



Summary of Interview Data on the Use of Tools for Institutional Adaptation Planning for Health Impacts of Climate Change

Health Analysis & Information For Action (HAIFA)

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1. Executive Summary

This qualitative study interviewed 20 key experts in key organisations, including central, local and regional government, and public health units, as well as interviews with academic and rural sector support representatives. The study aimed to better understand institutional readiness for using the Health Analysis and Information for Action (HAIFA) climate change and human health impacts modelling tool for informing adaptation planning. Questions focused on identifying different institutional drivers and barriers, and better understanding of the roles and relationships between public health, local, central and regional government, and the rural sector with respect to health impacts of climate change. The interviews also sought to explore interviewees' interpretation of climate change impacts and awareness, the use of climate change planning tools, and how different organisations approached adaptation planning.

The interview responses confirmed expert views of the areas where climate change could most likely have significant implications for human health in New Zealand (NZ), and reflect those identified in the international literature (e.g. Bowen *et al.*, 2012; Markandya and Chiabai, 2009):

1. Drinking water quality and quantity,
2. Increased floods, droughts and extreme weather events,
3. Food-borne illness,
4. Mosquito-borne diseases,
5. Rural economy and mental health,
6. Anticipatory immigration, migration, and
7. Other areas such as zoonotics were also noted.

People tended to look for information on climate change from websites; the Intergovernmental Panel on Climate Change (IPCC), Ministry for the Environment (MfE), Ministry of Health (MoH), NIWA, Landcare Research, as well as NZ university sites. Many respondents noted that there are limited tools and information available that has the level of regional or local specificity required.

Most significantly, this study suggests that specialised planning specific to the impacts of climate change on human health may be marginal in most organisations. Those interviewed felt that climate change, especially climate change and human health, was generally not a high priority for planning, and that the focus on 'climate change and human health impacts' struggled to compete against other priority areas for attention and funding. These observations are similar to the limited overseas studies to date in the area of institutional planning for climate change (e.g. Bowen *et al.*, 2012; Costello *et al.*, 2009; Ebi & Semenza, 2008; Frumkin & McMichael, 2008).

Several key reasons were given as to why climate change adaptation is not a high priority within the different institutional settings. These factors were raised across the discussion themes of awareness and information, tools, and adaptation planning. These being:

1. Health impacts for NZ not perceived likely to be major, compared to other nations,
2. Scepticism,
3. Competing priorities, limited time, and
4. Lack of resources.

Uncertainty, lack of evidence and lack of local data were factors acting against climate change adaptation planning, preparedness and prioritising within and across the different institutional settings.

Whilst international literature suggests debate has shifted to recognise that climate change, whether man-made or natural is inevitable (Nerlich *et al.* 2010), some of those interviewed reported that strong levels of climate change scepticism within their institutions made adaptation planning difficult. Some noted that even if regionally specific and NZ wide data are available, uncertainties will always remain about the timing, incidence and severity of impacts. Actual measures of the impacts on human health were seen as difficult to anticipate and there is also a need for local knowledge about rural business, social investments, and social capital in determining vulnerability and impact.

In current NZ institutional responses to climate change and human health, activities seem confined to fairly narrow areas of application; namely disaster preparedness, infrastructure planning and drinking water. Impacts on drinking water security are identified by the respondents as the first wave of effects on public infrastructure. Respondents noted that activities between public health authorities and local government tend to focus on disaster preparedness and/or planning for extreme and/or protracted weather events (e.g. flooding or drought).

The interviews revealed a perception that NZ will not be too badly affected, at least compared to other countries, because it is 'buffered': Geographically it is as an island cooled by ocean wind flows, and compared to other countries, our population is small and our infrastructure well resourced. There was however strong opinion that NZ will be vulnerable to increased incidence and impacts from extreme weather events, including coastal erosion and threats to drinking water quality and surety of supply.

Local government and regional public health settings share similar institutional barriers to effective adaptation planning, but there are also some distinctive differences. In health settings anticipated climate change and human health impacts occupy a fairly low priority where they compete with more urgent clinical and public health funding demands. In local government, whilst climate change adaptation planning may be mainstreamed into infrastructure planning, local government deems that public health authorities are responsible for planning for health impacts. Institutional planning for climate change adaptation does appear to work well when resources and responsibilities are shared between local government and regional public health organisations, where shared or joint appointments seem fruitful in gaining institutional traction and cooperation.

Whilst international impetus for climate change action is strong and there is some resourcing for NZ to play its part on an international stage, those interviewed who are responsible for local adaptation planning felt that the localised impacts for NZ were not recognised as being significant or salient enough to warrant serious institutional action and attention. Many interviewees noted a lack of commitment in the NZ political environment as well as lack of funding and lack of clarity on funding structures and relationships for cross governmental and collaborative planning approaches.

'Mainstreaming' was deemed a good way to ensure that planning for climate change was not a stand alone or a specially dedicated initiative, but rather would be combined and integrated with other routine, 'business as usual' planning activities. How robust this is in practice needs to be questioned. Whilst 'mainstreaming' underpins much of the current approach for central government agencies, the interviews revealed that dovetailing climate change adaptation strategies into existing work-streams and planning processes may also be vulnerable. This is related to current mainstreaming practice that appears to rely on individual champions and their networks to ensure that climate change is highlighted. Therefore the extent to which the focus on climate change becomes embedded without the constant support of champions inside the respective institutions is questionable.

Mainstreaming is identified as necessary and recommended in the literature (e.g. Ministry for the Environment, 2011; California Natural Resource Agency, 2009), and may be an efficient strategy given the current political environment of climate scepticism. However, most of those interviewed thought that a lot more could be done to inspire various organisations and communities to think and plan ahead. Others also noted considerable opportunities for NZ to market and position the country to economically benefit in food production and food security in response to climate change impacts on food supply overseas.

Co-benefits approaches, where win-win outcomes are sought that will deliver on climate change adaptation as well as other public health benefits (e.g. urban planning that also enables increasing public use of cycle and walkways), also seem more successful in activating collaborative mitigation and adaptation planning for climate change.

In the health sector, adaptation planning for climate change and human health necessitates joining the dots together in the different data sets, projections and anticipating public health impacts. In health especially, where there is often top-down expert driven decision making, it is important that an evidence base supports the necessary conversations about funding and the degree of attention merited. Yet questions remain about the extent to which HAIFA (Health Analysis and Information for Action) may actually change the content and outcome of these conversations about prioritisation of resources. Compared to the 'epidemics' of obesity, type II diabetes, as well as other demands for tertiary health

services, the impacts of climate change on human health are anticipated by some to be comparatively small. There is confidence that the modelling will provide evidence of what is likely to happen, but questions remain whether the anticipated impacts will be great enough to influence institutional decision outcomes, and prioritising, funding and planning trajectories in health settings outside drinking water management. In local government settings, HAIFA's information about regional impacts could support multi-stakeholder civil conversations necessary for comprehensive coordinated adaptation planning, but this would require resourcing and innovation beyond the current 'business as usual' mainstreaming approaches.

2. Introduction

Background, aims and purpose

The Health Analysis and Information for Action (HAIFA) resource system is a ‘proof of concept’ designed to provide end-users (professional communities of interest in health and the environment in central, regional and local authorities) with scientifically robust methods, tools and information to help develop appropriate responses and adaptive strategies that can increase human health resilience to the infectious disease consequences of climate variation and change. This multi-disciplinary study, includes researchers from three Crown Research Institutes (Environmental Science and Research (ESR), Landcare Research and NIWA) and two universities (Massey and Waikato), with expertise in medical and veterinary infectious disease control, climatology, risk management approaches for drinking water supplies, statistical and mathematical modelling, ecology, epidemiology, disease surveillance, and GIS-based system design and development. Social science expertise in data gathering and analysis has been employed to better identify and understand the human and institutional contexts and factors relevant to climate change adaptation that are likely to influence the uptake and use of the HAIFA tools. Australian and WHO-Europe collaborators were also involved. There are three linked Objectives:

Objective 1. Identify and develop predictive models for six Indicator Diseases. These were campylobacteriosis, cryptosporidiosis, influenza, Neisseria meningococcal infectious disease, Ross River fever and dengue fever. In addition, risk assessment tools (DAISY and DPSEEA Climate Change Environmental Health Indicators) were developed;

Objective 2. HAIFA system development of a GIS web-based graphical interface. This incorporated the outputs from Objective 1 and includes the ability to vary the models and climate projections to carry out ‘what if’ scenarios;

Objective 3. Identify the capacity, assumptions and barriers that exist for coordinated adaptive planning between the health and environment sectors. In addition, a water supply vulnerability assessment tool was developed.

