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Timaru District Council Climate Change Management

“Climate change presents legal liability for councils and public agencies.” “The Office for the Auditor General is also closely monitoring Council actions relative to their commitments, following widespread deferral on action in 2018 Long Term Plans.” “Climate change is the biggest environmental challenge of our time”. “The sea level is projected to rise by about 0.8m above present-day levels by 2100.” “Wildfires will become more likely as hotter drier summers occur. *Rural areas will be more highly exposed.*” “Drought potential is likely to increase across most of Canterbury.” “Extreme weather events (e.g., severe storms) are likely to happen more often.” “Current planning objectives, rules and policies are, generally speaking, inadequate and ineffective in dealing with effects of climate change.”

Canterbury Climate Change Risk Assessment Summary Report
Prepared for the Canterbury Mayoral Forum, December 2021

“It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.”

Climate Change 2021 – The Physical Science Basis
Working Group I Contribution to the Sixth Assessment Report
of the Intergovernmental Panel on Climate Change
Endorsed by 198 countries

“Increased heatwaves, droughts and floods are already exceeding plants’ and animals’ tolerance thresholds, driving mass mortalities in species such as trees and corals. These weather extremes are occurring simultaneously, causing cascading impacts that are increasingly difficult to manage. They have exposed millions of people to acute food and water insecurity.... People and ecosystems least able to cope are being hardest hit”

Climate Change 2022 – Impacts, Adaptation and Vulnerability
Working Group II Contribution to the Sixth Assessment Report
of the Intergovernmental Panel on Climate Change
Endorsed by 195 countries

Regarding the above report: "I've seen many scientific reports in my time, but nothing like this." UN Secretary General Antonio Guterres described it as an "atlas of human suffering". He has no doubt as to where the blame lies. "The facts are undeniable. This abdication of leadership is criminal."

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Contents

This paper:

1. Presents key points relevant to Timaru District regarding climate change
2. Recommends governance-level and management-level, climate-change actions
3. Is supported by appendices containing background information:
 1. A summary of feedback from interviews with over 50 Timaru District stakeholders
 2. Lists of actions that TDC can lead including what TDC:
 - i. Has to do
 - ii. Can choose to do in-house
 - iii. Can choose to support externally
 - iv. Probably cannot do because they come under central government and international agreements
 3. A list of stakeholders who contributed their climate change management ideas
 4. Bibliography
 5. An example of a hypothetical potential major project, demonstrating multiple benefits

Key points relevant to Timaru District Council regarding climate change

1. The latest two reports from the International Panel on Climate Change (IPCC) confirm the reality and expected major impacts of climate change, are based on over 30,000 scientific papers and have been endorsed by 198 countries (report #1) and 195 countries (report #2) and by many major institutions and companies
2. A report for the Canterbury Mayoral Forum, "*Canterbury Climate Change Risk Assessment 3/2/22*" further confirmed the reality and impact of climate change in South Canterbury
3. But, while:
 - a. 80% of New Zealanders accept the science that anthropogenic climate change is happening
 - b. 76% believe individuals are responsible for responding to climate change
 - c. 61% want more ambitious emissions' targets
Ministry for the Environment survey results
 - d. in the UK (which may or may not be similar to Canterbury), a majority of people do not want to change their lifestyles to mitigate or adapt to climate change
UK YouGov survey results
4. Our climate is changing 200 times faster than anything found in the geological record
5. Per capita emissions by New Zealanders are 6th highest in the world (16.9 tonnes CO₂ equivalent per person). For our district with a large rural population, 47% of emissions are *on-farm*, with two other main contributors being transport (which includes substantial

