



Climate Change Contribution Consultation
Ministry for the Environment
PO Box 10362
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Attn: Climate Change Contribution Consultation

Water New Zealand Comment on Setting New Zealand's Post-2020 Climate Change Target

Introduction

Water New Zealand is an independent, not for profit association of water professionals and organisations providing leadership in the water sector through effective advocacy, collaboration, technical advice and professional development. Our purpose is to promote and enable sustainable management and development of our water environment.

Climate change presents both risks and opportunities for the sustainable management of water in New Zealand. Our submission has outlined the risks posed to our sector, and the need for targets commensurate with these risks. We have also outlined a number of opportunities for the water sector to contribute to a climate mitigation target.

The submission is not able to offer a quantitative analysis of these risks or opportunities, but does highlight examples of costs from existing climate events. Much of this information has been sourced from Ministry of Environment resources, and so could be included in further development of climate change targets.

Where there are opportunities to further develop our understanding of associated costs and benefits of climate change these are identified in the submission. We believe these costs require further analysis to inform a science based climate change target that is suitable to New Zealand unique circumstances.

Water New Zealand would welcome engagement with the Ministry to collaborate on the opportunities outlined in our submission.

Objectives for the contribution

1a. We have set the following three objectives for our contribution:

- ***it is seen as a fair and ambitious contribution – both by international and domestic audiences***
- ***costs and impacts on society are managed appropriately***
- ***it must guide New Zealand over the long term in the global transition to a low emissions world.***

We agree with these objectives.

1b. What is most important to you?

In addition to the stated objectives we believe it is also important that climate change targets balance the costs of inaction on climate change mitigation. New Zealand's economy is vulnerable to the impacts of climate change. Our unique circumstances as an agricultural based economy and island nation mean we are heavily exposed to changes in hydrological cycles and rising sea levels which will occur as a result of climate change.

Our target needs to recognise the costs associated with climate change adaptation under a high emissions pathway. For example, if New Zealand's contribution constitutes our fair share of a global target limiting emissions versus four degrees, versus two degrees, what are additional costs that society will bare as a result of the additional two degrees warming?

What would be a fair contribution for New Zealand?

2. What do you think the nature of New Zealand's emissions and economy means for the level of target that we set?

The Consultation Document notes that due to national circumstances, New Zealand has fewer low-cost options to reduce our domestic emissions compared with other developed countries. While Box 4 does provide information on research to reduce agricultural emissions, it is unclear how this assertion has been arrived at.

New Zealand needs a comprehensive analysis of emission reduction opportunities in order to understand the costs of abatement potential in different regions and industries. Such an analysis should include the opportunities for the water industry to contribute to emissions reductions. Examples of these opportunities are outlined in our response to question 4.

Greenhouse gas abatement cost curves provide a fact base for assessing emissions-reduction opportunities and their associated cost and investment needs. National Greenhouse Gas abatement studies of this nature have been conducted in the United

States, China, India, Brazil, Russia, Germany, the United Kingdom, Sweden and other countries.

Opportunity:

New Zealand should produce economy-wide greenhouse gas abatement curves to compare available emission reduction opportunities. Water New Zealand would welcome the opportunity to co-ordinate input from the water industry on emissions reduction opportunities. Examples of where these may lie are outlined in response to question 4.

How will our contribution affect New Zealanders?

3. What level of cost is appropriate for New Zealand to reduce its greenhouse gas emissions? For example, what do you think would be a reasonable impact on annual household consumption?

The costs of setting 2020 targets should be commensurate with the risks that inaction on climate change poses to our economic, social and economic wellbeing. This requires further economic modelling to be undertaken on the likely costs associated with climate risks under different emissions scenarios. Some of the climate change risks posed to Water New Zealand members are outlined here.

A quantitative assessment of climate change risks under different emissions scenarios is not currently possible. This section provides a qualitative listing of the types of impacts posed to the water sector and provides examples of previous events to indicate the expected magnitude of costs in the future. It is clear from the cost of previous events that risks posed by climate change are likely to have large future costs, and these will be exacerbated under high emission scenarios.

The water industry has a number of opportunities to contribute to climate mitigation that would concurrently support economic growth and environmental improvement. It may be appropriate to account for the co-benefits of climate mitigation activities when determining what is a reasonable cost for New Zealand to reduce greenhouse gas emissions. Co-benefits for the water sector in investing in climate mitigation are outlined in response to question 4.

