

Rural Water Supply: Planning for Climate Change



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BUILDING A BETTER WORLD

Overview of Presentation

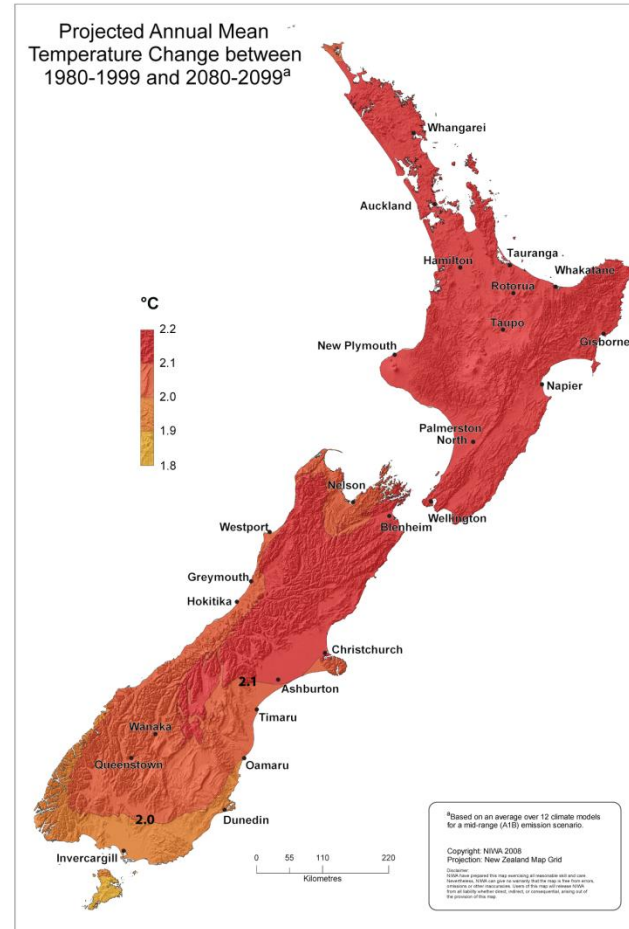
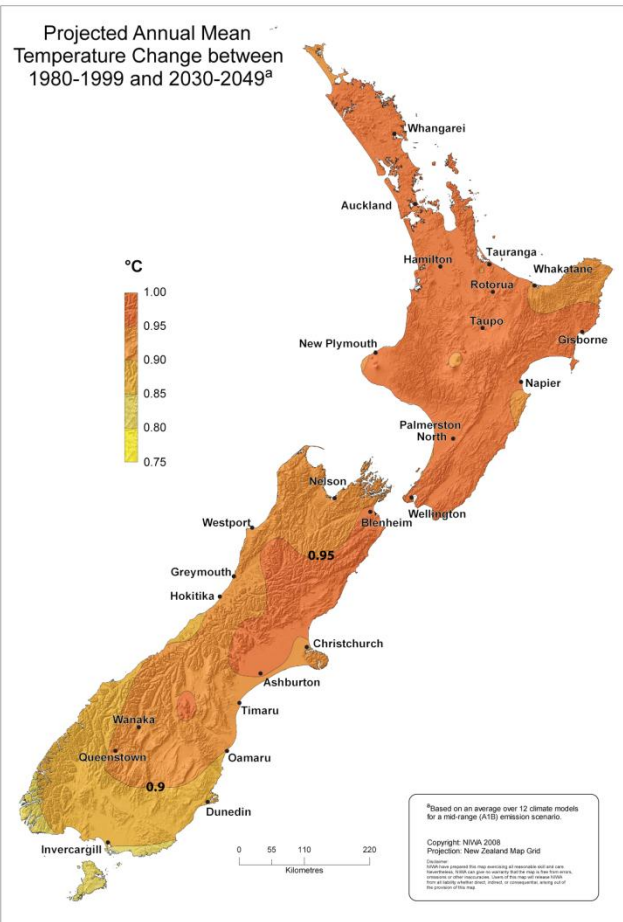
- MAF study to assess climate change impacts
- Climate change projections
- Effects on rural water supply and infrastructure
- Impacts on irrigation schemes
- Adaptation/response strategies
- Planning considerations
- Manuherikia Irrigation Scheme case study
- Opportunities for planning changes



Methodology

- Case study approach to assess impacts
 - 5 irrigation schemes
 - 7 stock water supply schemes
- *MfE Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Govt in NZ – 2nd Edition (2008)*
- Assessment of effects
 - Hydrological and meteorological
 - Water temperature and quality
- Impact on Infrastructure
- Response options and recommendations for water infrastructure management
- Planning perspective

