



CONSIDERING CLIMATE CHANGE IN YOUR COMMUNITY:

A STARTUP GUIDE FOR BC COMMUNITIES

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Considering Climate Change In Your Community: A Start-up Guide for BC Communities

INTRODUCTION

As the climate continues to change communities in British Columbia will face a host of new and recurring challenges. In the interest of both global and local sustainability reducing greenhouse gas emissions and other steps to help slow the rate of climate change is an important effort. But even if we do our very best climate change will not be averted entirely and we will be forced to respond.

Global warming will lead to changes in a number of key climate features such as annual and seasonal temperatures, the timing and type of precipitation, the intensity and frequency of extreme weather and storms. These in turn will have numerous complex and interacting affects on the places we live and the natural resources upon which we depend. In very large part it will fall to community leaders and officials to manage and deal with these changes.

This document is aimed primarily at small and medium size communities in British Columbia (Population less than 20,000 +/-) although it probably has some relevance to larger centres as well. The target audience is local authorities, elected and non-elected decision makers responsible for a wide range of community services, management and operational issues from infrastructure and transportation to safety and economic development. It is intended for those who want an answer to the following question:

Climate change is probably going to have (is already having) an effect on our community, we need to respond, we need to deal with these changes... Where do we start?

Considering Climate Change In Your Community is a simplified checklist of first steps and a guide to the initial questions a community might consider to help it determine how (and whether) it should deal with climate change. It is not a comprehensive manual on how to develop plans and make adaptation or risk management decisions.

Climate Change and the Human Response

Responding to and/or dealing with climate change (aka. “adaptation”) falls along a continuum. At one end, the wait and see approach where no specific plans are made and the effects of climate change (aka “impacts”) are simply dealt with on an *ad hoc* basis when and as they come along. At the other end is doing everything in our power to slow the progress of climate change by reducing greenhouse gas emissions and attempting to remove excess CO₂ from the atmosphere (aka “mitigation”). In between these extremes there are potentially hundreds of alternative strategies and steps we can take to manage the impacts of climate change on our communities.

CLIMATE CHANGE AND YOUR COMMUNITY

The impacts of climate change on your community and region depends on a wide range of physical, ecological, social, economic and historical factors. Local governments in BC

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are responsible for a range of functions such as zoning and restrictions of building and development, water supply and storm water management, infrastructure maintenance, repair and replacement, resource management, waste control and various types of natural hazard and emergency preparedness. Climate change will affect each of these in different, often interacting ways. Being informed and planning ahead can help maximise benefits and minimise the direct and indirect costs of climate change.

Often the biggest challenge is where to start. Many climate-related risks and challenges are not new to community planners, managers and administrators, however, the exact nature of risks and impacts is difficult to predict. While climate change is a highly complex problem a key message of this guide is that it can be broken down into manageable parts and dealt with as part of existing operational and planning processes. Managing the effects climate change does not necessarily require new resources or processes.

Given the varied and location specific nature of climate change impacts it is neither possible nor desirable to provide a standardized set of solutions or best practices. The way to get started is to gain a basic understanding of how climate change may unfold in your region and assess where and how your community may be at risk. What are its strengths and weaknesses vis a vis the effects of climate change. What other pressures and changes does the community face now and in the future and how may these interact with climate change? By asking these and other questions it is possible to begin a process of assessing which effects are likely to be most significant and where efforts should be placed to develop appropriate responses.

A Two-Pronged Approach

A holistic approach to responding to climate change is to anticipate the future impacts of climate change on your community and to identify and assess in what ways your community is currently at risk or vulnerable to change in general. It is also useful to know what the community has in the way of human, social, natural and economic resources to deal with challenges and change. In other words how resilient is your community or what is its “adaptive capacity”?

Modeling and scenarios tools are improving all the time and are increasingly available (see Information Resources and Tools section). Combining information on future scenarios of how the climate will change with data on recent climate trends (i.e. how have climate patterns changed over the past 50-100 years) and with local knowledge and observation, provides enough information for a community to begin to contemplate how it will be affected by climate change. Linking up with one or more climate change researchers is a good way to build a picture of current and future impacts on your community.

Risk assessment and risk management are familiar practices to local government planners and administrators, resource managers and those responsible for emergency and hazard response. Assessing the exposure and sensitivity of community services,

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infrastructure, and other attributes to various types of change or stressors in general, or climate change impacts in particular, is known as a risk based or *vulnerability* approach. Generally such approaches enable a community to identify those areas or attributes of the community most at risk and help leaders develop a sense of priority as to where efforts and resources should be focused to help the community respond effectively to climate change.

The following sections provide specific questions to help community leadership and staff assess how to begin to approach the problem of climate change at the community level. In the section that follows a number of examples of existing frameworks developed for the purpose of climate change risk assessment are presented. The goal is that this information will help communities begin a process of improving their capacity to adapt to the impacts of climate change in a proactive manner.

Why take account of climate change?

Climate is already changing and will continue to change throughout this century. This will affect many of your council's services and assets and infrastructure. Recent extreme weather events...have shown that climate can have a big impact on our society and that infrastructure and services need to be designed to meet the risk. Climate change makes this particularly important for policy makers

Ask yourself

Do you know what impact climate change could have on your area?

Do your current policies, strategies and plans include provision for the impact of climate change?

Can you identify and assess the risks from climate change to your services?

Are developments with a lifetime of more than 20 years required to factor in climate change?

Are you addressing climate change in your local Community Strategy or Community Plan?

Have you briefed your elected members on any key risks arising from climate variability and long term climate change?

If you answer NO to any of these questions your assets and services could suffer from the negative effects of climate change and you may also miss out on any potential benefits.

Source; UKCIP 2003

My community and climate change, where does it stand?

The impacts of climate change are local; therefore, each region, improvement district and community will have its own climate-related vulnerabilities and priorities. Begin by asking some of the following questions that will help identify broad areas of concern:

GENERAL ISSUES

What are the likely effects of climate change in my region?

Which community services and assets are exposed to disruption or damage from these changes?

Are any of these effects considered in the official community plan (OCP)?

Are there adequate controls in place to consider the effect of climate change when amending or developing plans?

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How might asset and resource management decisions change to reflect the increasing risk of coastal erosion, flooding, salt water intrusion of aquifers and drainage problems?

How might asset and resource management decisions change to reflect the increasing risk of forest fires? Of drought? Of other climate risks?

Does the community have emergency response and/or hazard management plans or systems in place? If so, are they designed to cope with the increased risks of a changing climate?

Will existing flood plain management decisions be adequate to cope with changing rainfall and a likelihood of increased storm events? (e.g. are dikes high enough? Are drains and storm sewer pipes big enough?)

WATER SUPPLY

Is the community water supply dependent on snowpack and will a shift to more rain and less snow impact community water supply?

Will changes in the timing and amount of precipitation, for example an earlier spring freshet and/or a longer dry period pose problems for regional water supply?

What other changes or increases in water demand are expected for the community or region and how will these be impacted by a changing climate?

COASTAL ZONES

Are the community's stormwater and drainage systems designed to cope with increased frequency and/or intensity storms, rising sea levels and the combined threat of more dangerous storm surge?

Are groundwater supplies in the region susceptible to infiltration by sea water in the case of more frequent storm surges or sea level rise?

Can vulnerable coastal roads continue to be maintained?

What development is appropriate in areas that may be prone to more frequent river flooding?

What degree of coastal property development is appropriate in my community, given higher likelihoods of coastal inundation and erosion?

(In northern communities especially) What is the effect of consistently warmer winters on local roads and transportation infrastructure?

FORESTRY AND FOREST REGIONS

Is our community exposed and / or sensitive to the impact of the mountain pine beetle outbreak?

How dependent is the local economy on forestry?

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What will be the impact on local tourism widespread die off of pine forests or an increase in forest fires?

To what extent is the community/region vulnerable to forest fires? And can we expect that pine beetle killed forests and more frequent drought conditions to increase forest fire risks?

A qualitative assessment of climate change and your community

Questions such as those proposed above can (indeed should) be considered prior to detailed analysis of key climate impacts, consideration of future scenarios or detailed risk management and adaptation planning. However, the list of potential questions can quickly grow and become unmanageable. A more structured approach is useful for planning and assessment of the implications of climate change to your community or region. Such an approach helps to identify where climate change impacts may coincide with other pressures and where responses (i.e. adaptation) might overlap with other objectives.