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- transportation of *agricultural* products) and industry (with some of the main emitters being processors of *agricultural* products)
6. Canterbury sea levels have risen 0.2m since 1900 and are on track to rise by 0.8m by 2100
 7. Global heating and sea level rise are accelerating, with 1.5 degrees heating already locked in and the world on a path to 2.7 degrees even if all countries' pledges are met
 8. With 1.7-1.8 degrees of heating, half the world's people will experience life-threatening heat and humidity events
 9. With 3 degrees of heating, climate refugees will be New Zealand's biggest issue as Australia and all countries within about 30 degrees of the equator become essentially uninhabitable
 10. All of Canterbury is already experiencing more frequent and more extreme weather events, especially bigger floods and longer and more severe droughts, leading to property and crop losses. For example, the recent Rangitata floods were 20% more likely and 10-15% bigger due to climate change
 11. South Canterbury will experience some localised coastal inundation and erosion, with the most valuable assets that will be impacted being commercial land at the port and at Washdyke, farming land north of Washdyke and the residential land at Milford Huts
 12. Although South Canterbury will experience the above impacts of climate change, these impacts are small compared to what billions of vulnerable people worldwide will experience (New Zealand is one of the most privileged places on the planet in terms of climate change)
 13. While the science of climate change is unequivocal, determining the best mix of actions that individuals, communities, government and organisations must take locally is challenging
 14. *Business-as-usual is not an option, so we need to define the best possible new business-as-usual for South Canterbury and 'go-for-it' – perhaps before other parts of New Zealand realise that we are securing the best future opportunities (first-mover advantage)*
 15. Climate change risk is a combination of exposure x sensitivity x adaptability, so all three parameters need to be evaluated when prioritising actions
 16. By world standards, the majority of people in South Canterbury have sufficient resources to be able to adapt to climate change, albeit with some effort and discomfort
 17. However, our various vulnerable communities will be worse affected by climate change, less able to adapt and will suffer accordingly
 18. Even if TDC became carbon neutral it would have only a modest impact on South Canterbury's greenhouse gas emissions, so to be effective, our responses to climate change need to be embedded throughout our district
 19. Climate change cannot be made 'simple' as it is inherently complex and evolving
 20. To respond effectively we must understand climate change in sufficient detail to make wise decisions and/or to trust the recommendations of those who *do* understand climate change.
 21. Council staff appear to have most of the knowledge and skills necessary to implement, enable or guide almost all in-house climate change management actions that are within the remit of the council
 22. All but three of the 52 South Canterbury stakeholders spoken with asked that TDC take a lead on climate change management and as a minimum, publish succinct *governance* statements about the council's position on climate change
 23. *These governance statements by TDC are essential first steps for guiding actions by TDC management and staff. They will also give confidence to the many stakeholders who are already taking, or are wanting to take, action on climate change*

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24. Specifically, council staff and our communities need explicit governance guidance from the elected council on the council's adoption of all, or an edited combination of the following 5 principles and/or other principles:
- a. Take no new climate change management actions because the impacts of climate change in South Canterbury will be much less than for other countries, plus by global standards, a majority of our residents have enough resources to adapt with only moderate difficulty
 - b. Take new climate change management actions that address just TDC's own greenhouse gas emissions and adaptations
 - c. Take new climate change management actions (both mitigation and adaptation) that will enable, empower and inspire substantial actions by many stakeholders throughout the district e.g., improving resilience of water supplies through catchment restorations, large scale wetland development following coastal inundation, regenerative farming, alternative housing and so on
 - d. Take new climate change management adaptation actions focused on enabling and empowering our various vulnerable communities to adapt to climate change
 - e. Take responsibility for our share of world-wide climate change mitigation to reduce the international impacts of climate change on vulnerable people worldwide

Recommendations

1. *Governance*: TDC councillors issue a succinct statement of its *governance* position on climate change based on all or some of the above 5 statements. This is the *first, essential action* for council to take
2. *Governance*: TDC establish a Climate Change Working Group (CCWG) of councillors, staff and potentially other stakeholders with a robust, results-oriented mandate, upskill the CCWG members and draw on the knowledge of credible climate change professionals
3. *Governance and management*: TDC commission the development of a South Canterbury Climate Change Strategy encompassing, but not limited to, the TDC's own climate change management strategy, to be completed within 6 months
4. *Management*: TDC staff:
 - a. triage the many climate change actions that have been proposed for South Canterbury through various channels
 - b. distil those that have particular merit consistent with the above TDC governance statement, the Canterbury Climate Change Risk Assessment, the IPCC reports and the evolving South Canterbury-wide climate change strategy
 - c. implement those actions that require minimal resources
 - d. prepare compelling business cases for those actions that require more resources
 - e. prepare a succinct engagement plan to help guide our communities' actions, possibly including the phrase "double the good, halve the bad" and a table of "good things to do more of and bad things to less of".

