advocating for nature-based solutions to risks from natural hazards like flooding for nearly all of our 100-year existence. A pamphlet from our first decade has a call to action which is just as relevant today and is very relevant to this committee’s deliberations:

*"New Zealanders! No forests means decreased production, desolation and poverty. Will YOU help to avoid these results?"*

4. Forest & Bird submitted to the Environment Select Committee’s inquiry into climate adaptation (2023). As noted by the committee guidance, we assume that submission will be considered within this current inquiry and will not resubmit the content. However, we may refer the Committee back to it where relevant.

## SUBMISSION POINTS

(presented by TOR topic and questions posed by committee)

### (a) THE NATURE OF THE CLIMATE ADAPTATION PROBLEM NEW ZEALAND FACES

5. This section addresses the TOR topic on the “nature of the climate adaptation problem New Zealand faces” and the following questions posed by the committee. It divides the section by question. Key points in our answers are **emboldened** to make summary or reference easy for readers.
  - What are the problems with New Zealand's approach to managing climate-related natural hazards? What are the underlying drivers of these problems?
  - What are the particular issues facing Māori, especially sites, assets, and land vulnerable to climate-driven natural hazards?
  - What outcomes should such an approach to adaptation lead to? What are the highest priorities to achieve?

- What are the particular issues facing Māori, especially sites, assets, and land vulnerable to climate-driven natural hazards? (NB: this is addressed again under 'Roles and Responsibilities')

**What are the problems with New Zealand's approach to managing climate-related natural hazards?  
What are the underlying drivers of these problems?**

6. **Historic and ongoing land use change in Aotearoa New Zealand has significantly increased our vulnerability to natural hazards**, which is now being worsened by rapidly increasing climate change. It is a key driver of our high exposure to natural hazards. Widespread clearance of native forest (particularly on steep erodible hill-country), drainage and destruction of wetlands, and development of riverbeds and floodplains has increased the speed with which water flows across our landscapes, worsening flooding, erosion, and drought. Landscapes cannot regulate or store the water flowing across and through them, resulting in widespread damage during extreme weather events (and increasing difficulty accessing water during dry periods as recharge is reduced and groundwater levels drop). This is only worsening with climate change. It is critical the committee understand that:
- Ninety percent (90%) of natural wetlands in Aotearoa have been destroyed<sup>4</sup> and this is exacerbating flooding problems.** Following Cyclone Bola in 1988, the Parliamentary Commissioner for the Environment (PCE) wrote "The draining of wetlands has intensified flooding problems in many areas, as wetlands can "buffer" floodflows."<sup>5</sup> This seems to have been ignored and wetlands continue to be lost<sup>6</sup> (and protections are being weakened<sup>7</sup>). Flooding, unsurprisingly, continues to worsen as well.
  - Native forest cover has been reduced by approximately three-quarters, reducing it from 82% to 23% of the land surface area.<sup>8</sup> This is also exacerbating erosion and flooding problems.** The PCE wrote in 1988 that "...extensive deforestation... has led to... greatly accelerated, widespread, severe erosion...". Their advice that "pastoral farming cannot be considered a sustainable land use on much of [the East Coast's] hill country... [and]...afforestation of the land probably represents the only realistic, economically viable, erosion control option" was ignored.
  - Development of urban areas and productive land uses has been concentrated in floodplains and has taken space from rivers and streams which they require to flood safely. Again, this is worsening flooding impacts.** For example, Environment Canterbury

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<sup>4</sup> <https://newzealandecology.org/nzje/3444>

<sup>5</sup> Parliamentary Commissioner for the Environment, (1988). Inquiry into flood mitigation measures following Cyclone Bola. <https://pce.parliament.nz/publications/archive/1987-1996/inquiry-into-flood-mitigation-measures-following-cyclone-bola/>

<sup>6</sup> [https://www.wetlandtrust.org.nz/wp-content/uploads/2021/02/ROOT-CAUSES-OF-WETLAND-LOSS-IN-NZ\\_Jan-2021.pdf](https://www.wetlandtrust.org.nz/wp-content/uploads/2021/02/ROOT-CAUSES-OF-WETLAND-LOSS-IN-NZ_Jan-2021.pdf)

<sup>7</sup> e.g., Government's removal of some of the protections for wetlands from coal mining. <https://www.beehive.govt.nz/release/first-rma-amendment-bill-introduced-parliament>

<sup>8</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0006320706002886>

reports nearly 15,000 hectares of undeveloped or forested land alongside braided rivers have been developed into intensive agriculture since 1990.<sup>9</sup> The PCE wrote in 1988 that “...unwise intensive development behind stopbanks has often been encouraged...” and “In the interests of future generations... government cannot allow the... nation’s floodplain land to be unwisely used.” This advice was also largely ignored.

- d. **Reduced biodiversity and decreased ecosystem functionality exacerbate the impacts of climate change**<sup>10</sup>. The health of indigenous ecosystems is crucial, as these ecosystems provide essential services from natural systems that are integral to our economic, cultural, social, and environmental wellbeing<sup>11</sup>. For example, clean water and stable levels in groundwater provides for irrigation; healthy soil underpins crop growth; and healthy insect populations provide pollination. Recognizing this, the United Nations has endorsed ecosystem-based adaptation as a primary approach in climate resilience strategies<sup>12</sup>. It is imperative that Aotearoa New Zealand's adaptation frameworks prioritize the protection of both the natural environment and the communities that depend on it.
7. While the impact of extreme weather events on our communities is worsening as landscapes’ buffering capacity degrades, **decision-makers at all levels of government continue to develop new communities in increasingly high-risk locations**. There is a desperate lack of specific central government direction (except perhaps the NZ Coastal Policy Statement) for decisions at any level to consider the risk from natural hazards and climate change. While the RMA provides for councils to manage land to “avoid or mitigate” natural hazard risks, councils are reluctant to do so. This reluctance has been noted in an MfE/HBRC case study report, saying “Councils are concerned that they will be taken to court if they try to strengthen provisions to prevent development occurring...” and “Councils are concerned... that they will not be able to implement appropriately restrictive zoning to avoid further building behind defensive measures.”<sup>13</sup>
8. The fundamental lesson of comparing the recommendations of the Parliamentary Commissioner for the Environment after Cyclone Bola (in 1988) and the impact of Cyclone Gabrielle is that since 1988

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<sup>9</sup> Environment Canterbury *Land use change on the margins of lowland Canterbury braided rivers, 1990–2012* (2015) (Report Number R15/49); Environment Canterbury *Land use change on the margins of lowland Canterbury braided rivers, 2012–2019* (2021) (Report Number R21/05).

