Understanding the Social Impacts of Freshwater Reform: A Review of Six Limit-Setting SIAs

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1. Introduction

1.1 General Introduction

The Government has developed the Essential Freshwater Package (the Package) to improve and maintain sustainable outcomes from freshwater management. To support the Ministers' decision-making on the Package, the Ministry for the Environment is undertaking impact assessments to better understand the environmental, economic, social and cultural impacts of the proposed regulations on freshwater quality, and how rivers are used and enjoyed. This review was developed to inform the social impact assessment (SIA) of the Package, which will in turn support the development of a Regulatory Impact Statement (RIS) as required by Treasury for all policy decisions. The RIS forms part of the Ministry's advice to Ministers on the Package.

This review does not constitute a social impact assessment of the Package. It provides the Ministry with insights on the *potential* nature of social impacts emerging from freshwater policy changes, based on past social impact assessments of previous freshwater limit-setting processes. It draws in particular on six existing SIAs that were conducted for specific and sometimes distinctly different foci, where the overall intent was to establish environmental limits and action plans that would ultimately improve freshwater quality, as driven by the 2011, 2014 and 2017 National Policy Statements on Freshwater Management (NPS-FMs).

The review concentrates on the components of social impact covered in the six assessments. These were focused on the land-uses, rural populations and communities within the catchment boundaries of each limit-setting process, and the recreational activities of catchment residents, adjacent urban areas and visitors.

Independent cultural assessments were completed by appropriate iwi members or their consultants for the subject catchments[1] and this review does not attempt to draw on these. It is, however, important to recognise the overlap between cultural values, natural values and social values of waterways, especially in respect to recreational uses. All these sets of values demand high quality of the freshwater environment.

The catchment-level SIAs drawn on for the review are:

1) **Selwyn Waihora:** Taylor, N., McClintock, W. and Mackay, M. (2015). Technical report to support the water quality and water quantity limit setting process in Selwyn Waihora catchment. Predicting consequences of future scenarios: Social Impact Assessment. Technical Report prepared for Environment Canterbury. Taylor Baines and Associates.
2) **Hinds Hekeao:** Taylor, N., McClintock, W., Mackay, M. and Goodwin, M. (2014). Hinds Hekeao catchment limit setting process: social assessment. Technical Report prepared for Environment Canterbury. Taylor Baines and Associates.
3) **South Canterbury Coastal Streams:** Taylor, N., McClintock, W. and Mackay, M. (2015). South Canterbury Coastal Streams (SCCS) limit setting process: Social profile and assessment. Technical Report prepared for Environment Canterbury. Taylor Baines and Associates.

[1] For example, Tipa (2012 and 2014).

4) **Waitaki:** Taylor, N., Harris, S., McClintock, W. and Mackay, M. (2015). Waitaki Limit Setting Process: Social-economic Assessment. Technical Report prepared for Environment Canterbury. Taylor Baines and Associates Ltd and LWP Ltd.
5) **Waimakariri:** Sparrow, M. and Taylor, N. (2019). Waimakariri Land and Water Solutions Programme, Options and Solutions Assessment: Social Assessment. Technical Report prepared for Environment Canterbury. Mary Sparrow and Nick Taylor and Associates.
6) **Ruamāhanga:** Taylor, N., Erasmus, T., Perkins, H., Mackay, M. and Russell, K. (2017). Ruamāhanga Social Assessment. Report for Greater Wellington Regional Council. Nick Taylor and Associates.

1.2 Structure of the Review

The review has 7 sections. Sections 2 to 6 draw on the SIAs reviewed to identify key social impacts and, where possible, the casual mechanisms that lie behind these effects, or "chains of effects". This commentary is at a high-level appropriate to a national perspective and is not provided at the level of specific catchments, regions or populations, although, where appropriate, specific examples are used. Sections 2 to 6 are organised around the following key themes:

- Regional economic activity and employment
- Population and communities
- Human health
- Socio-cultural values
- Social equity, cost of living and cohesion

Each of the section begins by contextualising the primary focus of the SIAs, with a note on the evidence base for the assessments. Sub-sections discuss key linkages and effects at a high level (across the SIAs). Sections conclude with a summary impact statement that provides common findings across the SIAs reviewed.

Table 1 aligns the main sections of the report (columns 1 and 2) to current and future wellbeing indicators (column 3) drawn from Treasury's Living Standards Framework (LSF).[2]

Section 7 of the review draws on the SIAs to address the following key question: *In terms of wider transition processes how could major social impacts be best managed to maximise net positive social outcomes?* Here the focus is on the social impacts and subsequent transitions that are likely to require active management of social change to maximise net positive social outcomes.

Drawing on the review, the conclusion provides some high-level commentary on the changes already underway as a result of the limit-setting process over the last decade, and the perceived need for some change among those who participated in these processes. The conclusion also draws on the review to comment (a high-level) how changes in freshwater management are likely to vary across catchments, people and communities.

[2] Table 1 was developed specifically for this report to provide guidance for the regulatory analysis by MfE.

Table 1: Report content mapped to the Living Standards Framework (LSF)*

Report Section Heading	**Report sub-heading consistent with the six SIAs reviewed**	**Indicators of social well-being consistent with the LSF***
Regional economic activity and employment	Land uses On and off farm employment Sustainable land uses Water for production Primary processing and rural jobs	Paid work Disposable income Financial wellbeing Household net worth Employment status Sustainable food production
Population and communities	Population size Population character and composition Qualifications and skills of farmers Economic diversification Schools and social services	Knowledge and skills Educational attainment
Human health	Safe and secure drinking water Upgrades of urban waste and strom water Upgrades of drinking water supplies Mental health of farmers Contact recreation Health benefits of recreation	Drinking water Water quality (Swimmability) Waste management Health status Mental health Feeling safe
Socio-cultural values	Sense of identity and place Recreation Outdoor and environmental education	Ability to express identity Access to the natural environment Biodiversity and genetic resources Perceived environmental quality
Social equity and cohesion	Amenity values Household incomes Social connection and capital Social equity Community cohesion	Housing costs Housing quality Trust in government institutions Social networks/support Sense of belonging Loneliness

*see https://treasury.govt.nz/sites/default/files/2019-12/lsf-dashboard-update-dec19.pdf

1.3 Background to the SIAs reviewed

Over the last 10 years, social impact assessment has been integrated into the land and water planning process for several regions in Aotearoa New Zealand. The process has been driven by the NPS-FW (2011, 2014, 2017) which required regional councils to establish resource allocation *limits* for catchments within their land and water regional plans. Limits are a combination of river nutrient loads and water allocation measures that must be set at a level to halt any decline in the quality of local waterbodies, while also achieving *community-defined* social, economic and cultural outcomes.[3] They define minimum river flows and quality standards, with implications for recreational, farming, cultural, urban and industrial uses.

In Canterbury to date, "limit-setting" has been conducted catchment-by-catchment under the Canterbury Water Management Strategy (CWMS). The CWMS divides Canterbury into 10 water catchments (or "Zones"), each with its own Zone Committee: a local water governance group comprising appointed community, local government and industry representatives. The Zone Committees, with the help of technical advisory teams (including social impact assessment specialists), have worked together to explore the interrelated aspects of land uses, policies and water management options on local waterways, social life, culture and economy.

In Wellington, the Regional Council (GWRC) also initiated a community-led planning process to address land and water management under the NPS-FM (2014 and 2017). This process was also catchment-based, with the region divided into five Whaitua, each with a committee representing a partnership between the regional council, iwi, territorial authorities and the community.

While there were some variations in approach both within and between regions and over time, land use change scenarios were at the heart of all the assessments. Each scenario typically included a "business as usual" (BAU) option, alongside those that explored increasing levels of environmental improvement, over short, medium and longer-term timeframes.

The scenarios provided participants with a focus for debate and a basis upon which to explore the impacts of the various scenarios (or limit "options") against the outcomes *they* had set. In broad terms, the scenarios ranged between expansion of farming to achieve economic outcomes, and reductions in intensive farming with associated farm mitigation practices to achieve environmental outcomes.[4] Assumptions built into the scenarios were generated in response to the NPS-FW by the Regional Council working with local communities and stakeholders through the Zone and Whaitua Committees.

To inform the process, the technical teams used available science and new modelling[5] to predict and drive discussion about the social, economic, environmental and cultural

[3] Snelder et al. (2013).
[4] For further comments on the methodologies, including scenario approaches and modelling, see Norton et al. (2012).
[5] For the social assessments, the current state analysis involved the establishment of a spatial framework utilising either Census Area Unit or Mesh Block boundaries that fitted most closely to the catchment boundaries. This spatial framework was then used to build a picture of demographic and employment factors using a mix of social statistics but relying predominately on census data. The profiles also utilised descriptive data from one-on-one interviews and from community workshops. In

impacts of each change scenario. There was considerable community and stakeholder involvement in these processes and discussions raised a range of issues for populations and communities.

The social impacts typically explored (excluding local issues and effects particular to the catchments) in the assessments are presented in Table *2*.

In each catchment, the modelling and assessment work also explored policy and planning actions as well as local actions and solutions.[6] These solutions have included, for example, investigation of managed aquifer recharge in some catchments (Hinds Hekeao[7], Selwyn Waihora, Waimakariri to increase groundwater supplies and to dilute nutrients in ground water). Others were focused on ecological outcomes, such as particular restoration efforts in a water way or wetland, and efforts to reduce nutrients in a problematic water body. Examples of these sorts of options include trials to examine nutrient reduction through enhanced wetlands at Lake Waihora Ellesmere, and diversion of Ruamāhanga River water through Wairarapa Moana Lake Wairarapa. Some of these options had high capital costs that would fall on farmers or ratepayers or require external funding.

For each catchment the technical assessments and community deliberations resulted in a recommended package of plan changes and actions for regional councils to consider and implement. These assessments are all publicly available through council websites. This report reviews six SIAs that were completed as part of the technical assessments described above. For each SIA at least one of the authors of this review was involved in the assessment.

addition, historical data provided an understanding of recent trends. The social profiles were updated throughout the planning process, recording wherever possible the views of local people and those aspects of the catchment that they value.

[6] Usually as additions to regional policy statements.

[7] Note: instances where the English name precedes the Māori name in this document follow the usage in that assessment, otherwise the standard convention prevails.

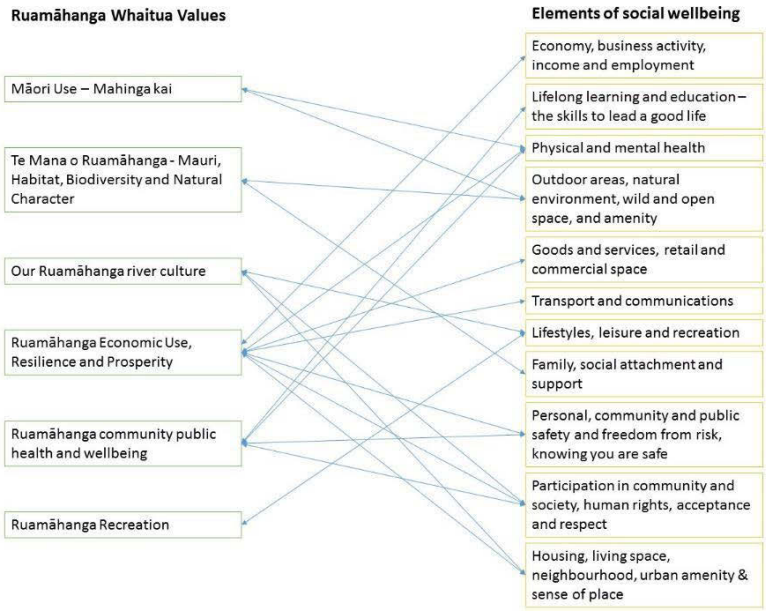
Table 2: *Examples* of common social impacts explored in scenario development and testing[8]