Contact

Dr Phil Driver

phildriver@openstrategies.com

021 0236 5861, 784 Beaconsfield Road, RD2 Timaru

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Appendix 1: Feedback from 52 stakeholder interviews

These many statements are not prioritised or put in any particular order but are provided as guidance for TDC staff and other stakeholders for use *after* Council has *first* confirmed its governance statements on Climate Change. The governance statements are necessary to enable the following stakeholder suggestions to be prioritised.

Stakeholders:

1. acknowledged and appreciated the support TDC has historically provided and currently provides to our communities to help them act on a range of issues (52 stakeholder agreed)
2. confirmed that climate change is real (51)
3. confirmed that climate change poses significant threats in South Canterbury and the world (51)
4. acknowledged that the impacts of climate change in South Canterbury will be relatively small and manageable compared to those experienced by vulnerable communities around the world (51)
5. confirmed that while living in a relatively wealthy part of the world, most South Cantabrians have the resources and resilience to adapt to climate change, albeit with considerable effort and cost (51)
6. confirmed our various types of vulnerable communities will be the most impacted by, and less able to respond to, the challenges of climate change (51)
7. confirmed that significant climate change management action is essential in South Canterbury (50)
8. a majority of stakeholders believe Timaru District needs a district-wide climate change strategy of which TDC's own climate change strategy will be an essential component
9. confirmed that climate change, its impacts and its mitigations and adaptations are complex and evolving, so need in-depth understanding in order to make wise decisions (50)
10. confirmed that we need to either develop sufficient understanding of climate change or find, trust and follow leaders who do understand the issues (50)
11. urged TDC to lead, and be very visibly seen to lead, on climate change adaptation and mitigation (48)
12. urged TDC to make a succinct statement on their *governance* position on climate change management so as to guide in-house actions as well as help support climate-friendly actions by communities, organisations and businesses (49)
13. confirmed that in many cases, domestic and commercial stakeholders are *already* taking, or are willing to take, significant actions to adapt to and mitigate climate change (50)
14. want TDC to enable, empower and facilitate community groups and others to take collaborative climate change actions and that this is at least if not more important than TDC taking internal actions on climate change (49)
15. recognised that TDC:
 - a. Is required to take some climate change management actions (52)
 - b. Can optionally take further in-house climate change management actions (52)
 - c. Can optionally take external climate change management actions, especially inspiring, enabling, empowering, facilitating actions by others (52)
 - d. Cannot take some climate change actions as they are the responsibility of central government, communities, businesses and other organisations but can nevertheless influence such actions in various ways (lobbying, inspiring, enabling, empowering, and facilitating) (52)