<sup>10</sup> <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/ecosystem-function>

<sup>11</sup> <https://www.doc.govt.nz/globalassets/documents/conservation/biodiversity/anzbs-2020-biodiversity-report.pdf>

<sup>12</sup> <https://www.unep.org/topics/climate-action/adaptation/ecosystem-based-adaptation>

<sup>13</sup> Ministry for the Environment, HBRC. Case study: Challenges with implementing the Clifton to Tangoio Coastal Hazards Strategy 2120. (p. 22, p. 29). <https://environment.govt.nz/assets/Publications/Files/challenges-with-implementing-the-Clifton-to-Tangoio-coastal-hazards-strategy-2120-case-study.pdf> (note the suggestion that councils “Councils are concerned [they can’t restrict development], based on past Environment Court decisions...” is based on rumour rather than fact: we have been informed by the court that no decisions they are aware of have overruled any council's attempt to restrict development at risk of natural hazards.)

society has made poor choices in an effort to address issues like housing affordability, population growth, without adequately considering environmental risk, with the consequential imposition of an estimated \$9b - \$14.5b (The Treasury<sup>14</sup>) cost to society resultant of the Auckland Floods and Cyclone Gabrielle. As of September 2023, insurance companies had paid out over \$3.5b<sup>15</sup>. The irony of being overly focused on property rights over responsibilities is that it has led to substantial damage to property. This is particularly the case where:

- a. tolerating poor environmental management in upper catchments (such as through pastoral farming and poor forestry management on erodible land) has destroyed property lower in the catchment (e.g., sediment loss upstream buried land downstream).
  - b. reluctance to limit development on floodplains has put investment in the path of damage exacerbated by poor catchment management.
9. This apparent national flaw in decision making continues. An example of this is the 1,415 new homes consented on Auckland flood plains in the year since the 2023 flooding disaster<sup>16</sup>. Another is the proposal to build housing in a flood-prone area of Napier.<sup>17</sup> Prior to that, a section of floodplain at Tangoio in Hawke's Bay was approved for upzoning (despite apparent regional and district council reluctance at the council hearing<sup>18</sup>) and building consents approved. The development flooded when Cyclone Gabrielle hit and is now zoned category 3, with council and government facing significant cost in buying landowners out (not to mention frustration from landowners, who had been allowed to build there with an expectation it would be their new home).
10. Aside from new developments, **across the country there are already 441,384 residential buildings at risk of flooding**, with an estimated replacement value of \$218 billion<sup>19</sup>. **Despite being at risk of flooding, these areas can still be subdivided and intensified, meaning more families and infrastructure can be exposed to natural hazard risk, increasing potential future social and economic cost.** Councils urgently need stronger direction and tools (and resourcing, financing, and information) from central government to address this risk<sup>20</sup>. In our view, a national policy statement on natural hazard decision-making is required as soon as possible addressing both intensification in

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<sup>14</sup> <https://www.stuff.co.nz/business/131883544/repair-bill-from-cyclone-and-auckland-floods-at-least-9b-treasury-estimates>

<sup>15</sup> <https://www.icnz.org.nz/industry/media-releases/2023-climate-disaster-payouts-top-2-billion/>

<sup>16</sup> <https://www.rnz.co.nz/news/in-depth/507562/1415-new-homes-consented-on-auckland-flood-plains-in-the-year-since-flooding-disaster>

<sup>17</sup> <https://www.nzherald.co.nz/nz/plan-to-build-houses-on-flood-prone-napier-land-not-viable-councillor-says/P5FLAVVRBFGCZOWJJG6RCG2RBI/>

<sup>18</sup> <https://www.nzherald.co.nz/hawkes-bay-today/news/seaside-community-plan-takes-shape/Q6WS56IOBUJELPGLMJCBGFBJRY/>

<sup>19</sup> <https://www.rnz.co.nz/news/national/493223/more-than-400-000-residential-buildings-in-flood-prone-areas>

<sup>20</sup> <https://www.hud.govt.nz/news/impact-of-climate-change-on-homes-buildings-and-places-have-your-say-on-the-draft-national-adaptation-plan>

existing at-risk locations and new development in at-risk locations. Forest & Bird's submission<sup>21</sup> on the proposed NPS-NHD can be referred to for details on how this can be achieved.

11. **New Zealand's local government finance position means that planned relocation / managed retreat is likely to be extremely unaffordable for councils.** It is difficult to see how regional or district/city councils could undertake planned relocation / managed retreat without systematic changes to the planning and fiscal system. As it stands, they have relatively low capacity to buy out property in high-risk locations. While this pressure is acute at the local level, central government faces similar pressures given the scale of assets (both private and public) that are at risk.
  
12. The above **issues are likely to be further exacerbated by the complexities created by property rights. Drawing the line on who owns and who is responsible for managing what, including risk created in one location, but where the impacts are more widely felt, remains a thorny issue.** We are aware of the Government's stated intention to reform resource management law with a particular focus on private property rights. The Government needs to be mindful that any changes to individual property rights need to be looked at in the context of environmental impacts that are increasingly falling beyond traditional or existing property boundaries. Changes which do not take in to account our changing climate could present further adaptation problems for society and the Government. For example, community re-location or retreat could be more difficult where individuals wish to stay and assert their rights to remain in place. Questions are increasingly likely to be posed about the ongoing provision of public services (utilities etc.) to those who choose to remain. The committee needs to be conscious that natural hazards pay no regard to where we draw lines on a map and the property rights in those bounds. This issue will grow in urgency in coming years and while it sits alongside the question of who pays, it has complexities of its own which need to be considered carefully and not exacerbated through future resource management reforms.
  