Costs of increased flooding

As a result of climate change, heavier and more frequent extreme rainfalls are expected over New Zealand, especially where mean rainfall is predicted to increase. The percentage increase in extreme rainfall is expected to be approximately 8 per cent per degree Celsius of temperature increase¹. It follows that the greater global efforts to limit climate change, the lower the associated costs of increased flooding.

Heavy rainfall is the most common weather related cause of river flooding in New Zealand. In some parts of New Zealand, such as Otago and Southland, flooding can be

¹ Tools for estimating the effects of climate change on flood flow: a guidance manual for local government in New Zealand, Ministry of Environment:

<http://www.mfe.govt.nz/publications/climate-change/tools-estimating-effects-climate-change-flood-flow-guidance-manual-loc-6>

exacerbated by the melting of snow. Warmer temperatures and rainfall on snowpack can lead to rapid snowmelt which sometimes causes floods. Other flooding may result from inundation caused by higher sea level impacts on rising ground water tables. All of these causes of flooding are expected to be exacerbated with forecast changes in climate².

Analysis of 2004 floods in the Waikato has been used to provide an upper limit for the economic impacts expected from a single storm-related freshwater flood in New Zealand. This flooding event was estimated to have cost farmers \$180 million, with \$130 million in relief funding provided by the New Zealand government³.

Opportunity:

Water New Zealand is in discussions with a number of stakeholders to scope the development of consistent rainfall and runoff guidelines for New Zealand. A similar project in Australia is intended to provide advice on incorporation of climate scenarios guidance in revisions to the Australian Rainfall and Runoff Guidelines.

The Australian project⁴ will provide practitioners using rainfall information advice on appropriate planning horizons, climate change projections and the suitability of different methods when calculating the impact of climate change. We would hope the Ministry of Environment could consider funding and collaboration on the project to develop rainfall and runoff guidance that also accounts for future climate scenarios in New Zealand.

Cost of coastal inundation

Climate change is expected to affect coasts through sea-level rise, storm surge, higher wind and wave action. Direct impacts on water industry assets will result through increased groundwater infiltration, inundation of coastal assets (particularly wastewater treatment plants and stormwater pipe outlets which are often located on the coast), increased drainage problems in low lying areas, and increasing salinity in coastal aquifers. The extent to which climate change will exacerbate these existing coastal hazards will depend on the level of emissions reduction achieved in reference to climate change targets as set.

In January 2011 a storm hit from the Bay of Plenty to Auckland, causing wide spread flooding and costing the insurance industry \$19.8 million in claims⁵. In Auckland itself a storm surge caused flooding of homes, local roads, and the Northwest Motorway. The flooding was worse than a similar storm that hit Auckland in 1936 – largely because the sea was 11 centimeters higher⁶.

² Preparing for future flooding: A guide for local government in New Zealand

³ Economic impacts on NZ of climate change-related extreme events: Focus on freshwater floods
<http://www.mfe.govt.nz/publications/climate-change/economic-impacts-nz-climate-change-related-extreme-events-focus-1>

⁴ Australian Rainfall and Runoff: Project 19, Selection of Climate Change Boundaries
<http://www.arr.org.au/revision-projects/project-list/project-19/>

⁵ Insurance Council New Zealand: Cost of Disaster Events in New Zealand
<http://www.icnz.org.nz/statistics-data/cost-of-disaster-events-in-new-zealand/>

⁶ Parliamentary Commissioner for the Environment, *Changing Climate and Rising Seas, Understanding the Science*, November 2014

The National Institute of Water and Atmospheric Research (NIWA) has projected that in 30 years' time, this level of flooding in Auckland will occur about once every ten years. A few decades later such flooding is expected to occur every year if the world takes no action to curb emissions⁷.

Opportunity:

The Interaction of Coastal Processes and Severe Weather Events could be included in the development of New Zealand rainfall and runoff guidelines. The importance of this understanding will increase in time as existing coastal communities are threatened increasingly by rising sea level as a result of climate change.