Local government functions and possible climate change effects (Adapted from: New Zealand Min. of Environment, 2004)

Local Gov't Function	Affected assets or activities	Key climate influence (e.g.)	Possible effects	Sensitivity to Effects
Water supply and irrigation	Agriculture Domestic uses	Changes in timing and/or type of precip., drought	Reduced security of supply (depending on water source); contamination of water supply.	Rivers, groundwater, water quality, water availability, coastal areas
Wastewater	Infrastructure	More intense rainfall and extreme events	greater risk of overflow events, longer dry spells may increase blockages and overflows.	Drainage
Stormwater Management	Storm sewers, ditches, drainage	Increased rainfall; rise in sea level	Increased flooding; increased peak flows in streams and related erosion; groundwater level changes; saltwater intrusion in coastal zones; risk to properties and infrastructure.	Rivers, drainage, coastal areas
Planning/policy development	Management of private sector development; urban expansion; infrastructure and communications planning	All	Heightened risk of property damage due to inappropriate location of development, inadequate or inappropriate infrastructure, costly retrofitting of systems.	Rivers, groundwater, drainage, coastal areas, natural hazards
Local Gov't Function	Affected assets or activities	Key climate influence (e.g.)	Possible effects	Sensitivity to Effects
Roadways	Road network and associated infrastructure	Extreme rainfall events, extreme winds, storm surge	Disruption due to flooding, landslides, fallen trees and lines; cut-off of key arterial routes.	Drainage, natural hazards, transportation/communication links cut off.

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Local Gov't Function	Affected assets or activities	Key climate influence (e.g.)	Possible effects	Sensitivity to Effects
Land management & conservation	Rural land management	Changes in rainfall, wind & temperature	Enhanced erosion; changes in type/distribution of pest species; increased fire risk; reduction in water availability for irrigation; changes in appropriate land use; changes in evapo-transpiration.	Water availability, erosion, biodiversity, biosecurity, natural hazards
Waterways and urban streams	Management of watercourses/ lakes/ wetlands	Rainfall & temp. changes	More variation in water volumes possible; reduced water quality; sedimentation and weed growth; changes in type/distribution of pest species.	Rivers, lakes, wetlands, water quality, drainage, erosion, biosecurity
Coastal management	Infrastructure; management of coastal development	sea level rise; extreme events, storm surge	Coastal erosion and flooding; road damage, communications; loss of private property and community assets; effects on water quality.	Coastal areas, natural hazards
Civil defence and emergency management	Emergency planning and response; recovery operations	Extreme events	Greater risks to public safety and to resources needed to manage flood, rural fire, landslip and storm events.	Natural hazards
Open space and community facilities management	Planning and management of parks, playing fields and urban open spaces	Temperature/ rainfall changes; extreme events, pests, drought, forest fire	Changes/reduction in water availability; changes in biodiversity; changes in type/distribution of pest species; groundwater changes; saltwater intrusion in coastal zones.	Groundwater, drainage, water availability, biodiversity, coastal areas
Transport	Management of public transport; provision of foot / bike paths, etc.	Changes in temperature, wind and rainfall	Changed maintenance needs for public transport (road, rail) infrastructure; disruption due to extreme events.	Drainage, natural hazards
Waste management	Transfer stations and landfills	Changes in rainfall and temperature	Increased surface flooding risk; biosecurity changes; changes in ground water level and leaching.	Biosecurity, natural hazards

A category capturing potential overlapping issues or stressors the community or region is currently managing or anticipates in the future would add to the assessment above. For example, population growth would probably create additional challenges around most of the functions and issues outlined above. Legislative or policy changes or infrastructure development initiated by higher levels of government may have a positive or negative affect that local government may have to identify on its own.

Sample Risk and Vulnerability Assessment Frameworks

Several frameworks or processes have been developed to assist with a structured approach to help identify, plan for and manage the potential impacts of climate change.

Again, these are not new processes but adaptations of existing approaches. The goal is to help community leaders and managers identify those areas where climate change impacts may pose a problem (or present an opportunity) and point to where in existing plans and processes climate change should be considered.

EXAMPLE 1: Adapted from McKinnon (2005) Risk-based approach to climate change adaptation in the forest management sector.

STEP 1: Establish context for management and response to climate change impacts. What other factors or trade-offs are involved in decision making?

Management objectives define what matters to stakeholders that may be vulnerable to climate change. Include measurable performance indicators if possible.

STEP 2: Vulnerability is a combination of exposure and sensitivity to change or stress. Involves consideration of where and how community attributes or sector is exposed to climate change impacts and readily it may be able to respond or deal with such impacts. What is the community's (or sector's) capacity to adapt or respond to stress? How resilient is it to change? If X happens, is it a disaster or can we manage it?

STEP 3: A collection of planned and proactive steps, a structured approach to obtain management objectives defined in Step 1 with options to deal with vulnerabilities defined in Step 2. Attempt to identify and give preference to strategies that are effective in the present but limit the potential for "regret" in the future. Process can range from relatively simple to highly complex and integrated. Brainstorm to identify as many potential risk management strategies as possible.

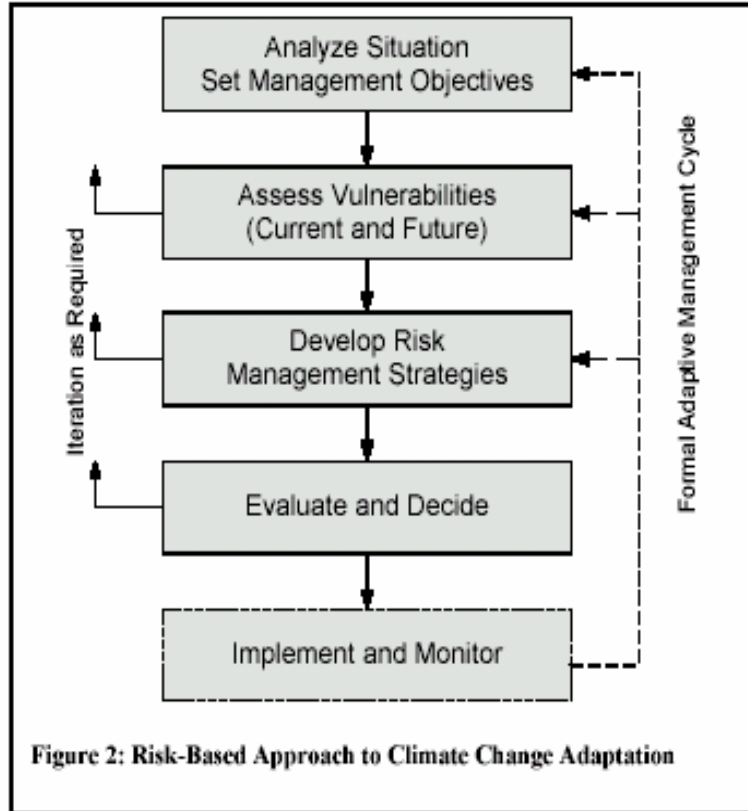


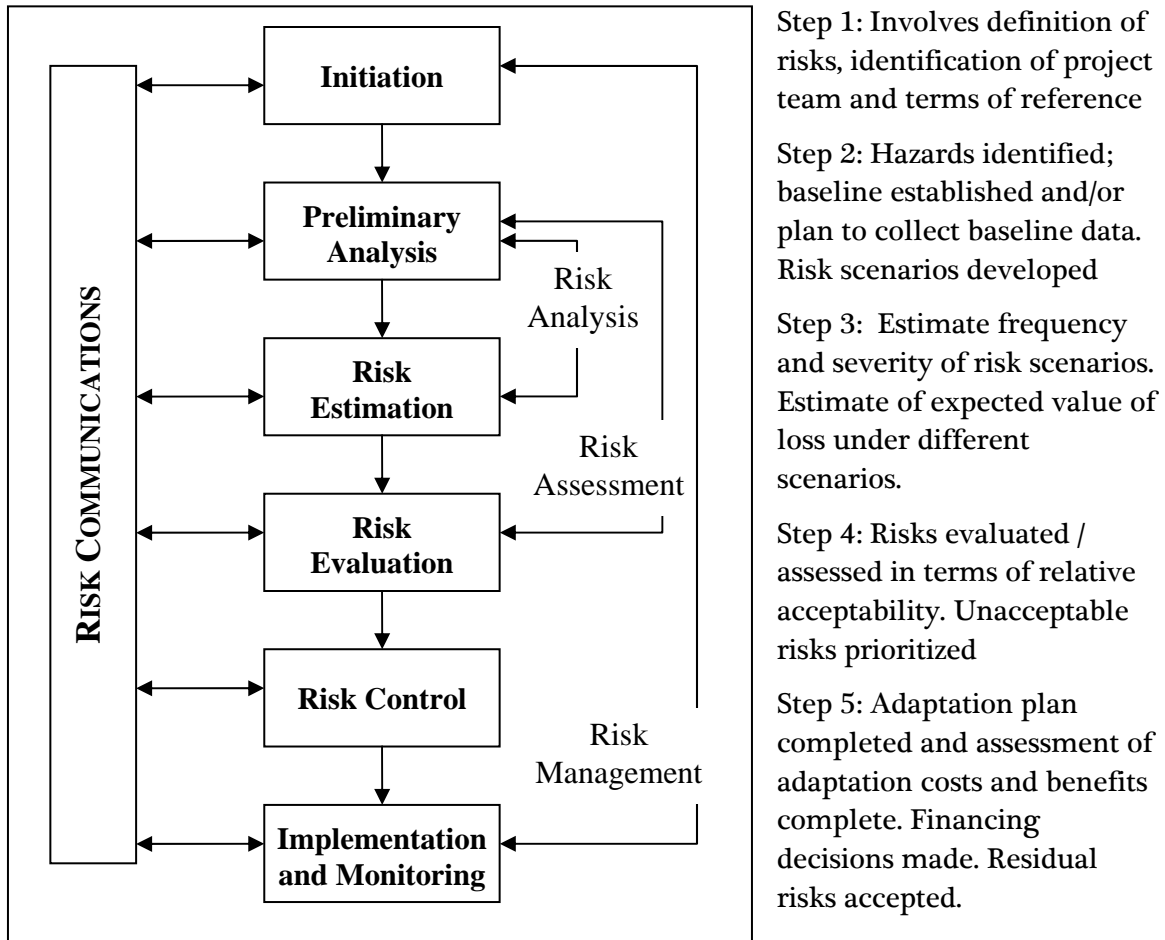
Figure 2: Risk-Based Approach to Climate Change Adaptation