Projected temperature changes



Projected changes to water supply

- Climate Change Effects
 - Increase in average annual rainfalls
 - Increase in extreme heavy rainfall
 - Frequency of drought events on increase
- Water Temperature Effects
 - Risk of new invasive organisms
 - Increased plant productivity and algae blooms



Effects on Rural Water Infrastructure

| Climate Change | Effect |
|--|--|
| Increase in rainfall | Higher rainfall and average river and stream flows will provide benefits for <u>instream</u> ecology and at times reduce pressure on the water resource. |
| Decrease in rainfall | Lower stream flows and potentially more rigorous residual flow requirements for source streams. Increased pressure on water resources. |
| Changing rainfall patterns | Seasonal variations may lead to increased pressure on water resources at times. Less water (or more water) available for storage at different times of the year. |
| Less snow fall and shorter snow melt season | Lower flows in spring and summer may lead to increased pressure on water resources at times. |
| Increased risk of drought | Increased frequency and durations of very low river and stream flows may at times increase pressure on water resources and stream ecology. Minimum/environmental flow could be reached more often and abstraction for schemes reduced or halted for periods of time. |
| Increased frequency and intensity of heavy rain events | Increased sediment and nutrient inputs to storages contributing to higher risk of nuisance algae blooms or weeds. Increased sediment yields and erosion in scheme catchments. Potentially increased maintenance costs for scheme infrastructure. An increase in the frequency of large floods may lead to re-evaluation of design parameters for storage lakes. Potential effects on pipeline stability. |

Effects on Rural Water Infrastructure cont.



| Climate Change | Effect |
|---|---|
| Increase in average temperature; Increase in very hot days | <p>Increased temperatures in source rivers and streams with potentially adverse effects on stream ecology.</p> <p>Increased temperatures in storages contributing to higher risk of nuisance algae blooms.</p> <p>Increased risk of weeds, pest fish or other unwanted organisms. May contribute to increased variability on DO and pH regimes.</p> <p>Potentially higher maintenance costs for scheme infrastructure due to clogging of screens and increased corrosion.</p> <p>May also increase the risk of invasion by other unwanted organisms (but possibly reduced risk associated with <u>didymo</u>).</p> <p>Increase in peak demand for stock watering.</p> |
| Increased summer water deficit for un-irrigated land | Increased water demand for land currently in schemes. |
| Increased windiness | Coupled with an increase in temperature this could lead to an increase in erosion of topsoil. |
| Sea level rise | Bores near the coast will have an increased risk of saltwater intrusion. |
| Decrease in groundwater levels | Increase in pumping head. |

Impacts on Irrigation Schemes

- Impact on all water supply schemes
 - Capital, operating and maintenance costs
- Increased water demand and reduced yields
- Increased flood damages
 - Increase in reservoir spillways
 - Increase in culvert sizes
- Increase in weed growth and blocking of canals, intakes and screens
- Increased pressure on water resources
- Disruption and reduced levels of service

Adaptation/Response Strategies

- Responses at Scheme level
 - Increasing storage within schemes
 - Remediation to reduce flood damage
 - Increasing volume of water take
 - River works to maintain intakes, river training, dredging
 - Weed management
- On-farm responses
 - Improvements to soil health and structure
 - Small-scale storage
- Pipe conversions likely to be more common

Planning Responses

- Strategic planning
 - Development of regional plans in source catchments
 - Non-regulatory implementation methods
- ‘Global’ resource consents
- Emergency works provisions
- Maintenance and asset management plans

