PACIFIC CLIMATE IMPACTS CONSORTIUM

Strategic Plan | 2015-2019

I. INTRODUCTION

The Pacific Climate Impacts Consortium (PCIC) is a regional climate service that was established to act as an interface between climate research and climate applications within British Columbia and surrounding areas, referred to as the Pacific and Yukon Region of Canada. Planning for the impacts of climate change and variability requires practical information on how the climate system affects the local landscape in the near and distant future. This information is generally not specifically available for the Pacific and Yukon Region (PYR) of Canada. Further, the region presents significant climatological challenges that complicate the use of climate information. These challenges are beyond the capacity of most organizations to overcome, thus they require an interface with the climate science community to understand the impact of climate variability and change on their organization.

Consequently, PCIC undertakes applied research that is motivated by stakeholder needs, on the physical impacts of climate variability and change in the Pacific and Yukon Region of Canada. We do this by both maintaining strong resident expertise and by fostering collaborative relationships with climate researchers and regional stakeholders to produce knowledge and tools that are useful to stakeholders in the region.

PCIC is first and foremost a service provider that delivers an array of quantitative climate information for a variety of needs. This strategic plan details several service objectives for the coming five years that encompass the spectrum of information delivery from data to user-specific interpretation. The service objectives are laid out in section V.

Since the information that PCIC seeks to deliver to its users is generally not directly available "off the shelf", it is necessary to make strategic investments in applied climate research and development in order to meet the service objectives. This plan therefore also outlines several strategic objectives that are required to achieve our service objectives.

PCIC has three applied research themes: Climate Analysis and Monitoring (CAM), Regional Climate Impacts (RCI) and Hydrologic Impacts (HI) with clearly defined research plans for the 2015-2019 period. These research plans are designed to guide future research activities of PCIC regional climate service delivery. Our commitment to collaboration and operational excellence further supports our service mandate.

The remainder of the strategic plan is structured as follows. It begins with a synopsis of PCIC, its history, governance and guiding principles. This is followed by descriptions of PCIC service objectives and modes of delivery for those services. The plan then summarizes the strategic goals that must be achieved to meet our service objectives.

PACIFIC CLIMATE IMPACTS CONSORTIUM

II. ABOUT PCIC

HISTORY

Established in 2005, PCIC is a regional climate service provider that is federally registered as a not-for-profit corporation of the University of Victoria (UVic). Since its inception, PCIC has grown significantly while maintaining focus on its original vision to "bridge the gap" between the climate science community, which is largely based at universities and large international climate modelling and analysis centres, and regional users of climate information. The vision was defined in a 2005 meeting of climate researchers and regional stakeholders who recognized the need for an organization to support the BC region, with its unique topography and climatic diversity, in its efforts to prepare for the impacts of future climate change.

An initial strategic plan for the development of PCIC and its programs was finalized in 2007. This plan defined PCIC's applied research themes as Regional Climate Impacts, Hydrologic Impacts, Climate Analysis and Monitoring, and Ocean Influences. During this time, PCIC's reputation as a user-focused organization began to take hold. In 2007, BC Hydro and PCIC entered into a four-year research agreement, marking the beginning of a very important and enduring relationship. The 2007 Strategic Plan also had an influence on the 2008 BC Government announcement to endow UVic with funding to provide long-term support to PCIC and create the Pacific Institute for Climate Solutions (PICS).

The endowment provided PCIC with base funding and solidified the Province of British Columbia as a long-term stakeholder in PCIC and the provision of regional climate information. PCIC grew rapidly with the advent of the endowment, and thus prepared a second strategic plan, the 2009-2013 PCIC Strategic Plan, which focused the mission of PCIC and laid out a strategy for ongoing program development. The goal was to build the first three of the applied research themes to fully functional programs. PCIC has grown to meet these expectations. Work in the Regional Climate Impacts and Hydrologic Impacts themes supported stakeholders in BC communities, the provincial government and industry. Both have enjoyed considerable backing from stakeholders, including renewal of the BC Hydro agreement in 2011 with a substantially higher level of support. Work under the Climate Analysis and Monitoring theme was also initiated with support from PICS and provincial government stakeholders. This theme took on additional importance with the 2010 signing of the Climate Related Monitoring Program agreement that positioned PCIC as the data-centre for climate related data in the province. The Ocean Influences theme has remained an element of the three research programs but did not develop into an independent PCIC program due to resource constraints.