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STEP 4: Evaluation of strategies identified in Step 3 in terms of how effectively they might obtain management objectives. Asks what are the potential consequences or outcomes of each strategy and what are the trade-offs between both management strategies and objectives.

STEP 5: Strive for balance among various trade-offs, may involve some trial and error, highly dependent on values and risk tolerance of those involved. Requires revisiting Steps 1-3 on a periodic basis and making adjustments as necessary.

EXAMPLE 2: A Risk Management Framework: Adapted from CCIARN Ontario Workshop: *Managing risks from a changing climate*, March 25, 2005. Guidelines for Facilitators



Step 6: Implementation plans in place including process/ indicators to facilitate monitoring.

INFORMATION RESOURCES AND TOOLS

I. Local and Regional Scale Case Studies and Resources in BC

NORTH AND CENTRAL

1. Canadian Model Forest Network - Climate Change Project - (guide book for communities in progress) McGregor Model Forest, Prince George – Northern Climate Change Network Project

Developing a website with web links to adaptation tools and resources for communities www.modelforest.net/

Contact: Cindy Pearce (250) 387-3966 cindypearce@telus.net

Project Time Frame for Tool Development: summer to winter 2006

Dan Adamson - <http://www.mcgregor.bc.ca/mmf>
2. CFS/Vanderhoof Community Vulnerability Assessment pilot project

Contact:

Brian Frenkel, Councillor, Town of Vanderhoof

Tim Williamson, Researcher, Canadian Forest Service, Edmonton
3. Graham Island (Haida Gwaii/Queen Charlottes); Impacts of Sea Level Rise. Principal Investigator, Ian J Walker, University of Victoria.

SOUTHERN INTERIOR

4. Okanagan Case Study of adaptation and management issues arising from twin threats of climate change and population growth.

Final report edited by Stewart Cohen and Tina Neale : *Participatory Integrated Assessment of Water Management and Climate Change in the Okanagan Basin*. Available at: By et al, Adaptation & Impacts Research Division (AIRD) / Institute for Resources Environment & Sustainability (IRES), UBC. Contact Tina Neale at tneale@ires.ubc.ca – Okanagan studies, AMSD case studies - Stewart Cohen et al
5. Columbia Basin Trust Tools

Regional climate trends and forecasts in partnership with Pacific Climate Impacts Consortium.

Vulnerability assessments and adaptation strategies under development with 2-3 communities in region, (eg. Revelstoke and Invermere)

Contact: Cindy Pearce (250) 387-3966 cindypearce@telus.net

Project Time Frame for Tool Development: summer to winter 2006

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SOUTH COAST

6. Corporation of Delta; Impacts of Sea Level Rise Reducing Canada's Vulnerability to Climate Change (NRCan) Municipal Case Studies: The Planning Process and Climate Change: http://ess.nrcan.gc.ca/2002_2006/rcvcc/index_e.php Phil Hill et al
7. Visualizing Climate Change Project

II. Provincial Resources and Tools

GOVERNMENT

1. Ministry of Environment

Climate Change Section – <http://www.env.gov.bc.ca/air/climate/index.html>

Lee Thiessen – Section Manager – contact for info about BC gov't climate change policy

Jenny Fraser – Climate Change Adaptation Specialist

Ben Kangasniemi – Climate Science Specialist

Coastal Climate Change Model (DFO & MoE)

This model is intended to help the impacts of climate illustrate coastal climate change scenarios. More information can be obtained from Ben.Kangasniemi@gov.bc.ca (Climate Science Specialist)

2. Ministry of Forests and Range

The Future Forests Ecosystem Initiative (FFEI) is the main tool by which the provincial ministry is considering the impacts of climate change on this key sector. Information can be found at: http://www.for.gov.bc.ca/hts/Future_Forests/.

The project manager for FFEI is Kristine Weese, Kristine.Weese@gov.bc.ca

Dave Spittlehouse is a ministry scientist with long experience in forestry and climate change impacts and adaptation.

Extensive information on the ministry's mountain pine beetle Action Plan can be found at: http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/.

NON-GOVERNMENT

3. Pacific Climate Impacts Consortium (formerly the Canadian Institute for Climate Studies) Canadian Climate Impacts Scenarios –focus on climate scenario modelling and distribution of impact information to industry and government, tools include online scenario simulations and technical data on climate impact scenarios

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<http://pacificclimate.org/> ; <http://www.cics.uvic.ca/>

Contact: Trevor Murdock Tel: (250) 472-4337 / email: tmurdock@uvic.ca

4. Royal BC Museum – Climate Change Scenarios Exhibit Royal BC Museum – Climate Change Scenarios Exhibit – Richard Hebda

This exhibit features interactive climate change scenario models for British Columbia for 2020, 2050 and further in the future. The scenarios are featured on a 3-D map of BC generated from satellite images.

Scenarios include visual presentation of extreme weather events and how species are responding to climate change. Interactive maps available online at:

<http://www.pacificclimate.org/impacts/rbcmuseum/>.

5. Canadian Model Forest Network Climate Change Project

developing a website with weblinks to adaptation tools and resources for communities www.modelforest.net/

Contact: Cindy Pearce (250)387-3966 cindypearce@telus.net

Project Time Frame for Tool Development: summer to winter 2006

6. Columbia Basin Trust Tools

developing climate forecasts for the region through working with the Canadian Climate Impacts Scenarios group at the University of Victoria & preparing a scientific report

providing a study summary sheet, brochure, and website for communities in the Columbia Basin

working with 2-3 communities on vulnerability assessments and adaptation strategies eg. Revelstoke and Invermere

Contact: Cindy Pearce (250)387-3966 cindypearce@telus.net

Project Time Frame for Tool Development: summer to winter 2006

7. Visualizing Climate Change Project

This project is developing a local community visioning process based on geographic information and advanced 3D visualisation technologies. These tools will provide realistic views of possible futures at the neighbourhood scale, showing plausible effects of alternative global and local responses to climate change: from doing nothing, to taking intensive steps to mitigate and adapt to climate change.