‘Information for action’ is a term commonly used within the data management and health informatics professions. It reflects the need to ensure that data and information gathered and collated in a public health surveillance setting is utilised to inform and support meaningful, practical action. The social science component of the HAIFA project (within Objective 3 above) has aimed to explore how the HAIFA data and information could be used by professionals themselves, and how it could be utilised by others to support policy planning and coordinated responses to environmental health issues. In particular, the social science team sought to identify the capacity, assumptions and barriers that exist for coordinated adaptive planning between the health and environment sectors, and to better understand two key capacity areas for adaptation responsiveness – ‘social capital’ and ‘information and communication’. Several phases of enquiry have been completed:

1. In-depth interviews with representatives from District Health Boards (DHB), central and local government, and key stakeholders in a rural area.
2. Development of a vulnerability assessment tool with those involved in managing drinking water.
3. A literature review from the climate change field to unpack the concepts of ‘social capital’ and ‘information and communication’ (as well as issues of scale, timing, and coordination mechanisms).

This report presents findings from in-depth interviews conducted in 2010-2011 with central and local government, local health, academics and rural agencies involved in adaptation planning for the impacts of climate change on human health. Direct quotes from interviewees are expressed in italics throughout the report. The aim of the interviews was to better understand institutional readiness for using the HAIFA climate change and human health impacts modelling tool for informing adaptation planning. Several key issues were examined:

- Awareness and understanding of climate change impacts for environmental health.
- Usefulness of climate change planning tools, and different institutional drivers and barriers relating to the use of tools for adaptation planning for environmental health.
- The relationships between public health, local, central and regional government, and the rural sector.

3. Methods

This qualitative study interviewed 20 experts, including academics, central and local government representatives, local public health professionals, and rural sector representatives (see Interview Schedules and Project Information Sheet, Appendices A, B & C). The different agencies likely to be involved in the use of the HAIFA tools were represented in the interview sample, although it would have been beneficial to have wider breadth of participants across different regions to better understand the interface between central and local government/rural communities given that adaptation is seen as predominantly the role of regional and local authorities supported by central government.¹ To protect interviewee confidentiality broad sector categories have been employed to identify the organisational contexts of information provided.

A snowballing technique was used, initially using contacts provided by the project team, and then the contacts of those who were first approached. The interview sample was not exhaustive or representative, but it did appear to provide 'saturation' in that 'new' data did not seem to be emerging with the latter interviews, but this could also be an artefact of the sampling technique. The data are from those actively working on climate change and human health, so there may be some bias and information gaps in learning about 'standard' practice and capacity beyond the expert views provided in the interviews. However, it must be noted that this interview data can be triangulated with the findings from the previous strands of work undertaken by the social science team in the production of journal papers and project reports for the funders and end-users.

¹ An overview of NZ government Ministry Briefings for Incoming Ministers, 2011, included the following statement: Adaptation is seen as best achieved by integrating adaptation activities in existing processes; practices; policies at all levels of society. Processes and priorities are to be factored into local government decision-making.

4. Findings

The inquiry for the report was structured into several areas. Firstly, we explored *awareness* by asking what people thought were most likely climate change and human health impacts for NZ, as well as levels of awareness across different organisations. Secondly, we were interested in *tools*, asking what tools were used and what makes tools useful or not. Finally we looked at how different organisations were approaching *adaptation planning* asking about collaborative planning and what barriers exist within organisations for adaptation planning.

4.1 Perceptions of climate change human health impacts

Perceptions of climate change-related impacts on human health were influenced by organisational mandates and responsibilities and sector affiliations, as well as wider knowledge from other organisations, research and media. Comments from the interviewees reflected a range of different approaches to health, different understandings of why particular groups of people may be vulnerable to particular risks, the role of the physical environment and infrastructure, and the nature of the hazard itself.

Temperature-related impacts

A warmer climate was viewed as likely to result in lower morbidity and mortality rates associated with winter illnesses and/or poor air quality, but severe cold weather events may increase the incidence of hypothermia in vulnerable populations such as the elderly. Small increases in heat-related health problems in summer were seen as probable, including heat stroke, dehydration, sunburn, skin cancers, and mood irritability that could exacerbate existing mental health problems. A small temperature increase was seen as potentially leading to increased vector-borne illnesses, such as mosquito-borne illnesses. Warmer temperatures could also lead to increased incidences of food contamination and pollen-related allergies as well as increased and more variability of toxic algal blooms. Food safety and biosecurity were mentioned and how NZ might be affected by shocks to the international food system and what impact this might have on nutrition. At the same time it was noted that a warmer climate may enable the growing of new crops in NZ that could be beneficial both nutritionally and economically.

Regional climate variation and adverse weather events

A drier East Coast and a wetter West Coast were frequently mentioned along with more extreme weather events, such as tropical storms, high winds, and heavy rainfall leading to flooding. Increased incidence of drought was seen as potentially impacting on small drinking water supplies (water supplies serving fewer than 5,000 people) and mahinga kai localities (traditional Māori food gathering locations), while in rural areas the impacts on farming communities could be significant, involving impacts on mental health, increased fire risk and other health hazards such as zoonoses, skin irritations and UV exposure.

Impacts on the rural sector

A number of respondents felt that the brunt of many possible impacts from climate change for NZ would be felt more acutely by rural rather than urban communities. Health impacts identified by interviewees included:

“Sunburn with hotter summers, mental health issues, irritability in hotter weather. Extremes are not good for health, mental health – wet gets to people and in spring time people are tired and busy with adverse weather” (rural sector interview).

“[Rural impacts will be] similar to urban, but more access to diseases associated with zoonoses, particularly tropical and mosquito borne illness. Leptospirosis is a concern; dairy herds can be inoculated, but there is a 40% hospitalisation rate for people, and it’s not hitting just the elderly” (rural sector interview).



Those engaged in the rural sector were concerned that the types of change anticipated and degrees of uncertainty would mean that past patterns, grounded in historical knowledge and shared collective experiences, would no longer equip communities for future adaptations. Mental health was a key issue, but some noted that this sat alongside other pressing human health issues for rural communities, including access to hospitals and specialised health services.



“Farmers talk of differences in coping for a drought versus a flood. In a flood the impact is evident, there’s obvious damage with a coordinated effort and whole community response. A drought is not as instant, it is not so obvious or immediately repairable. People are on their own, they withdraw into themselves, they see stock suffering and there may be pressure from consecutive droughts. We did see an increase in suicide rates in the droughts in the early 1990s” (rural sector interview).

“In rural settings water is a vital resource for production as well as for drinking water. Direct human health and economic impacts can be anticipated as well as greater pressure on this resource” (rural sector interview).

However, respondents also said that there could be significant opportunities for the rural sector and health benefits as well as adverse impacts.

“People may plant crops in areas not previously capable of doing. Buy local, consumers local, more variety, more local independent food supply. Positive or negative, could go both ways - it will be more extreme” (rural sector interview).

“For the agricultural sector there are issues of food security and food safety, and biosecurity. Some changes in rainfall and temperature may be beneficial in the short term. Changes in temperature could impact on the performance, function, integrity of biological value chain. NZ may have competitive advantage, and could expect increased demand for horticultural products from Australia for example” (central government interview).