Consistent with the 2012-2016 PCIC Strategic Plan, all three research themes have undergone a period of technological improvements in their respective modeling and analysis tools, allowing our methodology to remain leading edge, scientifically defensible and competitive with peer organizations. PCIC has also recently benefitted from an arrangement with the PRISM Climate Group at Oregon State University, involving collaborative development, technology transfer and exclusive rights for PCIC to produce PRISM products for British Columbia. PCIC has also invested substantially in establishing an online data portal for the dissemination of data generated by all three-research themes, becoming a significant data resource for the impacts and adaptation community and BC's consulting community. Research activities at PCIC have also become more integrated in the wider Canadian research community, with PCIC staff participating in the Canadian Sea Ice and Snow Evolution (CanSISE), the Canadian Network for Regional Climate and Weather Processes (CNRCWP), and the Marine Environmental Observation Prediction and Response (MEOPAR) scientific networks. In 2014, based on the results of a successful comprehensive 5-year review, PCIC received renewed support and a continuing operational mandate from the University of Victoria. The BC Hydro agreement was also renewed for a third time in 2015, with BC Hydro committing to similar level of support as the previous agreement.

Now with a full staff complement that varies between about 15 and 18 people depending upon resources and current project needs, PCIC continues to develop its role as one of the primary providers of climate services for stakeholders in the Pacific and Yukon Region of Canada. PCIC's user base now includes stakeholders at the municipal, provincial and federal government levels, as well as publicly and privately owned industries and the general public.

GOVERNANCE

As a not-for-profit corporation, PCIC is committed to public and accountable access to climate information. A key component of PCIC's accountability rests in its governance structure, which is centered on its Board of Directors, which in turn reports to the Board of Governors of the University of Victoria. The Board of Directors is responsible for the strategic review and oversight of the PCIC program. Direction and the operation of the consortium is the responsibility of the President and CEO of the Corporation who is also the Director of PCIC. Board membership includes representatives from the University of Victoria, the Provincial Government, the Federal Government, BC Hydro and Ouranos. The Director reports to the Board of Directors and is advised by regular meetings of a Program Advisory Committee (PAC), which consists of PCIC stakeholders and climate researchers. Members provide advice on the PCIC scientific program and priorities, stakeholder needs and participation in projects. PAC membership, which is determined on the basis of programmatic needs, currently includes representation from several BC government ministries, regional governments, BC Hydro, industry, Environment Canada and the university's research community.

APPLIED CLIMATE RESEARCH

As Our program is organized into three interrelated applied research themes:

- Regional Climate Impacts: making available future projections of regional climate change.
- Hydrologic Impacts: quantifying the hydrologic impacts of climate change and variability.
- Climate Analysis and Monitoring: delivering climate observations and interpreting evolving climate conditions.

The three themes provide scope for our regionally focused program, serving the needs of organizations and individuals in the Pacific and Yukon Region of Canada. This area is defined at its largest expanse as the contiguous landmass within the provincial and territorial boundaries of BC and the Yukon, respectively, plus all upstream drainage areas, and any additional 'downstream' drainage areas considered relevant by users and stakeholders (see Figure 1.). Nevertheless, the province of BC makes up the primary area of concern for PCIC.

BC is characterized by climatic diversity, driven by its diverse topography and reflected in the many ecosystems found within the province. Further, the proximity to the Pacific Ocean exposes the region to major climate fluctuations from El Niño/La Niña (ENSO) and the Pacific Decadal Oscillation (PDO). The three PCIC applied research themes account for these influences in their research programs.