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Contact: Stephen Sheppard - stephen.sheppard@ubc.ca or Siobhan Murphy Project Coordinator – GEOIDE SII Project – ‘Visualizing Climate Change’ (604)836-3871, siobhanmurphy@gmail.com

III. Federal Resources, Tools and Programmes

1. National Assessment of Climate Change Impacts and Adaptation, BC Chapter – Robin Sydneysmith, Ian J Walker et al National Assessment of Climate Change Impacts and Adaptation, BC Chapter. Fall, 2007
2. Canadian Climate Impacts and Adaptation Research Network (CCIARN),
This network was in operation from 2001-2007. An extensive archive of climate change impacts and adaptation information is available at: <http://www.c-ciarn.ca/>
Former BC Region coordinator - email: robin.sydney-smith@ubc.ca;
3. Adapting to Climate Change: An Introduction for Canadian Municipalities. Written and published by CCIARN, available at: http://www.c-ciarn.ca/adapting_e.html
This introductory report is designed for local governments across Canada. It includes an overview of climate change, an introduction to climate change adaptation, municipal case studies of adaptation processes, and suggestions for moving forward with adaptation plans.
http://www.c-ciarn.ca/primer_website/download.html
4. Municipal Case Studies: Planning for Climate Change (NRCan)
Working in cooperation with the Federation of Canadian Municipalities and the Canadian Institute of Planners (Infraguide) to develop a best practices guide focused on the incorporation of climate change impacts and adaptation into land use and community planning. Working through the case studies with extensive stakeholder involvement the focus has shifted to seek ways to incorporate climate change response issues into existing infraguides and other planning tools, rather than develop a stand alone climate change guide.
See: <http://www.infraguide.ca/> and/or contact: Kira Pejemsky, Program Coordinator, Canadian Institute of Planners; communications@cip-icu.ca
5. Municipal World - Series of articles on various topics relating to municipal issues and responses to climate change. Many written by municipal staff and other local practitioners – (2006 - 2007) – Navigating a Changing Climate – Dave Noble

IV. Case studies, tools and resources from other countries

STATE OF WASHINGTON

1. Climate Impact Groups (CIG) – University of Washington

CIG engages in climate science in the public interest, with a focus on the Pacific Northwest.

They perform basic research aimed at understanding the consequences of climate fluctuations for the Pacific Northwest (PNW) and promote application of this information in regional decisions. Regional research focuses on both natural and social science and community outreach.

Focus: water, fisheries, forest and coastal resources; provides outreach, classes and seminars forecasting and planning tools. North America extreme weather risk forecasts, climate change stream flow scenarios, information on why planning for climate change is important (eg. emphasize that climate change will largely be felt by local governments managing existing issues that will be exacerbated by climate change). Summary of Pacific Northwest climate impacts pertinent to planning (under the Watershed Planning Act)

UNITED KINGDOM

1. United Kingdom Climate Impacts Program

<http://www.ukcip.org.uk/resources/>

Develops guidance documents, case studies, and provides training for local government. Comprehensive and accessible information. UKCIP sets the standard for development of adaptation related information for communities and local authorities.

2. South-East Climate Change Partnership

Regional climate impacts & [adaptive planning](#) information

<http://www.climatesoutheast.org.uk/objectives.php?back=about.php>

investigates, informs and advises on the threats and opportunities arising from the impacts of climate change in South East England and promotes [adaptive planning](#) in the region.

The Partnership has been established by a range of public, private and voluntary sector organisations across the South East. Their mission is to investigate, inform and advise on the impacts of climate change in the region.

This network does not list specific tools per say, but has general information that may be helpful when planning to work with and develop tools for communities. It would

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be worth following up with them to see if they have developed specific tools that are not yet placed on their website.

<http://www.climatesoutheast.org.uk/objectives.php?back=about.php>

NEW ZEALAND

1. **New Zealand Government Climate Change Adaptation Initiatives –**
<http://www.climatechange.govt.nz/resources/local-govt>

Regional information, guidance documents, and tools on climate change impacts and adaptation for communities and local government, examples of outreach and training provided by the NZ Govt to help communities use existing knowledge of impacts and to make decisions.

2. **Adapting to Climate Change in Eastern New Zealand – a Farmer Perspective**

This resource kit includes a quick fact sheet for farmers and agricultural workers, an introduction to global climate change, and guide to developing on-farm resilience and adaptation; sections on farm design, water and energy conservation, waste management etc. Includes case studies.

Source: Kenny, G. 2005. *Adapting to Climate Change in Eastern New Zealand*. New Zealand: Earthwise Consulting Limited.

Available at: <http://www.earthlimited.org/accenzpubs.html>

AUSTRALIA

1. **Sustainable Regional and Urban Communities Adapting to Climate Change –**
Planning Institute of Australia

This is a four stage project aimed at preparing communities and industry for likely climate change impacts. The project focus is to develop planning tools to address climate change. The project is currently in Stage 1 of the process and a preliminary literature review, initial scoping study, and associated reports have been developed. Planning awards are also available for adaptation projects addressing climate change and the need for planning tools.

Contact: sharon@sba-planning.com

http://www.planning.org.au/index.php?option=com_content&task=view&id=26&Itemid=60

V. International tools and resources

1. **United Nations Framework Convention on Climate Change – Adaptation Tools**

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This is a background paper entitled: Application of methods and tools for assessing impacts and vulnerability, and developing adaptation responses. Annex 1 contains a summary of adaptation tools that are international in scope (includes vulnerability assessment tools, sector specific adaptation tools etc.).

<http://unfccc.int/resource/docs/2004/sbsta/inf13.pdf>

2. Adaptation Decision Matrix

a) The ADM evaluates adaptation options based on the relative effectiveness and associated costs. Research and use of multi-criteria assessment techniques is required.

http://unfccc.int/files/adaptation/methodologies_for/vulnerability_and_adaptation/application/pdfadaptation_decision_matrix_adm.pdf

3. ESPACE – European Spatial Planning: Adapting to Climate Events

Transnational partnership; creation and testing of tools; simulation of policy with partner regions; research into public attitudes on climate change

<http://www.climateforchange.org.uk/>

Community Climate Change Project: Manhood Project (launched in 2004)

Focus:

Develop a solutions based approach, by setting out locally agreed action plans to enable positive local responses to climate change

Provide a channel for influencing future planning and decision-making to account for effects of climate change locally.

<http://www.climateforchange.org.uk/cc%20mh.asp>

4. Linking Climate Adaptation (LCA) Network

The Linking Climate Adaptation (LCA) Network focuses on assisting communities, policy-makers, practitioners and academics to share knowledge and experiences about adaptation to climate change. Links to articles and web-based publications on climate change adaptation, research and organizations focusing on local and international adaptation projects. also included is an online forum for adaptation discussions.

The focus of the LCA Network is primarily on developing countries, natural disasters and climate change adaptation.

<http://www.linkingclimateadaptation.org/>

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New Zealand Climate Change Office (2004). *Preparing for Climate Change: a guide for local government in New Zealand*. Ministry for the Environment, New Zealand.

APPENDIX I:

SUMMARY OF LOCAL GOVERNMENT ACT RELEVANT TO MANAGING AND RESPONDING TO CLIMATE CHANGE

PART 1 – PURPOSES AND PRINCIPLES

Under the Local Government Statutes Amendment Act of 2000, the former Municipal Act of British Columbia has been renamed the Local Government Act on June 12, 2000. The purpose of the Act on a local level is to ensure that a “good government” is in place for its community. This is determined by the services and principles (such as providing stewardship of public assets and fostering current and future economic, social, and environmental well-being) that the local government deems necessary or desirable to the community. To effectively and efficiently serve the citizens of British Columbia, a cooperative relationship must exist between local and provincial governments. In order for local governments to successfully fulfill their responsibilities, the provincial government must inform and consult with the local government of all actions that will affect local interests.

PART 8 – SPECIAL MUNICIPAL POWERS RELATING TO PROPERTY

A municipality may expropriate personal property under the Expropriation Act to effectively and efficiently perform its duties and functions. This Act also applies to land situated outside the municipality if the purposes of the local government is to provide a service to the area outside the municipality or to establish and manage quarries, sand and gravel pits to acquire material for municipal works. Moreover, a municipality may authorize its agents or employees to take possession, break up, or enter real property without the consent of the property owner. The expropriation bylaw also authorizes municipalities (wanting to provide services in areas outside the municipality) to exercise its powers on properties located outside the municipality. In relation to expropriation, a municipality may also expropriate a licence under the Water Act that authorizes the diversion of water from a stream if it is deemed to be a suitable source of water supply for that municipality.

PART 13: SPECIAL FUNDS

A municipal council, through a bylaw, may establish a local improvement fund to set aside fund money taken from its general revenue. If there is excess money remaining from the fund after the implementation of the plan, then that money may be transferred to another fund established under this Part.

PART 15 – MUNICIPAL SERVICES

According to the Fire Services Act, a council may impose a bylaw to authorize fire chiefs to inspect properties that may be susceptible to fire hazards or endanger occupants and users of that land; to impose measures to prevent or suppress fires (including the demolition of structures to prevent the spreading of fire); and to request inhabitants to remove or dispose of anything from the premises that will potentially be a fire hazard.