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16. encouraged TDC to align its actions with the insurance industry which puts a huge amount of effort into risk-assessment
17. encouraged TDC to publicly sign-up to the Global Sustainability Goals
18. offered numerous examples of actions that can be taken in South Canterbury to mitigate and adapt to climate change (see Appendix 2) (50)
19. a majority of stakeholders asked that TDC's climate change management actions address all four wellbeings: economic, social, environmental and cultural
20. a majority expressed concern about poorly managed, (in some cases abandoned), exotic production forests that are established purely for carbon credits and which are badly impacting local communities and water retention in the upper catchments
21. a majority acknowledged that 'electric cars and solar panels are ways in which wealthy people can invest to live cheaper' as these technological options are not affordable by our vulnerable communities
22. we therefore need to support our vulnerable communities
23. many stakeholders said "we don't know where to start" so are seeking succinct guidance on at least some of the steps they can take
24. when people say " climate has always changed" I sense that they increasingly recognise that climate is changing faster and is more unpredictable and what they are in fact saying is "we've coped before and we'll cope again – and we're proud of that". I think this is a really important perspective. We need to tap into this proud and pragmatic spirit of South Canterbury in order to effectively address climate change.
25. young people on Environment Canterbury Youth Rōpū asked for a recognition of the urgency of climate change, saying: "change suggests gradual – we need to recognise the abrupt nature of it"
26. Iwi are looking for opportunities to 'bring our people home', so support initiatives such as wetland and catchment restorations and can assist, for example, by providing employment (tree propagation and plantings; fencing) and increasing Mahinga Kai opportunities
27. many stakeholders feel their lives have become unstable due to everything that is going on around them (Covid, Ukraine, biodiversity loss, plastic and chemical pollution etc) and crave some sort of 'stable core' where they feel safe enough to then branch out into new actions such as addressing climate change
28. most big businesses in the district are on-board with climate change management but many medium and smaller businesses are struggling financially to survive so are not focused on climate change actions
29. many stakeholders want very visible and accessible demonstrations of climate-friendly actions – locals prefer to listen to locals
30. need a climate change management think-tank reporting directly to council on district issues and options
31. we need persuasive and inspiring narratives to bring people on board including potential positives to come out of action on climate change
32. such narratives need to be in a crisp '101-format' so they are readily understood and acted on by all stakeholders because climate change is too big and complex for most people to comprehend
33. make 'the right behaviours' more appealing and easier, for example by fine-tuning development contributions to be climate-friendly
34. need credible media to counter climate mis-information

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35. be clear about the inspiration behind actions, e.g., the inspiration behind rain barrels (emphasise the benefits and how people can use the water)
36. keep monitoring and assessing our communities' willingness to act on climate change
37. support innovators and early adopters and the late adopters and laggards will follow along in due course
38. support catchment groups who are already trying to implement climate-friendly actions
39. recommend it is essential to retain water in the landscape and not flush it out to sea
40. confirm many industries already moving on sustainability and becoming carbon neutral as its either an advantage, or essential, in their markets. However, many (e.g., Fonterra, PrimePort, Alpine Energy) think of themselves as meeting/reporting to national standards and probably don't see themselves as 'reporting' to TDC.
41. recognise that many actions cannot be just one-off but require ongoing maintenance
42. ask TDC to really listen to the many wise stakeholders in our communities and to encourage the sharing and debating of ideas
43. ask ECan and TDC to present the same messages on climate change
44. ask TDC to recognise multiple simultaneous often-inter-related emergencies: climate change, biodiversity loss, increasing inequality, pollution, aging populations, pandemics, many caused by ecological overshoot (our over-consumption of finite planetary resources)
45. ask TDC to prepare for weather event extremes
46. propose that more emphasis is required on deconstruction/component re-use rather than demolition of buildings
47. encourage more re-use of waste and grey water
48. propose running 3-month trials of new ideas because no-one knows all we need to know to manage climate change – we must keep testing the system (consistent with complexity management)
49. ask that waste treatment must not enable continuing waste production but rather continually reduce waste production (the waste incinerator proposed for Waimate *may* be inconsistent with this)
50. ask TDC to better coordinate all climate-friendly actions across the district as it's too fragmented at the moment
51. request that any climate-friendly strategy that is developed must focus on what must be achieved, not on 'actions' and 'busyness'
52. request that updates to the District Plan encourage/permit rain gardens, rainwater tanks and other climate-friendly actions
53. note that current local democracy is not fit for purpose - split district and regional elections are not based on the integrated skill-sets required
54. note a need for more data – a Timaru District (not just TDC) climate change dashboard – so we can monitor what is and isn't working and share this information with our communities to help inspire climate-friendly actions, e.g., something visible and accessible that defines our actions within a global context
55. request cabinet collective responsibility for climate change management actions by TDC
56. note the symbolism of cycle trails and other forms of active transport is important because it increases the perception of a new climate-friendly-normal, as does the MyWay service
57. note that Timaru is at the confluence of the region so it is imperative to link urban and rural communities here
58. request the use of the phrase "*our* TDC" instead of "*the* TDC" to help improve engagement and collective ownership of issues
59. ask TDC to identify/anticipate 'trigger points' for action e.g., consider eVs and hybrids when council vehicles need replacing rather than replace them immediately