13. Just as the impacts of climate change cannot be looked at solely within property boundaries, nor should activities that can contribute to climate impacts and create a need for adaptation measures elsewhere. It should also be noted that property rights, for example, to drain a wetland or clear native bush on a property can exacerbate downstream flooding impacts and impinge on the 'rights' of those communities downstream to be safe from natural hazards. Again, natural hazards pay no regard to where we draw lines on a map and property rights in those bounds.
  
14. A number of submissions on the Fast Track Approvals Bill have warned of the risks that **the Fast Track Approvals Bill will lead to increased risks to life and property from natural hazards through inadequate decision making at pace.** The Parliamentary Commissioner's presentation to the Environment Committee addressed aspects of this, as did the New Zealand River's Group.

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<sup>21</sup> <https://www.forestandbird.org.nz/sites/default/files/2024-02/Submission%20on%20Proposed%20NPS-NHD%20-%20Forest%20%26%20Bird.pdf>

15. **New Zealand is failing to reduce its emissions fast enough to make a meaningful contribution to slowing climate change, meaning the extreme weather impacts we are adapting to are increasing at a rate we will struggle to keep up with.** New Zealand continues to underperform with regard to mitigating its emissions.<sup>22</sup> We have no effective system to reduce emissions from agriculture, which makes up over 50% of our emissions<sup>23</sup>. Ironically, as the climate continues to rapidly warm, agriculture will be one of the industries to suffer the most, as access to surface and groundwater for irrigation lessens in dry seasons, stock struggle to cope with warmer temperatures<sup>24</sup>, and crops potentially fail (or are destroyed, such as during Cyclone Gabrielle). **Our inaction on emissions reduction will mean we must adapt to greater impacts at an ever-increasing rate and threatens to undermine entire industries we rely on, including agriculture.**

16. **Current adaptation is made more difficult by New Zealand's large reliance on outdated methods of adaptation, such as grey infrastructure/engineering.** This was covered in paragraph 9 of our 2023 submission (and elaborated on in paras 10-17):

...communities have relied on 'engineered' solutions to manage risks from natural hazards, such as flooding... [these] protection systems only provide a certain level of protection from disaster and are effectively temporary in nature, [but] this generally has not been recognised by the public and communities protected by them.

[As] the climate changes, these solutions are increasingly prone to fail... It is increasingly clear to people and decision makers that we cannot protect ourselves from every natural hazard, and that in many cases moving out of harm's way is the most effective option...

Rather than look back to using 'engineered' solutions of the past (which have many unintended consequences and have been ecologically destructive, as well as expensive), we need to look at how we can work with and enhance nature to help us adapt to these impacts. By protecting nature, we can protect ourselves and our communities...

We urgently need to shift our thinking and include nature-based solutions

17. International practice to manage natural hazards has, over the past several decades, increasingly used nature-based solutions to reduce risk. Nature-based solutions are accepted by environmental engineers and experts, such as geomorphologists (river experts), as being the most cost-effective option for adaptation in the long-term with significant social, cultural, and ecological co-benefits.<sup>25</sup>

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<sup>22</sup> e.g., Climate Action tracker rates New Zealand's actions as "Highly Insufficient".

<https://climateactiontracker.org/countries/new-zealand/>

<sup>23</sup> <https://www.stats.govt.nz/information-releases/greenhouse-gas-emissions-industry-and-household-year-ended-2022/>

<sup>24</sup> <https://www.mpi.govt.nz/dmsdocument/58891-Thermal-stress-summary-for-dairy-cattle-beef-cattle-sheep-and-deer-in-Aotearoa-New-Zealand>

<sup>25</sup> See for example Brierley et al. (2022). Reanimating the strangled rivers of Aotearoa New Zealand.

<https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wat2.1624>

**New Zealand has been slow to adopt (and slow to require through legislation) nature-based solutions as the priority for investment when mitigating hazards.** Nature-based solutions should be the priority over grey infrastructure, wherever feasible. The proposed NPS-NHD included useful policy direction on this (see Policy 6 (a) “nature-based solutions are preferred over hard-engineering solutions;”).

18. **Planning timeframes (and election cycles) are generally so short that they result in prioritising short-term gain or lowest-economic cost in decisions, even if that costs communities more in the long term.** This is covered in part in para. 67 of the summary of submissions. Ideally, we should be planning out for 100 years or more when making decisions, as per the NZCPS.

67. Submitters noted planning timeframes as one area in particular where greater alignment would be beneficial. For example, the New Zealand Coastal Policy Statement requires consideration of the next 100 years, long-term plans under the LGA are for 10 years, infrastructure strategies are for 30 years, and the Building Act requires consideration of the next 50 years.

19. **The existing planning system ignores residual risk** (i.e., The fact that there is still a risk even if a community is ‘protected’ by infrastructure such as a stopbank. This the risk of the stopbank being overtopped, which has higher impact consequences than if the stopbank weren’t there – albeit a lower likelihood of flood occurrence). This is covered in paras 32-34 of our 2023 submission and provided in part here:

[In Hawke’s Bay] the convergence of two stopbanks [at Pakowhai], which were designed to protect the area, effectively created a ‘bathtub’ effect when water had overwhelmed stopbanks upstream, causing the area to flood to much greater depths than it otherwise would have if the stopbanks weren’t there, and resulting in people being evacuated from their rooftops by helicopter and boat.