Cost of drought

Most climate change scenarios predict rising temperatures and decreased rainfall in the east of New Zealand. This means eastern parts of the country are expected to experience more droughts as the 21st century goes on⁸. Drought impacts on Water New Zealand's members' ability to supply water required for agriculture, industry and urban use, whilst maintaining environmental flows. Drought additionally aggravates water quality problems.

Under a "low-medium" emissions scenario, by the 2080's severe droughts (defined as the current one-in-twenty year drought) are projected to occur at least twice as often as currently in inland and northern parts of Otago, eastern parts of Canterbury, Marlborough, parts of the Wairarapa, parts of Hawkes Bay, parts of the Bay of Plenty and parts of Northland.

Under a medium high emissions scenario, the frequency of severe droughts in these regions could increase even more. By the 2080s, severe droughts are projected to occur more than four times as often in eastern parts of North Otago, Canterbury and Marlborough, much of the Wairarapa, Bay of Plenty and Coromandel, much of Gisborne and much of Northland.

Analysis of the drought over much of the North Island and parts of the South Island found the drought lowered annual real GDP by between 0.2 and 0.7%⁹.

Clearly the level of global emissions will have significance for the economic impact of drought on New Zealand. This reinforces that targets need to be ambitious to align with the costs of drought on the New Zealand economy.

Opportunity:

Improving the efficiency by which water is used is one mechanism to minimise the impacts of drought.

⁷ Parliamentary Commissioner for the Environment, *Changing Climate and Rising Seas, Understanding the Science*, November 2014

⁸ National Institute of Water and Atmospheric Research, *Changes in drought risk with Climate Change – Part 2: Future Scenarios*, May 2005

⁹ Drying out: Investigating the economic effects of drought in New Zealand, Reserve Bank of New Zealand, June 2013

<http://www.nzae.org.nz/wp-content/uploads/2014/05/price.pdf>

The efficiency of water use of Water in New Zealand has room for improvement. The Water New Zealand National Performance Review (NPR)¹⁰ analysed 2013-14 data for providers of water supplies to over 70% of New Zealand's population. Median residential water consumption amongst New Zealand water providers was 231/litres/person/day, higher than most international benchmarks and on par only with Canada.

Not only is the amount of water consumed by residents high, significant water loss occurs through reticulation networks. The median current annual real losses (a commonly used measure of water loss efficiency) amongst NPR participants was 161 litres per connection per day, nearly twice as high as those in a study of urban Australia where median losses were 79 litres/connection/day¹⁰. It is clear that there is room for improvement here also.

To improve our understanding of water losses in homes and connections Water New Zealand is seeking partners for a residential end use study in collaboration with BRANZ. Water New Zealand would welcome government support (either in kind or financial) to deliver the project.

4. Of the opportunities for New Zealand to reduce its emissions (as outlined on page 15 of the discussion document), which do you think are the most likely to occur, or be most important for New Zealand?

There are a number of opportunities for the water industry to simultaneously contribute to greenhouse gas emission reductions while contributing to social and environmental and economic benefits. The likelihood of these occurring will depend on both the sector and governments level of ambition for their delivery. An ambitious greenhouse gas target and associated emissions costs is required for many of the low emissions alternatives outlined here to be cost competitive with established technologies.

Energy generation from wastewater

Opportunities for renewable energy generation and methane destruction occur through the use of wastewater biogas to generate electricity and heat. Through this process fugitive methane is captured and used to fire cogeneration units which displace the use of grid electricity, and converts potent methane gasses into carbon dioxide, thus reducing the overall greenhouse gas emission intensity of electricity generation.

Biogas capture and reuse can be employed on urban wastewater treatment plants, at industrial facilities (such as pulp and paper mills) and on farm based wastewater treatment systems (such as covered anaerobic lagoons at wastewater treatment plants). An organisation such as the EECA could be used to facilitate uptake of these existing technologies.

¹⁰ National Performance Review 2013-14, Water New Zealand, April 2015:
https://www.waternz.org.nz/Category?Action=View&Category_id=232

Cogeneration

The wastewater industry has the potential to deal with waste streams additional to traditional sewage such as fats, oils and grease, dairy, beverage and food. Organic waste combined (co-digested) with wastewater sludge (settled sewage) not only increases renewable energy generation options at wastewater treatment plants but can also divert waste from landfill reducing fugitive emissions and associated transport costs. Considering synergies between solid and liquid waste facilities during city planning and facility design stages could help enable co-digestion opportunities.