A municipality also has the right of possession to all municipal highways, which allows the council to dispose of any portion(s) of the highway in exchange for land necessary for improving, widening, straightening, or relocating the highway. Furthermore, by bylaw, a council can close a highway, or part of it, to traffic after sufficient notice has been given to the public. The council also has the responsibility of protecting highways from water damage by constructing works through, under, or over land adjoining a highway.

A council may, through a bylaw, regulate a person's design and installation of drainage and sewage works and require owners of real property to connect their structures to the appropriate sewer and drain connections as specified by the bylaw. If people are undertaking construction of dikes, pipes, or structures within the municipality, the council may, subject to the Water Act, establish bylaws to ensure proper maintenance and proper flow of water from these objects and to reduce erosion by the sea or any other causes. A council also has the right, through a bylaw, to appropriate land that constitutes a stream channel or bed that passing through the municipality and to control drainage by improving, diverting, or preventing water inside/outside the municipality from flowing out/in. Agreements can be made between the council and adjoining municipalities or with a landowner to construct, maintain, or remove objects in streams or watercourses to prevent the danger of potential flooding.

By bylaw, a council may require people to use a waste disposal or recycling service provided by the municipality and also require owners or occupiers of a property to remove waste and any other matter from their property and to clean and disinfect private drains, outhouses and other objects situated on their property; if not, the council will remove or dispose of the object at the expense of those persons refusing to do so.

PART 19 – LOCAL IMPROVEMENTS AND SPECIFIED AREAS

The council of a city, town or district municipality may, by bylaw either on its own initiative or on petition, to undertake local improvements, including, but not limited to, the construction, improvement, or extension of a sewer or water system; the sodding and planting of trees, shrubs and plants in boulevards or streets; and the construction of walls, dikes, or breakwaters along river banks or shores of a sea or lake.

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PART 21 – BUILDING REGULATIONS

To protect the property, health and safety of persons, a council may impose bylaws under the Health Act, the Fire Services Act, and these Acts to regulate construction, alteration, repair or demolition of (unsafe) buildings and structures; regulate the installation or repair of plumbing; require contractors, owners or other persons to obtain permits for construction rights; and require the establishment of safety precautions and allow for the inspection of buildings to ensure compliance with health and safety standards.

PART 22 – MISCELLANEOUS POWERS

A council may also adopt bylaws for the general protection of trees applicable to all or parts of the municipality. Through these bylaws, a council may prohibit and regulate the cutting and removal of trees through permits; prohibit the damage of trees or regulate actions that may damage trees; and require trees to be replaced if they have been cut, removed, or damaged in contravention of a bylaw. Persons applying for permits for the right to cut or remove trees must provide plans to the council identifying the trees that will be cut and whether those trees will be replaced.

On the contrary, a council may, by bylaw require owners or occupiers of real property to remove or trim hazardous trees and shrubs. In relation to this, a council may also, through a bylaw, give permission to employees or other persons to go onto private premises to inspect trees for safety issues.

By bylaw, a council may also regulate or prohibit the removal or deposit of soil, gravel, or other substances from any area of the municipality. The prohibition of depositing soil and other materials is to ensure that there are no contaminations to the environment, lands, and parks. To enforce this bylaw, permits are often required from persons wanting to remove or deposit materials on any of the lands in the municipality.

Furthermore, a council may, by bylaw, prohibit a person from polluting, obstructing, or impeding the flow of a stream, water, creek, etc. even if these waterways are situated on private properties.

By bylaw, a council also has the right to declare the removal of dangerous buildings and other structures, as well as structures that the council believes is dilapidated or offensive to the community. If the owner fails to comply with the order within a specified time, the council may enter the property and remove the structure at the expense of the owner or occupier.

PART 23 – IMPROVEMENT DISTRICTS

Through bylaws, a council of a municipality, the board of the regional district or the Lieutenant Governor in Council, may incorporate a land and its owners into a mountain resort improvement district. In addition, the council may transfer to the mountain resort improvement district any asset, right, or liability of another improvement district or water users' community, and dissolve the other district or community. Moreover, the

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improvement district also has the power to expropriate land and water diversion licences and related works, in order to carry out its objectives.

PART 25 – REGIONAL GROWTH STRATEGIES

Under the Local Government Act, a regional growth strategy can be set up “to promote human settlement that is socially, economically and environmentally healthy and that makes efficient use of public facilities and services, land and other resources”. When a specific region is undergoing significant changes in its population, economic development, etc., and it affects more than one government or requires the coordination between local governments, then the minister will recommend to the Lieutenant Governor in Council that a growth strategy is needed for that region. The main purposes of this strategy are: i) to avoid urban sprawl and to ensure that development takes place in a timely, economic and efficient manner, where adequate facilities are available, ii) to minimize the use of automobiles by encouraging people to walk, bike, or use public transportation, iii) to ensure that efficient movement of goods and people are in place as a result of ii), iv) to protect areas that are environmentally sensitive, v) to maintain and protect agricultural and forestry reserves and the like, vi) to support community economic development, vii) to reduce and prevent pollution of air, water and land, viii) to ensure that adequate and affordable housing is available to its people, ix) to ensure that adequate supply of land and resources are available for future settlement, x) to minimize the risks associated with natural hazards, xi) to preserve and create parks and recreation areas to link urban and rural open space, xii) to plan for conservation of energy and efficient use of alternative energy forms, and xiii) to provide a good stewardship of culturally valued heritage land, sites and structures.

Implementing a regional growth strategy will require a plan outlining the district over a 20 year period from the time of initiation; the future objectives for the district; the population and employment projections during this period; the plans for housing, transportation, services and economic development for the projected population; and other significant details of the strategy. The strategy must cover the entire regional district, or the board(s) must request the minister to authorize the regional strategy so that it will apply to only parts of the district.

PART 26: PLANNING AND LAND USE MANAGEMENT

A council may, by bylaw, assign development permits to specify areas of lands, those of which are susceptible to danger and natural hazards or require preservation, to remain free of development so as to protect people, habitats and nature from potential harm.

A local government may impose a runoff control requirement through a bylaw to require a landowner doing construction of a paved area or roof area to comply with the bylaw – to manage and provide for the disposal of surface runoff and storm water. Furthermore the government may specify a maximum percentage of impermeable material that can be used to cover an area of land.

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A local government or the Minister of Environment, Lands and Parks may adopt a bylaw specifying construction requirements in relation to flood plain areas. If an area is designated to be a flood plain, then the local government or minister must determine the flood levels of the flood plain and order the construction company to elevate a floor system or pad above the stipulated flood level. The occupants of the land must also comply with this bylaw and must place objects or buildings above the specified level.

A council may develop an official community plan that designates development permit areas to protect the natural environment, ecosystems, farming, and other development areas from hazardous conditions. The council must specify areas that may be subject to natural hazards, have unstable soil or water that is subject to degradation, and impose requirements in relation to the design and landscaping of structures so as to reduce wildfire hazards.

Bylaws can also be used by the board to have tree-cutting permits so they can regulate or prohibit the cutting down of trees in designated areas that are subject to flooding, erosion, landslides, or avalanches. The persons cutting the trees will have to provide a report that has been certified by a qualified person stipulating that the cutting of the trees proposed will not create flooding or erosion dangers.

Forest Land Reserves

If a council of the municipality believes that a municipal forest reserve land is suitable for reforestation purposes, then the council may adopt a bylaw to set aside that piece land. However, the council can only adopt the bylaw once they receive assent of the electors or by achieve an affirmative vote of at least two thirds of its members.

Conversely, a council can only propose a bylaw to withdraw, sell, or lease land from a municipal forest reserve if a counter petition opportunity is given along with the purpose of the withdrawal of land or the price received if the land is sold. In the case of leasing the forest reserve land, the council must include the lease amount in accordance to the area leased and the values of the current annual cutting, in addition to an agreement on a sustained yield basis and provisions to protect of the forest reserve from fire. The council is also entitled to cut, sell, or remove timber or any other products from the forest reserve as long as an agreement is made as to which trees can be cut (to protect younger trees), and provisions are set in place to protect the forest area from fire.

APPENDIX II

SELECTED CLIMATE TREND AND SCENARIO MAPS FOR BC COAST AND INTERIOR

The following maps provide regional downscaled representations of average climate from 1961-1990 (Summer and Winter mean temperature and precipitation) and regional projections or scenarios of how the climate on the BC coast and interior will look by the 2050s.

The climate projections represent one of several possible futures some of which are higher and some of which are lower than what is shown here.