Social impact	Source and nature of impacts (depending on the scenario)	Who is affected directly and indirectly?
Health risks from contaminated water	Nitrogen leaching from intensified land uses, potentially mitigated to some extent by farm management practices or dilution by alpine water– nitrogen and/or bacteria causes users to monitor wells more regularly, sink costly deeper wells or buy bottled water to feed babies.	Rural households with shallow wells, community and urban supplies from deeper wells (additional costs), especially vulnerable are families with babies. Public health services are required to adopt a stronger public health role for water quality.
Level of on-farm employment	Intensive, irrigated agricultural systems, such as dairy farming, generate on and off-farm employment, conversely reduction in levels of farming reduces employment.	Farmers, employees, farm service industries, rural communities, social service providers.
Demand for social and community services such as rural schools and health services, and businesses such as veterinarians and contractors	There is a direct link between employment and population in rural areas. Changes in land-use that effect on-farm employment will have a direct effect on population.	Farming communities; rural communities; rural businesses and social service providers.
The level of diversified population and community cohesion	Newcomer farmers and families and migrant workers attracted to increased economic opportunity, potentially creating a demand for social change management.	Rural communities particularly leaders and “anchor” families; settlement support services; migrant workers and their families.
Adoption of new technologies for irrigation, farm and riparian management; levels of skills and training, tertiary education	New rules and urban pressures around farm management, riparian protection, nutrient leaching and ecological status of waterways; demand for new knowledge.	Farmers, farm consultants and advisers, training organisations. farmer water and land management groups
Levels of farm debt; farmer stress	Capital investment in increasingly expensive farmland and conversion to intensive uses makes farms vulnerable to periods of low prices; commodity price cycles.	Farmers and farm families; Banks and rural lenders; farm financial advisers; rural support organisations; health services.
Location and quality of recreational fishing	Ecological status of lakes and streams; numbers of fish such as trout, salmon and whitebait.	Fishers, guides, accommodation and rural tourist businesses
Nature of contact recreation and level of recreational satisfaction	Visual appearance, bacterial levels of streams/waterways including cyanobacterial and algal blooms.	Swimmers, boaters, rowers, kayakers, sail board users and kite surfers (for example).

[8] After Taylor and Mackay (2016, p.112).

Figure 1, from the Ruamāhanga assessment, provides a conceptual mapping of catchment values and elements of social wellbeing. Unlike tables, this diagram illustrates the importance of multiple connections between the values and elements of wellbeing, which was found to be the case in all the catchment SIAs.

Figure 1: Example mapping of catchment values to social wellbeing[9]



It is important to note that there was a great deal of variability within and between the catchments studied. Recognition of such diversity underpinned the catchment-by-catchment approach used by the Regional Councils, and was reflected in the SIAs. There are for example varying degrees of water quality within catchments, such as between upland streams and lakes and lowland coastal streams, lagoons and lakes that typically have experienced significant declines (e.g., Lakes Waihora, Wainono and Wairarapa). It is not easy to compare directly a river system such as the Hinds Hekeao and the Ruamāhanga, when the latter incorporates significant sub-catchments as well as a major coastal lake and lagoon system.

It is also important to note that the status quo in these catchments identified major declines over time in the environmental quality of coastal streams and lagoons. Communities in the catchments found declines in river systems unacceptable under the status quo (or business as usual – BAU profiling and reporting) and pushed strongly for future attribute states under the National Objectives Framework (NOF) that represented positive step changes and associated improvements. At the same time, communities recognised that regional economies were benefiting strongly from intensified agriculture under irrigation and there was a need to strike a better *balance* between a thriving economy and healthy river systems.

[9] Taylor et al. (2017)

2. Regional Economic Activity and Employment

2.1 Context

The SIAs of the catchment plans reviewed recognised the primary effect from changes in the management of land and water on regional economic activity and employment. Across the assessments, social impacts were considered to result from changes in farm income and drawings by farmers, the profitability of a farm operation and the ability to reinvest that income on or off farm, the level of on and off farm employment, and the availability of capital gains and funding for the process of retirement and succession. The economic analysis traced how, over time, these changes at the farm level flowed into effects at the catchment level, and for districts, towns and regional economies. As discussed in following sections of this review, economic effects flow into social ones, for instance employment growth affects populations which in turn affects community vitality.

The analysis of social impacts of changes in the regional economy relied on independent economic impact assessments conducted for the limit-setting processes. An integrated assessment approach means that in addition to the outputs from farm economic models, the economic assessments also drew on other technical modelling (such as the nutrient modelling work) in order to assess the effects on changes in land uses and farm practices necessary to achieve desired freshwater outcomes. The assessments were also based on a detailed social economic profile – or baseline study of the catchments – comprising trend data on employment and GDP per sector.

2.2 Focus of the assessments: key linkages and effects

2.2.1 Land uses

Generally, land uses were predicted to change under scenarios where stricter polices and rules were applied to freshwater management, including limits to further expansion of intensive agriculture, such as dairy farming and grazing. Under BAU scenarios changes in land-use were typically modest as they were limited to changes already instituted through existing polices and rules, resource consents, and voluntary industry accords. These were likely to include good management practices such as exclusion of stock from waterways. Under other scenarios, alternatives to intensive land uses, such as dairy farming, were only considered in a limited way in terms of likely new areas of land use, such as horticulture or dry-land lifestyle blocks. For areas of sheep and beef farming, the alternative land use considered was usually forestry. An example is the Ruamāhanga catchment, where land use was predicted to change (on a large area of hill country – to production and conservation forestry, and to increased areas of horticulture, such as viticulture and olives).

The social impacts of land use change are well documented for Aotearoa New Zealand.[10] The key driver of this impact chain is land use to employment to population, and then to community effects. The primary impacts from land uses and changes in land use are on:

- farm revenue and expenditure;
- the number of farmers and farm workers on farm; and

[10] Taylor (2019).

- the ownership of farms.[11]

2.2.2 On and off farm employment and expenditure

Regional employment effects are typically assessed across the catchments, scenarios and planning options. The catchment SIAs often found there would be a net positive long-term effect on employment soon after expected new irrigation water boosts production in these catchments. Examples include the Hinds Hekeao catchment, where new water was available at the time of the SIA because of additional water available from the Barhill-Chertsey Scheme directed back through the Rangitata Diversion Race and associated irrigation companies. This new water was predicted to boost the upper catchment economy.

The SIAs and other research indicate that new water and associated land uses, such as dairy farming, provide allied impacts on employment, such as an increase in skill levels, workforce mobility and ethnic diversity.[12] Other catchments with similar conclusions drawn were the Upper Waitaki because of available water, the Southern Streams (south of Timaru using Waitaki River water), and Central Plains Irrigation in the Selwyn Waihora catchment (Rakaia and Waimakariri River water).

In catchments where no large quantum of new water was envisaged, or in more recent instances where nutrient limits are expected to constrain further intensive farming despite the availability of water, then the effects on employment from reduced farm revenue have looked to be more severe. The best examples here are the Waimakariri and Ruamāhanga catchments. Interestingly, both these catchments have diverse rural economies that include numerous small farmers and lifestyle blocks, horticulture, forestry and workers commuting to a major city. This diversity led to an assessment of relatively small regional effects from constraints to intensive farming.

For example, in the Waimakariri Catchment, the regional economic analysis of the proposed catchment plan points to a relatively small decrease in the diverse district economy and a more significant effect on the farming economy and some local economies. Any effect of lowered farm incomes from new controls on water takes and nutrients in waterways, plus other on farm costs such as riparian planting, will impact individual farms, farm services and general expenditure in the economy, affecting both rural and urban communities. The scale of these impacts was seen to be at the level of a period of depressed product prices or a weather event such as a prolonged drought. However, there was also potential for the on-farm effects to be concentrated in localised stream catchments.[13]

The potential for a cumulative effect across policies and other sources of pressure on farm operations and farm families was noted, such as a period of low product prices, new climate change policies, and new urban and land use planning rules that restrict

[11] Recent research found that there is a general shift in Canterbury towards more corporate farming systems involving farm owners, contract milkers and employees. This shift is unlikely to alter the general positive impact of intensive land-use on on-farm employment (and population and communities) (Taylor, et al., 2018).
[12] Taylor et al. (2018). Also see Rawlinson (2011), Tipples and Wilson (2005), Tipples et al. (2012), and Wylie (2009).
[13] Such as the Cam River catchment or Silverstream as a result of a collaborative process.

rural subdivision. This cumulative effect was found in the SIAs to have a high likelihood to increase the number of farmers who will experience increased levels of stress and mental health issues[14], as discussed in Section 4.2.4.

2.2.3 Sustainable and productive land use

The SIAs show that farmers are likely to turn to land uses that have more sustainable outcomes across social, cultural, environmental and economic results. For instance, some hill country farmers predominately focused on pastoral farming are likely to turn to a mix of production and indigenous forestry alongside grazing systems. Potential adverse economic consequences of this sort of change in land use could be offset by future returns from carbon capture under the Emissions Trading Scheme (ETS). This change in land use will also present new opportunities for alternative products and income sources such as outdoor recreation, farm tourism ventures or honey production (as discussed in the Ruamāhanga SIA).

Conversions of hill and high-country farms will affect employment in rural communities depending on the extent of this change. In some areas, such as the Ruamāhanga eastern hill country, the change could mean a diversification of existing farm units, potentially increasing net employment. On the other hand, if whole farms convert to forestry there will most likely be a net reduction in local employment and an increase in regional employment, especially in places where forestry contractors or forest processing are located.[15]

The review of SIAs indicates that increased costs of water and/or any reductions in the reliability of irrigation will potentially lead to farmers exploring, and in some cases adopting, a range of changes overtime, whereby they develop diverse portfolios of land uses and on or off-farm enterprises. Farmers are continually looking for higher value land uses, and non-agricultural enterprises such as tourism.[16]

There is also likely to be an increase in interest in the concepts of land and brand - linking production from the land to specific features of a locality and farms that produce food and fibre products. For example, the Ruamāhanga SIA found evidence of these trends in the Wairarapa. This approach can lead to higher revenue at an enterprise level, by sector groups and by localities and regions.

Another adaptive strategy identified is the potential sale of all or parts of a farm to other producers including lifestyle blocks, leading both to an increase in smaller properties[17] and an increase at the same time in larger sized properties and corporate farming, as also discussed in Section 3.2.4.

2.2.4 Net value added by irrigation and the reliability of irrigation

The effects of new water policies and rules examined in the SIAs included the possibility that farmers will look for higher returns from water while reducing emissions of nutrients and sediment. In this context, the SIAs have noted that, operating within new environmental limits, farmers might adopt appropriate horticultural uses and other high

[14] See Botha et al. (2013).
[15] This outcome is discussed in more detail in Taylor (2019).
[16] See for example Nelson and Mackay (2019).
[17] Experience in Canterbury suggests lifestyle blocks can introduce a wide range of new land uses and enterprises.

value cropping options as in vegetables, cereals, small seeds and new oil and fibre crops that provide returns that are enough to reward the investment in irrigated land/or irrigation infrastructure.

These options for irrigated land uses will vary with the type of irrigation system required for each crop and the reliability of irrigation water. High value crops may have highly efficient systems for applying water, but they also require increased reliability of water supplies. Climate will be another factor affecting options such as cherries in Central Otago, apples in the Amuri or grapes in the Wairarapa.[18]

The potential social impacts of new irrigated crops will depend on the number of farmers who choose such alternatives. They could include an increase in the number and type of employees on farms and living in rural communities. For instance, the SIAs discuss a potential increase in demand for seasonal and migrant workers, for example, horticulture in the Wairarapa.