Flooding was seen as potentially leading to contamination of water supplies, an increase in vector-borne diseases such as dengue and Ross River fevers (vectored by mosquitoes), food poisoning (campylobacter) and increasing incidence of leptospirosis.



Climate change impacts on determinants of health

A number of interviewees regarded climate change as likely to impact on the economy, housing, employment, infrastructure, population migration, food security, social and health services, sense of community (social capital and sense of place), all of which are determinants of health, but which, to a large extent, sit outside the direct responsibilities of the health system (except for health services).

“The broader socio-economic impacts of climate change have health implications” (health sector interview).

“NZ is potentially buffered from the worst of climate change as surrounded by water. Indirect impacts are equally important, potential for large impact – climate change refugees will increase from Australia, Pacific and Asia over the next 20 years. There will be flow on effects for economic activity and impacts on health services resourcing” (health sector interview).

“Indirectly, climate change will affect property, economy, social patterns, sense of security and knock-on effect from overseas. Immigration from climate change could mean increased diseases, social problems pressure on economy, social unrest including racism, division between rich and poor – social issues not even thought of ...” (local government interview).

“A wider discussion is needed on displaced population and climate refugees, More New Zealanders might come home from Australia if drought too bad there. NZ is buffered by ocean and could be seen as a haven, but there will be issues of border control, and biosecurity and infrastructure impacts including health” (local government interview).

The issues relating to immigration and migration identified above are important in light of the literature focusing on social capital in the context of climate change, whereby social norms such as trust, interpersonal relationships and formalised social organisation are seen as important in contributing to community resilience and building adaptive capacity (e.g. Pelling and High, 2005). Changes in settlement and community patterns and different cultural norms and interactions resulting from immigration and/or migration, then, are likely to impact on established patterns of community interaction. Social capital has also been identified as a determinant of health, or well-being; Wilhelmi and Hayden (2010) suggest that targeting specific indicators of vulnerability (to climate-induced heat stress) includes assessment of access to resources and social networks in terms of their likelihood to provide positive or negative health outcomes.

Other processes to get human health on the climate change agenda

Processes identified by interviewees to get human health on the climate change agenda included assessing vulnerability, raising community awareness and developing indicators, and multi-agency interaction. For example a local government sector interviewee stated that regional vulnerability assessments were to be carried out over the next three years. Vulnerability assessments could also address another issue raised - the absence of modelling of social determinants of health.

Community-based risk assessments were seen as a route to raise community awareness of climate change, to get other organisations involved, and to create expectations within a region, and enable developing indicators for making basic health impact assessments that could become taken-for-granted adaptation measures – a form of mainstreaming.²

Partnerships between local, central government and the research community were also identified. Some public health units were seen as proactive in engaging local authorities, and not looking at health in isolation. Health in all Policies (HiAP) is an initiative that recognises the links between human well-being, and the environment and the economy, and seeks to provide an integrated multi-agency approach to improve well-being and health. Examples of where this approach was working were identified: (i) The Healthy Christchurch Charter; (ii) the Environment Canterbury Resilience Programme; (iii) the use of the *Integrated Recovery Planning Guide*³ following the Christchurch earthquakes; and (iv) the urban design initiative – a health promotion tool for planners to consider different aspects of urban design, such as water, rainwater, shade trees, building design.

² Mainstreaming is the mechanism used to incorporate climate change adaptation into existing policies, plans and practices.

³ Canterbury District Health Board & Christchurch City Council (2011), *Integrated Recovery Planning Guide 2*. This guide includes targeted questions that are designed to help the wider Christchurch community and decision-makers plan in ways that build stronger more sustainable social, environmental and economic outcomes; promote the health of all; and keep sight of the shared vision for stronger, healthier and more resilient communities.

4.2 Climate change and uncertainty

While interviewees were able to discuss a wide range of potential health impacts relating to climate change, there were also strong views that NZ is buffered and fortunate compared to others. In particular, potential impacts of drought in Australia, rising sea levels and increased extreme weather events for the Pacific Islands were highlighted.



“New Zealand is relatively protected – a long, narrow island in water” (health sector interview).

“New Zealand is potentially buffered from the worst of climate change as surrounded by water” (health sector interview).

“Going on NIWA predictions of climate change for New Zealand, it’s not nearly as bad as for big continents” (local government interview).

Other mitigating factors included a relatively small population and well-resourced infrastructure. The interviews also illustrated that, for some, knowledge about climate change impacts on health was speculative, downplayed, and not a priority. Careful qualification is intrinsic to much of the language used in the interviews, such as a ‘big question’, ‘speculate’, ‘might’ or ‘could’.

“Climate change impacts are a big question, we can speculate only” (health sector interview).

“In my personal view I do not think it is a concern for human health in New Zealand in the same way it would be a concern for countries that don’t have strong infrastructure, social services or health services” (central government interview).

“The argument that climate change is nonsense is still being raised at most local council tables [and] government policies don’t reflect climate change – peak oil and a strong move to fund roads, not public transport” (local government sector interview).

The interviews also revealed that the scepticism and denial encountered within their wider organisations was sometimes fuelled by questions of uncertainty and impact.

“Some don’t think it is climate change, some think climate change is natural and not human related. The majority don’t see climate change as a priority issue or think that a technological fix will exist” (health sector interview).

“Some are not concerned about climate change – we’ve done surveys ... I think they’re denying for convenience, and the media has had a big part in playing up the debate and contention” (local government interview).

Interviewees reported strong philosophical views in the rural sector that climate change and variability is natural and that adaptation will therefore happen as a natural response. In addition, there was some evidence that negative responses to climate change could in part be shaped by reaction to other political interventions, for example, the Emissions Trading Scheme (ETS).

“Potentially we will adapt well, we have a community focus, and will be responding to extreme weather events as part of the rural environment” (central government interview).

“Strong view in agricultural community (e.g. Federated Farmers) that variability is a natural occurrence. Federated Farmers are against the ETS as they see it as a burden on producers. People are concerned about illness and not being able to participate in community, community is very important for rural” (rural sector interview).

An important factor that appears to contribute to the general down-playing of climate change impacts is a decline in central government in supporting climate change awareness and adaptation planning.

“On issues of climate change, awareness is high amongst other government agencies that deal with risks. The awareness of effects and impacts is high, but the awareness of effects in relation to human health, I don’t think is mainstream ... and the climate change work was phased out of MfE’s restructure” (central government interview).

“In central government, MfE takes the lead on climate change awareness and has a budget and resourcing. We had a forum for regular updates involving MoH, Department of Labour (DoL), Treasury, Ministry for Economic Development (MED), Ministry of Agriculture and Forestry (MAF/Biosecurity), Ministry of Fisheries, Te Puni Kokiri (TPK), Department of Conservation (DoC) and Ministry of Civil Defence and Emergency Management (MCDEM). This was a positive forum, but it has now fallen over, lacking government priority and funding. MfE also reported back on the international scene and formed publications of interest and organised climate change adaptation workshops in Wellington” (central government interview).

The decline in central government attention, support and funding to better plan for the impacts from climate change, was also felt to have affected local government and other institutional planning in NZ, where with few exceptions, health was not being prioritised.

“Most are not factoring human health considerations into planning and thinking. Most are aware of climate change though, some Regional Councils are thinking about dengue fever” (central government interview).

“Health is not top of the list for Territorial Authorities and Local Government New Zealand (LGNZ)” (local government interview).

“We focus on what we are doing, not what is happening. The Local Government Act, 2002 (LGA) says we must respond for the wellbeing of future generations, and the Resource Management Act 1991 (RMA) emphasises planning for the effects of climate change, so we could be liable if we don’t plan. Most are not worried about health impacts, they are less visible. Health officials don’t seem to be responding either. If the sea level rises as forecast, we could have 20,000 homes under water” (local government interview).