20. **The existing system (and ongoing changes to it) are failing to protect the ‘natural’ or ‘green’ infrastructure that we have – our forests, rivers, and wetlands – which provide natural hazard mitigation.** As noted, above in paragraphs 6-6d, New Zealand has lost much of the natural systems that mitigated natural hazard risk by slowing water down and holding soil on hillsides. But this loss has not stopped – ecosystems continue to be lost (e.g., ongoing wetland<sup>26</sup> or natural area loss on private land<sup>27</sup>). This will be exacerbated further by the weakening of protections for nature by this Government. This reduces the ability of landscapes to naturally mitigate natural hazard risk and climate change impacts, and ultimately costs us in ‘downstream’ adaptation costs (or impacts and clean-up expenses). It also has impacts on things like provision of clean and safe drinking water,

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<sup>26</sup> The Root Causes of Wetland Loss in New Zealand: An Analysis of Public Policies & Processes. National Wetland Trust. (2021). [https://www.wetlandtrust.org.nz/wp-content/uploads/2021/02/ROOT-CAUSES-OF-WETLAND-LOSS-IN-NZ\\_Jan-2021.pdf](https://www.wetlandtrust.org.nz/wp-content/uploads/2021/02/ROOT-CAUSES-OF-WETLAND-LOSS-IN-NZ_Jan-2021.pdf)

<sup>27</sup> See No Evil: Biodiversity Loss on Private Land. Forest & Bird. (2021). [https://www.forestandbird.org.nz/sites/default/files/2021-05/F%26B\\_See%20No%20Evil%20Report\\_2021.pdf](https://www.forestandbird.org.nz/sites/default/files/2021-05/F%26B_See%20No%20Evil%20Report_2021.pdf)



groundwater levels, recreation, and air quality, among other things. The issue of residual risk from the loss of natural infrastructure should be looked at alongside the residual risk from hard infrastructure.

21. The irony of this lack of emphasis on protecting natural infrastructure to provide natural hazard mitigation is that this is not a new concept in New Zealand. Forest & Bird was advocating for forest protection for soil and water conservation almost a century ago. Much of our current stewardship conservation land managed by the Department of Conservation (DOC) was originally ‘State Forest,’ and was protected for soil and water conservation reasons; the large extent of West Coast native forest was protected because it protects the farms, towns and infrastructure of the West Coast

*“Protection of the forest and soil mantle to protect the movement of debris into stream systems with consequent stream aggradation, flooding, and loss of water quality should be the first aim in all indigenous State forest areas.”<sup>28</sup>*

#### **What are the particular issues facing Māori, especially sites, assets, and land vulnerable to climate-driven natural hazards?**

22. **Taking of Māori land and the subsequent relocation of many hapū and marae has placed many Māori communities at higher risk of natural hazard.** As a result of land being taken from Māori, Māori have been left with ‘marginal’ land in many locations – land that is difficult to access or located in places of high natural hazard risk. This means they have limited choice on where they can build communities and makes relocation almost impossible. Māori are best placed to speak to these issues, but we note them to recognise the significant barrier this creates to effective adaptation and the further marginalisation that is risked for Māori if this isn’t considered in a future system.
23. **Many historic decisions on flood protection ignored what Māori wanted for their waterways and these impacts have not been redressed.** For example, the relocation and channelisation of the Ngaruroro River near the coast in Hawke’s Bay for flood protection has caused the effective death of the now Karamu Stream and Mokotūāraro River as it flows past Kohupātiki marae.<sup>29</sup> The relocation of the river also contributed to the ‘bathtub’ effect and flooding at Pakowhai noted at paragraph 19 above, in a clear example of the unintended and adverse social, culture, ecological, and economic consequences of supposed ‘flood protection’ engineering.
24. Paragraphs 66-68 of our 2023 submission provide further comments on considerations relating to Māori and are support for addressing the issues they face with the existing system.

#### **What outcomes should [a durable, affordable, and fair approach] to adaptation lead to? What are the highest priorities to achieve?**

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<sup>28</sup> Protection Forest Policy, New Zealand Forest Service, 1977.

<sup>29</sup> <https://www.stuff.co.nz/environment/300422562/this-is-how-it-ends-the-long-fight-of-the-river-people>

25. The loss of wetlands, forest, and riverbed/floodplain in landscapes have dramatically reduced their ability to cope with extreme weather. It is critical the committee understand that **any framework for climate adaptation will not be complete without mechanisms that drive restoration of ecosystems, which mitigate the impacts of extreme weather and climate change.** Without environmental restoration of forests, wetlands, and rivers/floodplains, we will not be able to slow or adapt sufficiently to climate change.

26. We consider the adaptation system must:

- a. **Be coupled with emissions reduction strategies.** If we do not reduce emissions, climate change impacts will continue to increase at a rate that we will struggle to keep pace with adapting to.
- b. **Stop the loss of existing ‘natural defences’ – wetlands, forests, riverbeds, and floodplains.** Ongoing loss of these ecosystems exacerbates impacts. This should be achieved through whatever means possible with urgency and must include regulation as well as incentive. We note the NZ Coastal Policy Statement policies 25-26 which direct protection of ecosystems in coastal areas to protect these ecosystems. Such protections must be extended to inland areas (see our submission on the proposed NPS-NHD<sup>30</sup>).
- c. **Stop development in high-risk locations such as floodplains** (e.g., Tangoio, Auckland). This could be achieved through introduction of the NPS-NHD.
- d. **Stop or limit intensification (including subdivision) in areas that are currently protected but where serious residual risk exists or where risk could significantly worsen over time.** While these areas are protected now (e.g., behind a stop bank) the likelihood of the protection being overwhelmed will increase with climate change, and the impact of overtopping will be more if more houses are allowed to be developed in that area.
- e. **Require the restoration of ecosystems so they can provide hazard mitigation.** We should be aiming to restore catchment native ecosystem cover to something ecologically sustainable (e.g., 30% of natural forest cover, 30% wetland cover, etc.) so these ecosystems are able to sustain themselves and not risk collapse or extinction, while providing hazard mitigation.
- f. **Provide for ecosystem retreat**, such as where coastal saltmarsh or wetland or dunes will need to retreat inland to be able to continue to provide hazard mitigation services (known as coastal squeeze<sup>31</sup>).
- g. **Address the issue of the gap between what local (and central) government finance can bear and the value of property and assets**, which makes planned relocation difficult to afford for government and council. Somehow, the system needs to increase council and

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<sup>30</sup> <https://www.forestandbird.org.nz/sites/default/files/2024-02/Submission%20on%20Proposed%20NPS-NHD%20-%20Forest%20%26%20Bird.pdf>

<sup>31</sup> <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/what-is-coastal-squeeze#:~:text=Coastal%20squeeze%20is%20now%20defined,conjunction%20with%20other%20coastal%20processes>