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60. request use of language like 'water resilience, food resilience and health resilience' (i.e., desired Benefits) rather than on the negative driving force of climate change
61. a number of stakeholders said that techniques such as Dynamic Adaptive Planning will be necessary to respond to the continually evolving climate change environment, so that everyone recognises that some activities may continue for years or even decades but will eventually need to change or cease
62. several stakeholders said that Timaru has many financially-comfortable retired people who want to volunteer but only if they feel they can make a substantial difference
63. about 45-50 stakeholders supported TDC leading perhaps 3-5 major, 10-30-year multi-stakeholder initiatives such as:
 - a. the planned management of inundation areas (e.g., the Port, Milford Huts, Washdyke Lagoon, coastal farmlands)
 - b. the restoration of key catchments such as the Pareora that is the primary source of Timaru's potable water
 - c. the large-scale development of 'community gardens' that are linked by active transport pathways (cycling, walking)
 - d. the redesignation of land to enable communities of tiny houses/permaculture/food forests
 - e. facilitation of education and physical support (e.g., provision or classification of land for allotments and community gardens) for community food growing and cooking
 - f. large-scale re-engineering and use of biological wastes especially as fertiliser replacements in agriculture
 - g. Large-scale water-use reductions and re-use
 - h. Continued development of public and active transport infrastructure
64. recognised that climate change's biggest impact in the Timaru District relate to water (coastal inundation and erosion, flooding droughts) so it makes sense to manage all aspects of water together (3 waters + source water + seawater) (51)
65. generally supported a district focus on "water resilience, food resilience, health resilience" as being consistent with how South Cantabrians view themselves (as being pragmatic, resourceful, capable of handling whatever comes our way, community-minded and independent)

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Appendix 2: Actions TDC management and staff can potentially take to manage climate change mitigation and adaptation

These statements are to provide guidance to TDC staff for use *after* Council has *first* confirmed its governance statements on Climate Change.

What TDC is required to do now or within the next 3 years

1. Monitor and report on The Council's main greenhouse gas emissions
2. Purchase carbon off-sets for the council's emissions, particularly from landfills (and/or capture and use of these emissions)
3. Additional actions as will be required through the evolving central government policies on climate change, 3 waters, RMA reforms and LGA reform
4. Include climate-related responses in the Stormwater Management Plan and associated applications for resource consents from ECan, due in 2022
5. Include climate-related responses in the District and Long-Term Plan updates
6. Continually identify and act on issues that affect the wellbeing of its communities

Optional behaviours and actions TDC can take for their in-house activities

1. Publish a succinct statement on TDC's climate change governance principles for in-house actions
2. Insist that all in-house council actions consider and where feasible incorporate climate change mitigation and adaptation
3. Facilitate and partly fund catchment and wetland restorations of TDC-owned land, including preparation for coastal inundation
4. Replace lawns in parks and other council-managed properties with meadows and low-maintenance plants (cut twice a year apart from firebreak margins)
5. Plant food-producing plants such as fruit trees in public spaces
6. Install rain gardens in public spaces to retain water and reduce flooding
7. Adopt procurement policies that place greater weighting on climate change mitigation and adaptation
8. Replace the vehicle fleet with hybrid and eV vehicles
9. Encourage more staff to use buses and active forms of transport such as walking and cycling
10. Install and use solar and wind power on council buildings

Optional behaviours and actions that TDC can take to support our communities (this list continues to evolve)

1. Publish a succinct statement on TDC's climate change governance principles for external actions
2. Adopt a climate change management leadership mantle while openly acknowledging the evolving uncertainties and asking for community support
3. Integrate actions so they simultaneously address climate resilience, biodiversity renewal, inequality reduction, pollution, recreation, and health