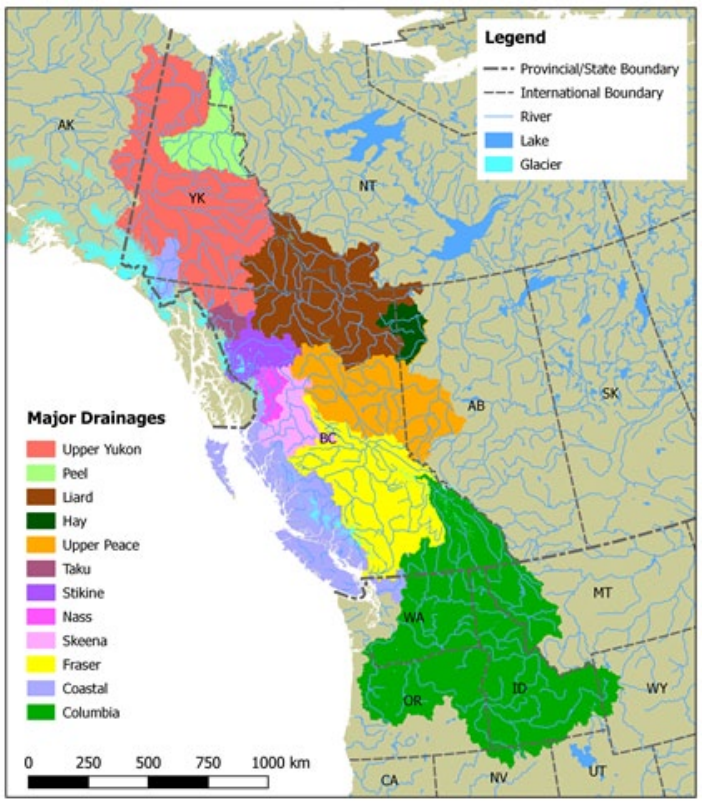


Figure 1: Map showing the PCIC study area, divided into major drainages, within the Pacific and Yukon region.

EXPERTISE

PCIC maintains strong internal resident expertise grouped around its major programs. PCIC's staff includes experts in the areas of: climatology, climate change scenarios, hydrology, scientific computing, geographic information systems, and communications.

CORE VALUES

PCIC and its staff members are committed to the PCIC program and its core values.

Quality:

We ensure that our methods are current and relevant, and that the implications and limitations of our results are clear. We take the initiative to solve problems and eliminate errors in order to produce robust results.

Collaboration:

Collaboration is integral to how PCIC operates. We work with stakeholders to target our applied research and with other researchers to provide new solutions for practical problems that arise in meeting the needs of our stakeholders.

Respect:

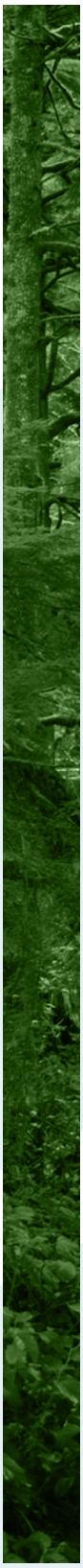
We listen to the needs of others and value their opinions.

Sustainability:

We strive to set an example of wise use of resources.

Professionalism:

PCIC's staff is dedicated to its objectives and conduct their work in a competent, efficient and professional manner. PCIC recognizes that its staff is its primary asset. It supports the professional development of its staff and compensates its staff equitably for the work that they are asked to do.



III. PERSPECTIVE

PURPOSE OF THE PLAN

Since its inception in 2005, PCIC has developed into a mature and respected source of climate services and information. The purpose of the PCIC Strategic Plan 2015-2019 is to continue to solidify PCIC's role as the leading climate services delivery organization serving stakeholders in the Pacific and Yukon Region of Canada.

The PCIC Strategic Plan 2015-2019 describes the high-level service objectives that PCIC will meet during the period. We have also defined three strategic objectives that must be attained to support the successful delivery of the products and services described in this strategic plan.

The PCIC Strategic Plan 2015-2019 builds on the previous strategic plan prepared for the 2012-2016 period. While the current plan presents a five-year outlook for the development and delivery of PCIC's services, it is our intention to continue to revisit this plan at two year intervals so that PCIC can continually refine its short-term objectives while steering towards the evolving medium term priorities and needs of its users.

REGIONAL CLIMATE SERVICE CONTEXT

The service objectives and strategic goals defined within this strategic plan depend on the assumption that PCIC will continue to be able to operate in an environment similar to that which has prevailed since 2008. In particular, this includes continued stable funding, and continued involvement and support, including financial engagement, by major stakeholders. It also assumes that PCIC's ability to leverage resources through the engagement of others will continue at roughly current levels (the combined value, particularly of in-kind resources from stakeholders, is easily double the value of PCIC's core funding from the endowment and stakeholders who have made long-term commitments, notably BC Hydro). The ongoing financial support for PCIC's mandate by the University of Victoria and the renewal of the BC Hydro agreement are strong indications of continued stable funding.