The downscaling of central government leadership and involvement in climate change adaptation (and vulnerability and resilience) has also been identified in other NZ papers (Boston, 2006; Russell *et al.*, pers. comm. 2012)⁴ and as noted above, the land-based sector is wary of regulations associated with the ETS.

These two sections have focused on the wide range of potential health impacts associated with climate change identified by interviewees as well as the ways in which they expressed reservations about the extent to which others ‘believed’ in climate change and what this means for particular sectors and/or organisations. This sets the context for the following section that relates participants’ views on the usefulness of tools, information and processes for climate change adaptation for environmental health.

⁴ Boston (2006) described New Zealand’s climate policy as characterised by a lack of consensus on policy directions among stakeholders and policy actors, inadequate cooperation between government and business, inaccurate forecasts of emissions, governmental prevarication, and a series of significant policy reversals.

4.3 Tools, information, and processes that could contribute to climate change adaptation for environmental health

Perceptions of the usefulness of tools

Developing tools was seen as a way of identifying and quantifying the potential impacts of climate change and their implications for health in order to plan interventions. Modelling was seen as a mechanism to better understand the likely implications, and was also seen as providing practical help that can be “plugged into” planning and advocacy. Models developed elsewhere that were used to convey particular NZ conditions were seen as potentially useful, such as NIWA using IPCC modelling to model temperature and climate conditions in NZ but this example related to food production, not human health concerns. Climate change modelling around projections has been regarded as more accepted and well known, but the usefulness of these would be enhanced by incorporating information to identify local impacts. This scale issue is commonly identified as a barrier to tool uptake and use (e.g. Borowski and Hare, 2007).

“The scale issue is really important, because responsibilities are generally region-confined and time limited. The information on climate change impacts has not been a good fit with their needs. So downscaling to local and relatively short, as well as long term projections would be useful” (academic sector interview).

However, another interviewee thought that different scenario-based tools would be useful for getting to understand local impacts and trends, but these needed to provide more certainty and detail. These tools were not seen as likely to identify acceptable risks, but could identify unacceptable consequences of impacts, and this information could help inform local government asset planning.

Tools that could identify hot spots for vector control were also seen as potentially useful for policy makers, while another interviewee identified weather forecasting as an important tool that could guide water quality and quantity monitoring.

Developing tools for health assessment, advice, guidance on health impacts relating to climate change in NZ – like RiskScape⁵, would; *“trickle down to health organisations responses”* (local government interview).

One interviewee thought that tools provide solutions, and that the route to tool-based solutions was through clarifying how researchers and potential users see their roles, and collaborative problem definition.

“People appreciate they have a problem, but haven’t worked out what the problem is” (academic sector interview).

Civil Defence and Emergency Management were regarded as ‘good’ at dealing with ‘calamities’ (natural disasters, such as floods, severe storms, earthquakes) but that the central and local agencies involved in planning were not seen as utilising opportunities for forward-looking creative collaborative planning for climate change impacts.

Making tools useful

The excerpts from interviews identified several issues linked to the usefulness of tools. These included in-house tool development that is informed by the context compared to the separate ‘worlds’ of tool developer and end-user. The need to be clear about the assumptions and uncertainties and complexity was also mentioned, along with a lack of knowledge, skills or capability to use the tool. Relevance to local contexts was seen as important rather than ‘importing’ overseas tools that may not be applicable in NZ environmental, social and governance contexts. Credibility was seen as important when using the tool to develop and implement policy. These issues resonate with those in the literature, such as Meinke

⁵ The RiskScape model provides a framework to calculate the risk of impact to assets from different types of natural hazards (<http://www.riskscape.org.nz>). Risk information can then inform decision making for a range of natural hazard management activities including land-use planning, emergency management, asset management and insurance.

et al. (2006) who note the possibility of a 'disconnect' between science (tool developer) and decision-making domains (e.g. policy contexts). Frumkin et al. (2008) also note that the complexity associated with climate change may frighten, alienate or confuse people, and in this context, time and effort need to be expended to build shared language and feedback loops.

"It depends on user's need and person developing - the user/developer duality. Tools are more useful when the user and developer is same person - i.e. in-house. Also easier administration - same cost codes, organisational and financial incentives exist to make tool make useful. Many tools for research projects are not taken up. Depends on what tools are supposed to do. Information tools, simple calculations and databases do work well. Some based on models are more challenging to use. The way the tool is designed doesn't necessary help decision makers. Often it's not developed on time or answers the right question ..." (academic sector interview).

"Some people lack the skills to use tools or the technology is difficult to use, or there is a low perception of utility, but the issue is usually far more systemic. Science then is not involved in decision-making and users don't appreciate science. These are different social worlds, and bridging the gap is difficult. There's very little researchers can do to improve this. Most managers want certainty, most modelling tools can't give certainty. Information systems can, but they are more complex and therefore less likely to be used. Sometimes they are only used once, but my impression is that they need to be used all the time. People internalise what they need so there's a lot of learning. People developing tools are very interested but people using tools are often disinterested" (academic sector interview).

"My personal view is that tools that provide clarity and rigour are good, but there are tools that are just production material and they are not good. There are tools that are patronising and just government proliferation of naïve advice, where the recipient (end-user) is not understood and those are useless. Tools that are an derivation or adaption of those overseas, and that are weakly and poorly adapted to NZ conditions or policy, we send them back" (central government interview).

"Presentation is everything, need graphic design and marketing, get egos out of the way. People are very suspicious about modelling so be clear about base assumptions and demonstrate that it is credible to non-science people. Do lots of high level work, people have to see why climate change is relevant" (health sector interview).

"There is confidence that the modelling will provide evidence of what is likely to happen, but questions remain whether the anticipated impacts will be enough to change institutional decision outcomes, and prioritising, funding and planning trajectories in health settings outside drinking water management" (central government interview).



4.4 Integrating tools with other information and mainstreaming

'Mainstreaming' was seen as a useful mechanism that integrates climate change tools, information and intervention systems with core business and planning activities, that may or may not also be linked to developing adaptation plans and strategies. The MfE Briefings for Incoming Ministers (2011) states that; "[A]daptation is seen as best achieved by integrating adaptation activities in existing processes; practices; policies at all levels of society", and the 2009 California Adaptation Strategy promotes prioritising strategies that "modify and enhance existing policies rather than solutions that require new funding and staff". Smit and Wandel (2006:285) also suggest that it is "extremely unlikely for any adaptive work to be undertaken in light of climate change alone" and that "work tends to occur as incremental modifications to existing initiatives" (Ibid: 289).

Examples of the benefits of mainstreaming were frequently provided by interviewees.

"Main thing that makes them useful is if they are already existing and in core business, so not designing from scratch to deal with the issue of the day and then letting them drop. And they are not things that are specific to climate change so we are not having to have the priority discussions about is this the best use of this money. So because they're part of core business and are used every day for a variety of things, this makes them much more sustainable and resilient" (central government interview).

"Focus on existing systems – e.g. air quality, infectious diseases, not building new ones, but we need to make sure existing ones are still robust. Make part of core business – everyday, not climate change-specific health protection. If there is a new area of health threat then review" (health sector interview).

"Planning is for outbreak and infectious disease and dealing with major weather events – mainstreaming is the way to go, except in the very early stages, to develop planning awareness and then the outcome of that gets fed into stronger systems more broadly" (health sector interview).

"The Health Intelligence Unit pulls together communicable and infectious disease, both nationally and regionally – weekly meetings, red flag diseases, mosquito monitoring programme, drinking water quality and quantity – not always asking the climate change questions, but if we're seeing unexpected results ... " (health sector interview).

One interviewee thought that existing tools and processes used for epidemics could be further developed by the IPCC to deal with climate change.