2.2.5 Primary processing and rural service employment

The SIAs show that the effect of policies on employment in primary processing and rural services will depend on two key factors: the location and kind of primary processing and agricultural servicing, and the type and overall level of farm outputs. Primary processing in Aotearoa New Zealand, such as milk and meat processing, is increasingly specialised and often concentrated on locations servicing a wider region, such as the case for South Canterbury.[19]

Effects on primary processing and rural services are indirect: they result from land uses, productivity and expenditure off farms. Traditional agricultural servicing business, such as shearing contractors, vet services and farm machinery, are increasingly centralised and serving larger areas. Also, workers are known to commute longer distances from their place of residence. Furthermore, the effects of water policies on a region are likely to be blurred by unrelated factors such as changes incorporate ownership structures and investment strategies of a processing plant, or technological innovations as plants seek to achieve greater efficiency. Where plants and services are in a rural area and experience employment changes up or down, with multiple redundancies, then experience suggests that there could be considerable social impacts in rural communities and towns.[20]

2.3 Summary impact statements from the SIA review

The work on social impacts to date indicates that in order to achieve an increase in the quality or quantity of water that will affect positively the health of waterways in Aotearoa New Zealand then:

- this set of changes will most likely have a negative effect on farm revenue, especially in the first few years of transition;
- any negative effect on farm revenue will also have a potential effect on the numbers and types of jobs on and off farm;

[18] As in the SIA of the Ruamāhanga and studies by the authors in Central Otago and the Amuri.
[19] Campbell (2019); Perkins et al. (2019).
[20] Bidwell and Colhoun (2013) discuss the health and well-being impacts of redundancies in rural areas with examples. The scale of losses varies depending on the local situation and the size of the employer.

- a multiplier effect means that changes in the number and types of jobs on farm will have a flow-on effect in the regional economy; and
- the extent of the effect on the regional economy will depend on alternatives for diversifying land uses and making efficient use of irrigation water.

For many lowland streams to meet new rules on minimum flows and primary water allocations, irrigation takes will need to be curtailed. The work on social impacts to date indicates that any reduction in irrigation water and reliability of water available to farmers will lead to:

- an increase in efficiency of water use in irrigation distribution systems such as piping of water distribution, and in investment in mechanisms for irrigation on farm, such as the adoption of centre pivot systems and digital technology to manage water application; and
- an increase in on and off-farm storage, noting that options for the latter are very limited in most catchments and this change requires considerable capital expenditure by farmers.

The work on social impacts to date indicates that in order to achieve changes in the health of waterways and quality of water in streams and groundwater will require farmers to reduce the application of nitrogen on farms, run-off of nitrogen, and infiltration of nitrogen through farm management plans and adoption of farm management systems such as Overseer. These primary changes will necessitate changes in farm management systems such as:

- a higher level of activity and associated costs of time and expertise devoted to farm management planning;
- increased use of the practices of adaptive environmental management;
- an increase in the technical skills of farmers, farm workers and farm advisors;
- a higher level of cooperation amongst farmers around land and water and catchment planning and increased expenditure on expert planning advice
- Increased costs of compliance for individual farmers and groups of farmers such as irrigation companies;
- increased costs of planning, monitoring and maintaining compliance by territorial authorities; and
- increased differentiation between winners and losers in catchments in terms of who has access to surface and groundwater and nutrient allowances on their farms, and who experiences the most reductions in their allocations, depending on allocation regimes.

The work on social impacts to date indicates that increased costs of water, reductions in reliability of irrigation and/or increased costs of farm management that reduce farm revenue and increase farm debt will potentially lead to farmers exploring and, in some cases adopting, a range of changes, including:

- more profitable, diverse portfolios of land uses including new crops and higher value crops, and an increase in non-agricultural enterprises such as tourism;
- farmers seeking higher revenue by linking land and brand explicitly on both an enterprise basis and by groups of farmers and regions;

- sales of all or parts of a farm to other producers including lifestyle blocks, leading both to an increase in smaller properties and an increase in larger sized properties and corporate farming;
- eventual land uses changes that will lead to diversification of the countryside and associated changes for populations and communities;
- a strong demand in the short and longer term to reskill parts of the rural workforce as new management practices and land-uses materialise.

These responses to policy and associated uncertainty will lead to negative impacts on the social wellbeing (including physical and mental health) of some farmers, at least in the short to medium term, and in the areas where policies have the most impact (see Section 4.2.4). The SIAs note that high-debt farmers could be particularly vulnerable.

3. Population and Communities

3.1 Context

The impacts of water management on population and communities are identified in the SIAs reviewed as a direct and indirect consequence of effects on employment and the regional economy. The typical chain of effects is either from changes in land ownership, changes in land uses, increased or decreased production on farm, increased or decreased farm revenue, or combinations of these drivers of social change to employment on and off farm.

The SIAs reviewed all recognised a direct relationship from the employment effect, on and off farm, to the number of people and households living in rural areas and the towns of a catchment. The SIAs also all recognised that rural populations are dynamic, so it is important to recognise how local factors, combined with external drivers, establish the social baseline and the ability of an area to experience additional changes in a positive or negative way. In these terms, the absorptive capacity and resilience of the social baseline will depend on factors such as:

- the amount of rural subdivision and associated amenity migration[21] (as per the Selwyn, Wairarapa, and Waimakariri catchments);
- proximity of urban labour markets (e.g., Selwyn, Wairarapa, Waimakariri and Hinds);
- structural aging, retirement and associated immigration or emigration;
- the size and location of the Māori population;
- the size, location and ethnicity of migrant workforces;
- the establishment (e.g., Darfield, Studholme) or disestablishment (e.g., Ashburton) of agri-food processing, such as dairy factories, meat works or vegetable processing;
- the presence of tourism activity (most catchments) and any other economic growth activities such as business parks: Wairarapa (Masterton/Greytown), Selwyn (Rolleston), Ashburton, Waitaki (Oamaru); and
- housing availability and affordability.

[21] See Mackay et al. (2009) for a summary of the amenity migration research. Also see Perkins et al. (2015).

3.2 Focus of the assessments: key linkages and effects

3.2.1 Land use, employment and population size

In the SIAs, testing of scenarios took a balanced approach, and generally considered business as usual, economic development scenarios and environmental scenarios. The direct relationship between employment and the numbers of the population was evident in these scenarios. An economic development scenario, for instance, (basically more irrigation and lighter rules on nutrients and riparian management), meant that populations were projected to increase a little, recognising that most of the land-use conversions to dairy and associated growth in employment had already taken place (e.g., Hinds Hekeao) or were part of the permitted baseline (e.g., Selwyn Waihora and Central Plains Water). These economic development scenarios in Canterbury, while incorporating improvements in environmental outcomes, tended to assume that there was an increase in productive land-use as a result of an increase in the amount of water available for irrigation. This was not the case for the Ruamāhanga, catchment, where the possibility of increased areas of dairying would depend on the success of a water storage initiative known as the Wairarapa Water Project, if it were to proceed at all.

It is also useful to note that the increasing costs of irrigation and on farm water storage, and thus the cost of reliable water, are tending to push farmers facing these costs towards consideration of alternative intensive land uses such as horticulture or cropping, and not necessarily irrigated dairy farming. These alternatives are driven by a mix of factors that drive farmer motivation including debt, succession planning, expectations for farm drawings, technical knowledge and a variety of regulations.[22]

Across the SIAs reviewed, in contrast to development focused scenarios, those scenarios with strong environmental outcomes built in tended to show a small decrease in employment and therefore also in population[23], noting that the population changes were minor compared to the regional population, but could potentially be more significant if concentrated at the a local level.

Across the SIAs, the range of social outcomes spanned the ready adoption of new farm management technologies that have already proven to reduce environmental impacts on water while maintaining farm employment. They also spanned the possibility of farm operations forced to sell up with resulting changes in ownership and potential subdivisions of properties and amalgamations of parts of properties into other farms. It is useful to note here that there have been effects on farmer mental health from proposed plan changes (levels of stress raised as a result of limit-setting, as discussed in the Section 4.2.4).

[22] As revealed in community workshops.

[23] For example, in the Hinds Hekeao catchment, an economic development scenario based on an increased area irrigated was shown to be likely to increase regional employment and the total population, whereas the environmental scenario for the Hinds showed both gains and losses in employment with an overall neutral result. In the Ruamāhanga Gold scenario (emphasising environmental outcomes) would likely decrease population, with a potential loss of 450 people (a 2016 population of 42,490) by the year 2080.

3.2.2 Rural population character and composition

The presence of population in rural areas and small settlements is identified in the SIAs as a significant benefit to community wellbeing, through the effect on school rolls, health services, organised sports, and a range of community organisations and facilities.

The change in composition of communities with irrigated land uses has two main components: the age composition of the population and the ethnicity of the population. The key drivers of these two effects are dairy farming and horticulture. When compared to sheep and beef farming, these two sectors are shown in the SIAs to attract younger workers and, also, overseas migrant workers. In respect to age composition, dairy farming attracts a younger workforce including farm workers, share milkers, and contract managers. This was identified in the SIAs and supporting studies that the SIAs drew on, such as a comparative study of the Amuri area and the Waitaki Plains before and after irrigation took place[24] and in a research thesis in Ashburton District.[25]

Others point out that the shift from dryland beef and lamb production to intensive horticulture and dairying in Canterbury has been associated with "as much cultural change as environmental and economic change … Several farmers commented to the effect that more intensive production brings more people, and more people means greater diversity, a need for tolerance, adaptation, and new perspectives."[26] This effect was clear in Hinds Hekeao, for example, where irrigated dairy farming had attracted Filipino and other ethnicities to the area to the point that this diversity is seen as a feature of the Ashburton District.[27] An updated study of the social impacts of the Amuri irrigation project in Hurunui District had a similar finding.[28]

The SIAs also show that there is an important underlying trend in age composition of many of these communities in structural ageing and attractiveness for retirement. Where environmental policy affects amenity migration (by creating both more attractive urban/rural environments and recreational opportunities) then it is likely that a range of age groups will be represented among new residents (including second homeowners). The SIAs show that this plays out differently across catchments. It will depend on a *range* of factors such as the types of natural resources in the locality and access to them, housing affordability/availability and proximity of key services (e.g., Waimakariri and Ruamāhanga).

The SIAs make it clear that any effects of new policies and limits on water use are certain to be uneven within or between social groups. For example, the effect of a reduced FTE[29] on farm is more likely to fall on younger workers with short term or insecure employment than on established workers with a strong employment history, or on workers with the necessary skill levels to adopt and utilise fully the best management practices for enhanced environmental and economic outcomes.

[24] McClintock, et al. (2002).
[25] Rawlinson (2011).
[26] Pomeroy and Newell (2011, p. 37).
[27] Perkins et al. (2019); Campbell (2019).
[28] Taylor et al. (2018).
[29] FTE = Full-time equivalent worker.

3.2.3 Qualifications and skills of farmers

The SIAs found that for all the scenarios for future water management the higher qualifications and technical skill levels of farmers and farm workers are expected to increase. This change is partly due to an underlying trend of increasing tertiary qualifications in farm families in general. It is also due to the one-off effect of conversion of land uses such as from sheep and beef farming to dairy farming. In the BAU scenarios, some catchments may also find there is an unrealised effect of this nature from land use changes currently taking place, such as the upper Hinds and Selwyn-Waihora catchments from consented irrigation projects, or in the Wairarapa from a planned project, where the associated intensification of land uses increase the level of higher qualifications.

Relevant qualifications and ongoing learning, increasingly, are requirements for employment on large high-tech farms and corporate-structured operations. In addition, across the catchments, adoption of an increased emphasis on environmental sustainability in farming, with associated regulatory controls and on farm mitigation strategies, will demand a more sophisticated set of skills and active involvement in agricultural extension. The lower average age of farmers and farm workers in sectors, such as dairy farming, are also likely to increase the level of education across the farming population, except for some low-skilled, seasonal workers in dairy and horticulture.

The reorientation of farming systems to stricter environmental standards in all scenarios were likely to increase farmer and farm worker interest and participation in agricultural extension activities along with active programmes of technology transfer such as farm demonstrations and field days for environmental practices. This increase is likely to be most evident for intensive farming practices because of the strong incentive to maintain economically viable operations while meeting environmental objectives and requirements.

Diversification of rural economies through amenity migration and lifestyle subdivisions on farmland (discussed below) are likely to increase the proportion of professional or trade qualifications and business experience in rural areas. New areas of low intensity farming could also have the effect of increased interest in alternative enterprises and employment on and off farm, with off-farm employment requiring updating and upskilling of qualifications and activities such as crafts, artisan foods and rural tourism, all requiring new skills.

The SIAs also identify that for an increase in the proportion of Māori workers on or off farm there would need to be a specific programme designed to train and place Maori workers with new and intensified farming operations and contractors or businesses servicing them.