- government resources relative to land prices (to enable buyouts, for example). See Appendix 1 for an expansion of this discussion.
- h. **Avoid a system that considers property rights in isolation** and instead considers spillover impacts, collective wellbeing and area-based management. As noted above, natural hazards do not pay regard to where we draw lines on a map or to the supposed rights within those lines.
  - i. **Not be undermined by the Fast-track Bill.** As noted above and in others' submissions on the Bill, the Bill risks worsening natural hazard risk, destroying ecosystems that provide hazard mitigation, and putting communities in harm's way.
  - j. **Prioritise nature-based solutions.** These are accepted internationally by environmental scientists, ecologists, geomorphologists, and engineers as being the best way to manage natural hazard risks and to maximise co-benefits.
  - k. **Make it a requirement that long-term planning horizons are considered in all decisions that may affect natural hazards** (50-100 years). Shorter term political cycles or long-term plan decisions are much too short to account for climate change-induced natural hazard risk.
  - l. **Address residual risk.** As per point (d) above, the system must also deal with the residual risk that remains even where 'protections' have been put in place. It must educate the public on these residual risks. As the PCE noted in 1988, "Public perception of river control schemes has been that the schemes offer an absolute standard of flood protection and unwise intensive development behind stopbanks has often been encouraged".<sup>32</sup>
  - m. **Recognise the considerable contribution to climate change (and increasing risk) that agriculture and other polluters are playing and internalise these costs.** The system can also recognise the significant potential for emissions reductions from industry and for nature-based solutions on rural land, for example, and incentivise opportunities for emissions reductions and nature-based solutions.
  - n. **Work with and listen to Māori in how they wish to participate in an adaptation system** to ensure issues of equity – particularly regarding land ownership and access – are addressed.
  - o. **Incentivise and/or require retrofitting of existing infrastructure to increase adaptation.** For example, green roofs, stormwater ponds and tanks at a household scale, planting of gardens with flax and native grasses (rather than mown lawns), etc.
  - p. **Maximise co-benefits.**
  - q. **Be evidence-based** and require that advice from natural hazard experts, geomorphologists, etc. be given high regard through decision-making processes.

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<sup>32</sup> <https://pce.parliament.nz/publications/archive/1987-1996/inquiry-into-flood-mitigation-measures-following-cyclone-bola/>

## **(b) FRAMEWORKS FOR INVESTMENT AND COST-SHARING**

27. This section addresses the TOR topic on “frameworks for investment and cost-sharing” and the following questions posed by the committee. It divides the section under heading (rather than by question).

- What would be a durable, affordable, and fair approach to adaptation for the existing built environment (i.e., where people live and work) in the future? How could that approach be phased in over time?
- What outcomes should such an approach to adaptation lead to? What are the highest priorities to achieve?
- What do you think the costs will be? How should these various costs be distributed (e.g. amongst property owners, widely across New Zealanders, and ratepayers, now and in the future)? Should this distribution change over time?

**28. The three principles that should guide the allocation of costs for adapting to climate change are:**

- Polluter Pays Principle:** The polluter pays principle is a long-standing principle of environmental management that seeks to internalise the environmental cost of activities as a way of discouraging pollution, correcting market failure and avoiding hidden subsidies. An adaptation levy on greenhouse gas emissions to cover a significant proportion of the cost of adaptation to the impact caused by emissions would be a fair means of allocating cost in relative proportion to responsibility. Such a levy should lie outside the emissions trading scheme because the emissions trading scheme is highly distorted, excluding approximately half of emissions (e.g., agriculture) and subsidising trade-exposed industries and those that can exercise strategic leverage (such as the Tiwai Point aluminum smelter).
- Beneficiary Pays Principle:** Property owners benefit from investment in climate change risk reduction. Investments in catchment management, forest protection, and wetland and dune restoration lower the risk to property, and this benefits property owners. One approach that could be considered to resource this sort of investment (in upstream nature-based solutions to reduce downstream risk) is a levy on property insurance, as risk reduction to property has the greatest effect on the property insurance market. A well-functioning insurance market is essential to maintaining an effective property market as was learnt with the freeze on property insurance in Canterbury after the Canterbury earthquakes. Property owners benefit from risk reduction because it lowers premiums and helps ensure property can be insured. Insurance companies benefit from risk reduction through reduced business risk and greater market viability. Expenditure from an insurance levy would best be directed towards nature-based solutions that reduce risk.

- iii. **Just transition:** In designing a system where the balance of cost lies between the Crown and property owners, and between ‘polluter pays’ and ‘beneficiary pays’, consideration should be given to not disproportionately loading costs onto those who can least afford to pay and the extent to which people have knowingly taken on risk. There is no reasonable excuse for allowing or undertaking future development in areas facing climate risks. Where new development or land use intensification occurs in places subject to climate risk the costs should be borne by the property developer and not the Crown and there should be a disclosure on property sales and leases (to ensure that any new owners or renters don’t unknowingly take on risk), see Appendix 1 for elaboration on this. Such disclosures also need to be considered against the ability of those poorer people in society, who may end up living in high-risk location out of necessity if these are cheaper places to live. This situation needs to be avoided.

29. Accordingly, Forest & Bird largely supports the principles outlined by the Expert Working Group (EWG) on Managed Retreat in their report, those principles being:

- Limit the Crown’s fiscal exposure.
- Minimise moral hazard.
- Design solutions to be as simple as possible.
- Ensure fairness and equity for and between communities, including across generations.
- Beneficiaries of risk mitigation should contribute to costs.
- Minimise costs over time by providing as much advance notice as possible.
- Solutions support system coherence and the overall adaptation system response.
- Risks and responsibilities should be appropriately shared across parties, including property owners, local government, central government, and banking and insurance industries.

30. The primary gap in these principles (from the EWG) is the polluter pays principle. Forest & Bird is surprised that a report by a working group looking at managed retreat that is required because of greenhouse gas pollution from human activities does not explore the polluter-pays principle in depth (it is mentioned at para. 5.206,<sup>33</sup> but only insofar as suggesting society as a collective group of polluters today must pay for future adaptation, not singling out significant polluters to contribute). New Zealand committed to applying the polluter pays principle when it signed up to the Rio Declaration in 1992 and the principle have a sound basis in economics. Emissions should be levied for the purposes of funding adaptation on an “all sectors, all gases” approach and this should be separate from emissions pricing aimed at reducing emissions and enhancing carbon storage.