One interviewee also identified initiatives relating to transport and building codes driven by energy and health concerns rather than climate change vulnerability, an example of mainstreaming that was relevant to but not specifically focused on climate change vulnerability. Another interviewee thought that the Ministry of Health had developed adaptation plans for floods, drought and drinking water as a climate change initiative.

One interviewee referred to the NIWA, Environment Canterbury, and the University of Canterbury collaboration in modelling for climate change impacts for the coastal environment, river systems, and estuaries, while another referred to the Wellington-based initiative for basic sea-level rise scenario planning. The learning from these kinds of initiatives appears to be mainstreamed into coherent frameworks that can inform 'business as usual' activities, such as district and asset planning.

The Institute of Hospital Engineers has carried out asset planning for hospitals to take account of climate change; this was jointly funded by Australia and New Zealand. This initiative suggests that there is a need to consider adaptation not only in relation to potential health risks but also for the provision of health services.

Another approach to learning about health impacts within a climate change adaptation framework was through case learning – examining organisational flexibility, local effects in small geographic areas, value-based decision-making, and how to develop a flexible set of criteria – e.g. protect, move, abandon.⁶

⁶ This framework has been used by a Canadian community to plan for a rise in sea levels and flooding from adverse rainfall events. Along with the territorial authority the community decided what adaptation strategies were acceptable, affordable and realistic (Natural Resources, Canada, 2010).

4.5 Perceived barriers to tool uptake and use

Key barriers identified included issues related to the tools themselves and how they interface with other models, tools and sources of information, for example, whether the use of the tool can be mainstreamed and incorporated into core business.

“It’s difficult to say what is missing, there’s so much debate – predictive models and actual lack of information. Tools are often criticised – the information in and underpinning assumptions are not necessarily the things you want to discuss. Human resources are lacking to actually utilise information” (local government sector interview).

“Disparity between research, policy and public perception of acceptable risk. That disparity makes it difficult or impossible to develop policies unless you want to ram it down from the top. Disparity is more of a problem than resources, information and tools. There’s a lot of information out there, proliferation of resources and tools but no culture for using, understanding the tools, knowing how to use the tools – ambivalence” (academic sector interview).

Organisational barriers included a lack of leadership and an organisational culture that could embed climate change and health, as well as fragmented inter-organisational roles and responsibilities. An especially salient barrier appeared to be the intersection between the organisation and personnel, including the skills, knowledge and expertise to use the tools, and a lack of time available to personnel to (i) develop expertise in using tool and (ii) justify time in terms of other health priorities.

“It’s not being led – different people doing bits, and we are reliant on local champions. We need capability, people who actually know this area, attention to and appreciation of what constitutes adaptation and resilience concepts ... we forever keep looking at impacts” (local government interview).

“Experience and degree of expertise in using, need to know how to use. ... work load ... day to day, contractual, organisational issues or other impacting factors. Some organisations are keen to see tools better used, but workload restricts me, competing priorities, less staff, recession” (health sector interview).

“The number one barrier is people’s time; climate change is over and above what they do. Need to shift 50/50 people’s understanding so climate change flows through. Some staff are not fully on board” (local government sector interview).

Improving tool development uptake and use

Input from affected sectors, groups and organisations was seen as necessary for developing tools that were useful, as well as constructive interaction between users and developers of tools.

“Tools are difficult if high level and we need more certainty about impacts. Scenario- planning is useful. We need a more collaborative approach to developing responses – researchers leave it to the government when they should be more involved, but they’re not funded” (local government interview).

“A co-benefits approach is a good idea” (local government interview).

Another interviewee thought that options for developing risk frameworks based on severity of impacts, likelihood and cost of expected implications would be useful, with options to change risk and choose most effective action using cost-benefit analysis. The need to talk to people about acceptable solution/s was regarded as crucial.

The findings in this section are similar to those of Demerit and Langdon (2004: 333) who examined the reception and response of local government to information being provided through the U.K. Climate Change Programme. The responses to their survey research indicated issues around information being too lengthy or too technical and that as well as ‘cognitive accessibility and ease of understanding’ there was also the issue of translating information into practice – ‘practical accessibility and ease of application’ (Ibid). Organisational barriers were also similar, and included being overworked and under-resourced, different levels of awareness and interest in climate change, and competing priorities. A deeper, more systemic issue was ‘the mismatch between the information being provided through the Climate Change Programme and the administrative functions of the local authorities’ (Ibid).

5. Understanding Factors Associated with Integrating Health Impacts, Tools and Wider Adaptation Initiatives

One of the key issues emerging through the analysis is the different meanings that people ascribe to the terms most commonly associated with climate change, including vulnerability and resilience, and adaptation as both planned and spontaneous response. Different languages, meanings and experiences influence individual perceptions of the usefulness of tools, who needs them, who could use them, and the timing of their use. This section attempts to ‘unpack’ how interviewees were using these terms and what this might mean when considering tool development and use.

5.1 Adaptation as spontaneous or planned response?

Many forms of adaptation are described in the ‘adaptation science’ literature (see HAIFA Information for Action literature review report). These include anticipatory or reactive, planned or autonomous, facilitated or spontaneous. A common theme though, is the distinction between adaptation as naturally-occurring (reactive and autonomous) or as planned (facilitated). The HAIFA project is firmly focused on supporting planned adaptation. Yet many interviewees referred to adaptation as natural or a spontaneous response related to specific impacts of adverse weather events, whether these events were perceived as natural or climate change-related.

“In the rural sector there is strong philosophical view that climate change and variability is natural and that adaptation will therefore happen as a natural response” (rural sector interview).

“Central government planning, and activities between public health authorities and local government that relate to climate change and human health impacts tend to focus on disaster preparedness or planning for extreme weather events” (local government interview).

“Potentially we will adapt well, we have a community focus, and will be responding to extreme weather events as part of the rural environment” (central government interview).

“With a flood the impacts are evident, there’s obvious damage and a coordinated effort and a whole community response” (rural sector interview).

It is worth noting that the narratives of adaptation response were governed by the severity and extent of an immediate hazardous event, such as an experience of a flood. Drought, by contrast, would have a much slower trajectory that may continue over an indefinite time period. Whilst more amenable to adaptation planning in theory, the more latent and cumulative effects of drought means that triggers for implementing planned adaptation may be less clear, and that natural adaptations may be less visible.

A local government interviewee also viewed adaptation response as an outcome of uncertainty, in which planning processes usually built on historical data and trends may not be relevant. *“Because of uncertainty it is more like disaster preparedness, not standard planning” (local government interview).*

One interviewee raised the question of where the limits of adaptation lie in relation to the potential health effects of climate change. Examples of relatively simple adaptation strategies were identified by others, such as turning up the air conditioning to cope with heat, or installing fly-screens to keep mosquitoes out. Alternately simulation tools to explore limits – or breaking points – of adaptation were regarded as being able to answer the questions of the limits of adaptation; *“what are the limits to vector control and how do we improve those?” (academic sector interview).*

5.2 Resilience and vulnerability

Similar to the different meanings of adaptation, some saw resilience as something that could be built for better preparedness, whilst others saw resilience as an emerging property to experiences of adversity. A number of interviewees described missed opportunities for NZ and drew attention to opportunities to contribute to community resilience before the impacts of climate change eventuate, as well as other social and economic benefits that ensured from having explored resilience in planned adaptation strategies. For example, one central government interviewee promoted the need to *“look at the state of resilience and express resilience through a set of indicators that aren’t necessarily related to outcomes around adaptation like community coherence, increasing trust, and developing creative ideas”* (central government interview).

“Resilience is an indicator of ability to bounce back after a major event, go back to what you were before but also to a better state” (central government interview).

Several interviewees mentioned the need to build resilient water and waste-water infrastructure systems under the umbrella of local government asset planning, while one interviewee talked about looking at other options such as collapsible or temporary fencing that could be removed before significant rainfall events.