3.2.4 The potential for economic diversification

Compensatory factors are difficult to assess in scenarios focused on impact chains such as land use to employment to total population, which then result in changes to the composition of the population and provision of social services. Diverse economies offer a strong set of livelihood opportunities that attract residents to a rural area. Any total

population losses may prove to be short term given this complex set of factors, especially those that make a place less or more attractive to newcomers.

When an area becomes attractive economically, socially and environmentally, it will attract amenity migrants, depending on the availability of lifestyle blocks and suitable housing. Enhanced water quality and other environmental improvements such as increased biodiversity will add to that attractiveness, as found in the Ruamāhanga and Waimakariri SIAs. This is consistent with Australian and New Zealand research on motives for amenity migration.[30]

New land uses can be unexpected as in addition to suitable land and available water, they depend highly on the presence of entrepreneurialism,[31] capital and community initiatives and partnerships.[32] In the longer term, land use changes and diversified economic activities are likely to replace less economic land uses, dependent on factors such as levels of innovation and technological changes,[33] local entrepreneurship and market opportunities, and availability of land for subdivision. Social factors can also play a part, including farm succession and retirement strategies, family values[34], social connection (particularly in isolated areas), and community outlook.

The option for dry-land farmers to subdivide their land into lifestyle blocks and rural residential subdivisions is moderated by their other land use options, the age of the farmer and their stage in farm succession planning, proximity to population centres and work opportunities. Subdivision was found to be a significant option for landowners in several districts, including the Wairarapa, Waimakariri and Selwyn.

3.2.5 Schools and Social/Health Services

Effects on schools and the provision of services such as health, that are directly related to population numbers, will depend on the size of any population effect (up or down). Any changes in total population will impact schools and similar services based on population numbers.[35] For example, in the Waitaki Valley two small schools have closed in the Hakataramea Valley with students consolidated on an expanded school in Kurow. In the Selwyn and Waimakariri Districts, schools affected by rural subdivision and dairy farming, such as Hororata and Swannanoa, have significantly increased roles and expanded overtime.

Population composition is another effect on schools, as younger-aged populations can boost school rolls for a time, but it is a cohort effect unless the sector, as happens with dairy, continues to bring in younger workers and their families. Cultural diversity also impacts schools, with rural schools often playing an important part in helping to integrate newcomers to an area, and create extra demand for language and other teaching resources.

[30] See Mackay et al. (2009) and Perkins et al. (2015).
[31] Nelson and Mackay (2019)
[32] See: Mackay et al. (2018) and Perkins et al. (2019).
[33] Small, B. (2019).
[34] Nelson and Mackay (2019).
[35] Ministry of Education has established policies around class numbers, teacher/class ratios, transport options (i.e., school bus provision) and procedures for closing or expanding schools.

Community members identified both increased school rolls and decreased rolls in the subject communities. These different experiences depended on the types of surrounding land uses and the effects these have had on local populations. For example, in the Hinds area, after a period of conversions of irrigated land to dairy production, school rolls increased. In Waimakariri, with large-scale availability of lifestyle blocks in areas outside the Waimakariri-Ashley Irrigation scheme, school rolls also increased.

Rural schools are essential community hubs and the SIAs found that dairy farming had a positive effect on this aspect of small rural schools because of the workers brought into an area and commitment to school fund raising, functioning, management and maintenance e.g., schools in Hinds and the Waitaki Valley.

It is important to note that school closures can result from education policy unrelated to environmental policies, with both positive and negative effects depending on distance to alternative schools and the provision of school bus runs. For example, while the Hakataramea Valley (Waitaki catchment) have experienced school closures, the school at Kurow has benefitted from an increased roll and allied rebuilding and amenities.

Population numbers and composition have led to several responses from local community organisations and groups including schools, churches, settlement support organisations and rūnanga. Churches can benefit from increased involvement and new community organisations and activities can result from greater numbers and diversity of the population, e.g., Ashburton and Oamaru. It was very clear that farmers are aware of the need to take a responsible approach to management of new workers, after some initial concerns about how well new workers were integrated into communities.[36] Farmers are also active in providing housing in horticultural areas (e.g., Ruamāhanga) and dairy (e.g., Hinds Hekeao).

3.3 Summary Impact Statements

The SIAs we reviewed identified several linkages from the primary effects of management policies and plans on economy and employment through to rural populations and communities. These consequential effects are summarised as follows:

- Assuming there are no compensatory factors, a reduction in farm revenue is likely to lead to a reduction in employment, which then flows into a reduction in the total population.
- If there are no suitable employment opportunities sufficient to maintain or increase household income, then workers are likely to leave the catchment, along with associated household members, in search of jobs, therefore decreasing population in rural areas.
- In the longer term, land use changes and diversified economic activities are likely to replace less economic land uses, dependent on factors such as levels of innovation and technological changes and local entrepreneurship and market opportunities. Any total population losses may prove to be short term.
- Even short-term losses of population will affect the viability of school and social services that rely heavily on population-related counts such as school roll numbers to maintain their viability.

[36] Taylor et al. (2018).

- The character and composition of populations is also related directly to the types of land uses that are allowed or encouraged by policies and plans. For instance, irrigated dairy farming, and horticultural production, are known to affect the presence of migrant workers in rural areas and therefore the level of cultural diversity in a population.
- The age composition of the population is similarly related to the land uses present in a catchment. Some types of land uses, such as dairy farming, bring new farm workers and families into a rural area on an annual basis, and this in turn influences the types of services supported by the population.
- Any losses of production and changes in land use as a result of policy changes are likely to have an impact on the social character of rural areas, balanced by any increases in population as a result of new land uses or amenity migrants.

4. Human health

4.1 Context

The impacts of water management on human health are identified in the SIAs of catchment plans as a direct and indirect consequence of actions taken in freshwater planning and management. The linkages are usefully considered in terms of the determinants of health, which are both bio-physical in nature and socio-economic. The Canterbury District Health Board have led thinking about health issues relating to water and other aspects of planning. They explain the approach[37]:

> "Health in All Policies (HiAP) is an approach to working on public policies across sectors and with communities. It systematically takes into account the health implications of decisions, seeks synergies, and avoids harmful health impacts – in order to improve population health and health equity."

An integrated assessment approach means that technical modelling, such as the modelling of levels of nutrients or pathogens in water and the ecological status of waterbodies and waterways, has guided the assessments of effects on human health. In the SIAs reviewed, the modelling and assessment work frequently drew on community workshops and information provided by health practitioners and public health officials in order to integrate an understanding of health effects into the SIAs.
Through its Health in All Policies programme, the Canterbury District Health Board had a direct input into community workshops and scenario assessments. In addition, a literature review on the health implications of increased intensive farming in Canterbury was used in several the SIAs.[38] Similarly, Community and Public Health at the Wellington District Health Board had an input to the Wellington Region assessments.

[37] https://www.cph.co.nz/your-health/health-in-all-policies/.
[38] Green (2014).

4.2 Focus of the assessments: key linkages and effects

4.2.1 Safe and secure drinking water

Safe and secure drinking water is considered by health authorities to be a basic human right and is an increasing public concern in the catchments assessed. It was very clear that the protection of drinking water supplies is an important social outcome sought from policy and planning for freshwater management.[39] Assessments have focused technically on available data on the average groundwater nitrate-N concentrations in comparison with ½ Maximum Allowable Value (MAV), exceedances of MAV, and data on any bacterial contamination of groundwater.[40] These data and commentary on them are available from relevant technical reports, which show general increases in nitrates in catchments and also that these effects can be affected by local factors such as surface water recharge of groundwater.[41]

In addition, public health organisations have raised concerns about the quality of drinking water. Two foci are common. The first is on the potential effect of high nitrate levels on babies fed formula mixed with water. This issue is about the potential for Methemoglobinemia, when high levels of nitrate can interfere with the oxygen-carrying capacity of the blood of infants. It is acknowledged in the SIAs that there are few, if any instances of the resulting "blue baby" syndrome in Canterbury. More recently, there are additional concerns raised about the effects of nitrates on the general population, such as the potential effects on cancer rates.[42]

The SIAs show that, typically, domestic drinking water wells in Canterbury are relatively shallow and dependent in quality on the type of land use change surrounding them. These wells have the potential for contamination by pathogens and Nitrogen and therefore potential effects on human health from any deterioration or improvements in water quality. Deterioration in the level of Nitrates in wells was evident in, or close to, areas of intensive farming, such as the Hinds Hekeao catchment and Ashley Rakahuri/ Waimakariri. Another interesting dimension revealed in the latter catchment was the potential for an effect on deep groundwater that underpins the many community wells supplying Christchurch City. So far this is largely a perceived effect, as the city residents place high levels of value on a high quality, un-treated water supply. It is evident that supplies of high-quality water are an important part of the sense of place in Christchurch.[43]

[39] National policy for protection to drinking water supplies includes the Health (Drinking Water) Amendment Act 2007, which requires drinking water suppliers to take reasonable steps to contribute to protection of sources of drinking water. At a regional level, The Canterbury Regional Policy Statement 2013, for example, states that "high quality, fresh water is fundamental to people's health and well-being".
[40] The New Zealand drinking-water standards set a Maximum Acceptable Value (MAV) for nitrate-nitrogen (N) at 11.3 mg/L (equivalent to 50 mg/L of nitrate).
[41] For example, Scott, M. (2014) and Scott, M. and Hanson, C. (2014). Risk maps of nitrate in Canterbury groundwater. Environment Canterbury.
[42] Ward et al. (2005) review several international studies that identify these potential risks. Also, Green (2014).
[43] This perception is also evident in recent public debates over the use of groundwater in commercial bottling plants.

4.2.2 Upgrades of urban waste and stormwater systems:

Upgrades of urban waste and stormwater systems are required to reduce nitrates and ammoniac nitrogen (NH4), and pathogens, in waterways, and to minimise cultural impacts of disposal to waterways. The analysis led to the analysis of wastewater disposal options in the scenarios, particularly for the Ruamāhanga catchment where several major settlements discharge into the river system. These analyses found that the costs of wastewater treatment and disposal upgrades would fall unevenly across settlements and the costs per household were likely to be uneven (see also Section 6).

4.2.3 Upgrades of drinking water supplies

The SIAs in Canterbury and the Wairarapa found that the costs of mitigating the effects of increased nitrogen or pathogens in water supplies will fall on a combination of individual households with drinking water supplied from private wells and on community infrastructure funded through local rates in urban areas. Likely costs to rural households could include better well-head protection, sinking of deeper wells and the purchase of bottled water, especially for infants. Improvements in water quality due to improvements in land use and associated land management are likely to benefit rural and urban households through reduced risk to health and, less directly, through reduced costs to households and flow-on benefits to household expenditure and well-being. (See also the discussion of living standards and social equity below).

4.2.4 Mental health of rural people

The income able to be drawn from farm operations by farmers and farm families, and from rural services or business that benefit from their activities, has the potential to affect wellbeing through income and living standards – which are known to be primary determinants of health and wellbeing.

Pressure on farmers from increased costs of production and requirements to adopt new technologies and change farm management practices are likely to increase pressure on farmers and farm families to cope psychologically, at least in the short term.[44] The SIAs indicate that these are additional pressures to those already common from market fluctuations, climate and other natural events, and climate change adaptation. The reports also make the point that while adaptation is a feature of Aotearoa New Zealand agriculture, the combined challenges that they will face into the future will place farmers under greater pressure to adapt to change than they have experienced before. While this might involve increased stress through a period of change there are likely to be longer term benefits as well providing there is adequate management of change and farmer support (see Section 7).

The effects on farmers will vary depending on their stage in the life and farm cycles, which typically influences the level of debt held and serviced by a farm operation and expectations for farm drawings. Also identified as important is the ability of farmers to enable the process of succession and retirement between generations verses the sale of a property or parts of a property to new owners.

Transitions between policies in the form of changes in farm management and associated technologies are likely to cause personal and financial stress in rural areas.

[44] See, for example Botha and White (2012).

Particular rules and limits for water management can reduce rural incomes. These changes will flow into mental health issues and effects for farm families with a flow-on effect through increased demand for mental health and other support services.