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4. Establish a Climate Change Working Group of councillors, staff and potentially other stakeholders who build and maintain familiarity with key aspects of climate change with particular emphasis on the impacts of climate change on our less resilient communities
5. Facilitate the development of a district-wide Climate Change Management strategy of which the TDC's Climate Change Management strategy is a part
6. Develop, maintain and disseminate a Timaru District Climate Action Information Dashboard
7. Promote the principle that climate mitigation and adaptation are 'the new normal'
8. Insist that all external council actions consider and where feasible incorporate climate change mitigation and adaptation
9. Insist that all council actions consider and where feasible incorporate actions which produce a minimum of 7 well-being benefits (this is a permaculture principle that is surprisingly easy to achieve)
10. Run multiple public and in-school information sessions on the causes, impacts and potential mitigation and adaptation actions of climate change
11. Promote very simple messages such as "double the good, halve the bad"
12. Facilitate communities to mitigate and adapt to climate change. This will especially include the identification of key community leaders and helping facilitate new leaders to pick up the reins when original leaders need to move on
13. Facilitate and partly fund catchment and wetland restorations including responses to coastal inundation in collaboration with Runanga, DOC, ECan, communities and businesses
14. Apply Dynamic Adaptive Planning to address the evolving coastal inundation of port land
15. Enable, permit and promote alternative domestic water sources especially rainwater tanks but also potentially treatment of ground water
16. Reduce transport costs and increase community food-resilience and ownership of local food production through various forms of allotments, community gardens and the use of public spaces for food production
17. Reduce waste-related methane emissions by promoting reductions in what's dumped and also capturing and using methane from landfills and/or water waste treatment
18. Increase carbon capture through supporting long-lived native forestry, wetlands and potentially coastal seaweed production
19. Increase transport resilience by enabling easier use of low emission forms of transport such as electric vehicles including new forms of ultra-light and heavy electric or hydrogen freight vehicles
20. Designate urban and rural 'social roads' which are safer for all users, for example by limiting speeds, especially for large vehicles
21. Reduce the need for fossil-based road re-surfacing of damaged roads by lobbying central government for road-use changes so heavy vehicles are excluded or must go slower on poorly formed roads – a big issue on easily damaged rural roads where HGVs need access
22. Permit and enable the re-engineering of large-scale biological waste processing such as optimally blended composts for agricultural use
23. Promote and enable the replacement of lawns with meadows and mulched native plantings
24. Enable a wider range of active and public transport including ride-sharing and social roads (see above)
25. Build on what communities, businesses and organisations are already doing
26. Be flexible with implementing District planning rules to enable dynamic adaptive planning of land to enable short to medium term use of land that will eventually be inundated (e.g., the continued medium term dairy farming on coastal land that will be inundated and converted

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- to wetlands) as well as permitting climate-friendly housing and food growing such as tiny homes, food forests and community gardens
27. Establish extensive natural carbon capture, especially through enabling riparian planting and catchment revegetation using native and non-pine exotics (including food producing) and possibly the development of kelp beds which would also provide coastal protection
 28. Lobby ECan and central government to update legislation and provide resources for South Canterbury climate action
 29. Change District Plan rules to more readily permit climate-friendly housing and food growing such as tiny homes, food forests and community gardens
 30. Make land available for community gardens of various sorts and link them with active transport options (e.g., cycleways)
 31. Enhance community resilience by running, facilitating and/or co-funding community courses on food growing and sustainable minimal-waste cooking
 32. Lobby central government to control forestry so as to be sustainable and contribute to climate change management goals, especially catchment water management
 33. Lobby government to replace coal-fired boilers in schools and hospitals with climate-friendly energy sources, especially solar electric power (which is available during the day when young people are at school)

What TDC probably can't directly do

1. Create rules on defend/retreat/compensate for loss of land due to coastal inundation, flooding or any other climate-change-induced land use changes. It is expected that these rules will be created through the reform of the RMA.
2. Create legislation relating to carbon emissions, e.g., the Emissions Trading Scheme, fossil fuel prices, types of vehicles permitted and discouraged, conversions from fossil fuel to alternative energy sources.
3. Change electricity generation and distribution networks other than indirectly through Alpine Energy.
4. Change international agreements on climate change
5. Have an impact on property insurance

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Appendix 3: Contributors to the climate change discussion

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Appendix 4: Bibliography

This report was informed by the stakeholder interviews and by the following critically important climate change documents.