Resilience for the rural sector was also important, but there was greater tendency to locate this as something spontaneous, rather than something that could be prepared or facilitated:

“We have looked at potential impacts, and water, grass growth, infrastructure, and done a good job of looking at projections and determining whether any production will be compromised or where there are opportunities, e.g. horticulture will be more advantageous in certain areas. Advice needs to be provided to farmers on building resilience; advice to industry although we will work in sectors interested to prepare and adapt, carry out horizon scanning, and be aware of overseas studies” (central government interview).

Some interviewees felt that understanding resilience was also thought to be needed to protect the mental health of rural communities, and if physical health was known in conjunction with climate change scenarios or projections for NZ, this could be a pathway to resilience.

Other interviewees also positioned resilience as a post-event consequence, that we cannot know how resilient communities or systems are until something happens.

“Not until after event. Resilience is critical but we won’t know until it gets played out. A resilient community coheres well and has shared projects and conversations” (local government interview).

“We won’t necessarily know [how resilient we are]. Social-ecological resilience could mean well-planned functional diversity so the system is better buffered in times of crisis. Don’t know until future comes, but most we can do is build resilience, take forward an understanding of what resilience is. A crisis is a big motivation” (rural sector interview).

A health sector representative thought that sustainability criteria, and reducing the impacts of extraction and/or production on the physical characteristics of the eco-system would promote; *“... ongoing community resilience with communities producing their own eco-foot-printing with climate change effects taken into account”* (health sector interview).

Vulnerability and resilience also implicitly underpinned some of the comments related to the need to better understand the relationship between determinants of health, and potential migration and re-settlement issues.

“Indirectly, climate change will affect property, economy, social patterns, sense of security and knock-on effect from overseas. Immigration from climate change could mean increased diseases, social problems pressure on economy, social unrest including racism, division between rich and poor – social issues not even thought of ...” (local government interview).

“NZ social determinants data interesting but the most pressing gaps/needs for ability to respond is Pacific Island countries” (academic sector interview).

A key driver for regional and local vulnerability assessments is the issue of local liability. Liability and associated costs are also a priority of central government, and the extent to which liability is a shared public-private concern (MfE Briefings for Incoming Ministers, 2011).

“Working with local territorial authorities, the challenge is how to embed planning for climate change. Because of uncertainty it is more like disaster preparedness, not standard planning. Most planning processes reflect historical data and norms, so how to get out of that mindset and into change. It’s a big issue and cross boundary. We need a region wide vulnerability assessment, and shared decision-making criteria needed. There is huge scope for litigation, this is a big risk and there is a need for common approach” (local government sector interview).

There is considerable tension between resilience as something that inheres within a community and that can be further developed to contribute to emergency responses, or adaptation; and resilience as something measurable that results from an event or is a consequence of processes of adaptation. Castleden *et al.* (2011) define community and disaster resilience as a community’s intrinsic capacity for resistance and recovery, while resilience of the social-ecological system (see below) relates to thresholds in capacity for adaptation. This raises questions about what knowledge and/or interventions are appropriate, when and for whom. A significant literature exists that supports the role of social capital as an indicator of resilience that could contribute to climate change adaptation (e.g. Adger, 2003; Jones *et al.*, 2012; McManus *et al.*, 2012; Tamini, 2010) while other authors note the contribution of social capital to response and recovery from adverse events (e.g. Aldrich, 2011; Cutter *et al.*, 2008; Maguire & Cartwright, 2008; Murphy, 2007). Interestingly, Pearson *et al.* (2011) explore the resilience paradox of good health in areas of high social deprivation, raising questions about the assumed relationships between social determinants of health, and climate change vulnerability and resilience. The questions raised by Pearson *et al.*, (2011) have implications for how the HAIFA tools are employed, and the need for a human-environmental perspective on vulnerability and resilience when considering how HAIFA can contribute to adaptation planning and response.

A social-ecological system approach to resilience was also identified by interviewees, e.g. *“Social-ecological resilience could mean well-planned functional diversity so the system is better buffered in times of crisis”* and another interviewee talked about ecosystem sustainability in terms of communities that can *“produce their own eco-footprint”* enables sustainability and future-proofing that takes climate change effects into account. A rural sector interviewee talked about on-farm resilience-focused interventions for dealing with pests and trialling diversification initiatives which were seen as micro-scale decisions made by individual farmers and shared with others in the land-use sector; *“Farmers are good at trialling and informal sharing”* (rural sector interview).

This approach also underpinned much of the interviewees’ comments on ‘good’ infrastructure and asset planning, and economics can also be added to the mix in this local government context. Infrastructure resilience clearly sits in the definition of resilience as preceding climate change impacts, and can serve to protect human health.

In conclusion, building resilience – whether of a community, a human-ecology system or water and waste water infrastructure – could also be regarded as adaptation capacity-building which will inform planning.

A question emerging from this brief discussion of resilience and different types of adaptation is: What are the perceived interrelationships between resilience and adaptation as planned and/or emergent responses, and to what extent should the answer inform the ways in which climate change tools are developed and used?

5.3 Merging adaptation response and planning: Mainstreaming?

A number of health sector interviewees identified mainstreaming approaches as having potential for adaptation responses. For example, through using existing systems of surveillance (not climate-change specific) a new area of health threat could be identified and reviewed in terms of a specific adaptation response. A slightly different way of merging adaptation response and planning was to develop awareness of potential health impacts of climate change (such as outbreaks, infectious diseases and dealing with major hazard events), plan the adaptation response and incorporate responses into wider mainstreamed systems. This second approach is similar to that described by an academic sector interviewee:

“Main thing is that NZ has a number of different communication systems already that are a core part of a general approach – water, surveillance etc. so use those systems. Back to champions and prodding. But also having broad systems in place so doesn’t require special things to build in climate change adaptation” (central government interview).

“For adaptation planning, we think of climate change as a risk multiplier and unfamiliar hazards may emerge as a consequence, pathogens behaving in unexpected way etc. To a large extent climate change is going to amplify and exacerbate existing problems, particularly in low income, low lying countries. So we think about climate sensitive issues that are presently causing strife and are difficult to control and then how these might be exacerbated by anticipated climate change issues. Then we think of how you currently deal with these problems, and if we can find better ways of control, so there will be early benefit and considerable gains in the long term – the co-benefits. Through this approach, adaptation planning merges with day to day and core business” (academic sector interview).

6. Conclusions

The interviews indicated that adaptation planning that incorporates possible health impacts associated with climate change is piecemeal, often non-existent, and subject to regional variations and different styles of approach.

“Most are not factoring human health considerations into planning and thinking. Most are aware of climate change though; some Regional Councils are thinking about dengue fever” (central government interview).

A number of health-related concerns that were identified early in the interviews would be amenable to adaptation planning, such as the impacts of drought on farmers and rural communities. *“Mental health is a concern. With drought it [the impact] is not so instant ... it is not so obvious or immediately repairable ... and there is pressure from consecutive droughts. We did see an increase of suicide rates in the droughts in the early 1990s”* (rural sector interview).

The HAIFA tools enable exploring scenarios and assessment of risk relating to potential health impacts of climate change, therefore they can aid adaptation planning. But the question remains as to how these tools will be used and by whom, and at what level will they provide input into adaptation planning. Will they be used by/for central government, regional public health, regional and local government, and if so what is possible for collaborative or integrated adaptive planning? A key factor influencing the potential uptake and use of HAIFA tools is surmised by one of the interviewees:

“There is confidence that the modelling will provide evidence of what is likely to happen, but questions remain whether the anticipated impacts will be enough to change institutional decision outcomes, and prioritising, funding and planning trajectories in health settings outside drinking water management” (academic sector interview).

Most significantly, this study suggests that specialised planning specific to the impacts of climate change on human health may be marginal in most organisations. Those interviewed felt that climate change per se, as well as impacts on human health, was generally not a high priority for institutional planning, and that any focus on ‘climate change and human health impacts’ struggled to compete against other priority areas requiring attention and funding. These observations are similar to the limited overseas studies to date in the area of institutional planning for climate change (e.g. Costello *et al.*, 2009; Ebi & Semenza, 2008; Frumkin & McMichael: 2008; Preston *et al.*, 2011).