4.2.5 Contact recreation

The quality of surface water has a direct effect on the health of humans and their pets through contact during recreation activities, particularly those involving immersion in water and exposure to pathogens. These pathogens are typically monitored or modelled in terms of the attribute of E.coli present in the water but other bacteria, and also viruses, may be present.[45] In addition, the SIA reports note the potential for cyanobacteria to increase with high nutrient values; these bacteria can release cyanotoxins poisonous to humans and other mammals, which can kill pets such as dogs and affect the health of people in contact with them.[46]

The quality of water available for mahinga kai has a direct effect on human health for those who gather foods for consumption or cultural uses, and an indirect effect on the mana and mauri of people associated with the affected water. These effects were noted in the SIA reports with reference to recreational uses and various cultural impact assessments undertaken in addition to the SIAs. The resulting cultural issues were commonly examined in community workshops, with strong support for the need to protect mahinga kai as a key community outcome, and to enhance it whenever possible through improved water quality and ecosystem health, including by restoration projects.

4.2.6 Health benefits of outdoor recreation

The quality and quantity of surface water and associated amenity values affects a wide range of outdoor recreation activity, and the level of activity can directly affect the health of people participating actively, and indirectly affect their health through mental and spiritual wellbeing.[47] More indirectly, the level of outdoor activity associated with fresh water will affect the level of employment in outdoor recreation and visitor or tourist sectors such as guiding operations, or businesses located next to waterways. Any economic activity that increases the level of employment and wages in the local or regional economy can in turn affect living standards and social well-being.

4.3 Summary impact statements: impacts on health

The SIAs we reviewed have identified several linkages from the primary effects of water management policies and plans on water quality and quantity through to health outcomes. Generally, these effects are beneficial to human health if they result in improvements to water quality and ecosystem health, but there is potential for some negative impacts on rural households, at least in the short to medium term. These consequential effects are summarised as follows:

[45] An epidemiological study by McBride et al. (1998, 251-255), found that beaches affected by rural discharges, or by human waste were significantly more at risk from selected diseases than “control” beaches, including gastro-intestinal illnesses and respiratory illnesses, for those who swam for long periods or interacted with the polluted water.
[46] See also Green (2014).
[47] Blaschke (2013); Angus and Associates (2017).

- The quality of potable water from ground water or surface supplies used by individual households or communities (rural and urban) will have a direct effect on human health through the levels of nitrates or pathogens in the water.
- The source and quality of water supplies pre-treatment has a direct effect on costs of infrastructure and therefore on the costs per household, with an indirect effect on human health through increased or decreased costs of living.
- The income able to be drawn from farm operations by farmers and farm families, and from rural services or business that benefit from their activities has the potential to affect wellbeing or rural households through income and living standards – which are known to be primary determinants of health and wellbeing.
- Transitions between policies in the form of changes in farm management and associated technologies, and resulting land use changes, are likely to cause personal and financial stress in rural areas. Rules and limits can reduce rural incomes. These changes will flow into mental health issues and effects for farm families, with a flow-on effect through increased demand for mental health and other support services.
- The quality of surface water has a direct effect on the health of humans and pets through contact during recreation activities, particularly those involving immersion in water.
- The quality of water available for mahinga kai has a direct effect on human health for those who gather foods for consumption or cultural uses, and an effect on the mana and mauri of people associated with the affected water.
- The quality and quantity of surface water and associated amenity values affects a wide range of outdoor recreation activity, and the level of activity can directly affect the health of people participating actively, and indirectly affect health through mental and spiritual wellbeing.
- The level of outdoor activity associated with fresh water will affect the level of employment in outdoor recreation and visitor or tourist sectors and this activity will in turn affect living standards and social well-being.

5. Socio-Cultural Values

5.1 Context

All the SIAs recognised the effects of changes in the management of land and water on the wider socio-cultural values of freshwater bodies (reflecting how they are used and enjoyed by a range of New Zealanders, including for outdoor recreation). Affected communities in all the catchments placed emphasis on recreational uses in addition to primary production.

Outdoor recreation is part of a healthy lifestyle for New Zealanders, providing opportunities for physical exercise and associated health benefits, rest, enjoyment of nature and escape from daily routine. It also creates opportunities for socialisation and contributes to community cohesion through social interaction.[48] All the SIAs reviewed in this report covered recreation in detail.

[48] Blaschke (2013); Angus and Associates (2017).

Modelling showed that social impacts mainly resulted from changes in the quality *and* quantity (flow) of water in rivers, lakes and streams, and the condition and visual appearance of waterways and the immediate and surrounding environment. Analysis of the social impacts relied (first) on other technical modelling to characterise the biophysical changes anticipated from different land use scenarios (such as more water and fish in streams, or a greater frequency of algal bloom warnings) so the social assessors could consider the effects of change on socio-cultural values specific to the catchment and its communities.

It is important to note that the social assessors reported a stark shortage of primary data on the socio-cultural value of freshwater and river recreation trends in all the catchments, as compared to other forms of water use.[49] The longitudinal New Zealand National Angler Survey[50] was the exception: it provided the assessors with a rough (but helpful) comparative measure of the changing use of specific freshwater systems for recreational angling, including number of fishing days at specific sites. Direct engagement with workshop participants, key informant interviews (with recreation guides and longstanding community residents), and secondary analysis of newspapers, guidebooks and the webpages of recreational organisations and businesses, helped to build the base of information.

GIS mapping was another important source of data: it helped generate a picture of specific features, such as angling points, picnic spots, boat ramps, and walking tracks and trails, and the location of swimming water monitoring sites and freshwater bodies that are recreationally important. GIS was also used in the SIAs to map water quality data for recreation – identifying the quality of water for swimming for the respective catchment's main lakes and rivers, reflecting the location of current issues.

5.2 Focus of the assessments: key linkages and effects

5.2.1 Sense of identity and place

Outdoor recreation is part of a healthy lifestyle (Section 4) and contributes to ones' sense of self and community identity. Connections to nature through recreation also contribute to a sense of place.[51]

The ability to live a healthy lifestyle is a drawcard for residents and visitors. The modelling suggested that areas of high recreational and natural amenity value were attractive places to live, with access to high quality water bodies seen as important. The social assessment showed that, overtime, people build strong connections with rivers and lakes, such as particular swimming holes, picnic and camping spots, fishing sites, huts and cribs, and club facilities. Users who related to a site over time, including farmers, readily confirmed their observational data about the current state of a catchment, that water bodies had declined in quantity and quality over time.[52] Most important was the sense of loss that people expressed, confirming the strong social-cultural association with freshwater in Aotearoa New Zealand.

[49] For example, see Taylor and Mackay (2016).
[50] For example, see Unwin (2009).
[51] Blaschke (2013).
[52] Taylor and Mackay (2016).

Mana whenua have obvious direct relationships to the mana and mauri of fresh water. The SIAs, while not providing a cultural assessment, recognised this direct relationship and the contribution to sense of place in many communities. For example, in the Southern Streams, the Waihao-Wainono system was home to taonga species and a critically important source of mahinga kai.[53] There, and elsewhere, the health of mahinga kai was recognised as a strong indicator of the health of the river system.

Several factors in community well-being come together in terms of the use of water bodies and adjoining areas for social purposes where recreational activities are the focus. Examples identified include, for example, events that relate to lakes and rivers, such as multisport events and community fund raisers. It was noticeable, for some water bodies that some social events have declined markedly, such as those associated with the Lakeside domain in Lake Waihora Ellesmere, which used to host water skiing and wind surfing competitions, which respondents put down to declining water quantity and quality as well as changing attitudes and technologies.

5.2.2 Recreation

Modelling and subsequent analysis showed that under status quo scenarios, further declines in water quality and quality are most likely, with declines in ecological values as well as attributes such as the presence of cyanobacteria and pathogens, and swimmability factors such as water colour and clarity. For instance, in the Hinds Hekeao catchment the SIA found that continuing declines in the longer term there would mean no improvements in recreational opportunities, with the possibility that remaining uses of whitebaiting and eeling would also be lost in addition to angling and swimming, further reducing local uses of the lowland streams. Angling for trout would continue to be displaced to other locations and species.[54] On the other hand, scenarios with improving environmental outcomes were found likely to increase the range and level of recreational activities such as active and passive uses. For example, the Selwyn-Waihora SIA found that improvements should lead to positive perceptions of improving lake and river environments, which should in turn enhance levels of use and user experiences over time.

Angling has a direct reliance on freshwater quality, both for the availability and quality of the angling resource and the fact that the fishing experience is directly related to the quality of the bio-physical and social environment. Anglers are attracted to high-quality rivers and outdoor experiences. Angling opportunities were found in each of the catchments studied. Improved trout habitats in rivers and streams, with improved flow as well as stream aesthetics, riparian planting, sediment control or removal, should see an increase in angling activity. Across the SIAs the overall perceptions of fisheries should improve with improving environmental outcomes, as will perceptions and use of waterways for food gathering such as whitebaiting, flounder, eels and other mahinga kai.

The assessments showed that for all types of outdoor recreation, any improvements in the recreational environment due to sustainable farming practices should increase recreational interest, particularly for those water bodies in close proximity to major urban centres, e.g., Waimakariri, Wairarapa, Selwyn) or hotspots for domestic tourism (e.g.,

[53] As was also reported for Wairarapa Moana.
[54] The Hinds Hekeao SIA also noted that displacement effects are particularly important for less mobile people, including those without easy access to vehicles (e.g., elderly, youth).

Waitaki Lakes and associated holiday settlements). This would have the flow on effect of increasing the social licence to operate for farmers.

The SIAs also identified the direct effect of recreational uses on commercial activities based on outdoor recreation, including tours, guiding and hospitality services. This effect is most evident when there are existing tourist flows or destinations, such as the Waitaki and the Ruamāhanga. Also see Sections 4.2.5 and 4.2.6 regarding consequences for health, and sections 3.2.4 on economic diversification where opportunities for farm tourism development are discussed.

5.2.3 Outdoor and environmental education

There is an important linkage between freshwater and environmental education. Schools are involved in a range of projects involving local water bodies often involving Department of Conservation, Fish and Game, local councils, marae and community groups. These can include environmental monitoring, riparian planting, predator control and wildlife management. The Hinds-Hekeao SIA, for example, notes there are opportunities for local schools to be involved further in enhancement activities on lakes and drains, enhancing ecology as well as amenity values as communities work (together) towards improved environmental outcomes as part of implementation packages. These packages involve a range of community-based actions. The SIAs note that restoration actions by rural communities can have the effect of building wider community cohesion, including between rural and urban areas, for example the activities of the Waihora Ellesmere Trust in Selwyn-Waihora and the Tuhaitara Trust in Waimakariri.

5.3 Summary impact statements: impacts on socio-cultural values

The work on social impacts to date indicates that if there is any increase in the quality and quantity of water suitable for contact recreation activity, then there would be:

- a general increase in the *amount* of contact recreational activity; and
- an improvement in the *quality* of the recreation experience

Strong indirect relationships are evident between freshwater quantity and quality, the level of recreational activity, and the sense of place in those communities directly associated with water bodies and nearby urban areas.

The work on social impacts to date indicates that if there is any increase in ecosystem health then there would be:

- an increase in the *amount* of recreational activity associated with improved biodiversity and amenity values, including passive and active recreation such as walking, picnicking, and bird watching.

Where the improvement is in species targeted for fishing and/or mahinga kai, there would be:

- an increase in the opportunities and quantity of recreational activity.

The work on social impacts to date indicates that if there is an increase in opportunities and quantity of recreational activity the following positive effects are highly likely:

- improved human (physical and mental) health (see Sections 4.2.5 and 4.2.6);
- opportunities for socialisation (social cohesion) (see Section 6.2.4);
- a flow on effect to businesses from commercial recreation activity and tourist operations, and other businesses that support those operations; and
- Enhanced social licence to operate for farming, providing the people understand and acknowledge that the adoption of sustainable farm practices has contributed to positive environmental outcomes.

The work on social impacts to date indicates that if there is an increase in opportunities and quantity of recreational activity, supported by information and public awareness, then there will be a greater need for active recreation management at sites:

- that are close to major urban centres, and easily accessible to large populations;
- that are close to existing facilities such as fishing settlements, boat ramps, toilets, picnic and camping areas;
- where conflicts might occur between different recreational groups; and
- where conflicts might occur between different recreationists and other water users.