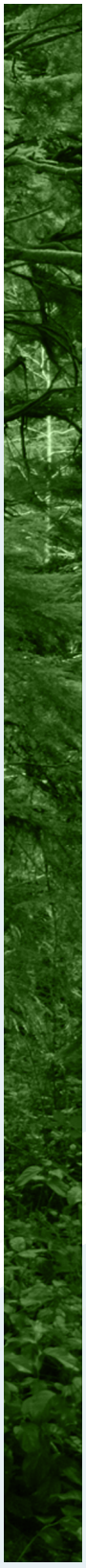
PCIC operates as part of a larger informal network of climate research organizations and climate information providers. This loose network is a source of important strategic partners for PCIC, and continued development of these collaborations through institutional and other arrangements is assumed in the drafting of this plan. Partnerships with research groups at BC universities, and invested stakeholders such as BC Hydro, BC ministries, Environment Canada and Natural Resources Canada, are all expected to continue. Nevertheless, it can be anticipated that these relationships will evolve substantially over time as funding opportunities and stakeholder objectives and priorities change. PCIC will be responsive to those changes, and will manage its resources so that it can flexibly balance the requirements for long-term professional engagement with a dynamic funding situation.

A further assumption underlying this plan is that PCIC will continue to enjoy the strong institutional support of UVic. UVic is an internationally respected centre of climate and ocean-focused research and an ideal location for a climate service centre such as PCIC. This plan assumes that UVic will continue to recognize the unique nature of PCIC as a service organization that undertakes knowledge transfer from the climate science community to regional users. PCIC in turn will strive to maintain a level of excellence and activity that enhances the university's reputation as an authoritative source of climate information for users within the region and more broadly.

Finally, this plan assumes that there will be a continued evolution of the climate service delivery system in Canada towards a three-tier system of federal, regional and private sector service delivery agents. It is assumed that the federal role will continue to evolve towards the provision of basic information to the public, internal federal service delivery between federal government departments in support of policy development and federal adaptation efforts, and high quality national-to-global scale information to regional service providers such as PCIC. It is further assumed that regional climate service providers such as PCIC will continue to undertake and further develop knowledge transfer between the producers of scientific information and regional users. Finally, it is assumed that the private sector will continue to provide and develop consulting services to help specific public and private sector users interpret and apply "off the shelf" technical material. These relationships are

expected to evolve along the same path while all the players continue to define their roles within the system.

In summary, this plan is founded on the assumptions that PCIC will continue to receive stable funding; maintain strategic partnerships; receive positive reception from UVic as our host institution, maintain managerial flexibility and be part of the evolution of the climate service delivery system in Canada. From our perspective, these are sound assumptions that support the successful realization of this plan.



IV. OUR SERVICE OBJECTIVES

PCIC is committed to the timely production and delivery of useful climate information, analysis and interpretation to regional stakeholders. We provide regionally focused climate services that are tailored to stakeholders within the Pacific and Yukon Region of Canada. Selected projects and activities serve to both strengthen PCIC's core capacity and to provide climate services to address user needs. PCIC works collaboratively with stakeholders, relying on the mutual exchange of information to provide and deliver applied, authoritative climate information.

Success over the five-year period defined in this plan will be measured against PCIC's ability to accomplish three service objectives. The objectives are to provide:

1. Analysis of the impacts of climate variability and change on regional climate and water resources.
2. Interpretation of regional climate information specific to user needs.
3. Climate observations and future climate projections specific to the PCIC study region.

PCIC will meet these service objectives by ensuring that users have access to a variety of tools and sources of climate information. Fulfilling Service Objective 1 will involve specialized regional analyses, including analysis of climate extremes, hydrological modelling and documenting uncertainty. Service Objective 2 anticipates direct interaction with users of climate information and involves the interpretation of future climate variability and change for specific user needs with the ultimate aim being the delivery of user-commissioned reports. Work towards Service Objective 3 reflects PCIC's commitment to deliver recent climate observations and future climate projections, providing baseline information for a variety of user needs. Note that although the service objectives remain unchanged from the 2012-2016 Strategic Plan, the objectives have been re-prioritized to reflect an emphasis towards analysis and interpretation of observations and model results.