31. It would be appropriate for some of the polluter pays funding for adaptation to contribute to New Zealand’s contribution to addressing international loss and damage obligations (the principle that

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<sup>33</sup> <https://environment.govt.nz/assets/publications/climate-change/Report-of-the-Expert-Working-Group-on-Managed-Retreat-updated-25-08-2023.pdf#page=234>

countries that have disproportionately benefited from greenhouse gas emissions pay for the loss and damage they cause others, such as vulnerable Pacific Island states).

32. Forest & Bird supports minimising costs by providing as much advance notice as possible for managed retreat, but this should not apply to consenting new development or activities in areas subject to reasonably foreseeable climate change risks such as flooding or coastal inundation. New consented activities in risky areas should fully internalise the risks of those activities. As noted above, even if these developments internalise their costs, there is still a moral hazard risk that developers can walk away and leave others to then live with the risk they created, without having had a say in the decisions about that risk (particularly if these areas become the more affordable places to live, and are occupied out of necessity rather than choice).
33. Significant thinking also needs to be put into how intensification (e.g., subdivision or building of higher density housing) in currently lived-in areas that will be at increasing risk of natural hazards, such as coastal areas, can be restricted/limited and whether/how any 'opportunity costs' to property owners who could have benefitted from that development are managed, as well as how any reductions in property value that come from putting restrictions on development are managed.

#### **Ensuring a financial framework for infrastructure that works with, not against, nature**

34. As discussed in our 2023 submission, we encourage the government to ensure infrastructure funding prioritises nature-based solutions over traditional infrastructure. There are opportunities to achieve this through, for example, existing vehicles such as Te Waihanga / the Infrastructure Commission (as discussed in paragraphs 63-65 of our 2023 submission), as well as via planned central government actions.<sup>34</sup> The recent investment of money into regional council flood protection work,<sup>35</sup> some of which include nature-based solutions, is another example of this opportunity. Through the proposed actions of the current Government, namely the Minister for Infrastructure, we can progress climate adaptation objectives, by ensuring:
  - a. The 30-year National Infrastructure Plan aligns with the National Adaptation Plan, which prioritises nature-based solutions.
  - b. The National Infrastructure Agency, when established, prioritises funding and projects that utilise nature-based solutions. Given a key objective of the agency is to ensure sustainable infrastructure funding, it is essential that through its establishment, the cost-benefit and long-term value for money<sup>36</sup> of nature-based solutions is well understood.
  - c. That the development of a new framework for infrastructure investment aligns with the National Adaptation Plan, prioritising nature-based solutions.

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<sup>34</sup> <https://www.beehive.govt.nz/speech/speech-infrastructure-funding-financing-conference>

<sup>35</sup> <https://www.beehive.govt.nz/release/regional-resilience-and-prosperity-focus-new-fund>

<sup>36</sup> [https://www.camecon.com/wp-content/uploads/2021/03/The-economic-costs-benefits-of-nature-based-solutions\\_final-report\\_FINAL\\_V3.pdf](https://www.camecon.com/wp-content/uploads/2021/03/The-economic-costs-benefits-of-nature-based-solutions_final-report_FINAL_V3.pdf)

## **Local government co-funding**

35. We discuss the roles and funding of local government in the following section.

### **(c) ROLES AND RESPONSIBILITIES**

36. This section addresses the TOR topic on “roles and responsibilities” and the following questions posed by the committee.

- What would be a durable, affordable, and fair approach to adaptation for the existing built environment (i.e., where people live and work) in the future? How could that approach be phased in over time?
- What outcomes should such an approach to adaptation lead to? What are the highest priorities to achieve?

37. Forest & Bird’s 2023 submission discussed roles and responsibilities. We refer the committee to the following paragraphs which will be relevant to this TOR:

- Para. 52-57: community
- Para. 58-61: private sector
- Para. 62-65: local government and Te Waihanga / the Infrastructure Commission
- Para. 73-74: enhancing the role of CDEM

## **Empowering and adequately resourcing councils**

38. Councils will need significant investment support to implement nature-based solutions to help mitigate and adapt to increasing flood risk, particularly in high-risk locations where development would be increasingly restricted. While some of this could be financed by developers (who would be required to provide mitigation, with a preference for nature-based solutions – noting the potential moral hazards of this approach outlined at para. 32), councils will also need to be proactive in initiating planned relocation / managed retreat and ecosystem restoration to mitigate flood risk. This could involve acquiring land in high-risk areas, which would come at a cost, as well as doing things like shifting/rebuilding stopbanks further back from rivers, initiating large-scale native afforestation projects, and restoring wetlands. Central government support will be needed (or alternative financing arrangements). This perspective is also largely shared with Te Uru Kahika Regional and Unitary Councils Aotearoa, who thoroughly explain the challenges and need of local government to deal with the task of climate adaptation in their report, Before the Deluge 2.0.<sup>37</sup>

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<sup>37</sup> <https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/climate-resilience-and-flood-protection-funding/co-investment-in-future-flood-protection/>

39. Resources may also be required to assist councils (particularly those smaller councils with smaller rates bases) with flood hazard mapping, LiDAR surveys, and community engagement and education on natural hazard risk, etc. Currently, many flood and risk assessment processes are funded by one-off grants. This is insufficient to manage ongoing and changing natural hazard risks such as flooding. We need a coordinated and centrally funded approach to ensure the best outcomes for everyone. We recommend a national approach to flood risk mapping, risk assessment, and flood response be funded by central government. The UK Government, for example, has a national flood forecasting centre,<sup>38</sup> as well as their meteorological office.<sup>39</sup>
40. Council functions may also have implications for resourcing. Currently, there is a separation of critical functions relating to climate mitigation and adaptation actions between regional councils and territorial authorities (TAs), despite the issues overlapping significantly. For example, regional councils are responsible for the management of rivers, river beds, and flood protection – i.e., keeping floodwaters away from communities. But TAs are responsible for the zoning of land for housing – i.e., potentially keeping communities away from floodwaters (but also for enabling development). This separation leads to conflicting decision-making, such as when a TA wants to enable housing intensification in a low-lying area but a regional council wants to avoid flood risks. To help address this issue, council functions should be more integrated, and responsibilities and outcomes should be better aligned. i.e., all decision-makers should be working towards the same plan – intensifying ‘safe’ areas for communities and housing, while restoring higher-risk areas for biodiversity (and other) gains or managing them in a way that they can be used for production without compromising environmental health. Council funding should also be more well aligned so that ratepayers’ investment is not being pulled in different directions and is instead being utilised to achieve a sustainable, well-planned future.
41. Please refer to our submission on the proposed National Policy Statement for Natural Hazard Decision-making (Appendix 1) for more information on roles and responsibilities. For example, para. 97 (Māori), paras 104-110 (local and regional government, and community groups), para. 113 (Government).