It is important to note that the work on social impacts to date also indicates that where there has been a deterioration in water available for recreation, this has often led to a displacement effect. Displacement can be of two types:

1. A specific activity moving from one site to another (e.g., from a degraded waterway – often lowland areas – to a better-quality site, often up-catchment lakes and streams).
2. A similar activity from one type and site, to another (e.g., trout fishing to salmon fishing).

The studies to date also show that there is potential for changes in access to waterways that could reduce recreational activity, for instance, an increase or decrease in intensive land uses that affect access to waterways across farms (cropping), and fencing and intensive riparian planting that affects physical access unless points are provided and maintained with appropriate signage.

6. Social equity and cohesion

6.1 Context

Changes in land and water management will have a direct effect on social equity and indirect consequences for social connectedness or cohesion. Actions taken in freshwater planning and management also have the potential to build the social capital of affected communities.

It is important to note that all the SIAs make it clear that the status quo option (current policies and plans running into the future from that point in time) are already causing negative community outcomes and are a source of social conflict. The fairness of new plans and actions will depend on the way they are designed and managed. At best, new policies and plans should enhance community outcomes, mitigate negative impacts and build community cohesion. At worst, new policies and plans will cause negativity and create or add to social conflict.

Analysis of the impacts on social equity and cohesion of freshwater planning and management in the SIAs reviewed was based on both quantitative data and modelling and qualitative information. Baseline data provided a picture of the subject populations in terms of their vulnerability to change, through the presence of particular groups such as the elderly, low income households and Māori, as well as information such as the level of volunteerism in an area.[55] Particular use was made of the index of social deprivation[56] and maps of that data to show spatial variations, such as information on differences within urban areas and between urban and rural areas. Modelling provided information about how costs were likely to fall in terms of the effects on farm operations, employment and regional incomes and employment. Community engagement such as workshops and interviews provided additional insights into aspects of social equity, social capital and social cohesion.

6.2 Focus of the assessments: key linkages and effects

6.2.1 Household incomes

The SIAs indicate potential effects of new policies for land and water management on household incomes because of reductions in farm revenue and expenditure when meeting new environmental standards. These results flow from farm incomes and employment to catchment and regional incomes and employment. However, the results at a catchment level are often mixed and will be spread overtime, depending on the potential for economic gains from further irrigation and sustainable production systems, alongside the costs of mitigation.

For example, in the Lower Waitaki, the proposed solutions package was shown to result in an improvement in economic indicators for the agriculture sector in aggregate, and for the wider community, including household incomes. In the Ruamāhanga catchment, proposed adjustments on farm were shown to influence farm income and, at least in the short term, there could be a negative effect on incomes of rural households. This effect was most evident for sheep and beef properties faced with retiring land from grazing and additional pole planting to control erosion. In the longer term, these hill country areas were seen to have potential for additional income from indigenous ground cover - through honey production, carbon credits and outdoor recreation.

The effect of farm changes on household incomes are also blurred in many areas because of the availability of alternative sources of income in a mixed district economy and in areas where there is work available by commuting to a proximate larger centre.

[55] Obtained from a census question on the amount of time people spend in voluntary activities that help to build social capital.
[56] Developed by the University of Otago.

This mitigating factor was evident in the Waimakariri SIA, and in the Wairarapa and Selwyn-Waihora.

6.2.2 Cost of living

Effects on the cost of living are most evident in those communities where there is a need to upgrade community storm, waste or drinking water infrastructure (costs to individual households are noted in 6.2.1). Many rural communities discharging storm and wastewater to rivers or lakes have a limited rating base. The projected upgrade costs for community infrastructure will affect the cost of doing business and the cost of living for households because they are likely to be allocated through rates and capital charges, or through direct requirements for expenditure by property owners, such as upgrades to septic tanks or links into sewerage systems. There are potential equity issues arising from allocating costs via a property rating system as the assumption that land or capital value indicates an ability to pay does not apply to all household types, such as those on fixed incomes. The SIAs show that the ability to pay will vary across household demographic groups and business types and size. The Ruamāhanga SIA, for instance, found that the lowest income quintile households will have the least spending power and are likely to be the most negatively affected by new costs.

6.2.3 Social equity

It is evident from these SIAs that policy decisions, planning rules and direct interventions designed to improve environmental outcomes all potentially have an equity dimension.[57] Baseline studies also indicate that populations and communities most directly affected by new policies and plans have existing social equity issues. It also arises if the rules for allocation result in uneven distribution of water through a catchment (e.g., Hinds), between types of land-use, and between surface and groundwater. Unfairness can arise in the way that costs are allocated, for example, by area, waterway or by the size or type of production. Unfairness also arises if the rules, monitoring or enforcement are insufficient to ensure mitigation takes place, leading to environmental costs borne by other water users, such as iwi, recreation groups or tourist operators.

Positive and negative effects of policies and rules should be identified and fairly distributed across water users and the population (as a whole), including how any costs and ensuing benefits are allocated by types of household, and their ability to pay. Social baseline studies in the SIAs found that lower income households are often concentrated in rural towns, with higher incomes evident in farming areas and lifestyle blocks across the SIAs. Areas with large proportions of Māori or elderly tend to have lower incomes.

Children and youth are also potentially affected proportionately by poor water quality, especially for recreation activities. Examples in the SIAs include the loss of swimming holes in some rivers, such as the Selwyn or Hinds Hekeao due to reduced flows or presence of macrophytes and algae (especially cyanobacteria) or pathogens in the water (see Section 5 for further details). There is also the example of displaced activity as in the Ruamāhanga catchment, where youth were noted to be displaced several kilometres to a more suitable swimming hole.[58]

[57] This section draws on the Ruamāhanga SIA which in turn drew on notes on social equity prepared by Dr Jim Sinner for the Ruamāhanga Whaitua Committee, 21 November 2016.
[58] See cultural assessments for each catchment for specific impacts on Māori populations while noting that Maori participants in collaborative processes made strong points about the historic basis to their

Another equity issue and potential source of social conflict is the difference in impacts of an action between the upper and lower parts of a catchment, or the rules for a sub catchment verses the rest of a catchment. An example is the Hinds Hekeao catchment,[59] where actions in the upper catchment to improve irrigation efficiency by converting from border-dyke application to centre pivot, a considerable investment on farms, saw a reduction in recharge of groundwater and therefore in irrigation water supplies from wells and streams in the lower catchment. In the Waimakariri catchment, farms in the nitrogen priority area[60] and in sub catchments such as the Cam with high amenity, cultural and recreational values will experience the strictest rules on water abstraction and nutrient discharges, while the benefits will accrue to the population within and outside the District.

6.2.4 Social capital and community cohesion

The SIAs note that the level of trust in decision making in a community will depend on the level of community participation and the effort to engage and communicate with different stakeholder groups in the process of policy implementation, and in the adjustment of land uses and farming practices. The scenario assessments recognised that a level of community conflict is inherent in most sets of decisions because of the different sets of values involved in water management. The SIAs also show that farm production and environmental outcomes are not necessarily in conflict and many farmers have already adopted new management practices along with processes such as farm environment plans[61], or voluntary riparian planting and stream/wetland restoration activities.

It is also evident in the SIAs that community development initiatives funded through catchment implementation plans have a positive impact on volunteering and leadership and help to build social capital.[62] An example is the coastal area in the Waimakariri catchment, where the Te Kohaka o Tuhaitara Trust has undertaken extensive restoration work with the assistance of many groups of volunteers. External funding has assisted them in the costs of restoration and recently in hiring a coordinator.

Time is needed for communities to adjust and build or rebuild social cohesion when there are major policy changes taking place. Overall benefits to social and economic wellbeing will depend on a proactive approach to managing social changes as discussed below in Section 7. Landowners, councils and community groups should have an appropriate plan, timetable, and any necessary assistance, for transitions to enhanced freshwater management, and these efforts require cognisance of the needs to build social, cohesion through enhanced social capital.

concerns about loss of water-based resources such as mahinga kai, as well as ongoing environmental degradation.

[59] Irrigation water in this catchment is supplemented considerably by water from the Rangitata River via a diversion race system.

[60] With the greatest negative effects of nitrogen on drinking water inside and outside the catchment.

[61] Also shown to be the case in adjoining catchments such as the Hurunui, where farms in the Amuri Irrigation Scheme have adopted Farm Environment Plans alongside their access to water.

[62] Social capital is recognised as a key part of Treasury's LSF alongside natural capital.

6.3 Summary Impact Statements

The SIAs reviewed identified linkages from the effects of planning and implementing new water management policies to impacts on social equity, social cohesion and social capital. If the process of change is managed well, with community engagement, collaboration and a clear focus on social outcomes, then it is possible to reduce social conflicts and increase social cohesion. These consequential social effects are summarised as follows:

- Reduced farm revenue, expenditure and employment from farm management changes could have a negative impact on the regional economy in the short to medium term, at least while the economy adjusts and diversifies. This negative effect would incomes of rural households.
- However, rural households are resilient and in the longer-term are likely to seek alternative sources of income, while others (potentially in the short-term) may leave the district.
- Planning rules and subsequent actions could have a direct effect on household incomes, particularly *when* councils are required to upgrade infrastructure in smaller rural towns, where there is often a high proportion of people on low and fixed income, including the elderly and Māori.
- Policy decisions, planning rules and direct interventions designed to improve environmental outcomes all potentially have an equity dimension. Equity issues arise between groups in the population, users of freshwater, areas of a catchment and sub catchments, and over time.
- Equity issues can result in social conflicts as they come to the fore and may have the effect of reducing community cohesion.
- On the other hand, processes of engagement, collaboration and community development have potential positive effects on social capital as well as natural capital overtime.
- The more immediate effects on community cohesion and social capital are likely to be direct and at the local level, especially effects on farmers and rural communities.
- The positive benefits for recreational users of waterways will be longer-term and more dispersed depending on the timing and type of environmental improvements, and the location and types of users/activities.

7. Transitions to maximise social outcomes

7.1 Introduction to the management of change approach

It is inherently difficult to assess social change, especially in the longer term, because affected people get involved in adapting to change and look to enhance positive outcomes. An important aspect of SIA practice is therefore the management of social change, usually in the form of a social impact management plan. The development of a strategy for management of change is to maximise social well-being outcomes. The SIAs identified that adjustment of people and communities to recommended policy changes and associated actions, will depend on the way they are designed and implemented and how the necessary transitions are managed. All the SIAs reviewed for this report make at least some observations about the process of managing social

change. They observe that the management of change is important both to negative and positive social outcomes, and therefore to the net result in terms of social wellbeing in short and longer terms. In all cases, the recommendations for managing change were prepared after scenarios were assessed, and were at the discretion of the council or other relevant parties to implement.

The concerns of affected people acknowledged in the SIAs reviewed raise key issues: the need to allow affected people sufficient time to adjust to change, and the need to assist affected people to make changes in a way that reduces negative social impacts and enhances positive ones for the best net community outcomes. Throughout the SIAs there is concern expressed for managing the stress of change on individuals, families and communities. These concerns all appear relevant to implementing the Essential Freshwater Package.[63]

This section of our review draws on points raised in the SIAs about the management of change through a transition period using an adaptive management approach. The SIAs indicate that social impacts at the end of a process of change (residual impacts) will depend heavily on the way they are managed.[64] They also point out that any management of social change should integrate with existing plans and programmes of iwi, local, regional and national government, rural support organisation (such as the NZ Rural Trust, District Health Boards and other social services).

Past experience in rural areas of New Zealand shows that when economic and social restructuring takes place as a result of external drivers of change (such as commodity price cycles, new technologies or government policies) then people, communities and towns can and will adapt.[65] The ability to adapt (often referred to as resilience), and the of adaptation, will vary greatly depending on the extent that the change is spread over a large number of people and communities or be focused on one place, the available social, cultural, financial, human, physical and natural capital in affected communities, and the availability of suitable external funding from central government agencies or other sources.