The delivery of information under the three service objectives will involve a comprehensive approach that recognizes the complex and diverse user-base for climate information. Modes of delivery range from online tools to user-commissioned reports containing information that is sufficiently robust so that it can be acted upon by users.

MODES OF SERVICE DELIVERY

ONLINE TOOLS

PCIC online tools are designed for delivery of climate information and analysis to a wide range of stakeholders. The tools are accessible through the PCIC website and summarize information in PCIC's archives of climate change projections interactively through menu-driven user interfaces. Two tools provide access to future climate projections, serving different user-bases. The Regional Analysis Tool (www.pacificclimate.org/tools-and-data/regional-analysis-tool) serves the needs of sophisticated climate impacts and adaptation researchers, and Plan2Adapt (www.plan2adapt.ca) is a simplified tool designed for users that have less technical knowledge of climate science. PCIC will continue to update and improve these tools over the period covered by this plan.

PCIC DATA PORTAL

The PCIC Data Portal (www.pacificclimate.org/tools-and-data/data-portal) provides access to climate and hydrological data. The user interface includes map overlays that give a visual representation of the available climate data (see Figure 2 for an example). Once the region and variable of interest has been selected, flexible export options will allow the user to receive data in formats compatible with a range of analysis tools such as Google Earth, Excel, or Matlab. The data portal not only provides access to station data that are held in PCIC's archives, but it also provides access to PCIC's holdings of gridded downscaled climate change projections and both gridded and station-based hydrologic projections.