Further information about these and other regional climate, data, maps and scenarios for BC and Yukon Territory can be obtained by contacting the Pacific Climate Impacts Consortium, (PCIC): www.PacificClimate.org

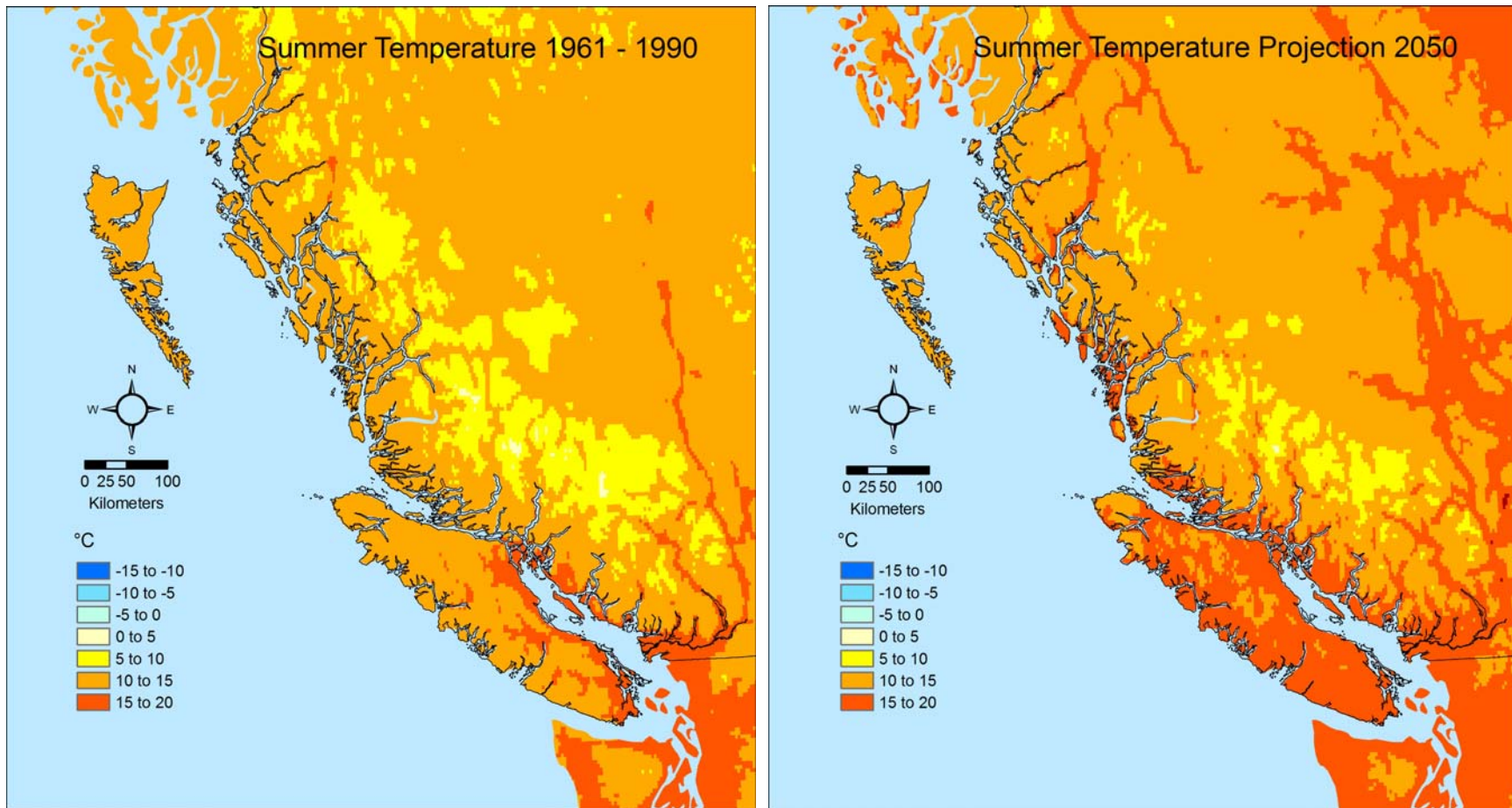


Figure 1: Summer temperature 1961-1990 Climatology vs. 2050s Projection

These climate maps provide comparison of the average summer temperature – i.e. the mean of daytime highs and night time lows for June, July, August – for the period 1961 to 1990 with the downscaled global circulation model projected temperatures for the 2050s. The south coast, south and central interior will warm considerably. Note also the increasing temperatures in alpine regions of the Coast Mountains.

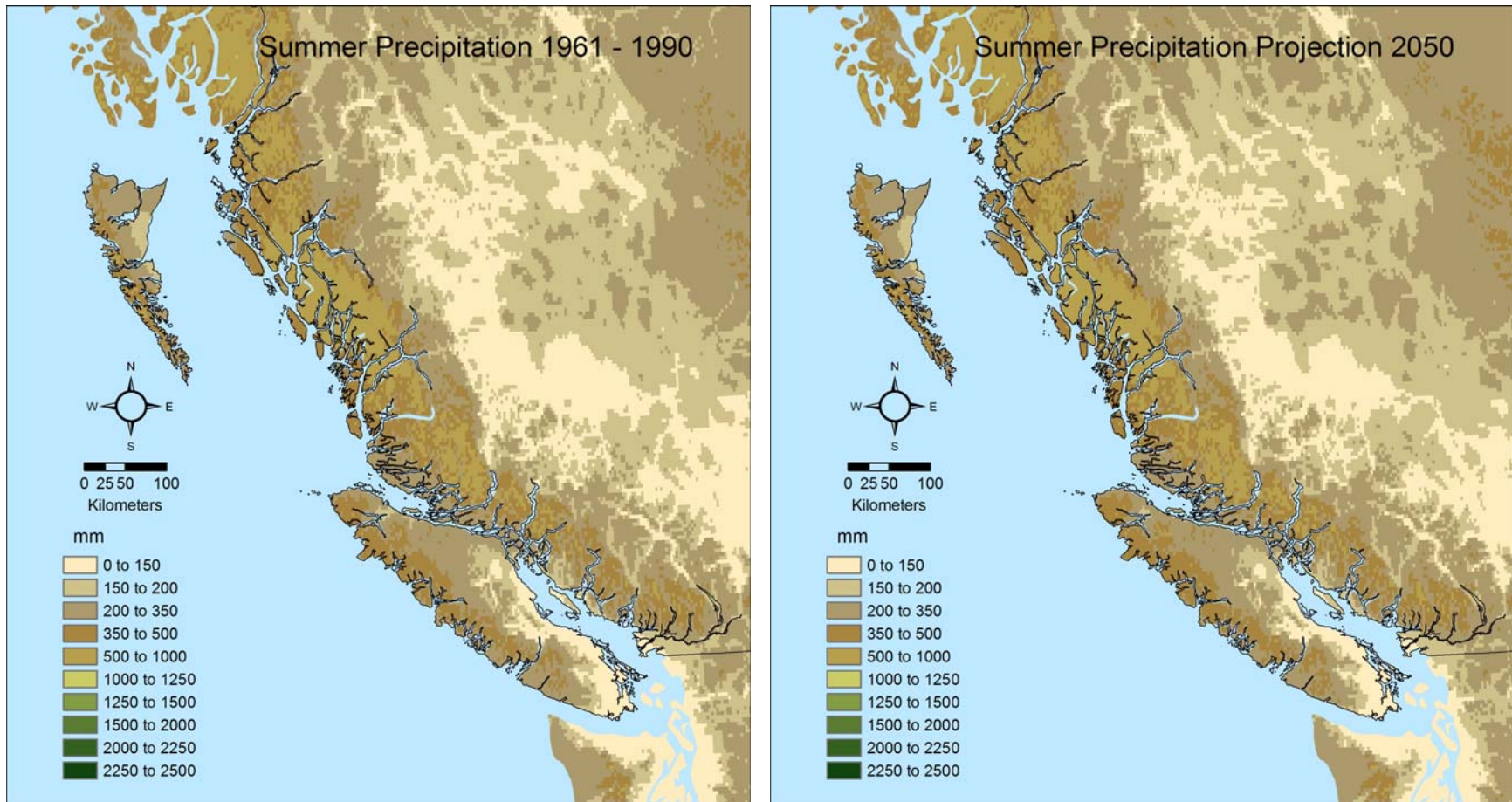


Figure 2: Summer precipitation 1961-1990 Climatology vs. 2050s Projection

These climate maps provide comparison of summer precipitation – i.e. total precipitation for June, July, August – for the period 1961 to 1990 with the downscaled global climate circulation model projection of summer precipitation for the 2050s.