Another aspect to consider is that the rationale for proposed changes as assessed in the SIAs is to gain environmental improvements, which enhances social wellbeing. Both the process of implementing improvements, and the expected environmental outcomes over time, can create ways of enhancing employment, incomes, human health, outdoor recreation and cultural values, which are all important aspects of social wellbeing.

Overall, the SIAs point to an adaptive process of implementing plan changes at the catchment level, consistent with the concept of adaptive environmental management. The Ministry for the Environmental[66] defines adaptive management as an iterative, process of learning by doing, dealing with the uncertainties of scientific knowledge and adjusting management instruments over time. Adaptive environmental management is often focused on ecological changes, but this is also an appropriate approach for

[63] Appendix 1, taken from the Waimakariri SIA, is an example of an existing network of social support organisations that could potentially participate in the management of change.
[64] This expectation is consistent with international practice and the development of social impact management plans as part of SIAs (Holm, et al., 2013).
[65] See Taylor (2019).
[66] In a 2016 submission to The International Seabed Authority, Ministry for the Environment (2016).

ensuing economic and social benefits are achieved. In the result, the mix of positive and negative outcomes for social wellbeing for the people and communities of the catchment will depend on a *proactive* process of change management in support of policy and planning changes through regional plans and catchment implementation programmes. Given changes from the implementation packages considered in the SIAs are likely to extend over a long time period, established planning processes can provide the necessary institutional framework for making changes to policies and rules, for example where minimum flow levels and abstractions are set for review in a short timeframe. There may be important opportunities for the Essential Freshwater Package in such an approach, based on the provisions already available in the Resource Management Act.

7.2 Timing and timelines

Time is identified as the most important factor for necessary transitions, especially as expectations for improved environmental and social outcomes depend heavily on behavioural change. The two aspects of this issue relate to the timing of implementation (when new policies come into effect) and the amount of time given for any necessary adjustments and transitions (the timeline for change).

Behavioural change towards improved environmental management will result from a mix of plan provisions, non-statutory measures and community leadership. These changes will, in turn, lead to the emergence of informal social control[67] – along with the ready exchange of technical information, and encouragement to better performance through farmer and industry leadership, informal networks, and more formal organisations such as farm discussion groups.

The SIAs point to rapid changes in land use having the greatest potential for social disruption. In this sense, time is regarded as an asset in terms of adaptation to new policies. For example, the Waimakariri SIA found dates to review irrigation consents that manage minimum flow regimes and stream depletion effects on groundwater wells will give farmers and farm managers at least eight years to assess the implications of any changes to their current consent conditions, and to adapt their management to accommodate the new rules.

An adaptive approach will assist farmers. Adaptive management is facilitated through phasing of change and good information. There are provisions proposed for better environmental monitoring and improved management of data. The results of monitoring and any subsequent technical should assist the implementation of changes. Furthermore, monitoring of expected improvements in environmental outcomes will provide rural communities with the necessary assurance that their efforts are worthwhile. If the results are not those anticipated, then then the reasons for any adjustments or additional actions will be apparent.

An adaptive approach to changes in farming systems can be assisted by provisions such as consent review mechanisms and additional plan changes as required, consistent with the current approach under the RMA. For example, the Waimakariri SIA points out that the definition of nutrient priority areas could change at the time of scheduled reviews of the proposed Plan Change.

[67] Based on new and emerging expectations around acceptable behaviour.

7.3 Transitions in farming systems

There is a basic message in the SIAs that actions and changes envisaged in farming systems, as farmers move towards advanced mitigation practices in the longer term, will require technical support. Currently support comes from multiple sources[68] including interactions between farmers (e.g., farm discussion and land care groups)[69]; self-funded farm advisors/consultants[70]; farm visits, field days and agricultural shows[71]; environmental groups and trusts[72]; rural suppliers[73]; financial organisations/rural lenders[74]; industry organisations, including those funded by an industry levy[75]; regional councils (such as ECAN's Farmer Hub[76]); and cross government industry initiatives and partnerships.[77] Crown Research Institutes and universities also provide support via training programmes, conferences/seminars and research-farm open days, including outreach and extension via social media.[78] A variety of measures may need to be investigated such as:

- Land purchases or financial assistance for retirement or planting of steep land, fencing, riparian management or wetland restoration[79];
- Technical advice for new or innovative uses of retired land;
- Assistance to trial and access new technologies, such as new species for erosion control or riparian planting[80] and irrigation technology[81];
- Assistance to trial and access technologies for irrigation efficiency and nutrient management;
- Assistance with financial management of new land uses or technologies including dealing with rural lenders (see footnote 75);
- Upgrading of skills amongst farmers and farm advisors[82]; and
- Technical assistance for developing farm environmental plans[83] or other farm-specific responses by way of a public farm advisory function or through subsidies for inputs by private farm advisors.

In addition to managing technical change, it is important to establish a programme to assist farmers and communities to adjust to financial challenges and the stresses involved for farmers, managers, workers and farm families. It will also be important to

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[68] See Mackay et al. (2011) for a study of farmer learning preferences and information sources.
[69] Such as: https://www.dairynz.co.nz/business/dairy-connect/.
[70] For example: https://www.agribusinessgroup.com/about.
[71] Such as: https://www.theshow.co.nz/.
[72] Such as: https://www.wetlandtrust.org.nz/.
[73] For example: https://www.ravensdown.co.nz/services/environmental and https://ballance.co.nz/Farm-Sustainability-Services.
[74] For example: https://www.anz.co.nz/rural/rural-specialists/ and https://www.rabobank.co.nz/knowledge/.
[75] For example: https://farmersweekly.co.nz/topic/farm-business/benchmarking/discussion-groups-make-them-your-own, and https://www.far.org.nz/about/get_involved/women_in_arable
[76] For example: https://www.ecan.govt.nz/your-region/farmers-hub/.
[77] Such as: https://www.mpi.govt.nz/funding-and-programmes/sustainable-food-and-fibre-futures/primary-growth-partnership/.
[78] For example: https://www.facebook.com/LUDairyFarm/.
[79] Sources include the QEII National Trust: https://qeiinationaltrust.org.nz/ and DOC's Nature Heritage Fund: https://www.doc.govt.nz/get-involved/funding/nature-heritage-fund/.
[80] Such as: https://www.dairynz.co.nz/environment/waterways/planting-waterways/.
[81] For example: https://www.irrigationnz.co.nz/PracticalResources/e-learning.
[82] For example: https://beeflambnz.com/news-views/extension-350-programme-underway.
[83] For example: https://ecan.govt.nz/your-region/farmers-hub/fep/.

work with health providers and relevant agencies and rural organisations such as health providers, rural trusts and social support organisations[84] to support farmers working through periods of change and increased levels of stress and potential mental health issues.[85]

The extent to which farmers and farm families will experience some increase in financial and personal stress will depend on how the recommended suite of additional controls will impact on them given their personal circumstances, irrespective of the type of farming with which they are involved. Some will need assistance to cope. The SIAs found increasing recognition of the mental health needs of New Zealand farmers in recent years. This is an issue that needs to be keep under review when considering measures likely to place additional pressures on those owning and managing farms. A recent literature search undertaken by the New Zealand Accident Compensation Corporation[86] found that farmers were more likely to commit suicide than other occupational groups in Australia, Great Britain and some northern European countries, jurisdictions like New Zealand.[87]

The NZ Rural Support Trust[88] can provide emotional support to farmers who are finding it difficult to cope with the pressures that they face. In addition, Fonterra advises that if their staff providing the Tiaki[89] service identify suppliers requiring support over and above that provided by this service, the Rural Support Trust will be advised of the need for their assistance. Local organisations are also evident. In Waimakariri, for instance, the Oxford Community Trust maintains an "open door" for all those living in its area who seek assistance, and maintain a commitment to suicide prevention. Community Wellbeing North Canterbury works with the Oxford Community Trust to fund paid staff and support voluntary activity, which is a strong basis for assisting individuals and local communities adjust to change.

Adjustments to rural economies such as increased forestry, native plant nurseries, horticulture, tourism or bee keeping are likely to attract new workers to an area, including, potentially, migrant workers. As a result, the population can increase, and in many cases, it becomes more culturally diverse. The SIAs show that it is important to provide social support programmes for newcomers so they can participate fully in the life of their host community, including people from other parts of New Zealand or from overseas. Suggested change management strategies for newcomers have included:

- Support for involvement in recreation (including arts and culture), sporting activities and churches;

[84] Such as: https://farmstrong.co.nz/, http://www.rural-support.org.nz/, and https://depression.org.nz/get-better/your-identity/rural/.
[85] A helpful resource is: http://www.rhaanz.org.nz/wp-content/uploads/2015/01/eFeeling-Down-on-the-Farm-2.pdf.
[86] Goffin (2014). Also, Botha and White (2012).
[87] The situation in New Zealand cannot be clearly ascertained from Coronial data because farming is combined with other trades for the occupations of people who suicide that are examined by Coroners in this country.
[88] http://www.rural-support.org.nz/.
[89] Tiaki is Fonterra's Sustainable Dairy Programme. See https://www.fonterra.com/nz/en/our-stories/articles/introducing-our-tiaki-sustainable-dairying-programme.html.

- Educating employers and employees about work requirements and responsibilities, including the development of cross-cultural communication skills;
- Encouraging newcomers to enrol their children in local schools;
- Ensuring health services and social support agencies are well informed about potential demand arising from any likely changes in land use, and cultural needs of minority ethnic groups;
- Providing appropriate locally based training for newcomers including English language learning; and
- Supporting the cultural networks and organisations of minority ethnic groups.[90]

Immigration New Zealand's Welcoming Communities platform[91] is an example of a new initiative drawing on multiple community organisations, social services and resources. It became well-established in Ashburton (and several other district where it was trialled) in less than two years, and is now being implemented nationwide.

7.4 Transitions in outdoor recreation and tourism

Potential improvements in the quantity and quality of freshwater have implications for water-based recreation (as discussed above). These improvements have potential for transitions in outdoor recreation and tourism in affected catchments, which calls for a strategic approach by councils and stakeholders. The SIAs point to the need for recreation strategies at catchment or district level, developed in conjunction with efforts at river care, stream augmentation and lake or lagoon improvements. It will be important to develop and implement an action plan for enhanced water based recreational activities to maximise the expected benefits from improvements in biodiversity and water quality for the benefit of outdoor recreation and tourism.

Proposed actions in the SIAs included:

- Working groups of representatives of iwi, recreational organisations, local government and other stakeholders to draw up and monitor an area visitor strategy[92];
- Promoting visitor attractions and related businesses by highlighting unique ecological values and their enhancement, or ongoing restoration and management efforts such as predator control[93];
- Enhanced access to rivers and streams, wetlands and lagoons such as board walks and access ways and working with landowners on new and improved recreation opportunities (there is an example of this sort of initiative in the Waitaki where the Alps to Ocean Cycle Trail crosses farmlands and numerous lakes and rivers, wetlands)[94].

[90] For example: http://fdwnz.co.nz/about-us.
[91] See: https://www.immigration.govt.nz/about-us/what-we-do/welcoming-communities/what-is-welcoming-communities.
[92] For example: https://www.waitaki.govt.nz/our-council/plans-reports-strategies/ourstrategies/Documents/Other_strategies/Tourism%20Strategy.pdf.
[93] See for example: http://www.wet.org.nz/.
[94] Mackay et al. (2019).

- Visitor interpretation at viewpoints, hides, parking and picnic areas, walking and cycling trails, and restoration points[95];
- Promotion of visitor attractions and related business opportunities by highlighting unique and improved ecological values (such as the Waitaki Whitestone Geopark proposal[96]);
- Working with district plan rules around visual effects of land use changes and restoration, and to protect ecological, cultural, amenity and heritage values (including old farm buildings[97]); and
- Managing visitor numbers and infrastructure, particularly toilet facilities, where activity is close to or potentially affecting water ways.

7.5 Transitions in urban communities

Transitions are needed in urban communities where wastewater and storm water facilities require upgrading to meet water quality standards. This problem is a challenge in smaller communities where there may have been many years of under or deferred investment. An example is the Wairarapa (Ruamāhanga) where the SIA considered that upgrades were necessary for towns across the catchment that currently discharge waste and storm water into the river system. Assistance may be needed for local councils to upgrade urban wastewater treatment and stormwater disposal services in the towns of the catchment. Central government were identified as one possible source of assistance.