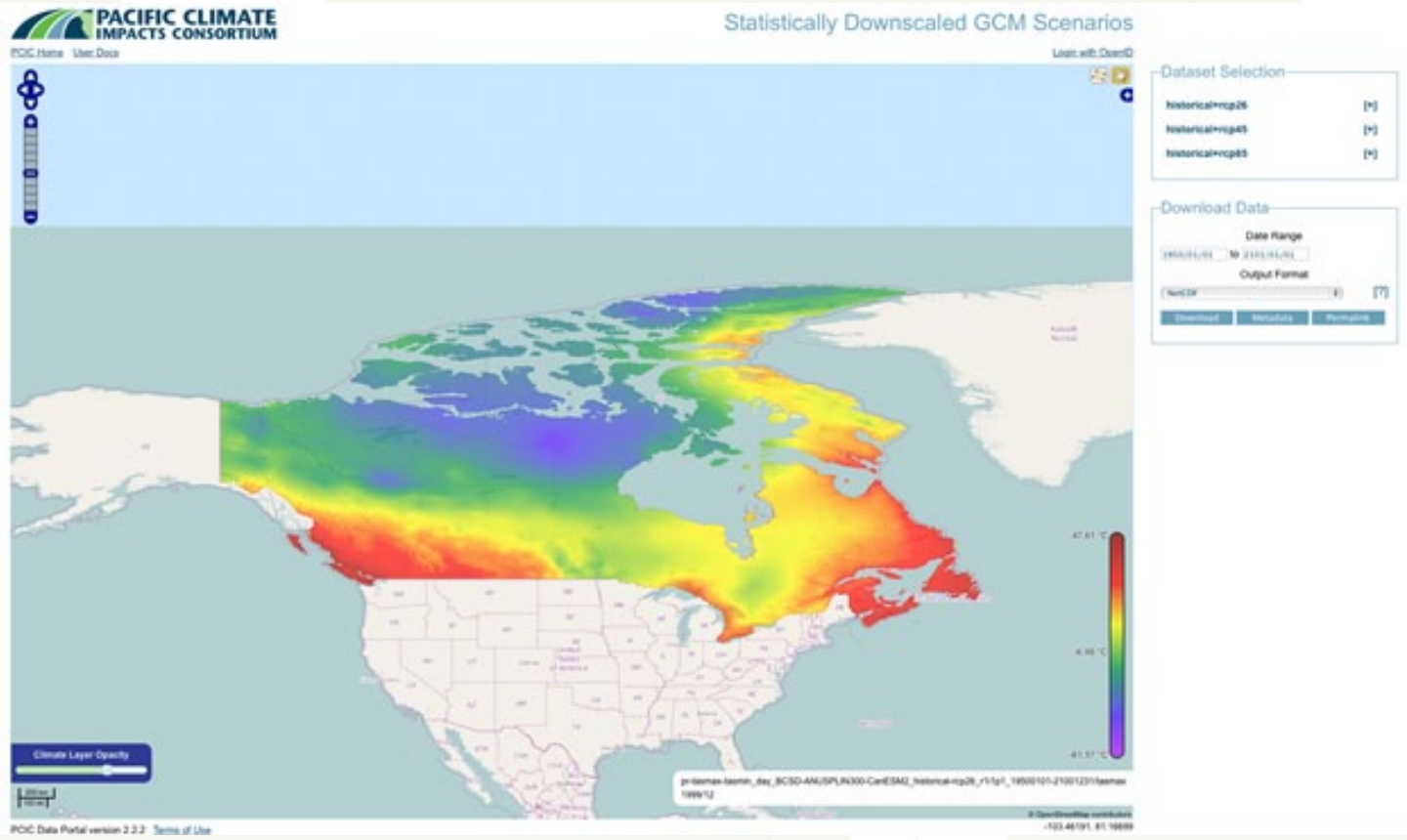


Figure 2: A screenshot of the PCIC Data Portal showing the Canada-wide domain of gridded statistically downscaled climate scenarios data.

ANALYSIS

PCIC will deliver the results of analyses of past, current and future change to users in a variety of ways, including:

a) User Commissioned Reports

User-specific reports are custom products that PCIC produces in response to a user's expressed needs (e.g. Figure 3). The reports are written in plain language to provide analysis and interpretation based on the user's business or sectorial context. In most cases these reports are published for public use.

b) Reports and Peer Reviewed Journal Papers

Publishing peer-reviewed articles that describe the results of the scientific work that underpins PCIC's climate services provides a means for the dissemination of scientific results to the greater scientific community. It also substantially increases the value of PCIC's climate services by demonstrating that its products are founded on scientific research and procedures that are well respected by PCIC's scientific peers. To meet the needs of users who are not climate specialists, PCIC will translate these findings for a user-audience in accessible formats such as summary documents.

c) Seasonal Climate Monitoring products

Products such as maps of seasonal climate anomalies and corresponding descriptive narratives that provide context for the maps will be delivered at regular intervals. They will provide analyses of the previous season's weather anomalies in the context of longer-term trends, including extreme events. These products will be of general interest since they will help the public and PCIC users understand the changing climate in which they live in the context of climate variability.

PLAIN LANGUAGE COMMUNICATIONS

PCIC is committed to keeping users up-to-date with our applied research and recent scientific developments relevant to the region's stakeholders in accessible formats. To this end, PCIC will produce quarterly newsletters, public presentations, webinars, science briefs, and continue to host an up-to-date website.

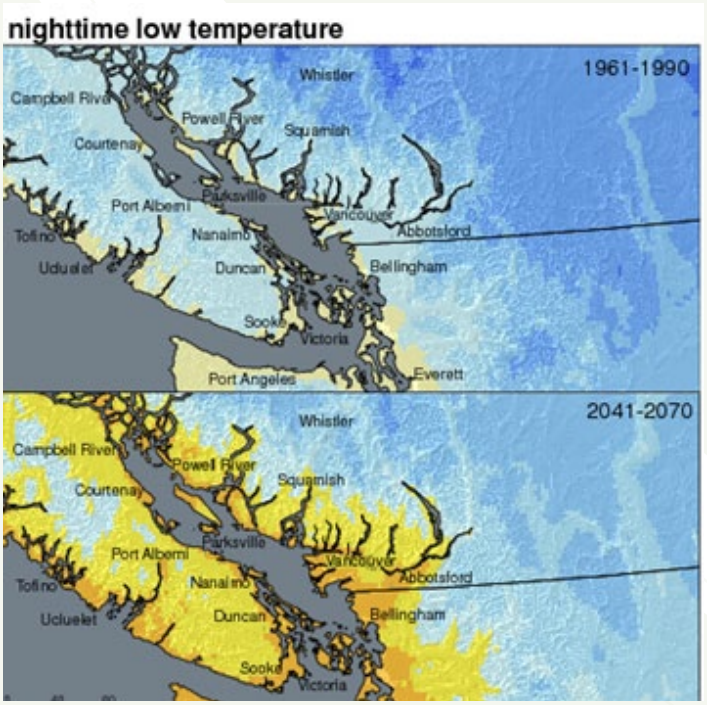


Figure 3: Example image from a user report commissioned to inform climate adaptation planning initiatives in the Georgia Basin region.