Alternative fuels

Wastewater can also be used to generate alternative fuels for use in transport, utilising emerging and established technologies to produce natural gas and algal based fuels. In Linköping in Sweden, the entire urban transport fleet, consisting of 64 biogas buses and 12 public biogas filling stations, is powered using slaughter house and industrial organic wastes, reducing emissions by 9000 tonnes/year¹¹.

Bio-sequestration

Many of New Zealand's waterways stand to benefit from riparian plantings, which additionally sequester carbon dioxide. Planting around rivers and waterways helps reduce erosion and improve nutrient control. Plantings around potable water catchments improves water quality and reduces treatment costs.

Energy efficiency

Wastewater and water treatment processes can consume significant volumes of energy. Providing guidance at a facility design stage, and creating incentives for energy efficient use present opportunities to reduce electricity use and in turn emissions at facilities. The Victorian Government in Australia previously facilitated interest free loans, available to water utilities for energy efficient upgrades through its Greener Government Building Program¹². Similar schemes could be made available to New Zealand councils.

Soil carbon

The water industry has the potential to provide bio-solids that can be land applied to improve water and nutrient holding capacity, and improve the carbon content of biomass as soil carbon. Water New Zealand is currently developing guidance for members on how bio-solids could be beneficially reused. The development of national standards would further assist in the uptake of bio solids reuse.

Reducing Wastewater emissions through advanced treatment processes

Novel processes exist to reduce nitrous oxide emissions from wastewater. One example is the Anammox process which has been used internationally to short cut the nitrogen cycle, reducing overall greenhouse emissions by 95%¹³. The development of a targeted

¹¹ 100% Biogas for urban transport in Linköping, Sweden: Biogas in buses, cars and trains, IEA Bioenergy http://www.seai.ie/Renewables/Bioenergy/100_biogas_for_urban_transport_in_Linköping_IEA_Bio_Task_37.pdf

¹² Efficient Government Buildings: Department of Treasury and Finance [Victoria, Australia] <http://www.dtf.vic.gov.au/About/Projects/Efficient-Government-Buildings>

¹³ The Anammox process for sustainable ammonium removal, Delft University of Technology: http://www.tnw.tudelft.nl/fileadmin/Faculteit/TNW/Over_de_faculteit/Afdelingen/Biotechnology/Research/Research_Groups/Environmental_Biotechnology/Highlights/doc/EBT_anammox_process.pdf

research program for New Zealand's water and wastewater sector would help facilitate the introduction of such opportunities to New Zealand.

Summary

5. *How should New Zealand take into account the future uncertainties of technologies and costs when setting its target?*

Until we can better account for the cost of climate risks Water New Zealand believes we should be adopting a conservative, risk based approach that accounts for the high costs of inaction on climate change. This will require that New Zealand is suitably ambitious in setting its Climate Change target.

To meet the goal of keeping atmospheric greenhouse gas (GHG) concentrations at levels sufficient to “prevent dangerous anthropogenic interference with the climate system” the United Nations Framework Convention on Climate Change states that global warming should not rise beyond 2°C above pre-industrial levels¹⁴. To achieve this, the Royal Society of NZ stated in 2011 that emissions from industrialised countries need to be reduced by 80-95% by 2050 relative to 1990. This would mean that the shorter-term targets being negotiated in Paris in December 2015 need to achieve at least a 40% reduction by 2030 relative to 1990 for industrialised countries¹⁵.

While uncertainties in technologies and costs of the targets may vary, New Zealand's target should be focused on avoiding the dangerous impacts of climate change in line with the stated objectives of our contribution:

1. It is seen as fair and ambitious – both by international and domestic audiences
2. Costs and impacts on society are managed appropriately
3. It must guide New Zealand over the long term in transition to a low emissions world

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¹⁴ NZCCC Climate Brief: The Challenge of Limiting Warming to Two Degrees, Resinger. A, Nottage. R, Lawrence. J, New Zealand Climate Change Centre, 2011

¹⁵ Gazetting New Zealand's 2050 Emissions Target Submission from the Royal Society of New Zealand <http://www.royalsociety.org.nz/media/Gazetting-New-Zealands-2050-Emissions-Target.pdf>