While ‘mainstreaming’ was seen as one way to ensure institutional adaptation planning, it was also pointed out that a climate change health impacts lens needed to be employed early to ensure that health impacts were an integral part of mainstream planning. Often this process depended on key people or champions, suggesting that institutional capacity may not remain embedded in regular practice were these key people to leave. Competing health priorities, allocation of resources and time were seen as barriers to developing capability and capacity. These factors can be seen to compromise the efficacy of mainstreaming as a cornerstone adaptive planning strategy for integrating human health and climate change.

A number of those interviewed also talked about barriers to vertical (top-down) and horizontal (regional/local) collaborative planning between institutions responsible for climate change planning. The scaling back of central government interest and planning was one such barrier and deemed significant given that *“central government leadership is a very powerful driver for local government, councillors and staff”* (local government interview). Demerit and Langdon (2004) also found that local authority respondents (to their UK based survey) expressed cynicism and distrust of central government motives in emphasising the role of local authorities in areas of climate change adaptation. These UK respondents felt that responsibility should be shared by local and central government and wanted understandable and practical information, and for government to show leadership, and commitment to making the hard decisions. In Europe, Biesbroek *et al.* (2010) also draw attention to the need for implementing and evaluating adaptation strategies, but that there are institutional challenges including multi-level governance and policy integration.

Respondents in our study felt that local government institutions also had to be better supported and that central government activity was crucial in raising awareness and fostering “*buy in at the community level that climate change is a reality and happening*” (local health sector interview). Local government ability to mobilise public and civic action was often hampered by disbelief and scepticism.

In current institutional responses to climate change and human health, we observe that coordinated activities seem confined to fairly narrow areas of application, namely disaster preparedness, infrastructure planning and drinking water, and/or planning for extreme and/or protracted weather events (flooding and to a lesser extent drought). Whilst for local government climate change adaptation planning may be mainstreamed into infrastructure planning, local government deem that public health authorities are responsible for planning for health impacts. Institutional planning for climate change adaptation does however appear to work well when resources and responsibilities are shared between local government and regional public health organisations, where shared or joint appointments seem fruitful in gaining institutional traction and cooperation.

As stated in the introduction, the interviews aimed to explore and understand institutional readiness for using the Health Analysis and Information for Action (HAIFA) climate change and human health impacts modelling tool; specifically how HAIFA can be utilised to best inform coordinated adaptation planning. Those interviewed that were familiar with the aim of the HAIFA tools project and/or had used similar kinds of tools, were largely positive about these types of tools in general. Positive features included being able to integrate different data sets, have greater predictive capacity, and improved ability to assess risk, all of which were seen as beneficial to adaptation planning, and able to inform responses, for example, to specific disease outbreaks or vector control and surveillance.

Institutional readiness was examined through focusing on three key areas likely to influence readiness:

- Awareness and understanding of climate change impacts for environmental health.
- Usefulness of climate change planning tools, and different institutional drivers and barriers relating to the use of tools for adaptation planning for environmental health.
- The relationships between public health, local, central and regional government, and the rural sector.

The findings of this study suggest that, in the NZ context, many key institutions are arguably not consistently ready to use the HAIFA tool to integrate climate change impacts on human health into current approaches to adaptation planning and strategies. Factors affecting institutional readiness included:

- The scaling back of central government interest, strategic direction and planning.
- Lack of leadership from central government.
- Uncertainty for some about whether climate change is ‘real’, and uncertainty about the scale, timing and severity of impacts.
- Lack of evidence and lack of local data - or ability to scale down.
- Mainstreaming approaches to adaptation planning that are not cognisant of environmental health issues relating to climate change, and tend to rely on ‘champions’ within the institutions.
- An emphasis on hazard events and infrastructure capacity.
- Competing priorities, workloads, lack of knowledge or skills for using tools, a lack of time and resources.
- Fragmented approaches to collaborative institutional planning.

These findings are similar to those of Bedsworth (2008) who surveyed public health officials across California, whereby health risks from climate change were identified and agreed on, but programmes specifically developed with climate change in mind had not been undertaken, although approximately one quarter of agencies were working with local government on land-use planning issues and heat-related emergency plans. Preston *et al.* (2011) suggest that critical weaknesses in adaptation planning relate to consideration of non-climatic factors, neglecting issues of adaptive capacity, and entitlements – or access – to various forms of capital required.

To some extent this NZ picture of apparent institutional un-readiness is symptomatic of a trajectory of end-user need, project development and funding that supports a top-down, linear approach to tool development, hand-over and use. However, there are alternative framings. For example, we could ask how the HAIFA tool could promote improved, integrated and collaborative approaches to institutional planning for climate change adaptation for human health, e.g. between central government, local government, local health and community organisations. Heikkila & Gerlak (2005) argue translational expertise is important in transferring knowledge from one professional community of interest to another, and there are positive indications that HAIFA could be used in this way because of the ways in which different data sets have been brought together and the inclusion of GIS that enables spatial/geographic characteristics to be identified down to a local scale. However, Demerit & Langdon (2004: 335) question the key assumption that “simply making more locally specific information about climate change more available to local authorities will motivate appropriate action.”

Alternatively – or additionally – we could ask how the HAIFA tool could be used to stimulate community preparedness, to develop social contracts of responsibility, and shared agreements between communities and institutions, for example, supporting rural and urban sector positioning for the potential health impacts of climate change (e.g. migration or resettlement patterns, mental health of rural communities). Heikkila & Gerlak (2005) note that access to science and technical information can help trigger public interest, and Frumkin *et al.* (2008) maintain that information is key to a responsive and functioning public health system, while Driedger *et al.* (2007) suggest that the use of GIS has potential to overcome the ‘spatial illiteracy’ in making use of rich data sets. These factors point to the considerable opportunity for HAIFA to be utilised to support creative civic conversations and human ecological approaches for adaptation planning and resilience building. This would however necessitate considerable movement beyond the more confined ‘business as usual’ mainstreaming strategies that seem far more likely to characterise NZ institutional engagement and uptake of HAIFA.

It appears from the interviews that readiness to (i) use the HAIFA tool and (ii) incorporate potential health impacts into adaptation planning (apart from those associated with hazard events) are complex and multi-faceted and, like Demerit & Langdon’s (2004) conclusion, these problems do not seem to be predominantly technical and informational, but rather political, social and organisational. Whether the HAIFA tool could be employed as a mechanism for promoting cross agency working and collaboration and/or community preparedness for climate change adaptation will remain to be seen. While the use of HAIFA could be one contribution to improving institutional and public knowledge and adaptation planning for health impacts of climate change, Wiseman and Nolan (2008) suggest that climate change is the next revolution in public health, whereby the boundaries of traditional health paradigms will be extended to broader questions about global sustainability. Maibach *et al.* (2010) similarly argue that reframing climate change as a public health issue has greater salience for members of the public, making climate change problems more personally relevant, significant and able to be understood. Such outcomes would however require considerable reconfiguration of the institutional drivers and barriers identified in this study.

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Appendix A. Interview Questions

Interview Questions for HAIFA – Adaptation planning for climate change and human health impacts

Check consent to record and data use?
Any questions/comments before we start?

1) Main questions: (to send to interviewee)

1. What climate-change related health impacts do you think are likely to arise in your region/district/area? and nationally? your sector?
2. What potential effects from climate change (positive and negative) might exist related to infectious or communicable disease?
3. In your view, is climate change/variability a concern for New Zealand with respect to human health? Why/why not? How do you draw this conclusion?
4. What information, tools and support for adaptation planning for climate change and human health/infectious disease impacts are you aware of?
5. How has your organisation approached adaptation planning for climate change in your policies and programmes?