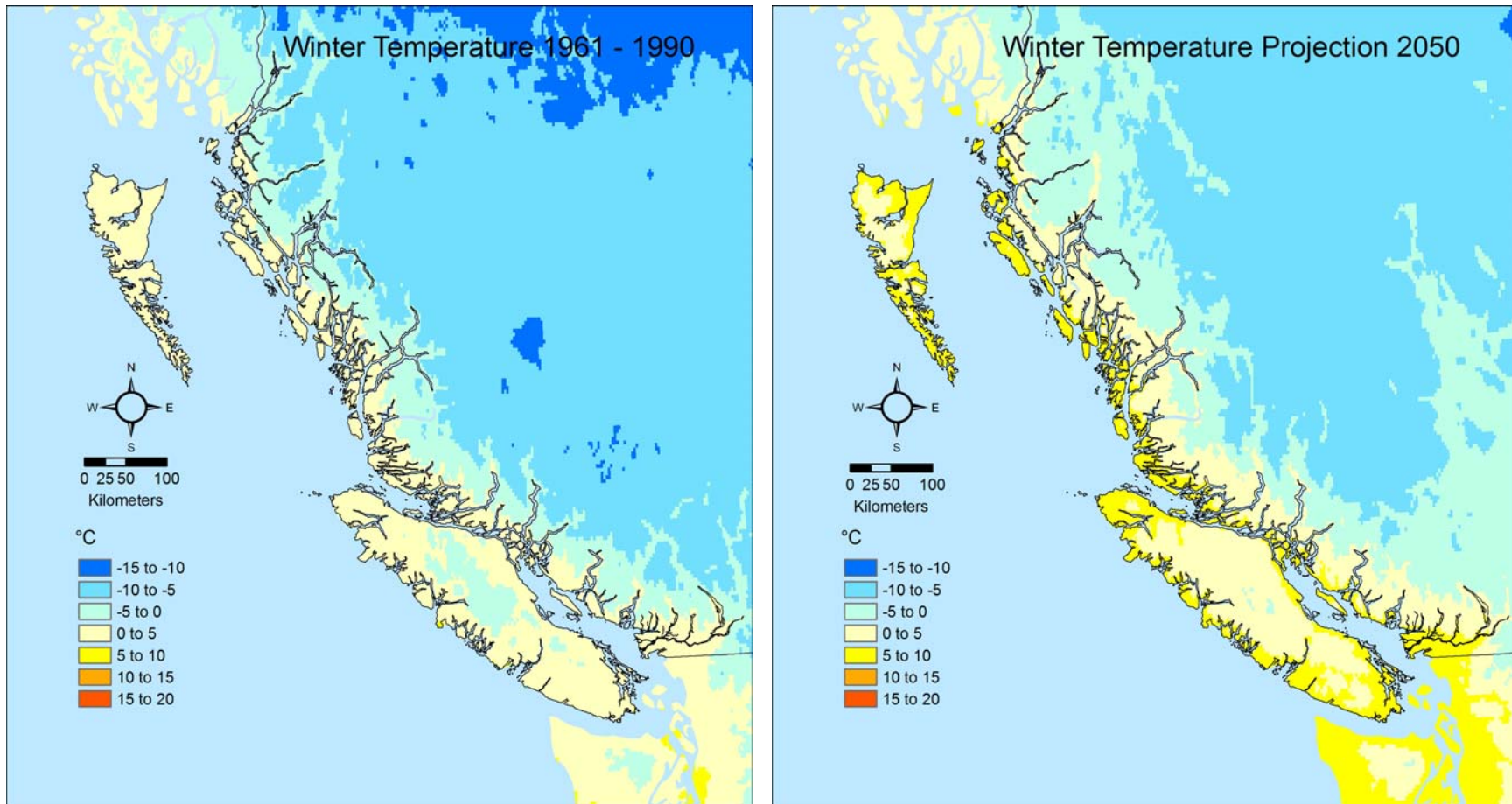


Figure 3: Winter temperature 1961-1990 Climatology vs. 2050s Projection

These climate maps provide comparison of the average winter temperature – i.e. the mean of daytime highs and night time lows for December, January, and February – for the period 1961 to 1990 with the downscaled global climate circulation model projected temperatures for the 2050s. The southern and central interior, and much of the coast, will warm considerably. Note also the increasing temperatures in alpine regions of the Coast Mountains. Sub-zero conditions in the interior, necessary to control future outbreaks of the mountain pine beetle are almost completely absent. Infrastructure costs such as winter road maintenance and safety tend to escalate as temperature moves from -15 C° to closer to zero.

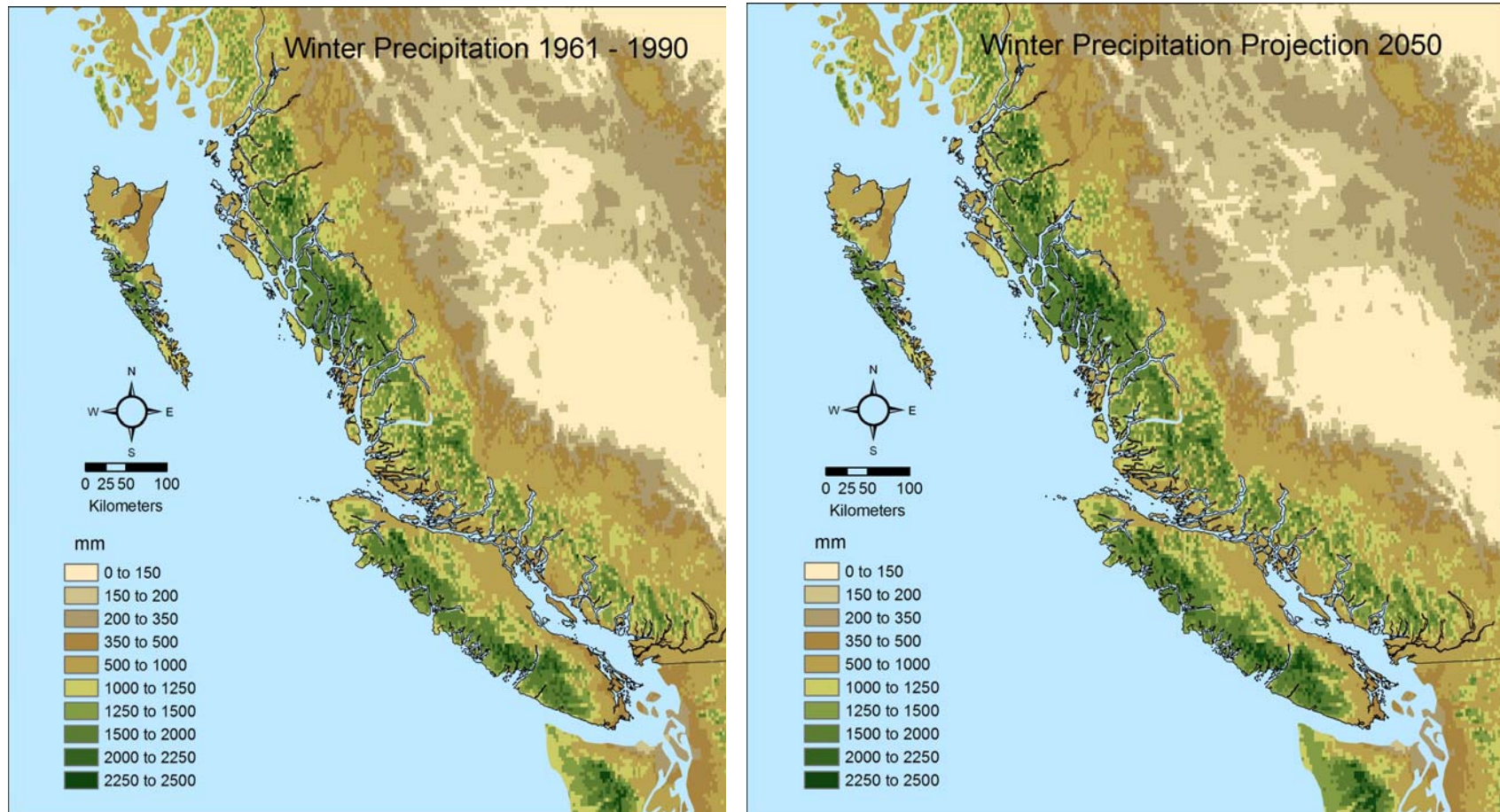


Figure 4. Winter precipitation 1961-1990 Climatology vs. 2050s Projection

These climate maps provide comparison of winter precipitation – i.e. total precipitation for December, January, and February – for the period 1961 to 1990 with the downscaled global climate circulation model projection of winter precipitation by the 2050s. Changes in winter precipitation are more substantial than summer changes but are also expected to occur in large part due to more frequent intense or extreme weather events. With increasing temperatures winter precipitation is also expected to be increasingly dominated by more rain and less snow.