SERVICE OBJECTIVE 1

To provide analysis of the impacts of climate variability and change on the regional climate and water resources

REGIONAL ANALYSIS, SUMMARIZING THE REGIONAL CLIMATE'S RESPONSE TO CLIMATE CHANGE AND VARIABILITY

We will continue to document projected changes in climate, including variability and extremes, on a regional basis within the Pacific and Yukon Region of Canada. The analyses will include assessments of the uncertainty in the projections that arises from multiple sources in the downscaling process. We will also consider user-focused impacts of the projected changes, both physical and ecological where collaboration permits. The updated high resolution downscaled information will provide the basis for this work. By including analyses of climate extremes the relevance of the climate information to the user will be improved. PCIC will support decision making by providing this information in a usable form by documenting the uncertainties that affect the downscaled climate change projections.

Delivery Mode: Reports and peer review journal papers

PCIC climate scientists will produce peer reviewed reports and journal papers describing innovative and novel aspects of the work that is undertaken at PCIC in support of user needs. This will provide a scientific outlet for PCIC's work, and will assure users of the quality of the work that underlies the information that they receive from PCIC.

Delivery Mode: User commissioned reports

PCIC will produce climate summaries intended to help regional stakeholders in British Columbia plan for the continued effects of climate change on their regions. The reports will give an overview of each region and its historical climate, and discuss future climate projections for each region, along with impacts

HYDRO-CLIMATE PROJECTIONS, QUANTIFYING THE HYDROLOGIC IMPACTS OF CLIMATE CHANGE TO YEAR 2100

PCIC will deliver updated projections of hydrologic impacts due to anthropogenically induced climate change over the period 2020 to 2100 for the entire PCIC study region. These projections will exploit the new CMIP5 suite of global climate change projections that were recently produced by the climate modelling community, using new greenhouse gas emissions scenarios. Projections will be based on improved hydrologic modelling, with explicit modelling of potential glacier and ice-cap changes within the PCIC study region. Projections will explore potential changes in hydrologic variability, including changes to extreme phenomena (floods and droughts), and the underlying physical mechanisms affecting such changes (e.g., changes in the frequency of synoptic events controlling local or regional flooding).

Delivery Mode: Reports and Peer Review Journal Papers

PCIC hydrologists will produce reports and journal papers and subject them to external peer review as results are produced. This will provide a scientific outlet for PCIC's work, and will assure users of the quality of the work that underlies the information that they receive from PCIC.

Delivery Mode: The PCIC Data Portal

Users will be able to access hydrologic projection scenarios via the PCIC Data Portal.

EXTENDED HYDROLOGIC APPLICATIONS

PCIC will extend the updated hydro-climate projections, which focus exclusively on hydrologic changes, to address impacts on water properties, such as temperature, as a human and ecological resource. Specifically, the intent is to quantify possible impacts to water-related resources and water-dependent activities such as hydroelectric generation, municipal water supply, flood management, in-stream flow needs and fish habitat, irrigated agriculture, recreation and navigation. The objective is to place the hydrologic effects of climate change and variability within the context of other externally driven changes to hydrologic systems within PCIC's study area, including flow regulation and land-use change. Additional proposed research activities include a region-wide analysis of changes in hydrologic extremes, specifically changes in flood and meteorological, agricultural and hydrologic drought hazard, and a regional analysis of projected changes in water temperature.