#### **Department of Conservation (DOC) and other Govt. organisations**

42. DOC could play a substantial role in New Zealand's adaptation strategy, overseeing roughly one-third of the nation's land. The potential this land has to contribute to the nation's ability to both mitigate and adapt to climate change must not be overlooked as we form a national framework for adaptation. Not only can this indigenous land cover protect the adjacent and downstream land/catchments by operating as a nature-based solutions (as explained above – e.g., decreases erosion, mitigation of flood and drought impacts, etc.), but it can also play a significant role in

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<sup>38</sup> <https://www.gov.uk/government/organisations/flood-forecasting-centre>

<sup>39</sup> <https://www.metoffice.gov.uk/>



regulating regional weather<sup>40</sup>, mitigating the increasingly severe weather events resultant of a changing climate. Healthy, well-functioning (free from pests<sup>41</sup>) indigenous forest, and other natural features such as wetlands, can also play a significant role in carbon sequestration.<sup>42</sup> The role of DOC in maintaining and enhancing one-third of the country's land will become increasingly important as climate change continues and the impacts of such are felt more regularly and severely throughout the country. And the impact of public conservation land that is not looked after will be felt more severely if DOC cannot afford - or is not enabled - to do so (see Figure 1 below, for example). The Government must understand the significant implications associated with the resourcing of the Department in relation to climate mitigation and adaptation, on both local and national scales.



Photos from visit to Spion kop paired fenced and non-fenced plots Sept 2017. Spion kop is in the Manson hunting block, which is the KMB block which receives the most deer hunting pressure from recreational hunters.

**Figure 1:** An unfenced area of the Kaweka Forest Park (left), which is accessible to and grazed by deer, compared with a fenced area of the Park (right). Note how there is no 'understory' in the image on the left, whereas the fenced area in the image on the right has substantial growth. The area on the right would have much greater capacity to slow and absorb water compared to that on the left. The area on the left has no trees coming up to replace the older trees if/when they die off. Note that the image on the left receives "the most deer hunting pressure" in the area, but this is not enough to allow the forest to regenerate. The deer are destroying this forest and its future capacity to slow water down. (DOC, 2017.)<sup>43</sup>

43. Other Government organisations with significant areas of land in New Zealand include LINZ and PAMU. Consideration should be given to how they can utilise their land to help reduce natural hazard risk for communities downstream. Forest & Bird has produced some information on this issue, for example, finding that some around 125,000 hectares of lost wetland in public ownership

<sup>40</sup> Columbia Climate School. 2017. <https://news.climate.columbia.edu/2017/05/30/vegetation-can-strongly-alter-climate-and-weather-study-finds/>

<sup>41</sup> <https://www.forestandbird.org.nz/resources/climate-change-and-introduced-browsers>

<sup>42</sup> <https://niwa.co.nz/news/native-forests-absorbing-more-carbon-dioxide>

<sup>43</sup> <https://www.doc.govt.nz/globalassets/documents/parks-and-recreation/hunting/hawkes-bay/kaweka-mountain-beech-project-annual-report-2017-18.pdf>

could be restored, providing habitat for native species and helping to protect Aotearoa against biodiversity loss and climate change impacts.<sup>44</sup>

### **Non-governmental organisations (NGO's) and community groups**

44. Please refer to paragraphs 54-57 of our 2023 submission for an elaboration on the below regarding the role of eNGOs and community groups:

We see communities as being engaged in managed retreat [planned relocation] in several ways – the most important of these being (1) active participation in understanding the need for potential retreat and in making decisions related to it and (2) active participation in implementing retreat and nature-based solutions to help adapt to climate change or restore areas following retreat. Communities, including community groups and NGOs, will need substantial financial support to facilitate this...

### **(d) CLIMATE RISK AND RESPONSE INFORMATION SHARING**

45. This section addresses the TOR topic on “climate risk and response information sharing” and the following questions posed by the committee.

- What do you think is the critical information that will inform people and help them understand future risks, costs, and impacts?

46. Forest & Bird’s 2023 submission discussed the need for access to information, risk management language, risk management tools, nationally standardised risk tolerance guidelines, and the importance of community engagement in paragraphs 48-57.

47. We note the summary of submissions included good commentary on some of this too, such as

- a. the development and provision of information throughout section 4 (Risk Assessment) - e.g., in paragraphs 118 – 127 (Standardisation).
- b. The need to educate the public on natural hazard risk – e.g., para. 147 “Many submitters indicated that people should be made aware of the implications of staying in a disaster-prone area...”

48. We note there is a critical need to educate the public on why natural hazard risk is increasing – i.e., education on climate change and on historic land use change (loss of wetlands etc) and the

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<sup>44</sup> <https://www.forestandbird.org.nz/resources/lost-wetland-public-land-could-be-restored-help-protect-against-climate-change>

connection to natural hazard risk. Forest & Bird has been undertaking this work<sup>45</sup> but can only reach so far – and more work is needed.

## **OTHER MATTERS RELEVANT TO THE PURPOSE OF THIS INQUIRY**

49. This section addresses other matters relevant to the purpose of the inquiry. It is divided by heading.

### **Inclusion of emissions mitigation**

50. Emissions mitigation – i.e., reducing greenhouse gas emissions – is critical to adaptation. We mentioned this above but elaborate on it here.