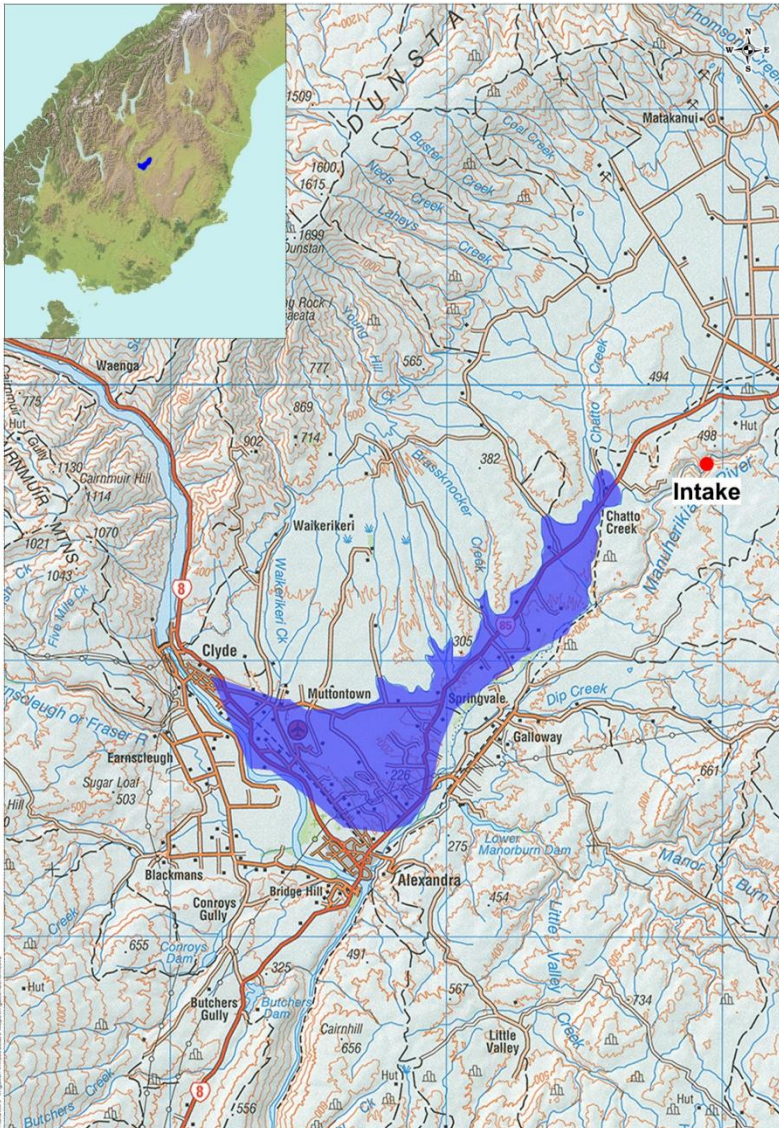
Manuherikia Irrigation Scheme

- Supply arable farming, horticulture, viticulture and lifestyle properties
- Supplies water to 285 properties
- Irrigated area of 2,250 ha
- Opened in 1922
- Storage and gravity scheme



15/04/2010

Location of Manuherikia Scheme



- Central Otago
 - North of Alexandra, east of Clyde
- Draws from Manuherikia River
- Storage in Falls Dam
- Supplemented by borough race system

Manuherikia Irrigation Scheme – Climate Change Projections

- Temperature increases
 - Very hot days increasing
 - Number of frost days decreasing
 - Increasing river water temperatures
- Mean annual rainfall increases
 - Increase in frequency of heavy rainfall
 - Reduced annual snow falls
 - Increased risk of drought



Climate Change Effects for Manuherikia Irrigation Scheme

| Climate Change | Effect |
|---|--|
| Average rainfall increased across all seasons | Higher average river flows across all seasons will provide benefits for <u>instream</u> ecology. |
| Increased risk of drought | Increased frequency and durations of very low river flows may at times increase pressure on water resources. |
| Increase in average temperature; Increase in very hot days | Increased summer temperatures in the Manuherikia River contributing to higher risk of nuisance algae growth and placing stream ecology under increased stress. |
| Increased frequency of heavy rain events | Increased sediment loads in the Manuherikia River. |
| Increased summer water deficit for un-irrigated land | Increased water demand for land currently in Scheme |

Impacts and Response Options for Manuherikia Irrigation Scheme

- Pressure on water resource reduced at times
- Increased pressure in dry summer months
- Increased maintenance costs
 - Sediment cleaning in the canal
 - Clogging of screens and increased corrosion
 - Increased removal of weed and cleaning
 - Damage and clogging of service lines and spray heads
 - Repairs for flood damage
- Installation of intake screens

Issues faced by system operators

- Pressure on water resource may result in change to piping
- Land use changes may increase nutrient loadings and weed growth
- Weed cleaning and canal cleaning requirements increased
- Flooding area of concern
 - Automation of intake gates
- 40% increase in annual O&M costs
- More intensive land uses needed for new schemes to be economic



Planning – Policy Framework

- Regional Plan: Water for Otago
 - source water body is substantially overallocated
 - new water permits attract high minimum flows
 - recognition of existing water permits, but policy direction to ‘claw-back’ overallocation
 - cessation of mining privilege rights in 2021

Planning - Options

- Water management groups
- Involvement in regional plan preparation/changes
- Global consents
- Maintenance and asset management plans



Planning – Water Management Groups

Regional Plan: Water Policy 6.4.12A:

To promote, approve and support water management groups to assist the Council in the management of water by the exercise of at least one of the following functions:

- (a) Coordinating the take and use of water authorised by resource consent.*
- (b) Rationing the take and use of water to comply with relevant regulatory requirements.*
- (c) Recording and reporting information to the Council on the exercise of resource consents as required by consent conditions and other regulatory requirements, including matters requiring enforcement*

Planning – Involvement in Regional Plan preparation

- Storage of water
- Minimum flows and/or water allocation provisions
- Other matters?



Planning – Global consents

- Common activities associated with one consent holder or series of infrastructural assets
- Maintenance works or structure upgrades
- Challenge to define the range of works that could be covered by consent