Prompts/ probing questions: (for interviewer)

Just getting to some more detailed questions and we can go through some of these more quickly if you feel you have answered in the main questions already.

2) Current knowledge and awareness

1. What sort of awareness do different organisations in the area you work have about these issues?
2. Have you ever been requested to supply information on climate change policy to other government or non-government organisations?
3. What information do you currently have, and what else do you need for better planning?
4. Where do you currently get your information about health impacts of climate change?
5. What resources, 'tools' or technology for adaptation and/or climate change planning do you use in your daily work?
6. What makes these tools more or less useful, or more or less difficult to use?
7. What resources, tools, information is lacking?
8. What resources, tools, information would be useful?
9. What further research is needed?
10. What practical help is needed?

3) Planning and action

1. How do you plan for possible impacts of climate change on human health?
2. How does adaptation planning get done? What types of communication support this? – meetings, advisory groups, email groups etc?
3. How do you ensure that adaptation planning is embedded and ongoing? Flexible? Responsive to uncertainty?
4. Which organisations in your region are most involved in adaptation planning for climate change and human health?
5. Who is responsible for adaptation planning within these organisations?
6. What role do different groups play?
7. Who ought to be involved?
8. What guidance comes from regional and central government?
9. Describe the relationships between local government and public health? Central and local government? Local government and iwi? Regional and district councils?
10. What support exists within your sector for collaborative multi-organisation planning?
11. What barriers (perceive or real) make collaboration difficult? How do you plan to negotiate these barriers?
12. What types of information/resources could better support this?
13. What makes it difficult to do strategic planning for climate change and human health?
14. What encourages adaptation?
15. What makes it difficult to adapt? (eg capacity)
16. How would you know whether any adaptation is successful?
17. Which of your plans mention climate change and human health?
18. Do the plans specify a time scale for different types of decisions for climate change and human health?
19. Do the plans specify roles and responsibilities? Which plans?
20. Do the plans make specific provision for addressing climate change and human health across boundaries with neighbouring regions?
21. Do the plans include provisions for monitoring effects of climate change on human health?

Who else could we talk with for this project?

Appendix B. Interview Questions Rural

Interview Questions for HAIFA – Adaptation planning for climate change and human health impacts

Check consent to record and data use?
Any questions/comments before we start?

1) Main questions: (to send to interviewee)

1. What climate-change related health impacts do you think are likely to arise in the rural sector?
2. What potential effects from climate change (positive and negative) might exist related to human health broadly? infectious or communicable disease?
3. In your view, is climate change/variability a concern for New Zealand with respect to human health? Why/why not? How do you draw this conclusion?
4. What information, tools and support for adaptation planning for climate change and human health (infectious disease and other) impacts are you aware of?
 - 4a. How are these tools etc used in the rural sector?
 - 4b. What tools/information do you think are needed for better planning?
 - 4c. What makes these tools more or less useful, or more or less difficult to use?
5. What observations would you make about how rural organisations have approached adaptation planning for climate change in their policies and programmes?
6. What support exists within the rural sector for collaborative multi-organisation planning?
7. What makes it difficult to do strategic planning for climate change and human health?
8. What encourages adaptation?
9. What makes it difficult to adapt? (eg capacity)
10. How would you know whether any adaptation is successful?
11. What further research is needed?
12. What practical help is needed?

Appendix C. HAIFA Project Information Sheet

HAIFA (Health Analysis & Information for Action) – Enhancing Human Health Resilience to Climate Variation and Change

Background

New threats to human health, particularly the emergence and spread of diseases, are becoming a major issue associated with global environmental change. Contributing to this is the role that climate variability and change, and extreme weather events, play in altering infectious disease risk.

The potential effects on human health from climate change are gaining attention in international research. In New Zealand also, it is recognised that information needs to be available to help authorities assess, anticipate and monitor human health vulnerability to climate variability and change, in order to plan and implement mitigation, adaptation and management responses.

Aim

Health Analysis & Information for Action (HAIFA) is a Foundation for Research, Science & Technology (FRST) funded project that is designed to develop information analysis systems that will provide end-users with scientifically robust tools for responding to predicted human health effects from climate change. This will provide central, regional and local authorities with information to help formulate and plan the implementation of responses and adaptive strategies that build human health resilience to infectious diseases.

This multi-disciplinary study includes medical and veterinary expertise in infectious disease control, and expertise in climatology, drinking water supplies and their risk management, statistical and mathematical modelling, epidemiology, disease surveillance, GIS-based systems design and development, and social sciences from three Crown Research Institutes (ESR, Landcare Research and NIWA) and two universities (Massey and Waikato). Australian and WHO-Europe collaborators are also involved.

There are three linked Objectives:

Objective 1. Identify and develop predictive models for six Indicator Diseases. These are Campylobacteriosis, Cryptosporidiosis, Influenza, Meningococcal disease, Ross River virus and Dengue Fever. In addition, risk assessment tools (DAISY and DPSEEA Climate Change Indicators) will be developed;

Objective 2. HAIFA system development of a GIS web-based graphical interface. This will incorporate the results of Objective 1 with an ability to manipulate the models and climate projections to carry out 'what if' scenarios;

Objective 3. Identify responses, adaptive strategies and feasible interventions – incorporating a case study and pilot drinking water quality vulnerability assessment.

Objective 3: Exploring adaptation planning

Objective 3 aims to strengthen the interface between the HAIFA modelling approach suggested and those involved in local and regional adaptation planning. This component of the work will utilise qualitative interviews to better understand the coordinated activities, and potential for responsiveness that exists within the health and environmental planning nexus with respect to climate change. It will look at levels of awareness of climate change and possible impacts on human health, as well as ask what planning capacities, dependencies, assumptions, and resources for adaptation that currently exist within and across the key stakeholder organisations. We would also like to understand what barriers may exist to coordinated adaptation planning.

Being involved in the research

We would like to conduct in-depth interviews with key stakeholders organisations involved in the health and environmental sector, especially those connected with the rural sector.

The interviews will be informal, face-to-face or telephone discussions, and will last 45-60 minutes. Hand written notes will be taken in the interviews, backed up by a digital recording. The notes and the final report will be available to participants on request after the interviews.

What will be done with the information from the interviews/focus groups/workshops?

- The information will be recorded, with participants' consent.
- Anything that is said in an interview will remain confidential. Individuals will not be mentioned by name. Any associated reporting will be written in such a way that any views reported come from the interviewee group as a whole, or where different views are expressed, are attributed to 'some people', or 'a person in the group'
- Information resulting from the interviews will be cited in a report for the HAIFA project, and may be used in further published material.

If you would like to be involved, or can think of key people who we could approach to interview for the project, please could you contact the researchers below;

Researchers;

Jinny (Virginia) Baker
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If you have any questions about the wider project, please feel free to contact either of the researchers above, or the overall project coordinators;

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Fax: +64-4 529-0601
Website: www.esr.cri.nz

Further Information: As the project develops information will be published on the following ESR website <http://www.esr.cri.nz/competencies/HumanBiosecurity/Pages/HealthImpactsofEnvironmentalChange.aspx>

CONSENT TO PARTICIPATE IN RESEARCH

Completing this form is optional.

This consent form will be held for a period of five (5) years

Project Title: Health Analysis & Information for Action (HAIFA)

Researcher: Institute of Environmental Science & Research Ltd (ESR)

1. I have read and I understand the information sheet (April 2011) for participants involved in the 'HAIFA' Project. I have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.
2. I understand that my taking part in this study is voluntary and that I may withdraw from the study at any time and this will in no way affect my future involvement.
3. I understand that my involvement in this study is confidential and that no material that could identify me will be used in any reports of this study.
4. I have had time to consider whether or not to take part.
5. I know who to contact if I have any questions about the study.

I _____ (full name) consent to take part in this study.

Date: _____ Signature: _____



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