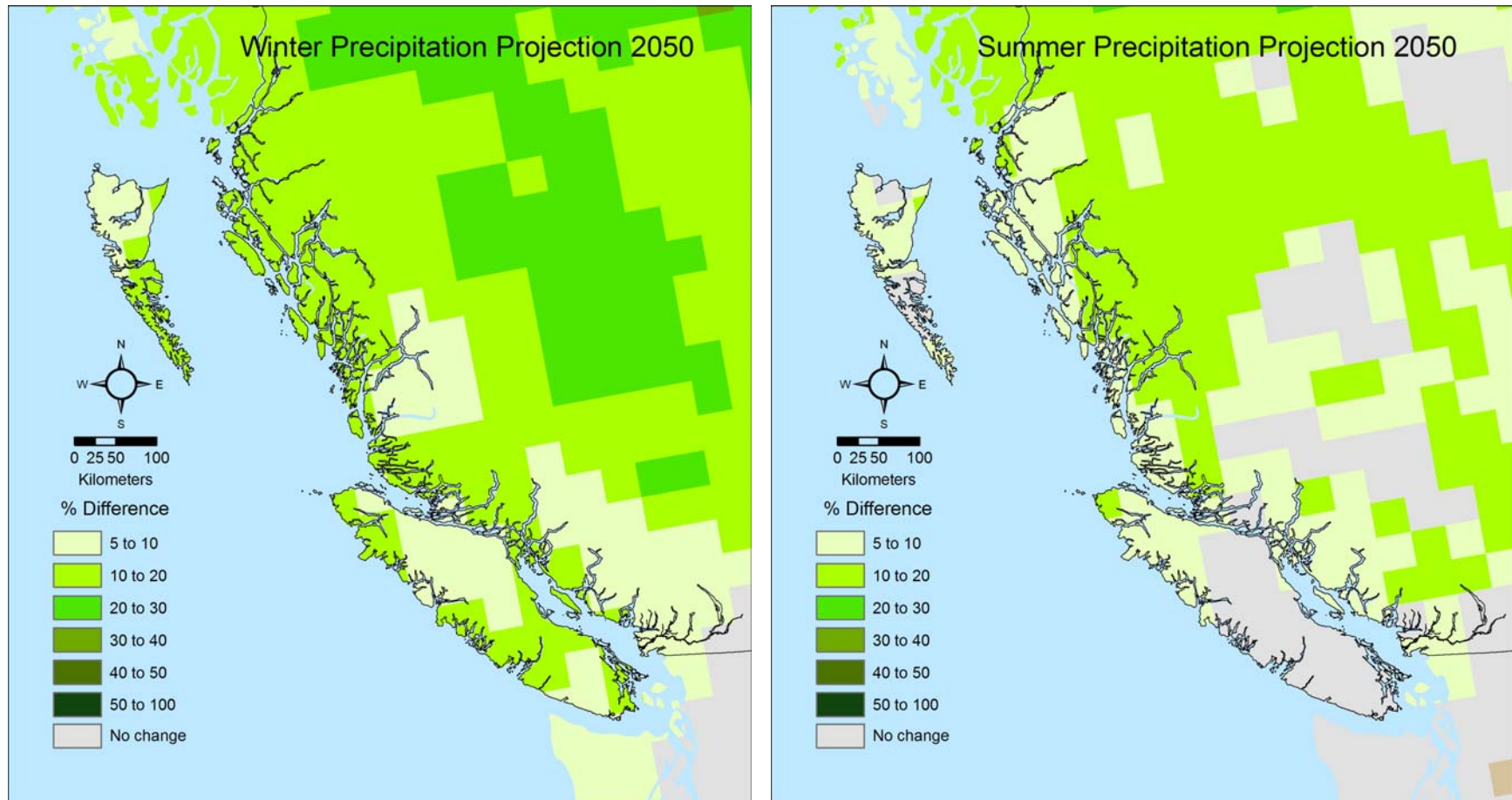


Figure 5 Regional Climate Model Precipitation 2050s Projections for winter and summer

These maps represent a regional climate model projection that illustrates precipitation changes as a percentage change from the 1961-1990 climatology. Winters in general will experience a greater increase in precipitation, except for the notable exception of the region surrounding the Bella Coola Valley on the central coast. Projections of no change and increases of 5-10% are relatively uncertain compared with larger increases.

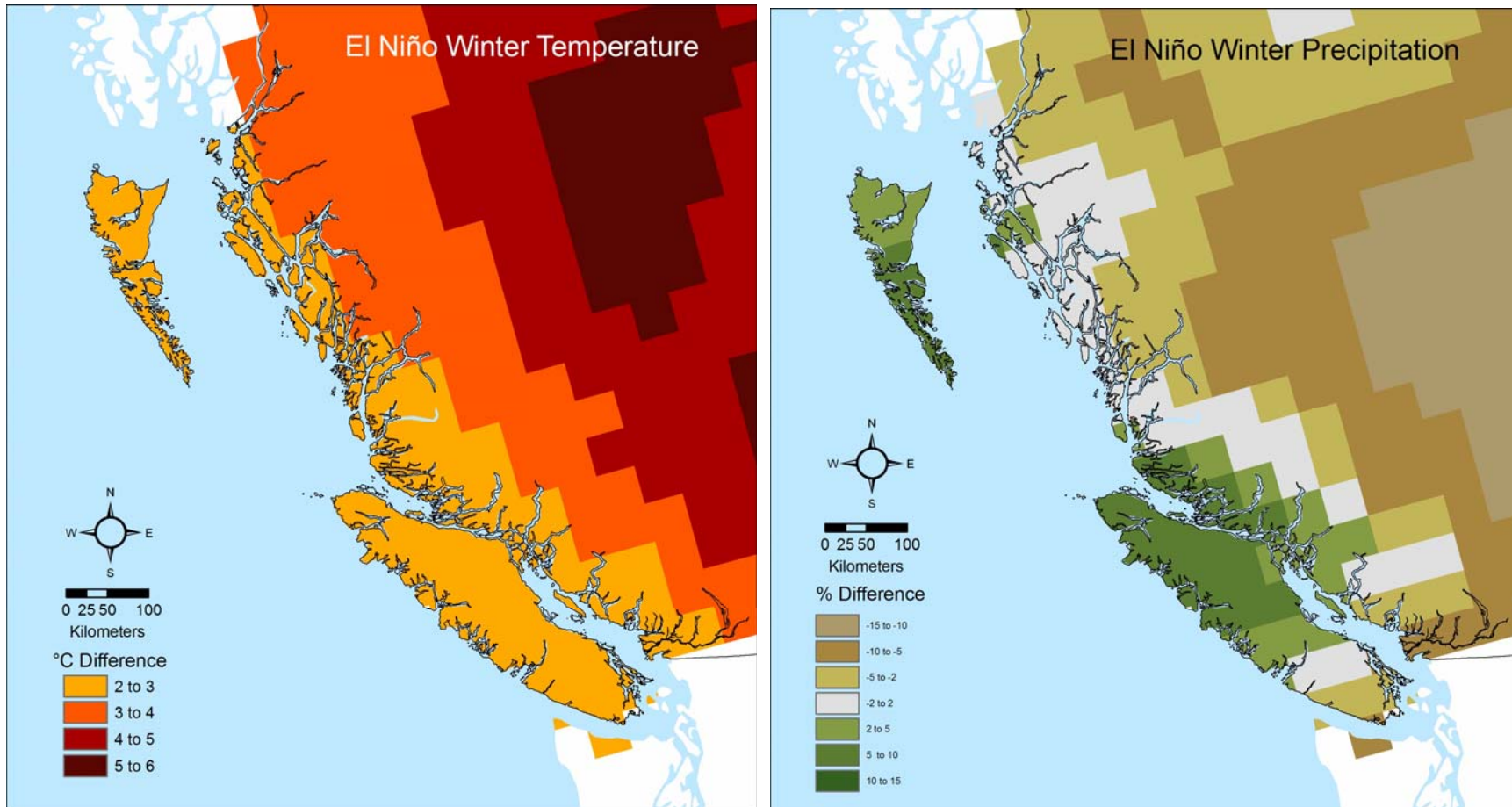


Figure 6: El Niño/Southern Oscillation effect on Winter Temperature and Precipitation

These maps illustrate the dramatic effect on BC's climate of cyclical climate variation caused by changes in certain Pacific Ocean currents and circulation. El Niño winters are, on average, warmer and for the most part drier in the interior but wetter on the coast.