1. Climate Change 2021 – The Physical Science Basis - Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Endorsed by 198 countries
2. Climate Change 2022 – Impacts, Adaptation and Vulnerability, Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Endorsed by 195 countries
3. Technical summary 3 February 2022, Canterbury Climate Change Risk Assessment, Prepared for the Canterbury Mayoral Forum.
4. New Zealand Ministry for the Environment <https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2019-snapshot/how-new-zealand-compares-to-other-countries/>
5. A joint MBIE-funded report Extreme Weather Event Real-time Attribution Machine – EWERAM - by MetService, NIWA, University of Canterbury, Victoria University of Wellington, Bodeker Scientific

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Appendix 5: An example of one potential major project

A number of major, multi-decade projects have been proposed including improving resilience of water supplies through large-scale catchment restorations (especially the Pareora), large scale wetland development following coastal inundation, regenerative farming, enabling alternative housing, and enabling a network of community gardens and allotments. Depending on which governance stance TDC takes on climate change management, such projects will need their own strategies to underpin compelling business cases for action.

Each of these projects has many potential benefits as demonstrated by the following hypothetical but realistic example.

Large scale catchment restoration e.g., the Pareora catchment

The challenge

Due to climate change the Pareora will become flashier with heavier but less frequent rain and longer very low flow periods. This will reduce the availability and quality of Timaru's drinking water supply. This situation is exacerbated by the historical mis-management (but perceived at the time to be good management) of the catchment and river. This included large-scale removal of native vegetation, loss of river-side vegetation, use of water-thirsty willows for flood control, a narrowed river bed having converted a meandering river into a drain to accelerate water removal (instead of slowing it down), in-bed weeds, pests such as wallabies preventing vegetative restoration, damming, gravel extraction, water abstractions, agricultural run-off, and ground-water drawdown reducing river flows. The Canterbury and Auckland university professors who taught river engineering in New Zealand published a report a couple of years ago acknowledging that they 'got it wrong'.

A possible solution – the large-scale restoration of the Pareora catchment and river

The large-scale restoration of the Pareora catchment and river would involve primarily:

1. Wallaby and pest control (potentially by a catchment-scale pest fence)
2. Extensive plantings of suitable plants (mostly natives + edibles)
3. Replacement of water-thirsty willows
4. Where possible, the widening of the river bed
5. Establishing water-retaining wetlands and swales

The Results and Benefits

1. Higher water *reliability* (drinking, cultural, irrigation, recreation)
2. Higher water *quality* including TDC city and community water supplies and irrigation (avoiding having to use manganese/iron-rich groundwater)
3. Improved mahinga kai opportunities
4. Restored mana of the river
5. 'Slower water', leading to improved low flows, reduction in damaging high flood flows and potentially allowing slow-moving flood waters to deposit minerals on agricultural land
6. Reduced sediment build-up in estuaries and lagoons
7. Increased carbon sequestration
8. More water due to the taller vegetation condensing and holding moisture from mist and clouds
9. More people employed to do the restoration work and then to provide ongoing guidance to people engaging with the restored environment (short courses on mahinga kai and other cultural practices and biodiversity, guided cycle tours, guided fishing, food harvesting)

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10. A beautiful environment
11. More recreation opportunities (swimming, fishing, boating, cycling, walking)
12. An educational environment e.g., for Kiwi Conservation Club
13. Enhanced biodiversity – especially more birds and bats
14. Reduced multiple pests (wallabies, deer, possums, rabbits, hares, plant pests) for the 'natural' parts of the catchment and also for surrounding agricultural land
15. High value timber for later selective harvesting
16. Free food for hunter-gatherer folks
17. Enhanced relationships between different parts of our communities by bringing people together to work collaboratively (enhanced community resilience)
18. Improved health outcomes due to more people exercising in the outdoors in a healthy environment
19. Demonstrated TDC leadership
20. Demonstrated what's possible and so inspire people to do restore other catchments