A related issue is the potential impact of upgrades on economically vulnerable urban households that face increased costs through rates, rentals or capital requirements. Small populations mean that cross subsidies within a town may not be feasible. The SIAs also note potential actions by households such as installation of rainwater tanks, improved stormwater connections (sumps and pipes) or upgrading of septic tanks (rural areas). Assistance could include targeted rates relief, subsidy for works, or reduced consent fees (local and regional).[98]

7.6 Transitions in rural-sector employment

Implementation of “implementation packages” for catchments could create a range of employment possibilities that offset, or supersede, any initial job losses to the regional economy resulting from costs to farm operations. The SIAs indicate that any softening effect on employment losses will depend on the level of diversification in land uses and the rural economy.

Rural residents in areas such as the Wairarapa, Hurunui and Waimakariri are finding new livelihood opportunities in commercial recreation and tourism, ranging from small-scale, leisure activities for local and urban residents to serving international visitors. Associated with these activities are regionally focused brochures, guidebooks, and electronic, media promoting an area. The development of recreational opportunities, hospitality and associated place-promotion often sits alongside longstanding local uses of waterways and natural areas for recreational activities, with many visitors looking for

[95] For example: https://groundtruth.co.nz/news/wairarapa-moana-wetlands-project/.
[96] Mackay et al. (2018).
[97] Taylor et al. (2019).
[98] The potential for Water-sensitive Urban Design was considered by the Greater Wellington Council for the Wairarapa and for the catchments of Porirua Harbour Whaitua. https://www.gw.govt.nz/assets/Whaitua/Porirua-WIP-web.pdf.

"authentic" experiences. These visitors require high quality natural and cultural environments and often take advantage of new land uses and landscapes, reinforcing efforts to restore, conserve or protect water bodies. Particular examples were the coastal lagoons and lakes such as Wairarapa Moana, Waihora Ellesmere and Wainono (South Canterbury).

A coordinated strategy for maximising future on-farm and off-farm employment will include training and skills development. The local training and employment strategy can be based around iwi, existing providers and business and employment programmes of central government agencies. The aim is to take advantage of work in mitigation actions and new land uses, as well as focus the recreation and visitor sectors to maximise the opportunities from environmental improvements, and from innovative land uses that contribute to already regional food and beverage markets. It is necessary to integrate outdoor recreation planning and management with a regional visitor strategy and regional economic development more broadly. Specifically, implementation packages can:

- Ensure ITOs, training providers and high schools, WINZ, and community providers are well informed about the work opportunities that could arise in the mitigation actions on and off farm (such as plant nurseries, riparian planting, restoration activities, new land uses and hospitality);
- Work with agencies and groups to define the required skill sets, timing of needs, and to identify priorities for particular groups;
- Encourage employment opportunities for Māori in mitigation actions, including plant nurseries, restoration works and re-planting, environmental management and environmental monitoring, consistent with iwi development strategies[99]; and
- Identify new and expanded employment needs in farm servicing (e.g., vet services, fencing contracting and rural transport) and seek ways to meet those needs locally through regular communication with the rural business sector.

7.7 Communication and collaboration

Another important factor in the management of change is the provision of timely and helpful information and effective communication to inform all stakeholders about the nature and timing of key changes. This communication can build on the collaborative efforts already established by many regional councils. A comprehensive communications policy should include:

- Provision and regular updating of information on appropriate websites along with printed newsletters, pamphlets and media outputs;
- Audio-visual material for displays at local markets and community events and alongside farmer field days and technology transfer activities; and
- Ongoing, face-to-face meetings with affected parties (e.g. farmers in particular areas), individually or in groups (catchment communities) along with social and health services, economic development agencies and the recreation and visitor sectors, to identify any social issues as they arise and to recommend specific mitigation or enhancement measures.

[99] For example see: https://ngaitahu.iwi.nz/environment/te-waihora/whakaora-te-waihora/.

7.8 Catchment communities

The Greater Wellington Council has used the concept of catchment communities as a way of working more closely with people and communities of a catchment. The SIAs generally support the need to utilise and support community based environmental management and restoration projects, including Enviroschools, is an important step towards enhanced social outcomes. Advice can be sought from organisations including the CRIs and universities through the Our Land and Water[100] National Science Challenge (which includes mātauranga Māori), Ministry of Primary Industries (Rural Communities and Farmer Support group) and citizen science providers. The NZ Land Care Trust[101] is another source of advice, as an organisation that has extensive experience in farmer-driven rural change.

The SIAs were part of collaborative approaches to technical modelling, analysis and development of policy and planning recommendations. They suggest that this approach can and should be extended into management of change through implementation programmes at the catchment level. Key organisations will include, at least, regional councils, iwi and rūnanga, district councils (or council), farmer and grower organisations, Rural Support Trusts, Fish and Game and other recreational groups, community organisations involved in restoration projects, training organisations and Enviroschools.

7.9 Updated baselines and ongoing monitoring

A well-defined social baseline and projected trends without the planned interventions are a fundamental step to assessment of status quo scenarios for policies and regulations around land and water. They also provide the basis for examining aspirational scenarios and packages of change for improving the freshwater environment. Of interest to the SIAs are potential effects on employment by sector, population changes relating to that employment, services based on population, personal and household income and social equity, including any specific effects identified for the Māori population (excluding cultural effects). Also, important, are the potential effects on recreational activity based on water, amenity vales and sense of place through social connections to water.

Monitoring is another critical aspect of an adaptive management strategy. While monitoring is rightfully focused on physical (water quality) and ecological indictors, it is important to report these over time in relation to the NOF and expected outcomes for health and wellbeing of people and communities. Future social monitoring can include regional surveys of residents and recreation users, and local or sector surveys of residents or groups such as farmers, using questions specific to and catchment implementation programme and established community outcomes, and guided by the sorts of indicators in the Treasury social wellbeing framework.

8. Conclusion

Social impacts of freshwater management are shown in the SIAs to be complex. Because of these complexities, regional councils found that it was necessary to develop and implement collaborative approaches to planning, combining local, scientific and cultural knowledge in an integrated way. They also found it necessary to respond to the

[100] http://www.ourlandandwater.nz/
[101] http://www.landcare.org.nz/

physical, social and economic variation between the catchments by bringing relative community input into each planning process through the formation and involvement of catchment groups. This reflected an acknowledgement that a single approach to freshwater management is unlikely to bring about the same result for all catchments, people and communities.

The review of the SIAs found there were common cause and effect relationships that create social impacts. These chains of effects – for example, changes in water quantity and quality affecting freshwater ecology which, in turn, affected cultural or recreational uses – also required an interdisciplinary approach to social impact assessment, and community input. Similarly, the SIAs identified a strong linkage from the economic impacts of policy and regulation on farming systems, to employment, regional economies, and thence to people and communities.

The SIAs reviewed in this report have a common theme where communities found the status quo (policy settings and allied environmental outcomes) unacceptable when analysed in BAU scenarios. They portrayed a future that, despite increasingly prescriptive NPS guidance, did not fully meet desired community aspirations including, for example:

- Abundant mahinga kai
- Safe water for contact recreation
- Safe drinking and stock water supplies
- Flows that fully support aquatic life and biodiversity
- Flows that support recreational activity
- Reliable water supplies for urban and rural uses
- Sustainable and productive land uses
- Diverse and resilient economies
- Thriving and cohesive communities

This challenge and the opportunities it represented, galvanised participants to engage in the development of solutions and recommendations that ranged from policy settings and planning rules, to community based restorative actions. The emphasis, however, varied with the farming sector primarily interested in gaining social licence to operate through evidence of a change towards best practice and more sustainable outcomes from the use of water. At the same time, urban communities emphasised the need to protect drinking water, while minimising their investment in infrastructure. Recreational interests were evident throughout the collaborative processes and across urban and rural communities. So, while all groups agreed that change was necessary, deliberations centred on the nature, cost, degree and timing of the changes needed.

The effects of policy changes assessed in the SIAs showed that effects (positive and negative) will vary between catchments because of their different physical characteristics such as the presence of upland lakes, coastal lagoons, settlement pattern, irrigation, land uses and level of visitor activity and tourism. The presence of a large urban area and rural subdivision close by was also a major factor because of the demand for outdoor recreation in and around freshwater, and the availability of work and incomes.

Also identified was the high likelihood of direct and indirect effects due to the causal relationships involved in water management. This means that the actions of one social group, such as farmers, has potential to affect other water users downstream. It also means that costs for one group translates into benefits to another. Furthermore, it

means that physical, ecological and economic effects can all have social and cultural consequences.

It was no surprise that the SIAs focused attention on the potential effects (positive and negative) on farmers and rural communities and much of the expected change was to farming systems. It was also clear that changes in farming practices are urgent because of the lag effects through surface and ground water and eventually to ecosystem improvements. That said, in some catchments, there was an urgent need to improve urban water management, often at a cost that will affect household incomes.

The ability of farm operations and urban households to effect change will vary depending on factors such as debt and income. There was often consensus around the need to assist people through transitions where these costs fall disproportionately on particular social groups or communities. A process of managing change through necessary transitions with appropriate strategies and resources, with ongoing public involvement, is therefore critical to realising the success of any new policies while maximising the net social benefits from these transitions.

An adaptive approach is proposed to assist rural and urban transitions. Adaptive management is facilitated through phasing of change, resources for change, monitoring, good communication, transformational leadership and active involvement by affected people and communities.

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Appendix 1: The Waimakariri's Social Support Network

The Waimakariri District SIA (Sparrow and Taylor, 2019), provides the following example of an existing network of social support organisations that could potentially participate in the management of change.

Social support organisations:

Rural Support Trust – provides for the psychological wellbeing of farmers. This organisation has the capacity to provide support for individual farmers and to organise group activities for farmers in communities facing particular challenges, whether economic, weather or natural disaster related. This is the point of referral for the Fonterra's Ti Aki team when they find supplier farmers psychologically stressed when trying to comply with environmental regulations.

Oxford Community Trust – based at Oxford is the contact point for information, budget services, income support, counselling, free legal advice, you workers, family services, elderly transport, youth driving, food-bank, OSCA holiday programmes and after-school care. This organisation receives funding from a range of charitable organisations and from government funding agencies such as COGS, but does not bid for social service contracts.

Wellbeing North Canterbury Community Trust – based in Rangiora and provides a range of services including family counselling, youth drug and alcohol services, school attendance, restorative justice. Most of its services are provided on contract to the Ministry of Social Development, the District Health Board, Ministry of Justice and other agencies. Its range of services vary as the range of government contracts change. The Trust also has the capacity to accept limited duration contracts in response to emergencies such as the Waiau earthquake, which saw it become involved with the navigation service assisting with the repair of homes, and social worker support.

Kaiapoi Community Support – a branch of the Wellbeing North Canterbury Trust based in Kaiapoi provides a point of contact for information, and support services including the Kaiapoi Community Pantry, and volunteer drivers.

Victim Support North Canterbury – Support to people bereaved by suicide. Support can be provided to families/whanau/ discoverers/ those affected by bereavement. Psycho-social support and referrals to appropriate support agencies. Referrals are made through Police, self-referrals and referrals from concerned family or friends.

Religious based organisations provide counselling services including:

Hope Community Trust - Wrap-around service, counselling, community drop in centre, foodbank and chaplaincy service provided by the Rangiora Baptist Church.

Presbyterian Support Family Works – Counselling service, social work in schools, safety programme (violence protection order information), and parenting through separation.

Salvation Army – Budgeting advice and food-bank. Oasis Centre for free consultations and rehabilitation for problem gamblers and their families.

St John of God Hauora Trust – Child and adolescent mental health and addiction services, primary/community and secondary/specialist service. Work to support improvements in mental health and addiction services delivery by the Canterbury District Health Board and NGOs.

Social Services Waimakariri – a collaborative organisation involving most of the main social/welfare agencies and NGOs, and is able to bring these organisations together to discuss key issues for the community as these emerge.