51. Incorporating mitigation into adaptation strategies is not just beneficial; it's imperative for a robust response to climate change. Mitigation actions directly influence the scale and intensity of climate impacts, thereby shaping the adaptation requirements. Without mitigation, adaptation efforts may be overwhelmed by the accelerating pace and heightened severity of climate change effects.

52. Furthermore, mitigation can often enhance adaptation outcomes, creating synergies that bolster resilience. Nature-based solutions<sup>46</sup> provide ample opportunity to meet both adaptation and mitigation goals, enabling New Zealand to effectively protect our environment and society from climate hazard risk, while also ensuring we meet international obligations to mitigate the causes of climate change.

53. For example, indigenous afforestation not only captures carbon but also increases landscapes' ability to cope with extreme weather by, for example, increasing slope stability and decreasing peak surface water runoff (flow), demonstrating that mitigation can be a force multiplier for adaptation.

54. Failing to appropriately consider the mitigation component in adaptation planning risks inadequate preparation for future climate scenarios, potentially leading to greater environmental, economic, and social costs. Thus, a failure to integrate mitigation is a missed opportunity to strengthen adaptive capacity and secure a sustainable future.

55. Forest and Bird are concerned by the absence of mitigation in this inquiry's terms of reference given the significant interrelations and encourage the Committee to address this.

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<sup>45</sup> e.g., through a national tour to communities explaining the impact of environmental management and engineering/development on flood risk - <https://www.rnz.co.nz/national/programmes/saturday/audio/2018903322/tom-kay-let-the-river-go-with-the-flow>

<sup>46</sup> <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/adapting-to-climate-change/national-adaptation-plan/>

## **The RMA (or replacement of) is a primary focus of the inquiry**

56. A key factor of success in implementing a national adaptation framework will be the degree to which financial policy and resource management planning complement each other. For the framework to be successful, it's imperative that these two elements not only align but also reinforce each other (positively). A robust financial framework is essential for equitably distributing costs among stakeholders. However, its effectiveness is undermined if land use planning does not concurrently mitigate risk by steering development away from areas susceptible to natural hazards. This proactive approach is crucial under regulations such as the Resource Management Act (RMA), which should be leveraged to preemptively reduce potential costs and enhance the resilience of communities. Therefore, the integration of financial and land use planning is paramount to reduce long-term expenses and ensure the sustainability of the adaptation initiatives.
57. Additionally, consenting frameworks developed via amendments to, or the reform of, the RMA should enable (and prioritise) nature-based solutions. It will be important to not only financially incentivise the use of nature-based solutions, but to also ensure that projects utilising and prioritising nature-based solutions are enabled through the consenting pathway. Concurrently, there should be measures to deter the reliance on conventional hard infrastructure when such solutions are unsuitable. This approach would encourage sustainable development practices that align with national adaptation progress and indeed the National Adaptation Plan.
58. Given the opportunities discussed above and the many other factors that determine the success of adaptation being inherently linked to the RMA, Forest & Bird believe it is essential for the RMA to be a primary focus of this inquiry. At the least, the committee should consider making recommendations on how any RM reform can avoid undermining a robust and evidence-based adaptation framework and provide these to parliament.
59. The committee should consider inviting submissions (or seeking advice from) the PCE, particularly given their recent report on land use which discusses connections to resource management, climate change mitigation, and nature-based solutions.<sup>47</sup>

## **Cost-benefit of nature-based solutions**

60. Considerable adaptation costs could be avoided through the protection and retention of existing ecosystems. It is much cheaper to simply protect what already exists rather than trying to 'recreate' nature as a 'nature-based solution' later. For example, "A study by design firm Arup found nature-based infrastructure to be fifty percent more affordable than human-made alternatives, and 28 percent more effective."<sup>48</sup> Where those nature-based solutions are in situ (and therefore do not come at a cost – they simply require recognition and protection), they would be even more cost-

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<sup>47</sup> <https://pce.parliament.nz/publications/going-with-the-grain-changing-land-uses-to-fit-a-changing-landscape/>

<sup>48</sup> <https://helenclark.foundation/publications-and-medias/sponge-cities/>

effective. They also avoid a time lag to adaptation and provide a key tool in early adaptation, noting “Research by the Global Commission on Adaptation found that early adaptation is in countries’ strong economic self-interest, with an overall rate of return on investment in improved resilience showing cost-benefit ratios of as much as 10:1 within ten years for some interventions.”

61. We discuss the effectiveness of nature-based solutions in depth in our 2023 submission and submission on the NPS-NHD, as well as in previous paragraphs in this submission. We also note other expert groups’ support for nature-based solutions, such as the NZ Rivers Group’s promotion of modern methods of river management such as ‘erodible river corridors’ and ‘making room for rivers’.

### **Te Tiriti o Waitangi**

62. Incorporating the perspective of te ao Māori and embracing Māori principles is crucial for effectively addressing and adjusting to climate change effects in Aotearoa. The commitment to the principals of te Tiriti o Waitangi is a key component of an enduring adaptation strategy, as detailed in the national adaptation plan. To apply a te ao Māori perspective is to craft adaptation initiatives collaboratively with Māori, to prioritise te ao Māori and mātauranga Māori within the adaptation efforts, and to enable Māori leadership in devising adaptation plans that are by and for Māori. The Committee must make the consideration of the former a primary focus of this inquiry.

63. Please refer to paragraphs 66-68 of our 2023 submission for an elaboration on the above.

### **Post-retreat land use**

64. Please refer to our 2023 submission for comments on post-retreat land use.
65. While retreat is one of the primary tools for managing at-risk housing and infrastructure, we must also ensure ecosystems are also allowed to naturally ‘retreat’, or migrate inland, such as where an estuary may need to retreat inland to continue to provide habitat for native species, or a dune similarly a dune system migrates landward as a response to sea level rise. If we fail to consider and appropriately manage ecosystem retreat, we will drive processes such as coastal squeeze<sup>49</sup>, putting further pressure on our already at-risk ecosystems and species (the importance of which in the frame of adaptation earlier addressed).

## **SUBMISSION ENDS**

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<sup>49</sup> <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/what-is-coastal-squeeze#:~:text=Coastal%20squeeze%20is%20now%20defined,conjunction%20with%20other%20coastal%20processes>