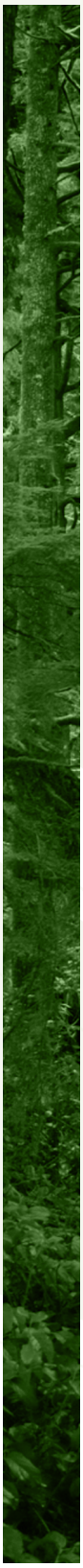
The scope of applied research pursued under this objective will be developed over time in response to partner and stakeholder needs and the availability of external expertise and resources, and will rely upon exploiting opportunistic research partnerships. Extended hydrologic application projects will be regionally prioritized based on stakeholder needs.

Delivery Mode: Reports and Peer Review Journal Papers

PCIC hydrologists will produce reports and journal papers and subject them to external peer review as results are produced.

Delivery Mode: User commissioned reports

Interpretation is best provided through dialogue and partnership. PCIC will continue to work directly with users to produce user-commissioned reports and summary information.



SERVICE OBJECTIVE 2

To provide interpretation of regional climate information specific to user needs

HELPING USERS ASSESS THE IMPACTS OF CLIMATE CHANGE AND VARIABILITY

PCIC will extend the services described in Service Objective 1 as required to meet the needs of specific users. Users from different sectors such as agriculture and mining may have different information needs and require different types of interpretation and presentation. By working with these users, PCIC can determine their specific needs and build on previous applied research to produce user-specific results. It is anticipated that PCIC will be continually engaged in user commissioned projects that will typically have a duration of less than one year. They will often involve custom analyses and the development of new capabilities such that they contribute to the overall improvement of PCIC's capabilities. These projects are generally user supported on an incremental cost basis, and will often include active user participation.

Delivery Mode: User commissioned reports

Interpretation is best provided through dialogue and partnership. PCIC will continue to work directly with users to produce user-commissioned reports and summary information.

MAINTAINING A TWO-WAY DIALOGUE WITH USERS

PCIC's service provision is user-motivated, meaning that we maintain a clear perspective on the users of our results throughout our planning, research and dissemination of findings. To properly serve users, we must know how regional climate information is used, what additional information is needed, and in what form it would be most useful. This is achieved by participating in user-led projects such as vulnerability and adaptation assessments as well as by maintaining two-way communication with the user community

Delivery Mode: Plain language communications

An important part of maintaining a dialogue is keeping users up-to-date on PCIC's applied research via plain language communications, including regular updates via the PCIC Newsletter, the production of regular plain language Science Briefs, and the production of plain language Summary Reports that synthesize PCIC's major achievements into short, easy to read, user oriented briefs.

Delivery Mode: Regular user consultation

We will continue the active engagement of users in PCIC's planning process through biannual theme-based user meetings, regular meetings of PCIC's Program Advisory Committee, an accessible and user-friendly web presence, and a welcoming, open-door attitude towards user questions and engagement.

SERVICE OBJECTIVE 3

To provide recent data and future climate projections specific to the PCIC study region

PROVIDING AUTHORITATIVE HISTORICAL CLIMATE DATA

PCIC will continue to update and maintain the Provincial Climate Data Set (PCDS), a database of weather and climate observations for the PCIC study area. With quality control and station homogenization efforts, improvement to the data will be an ongoing project. Where sufficient temporal coverage exists, the data will be used to calculate and periodically update station climate normals for as many locations in British Columbia as possible. The PCDS will be continuously updated in a near real-time fashion by the automated transfer of data from Environment Canada and CRMP contributors.

Delivery Mode: PCIC Data Portal

Public access to the PCDS will be maintained through the PCIC Data Portal. The available data are currently being provided on an "as-is" basis without quality control or homogenization. Users are provided with appropriate caveats warning of potential quality problems. Data quality and homogeneity will be assessed throughout the life of this strategic plan, with the objective of producing adjustments to the PCDS that will improve homogeneity and the suitability of the dataset for analyses of climate change and variability. All adjustments will be fully documented and an archive history of changes will be maintained to ensure that the original observations are not jeopardized in the adjustment process.

Delivery Mode: Seasonal Climate Reviews

The data from the PCDS, including data incorporated in real time, will be used to issue reports on weather anomalies from the preceding three-month period at intervals corresponding to the ends of three-month seasons. These reviews will include details on selected stations distributed throughout the eco-provinces of BC with maps of the distribution of anomalies in space. Station and regional descriptions will be accompanied by a description of atmospheric circulation and connections will be made between circulation and observed seasonal weather.

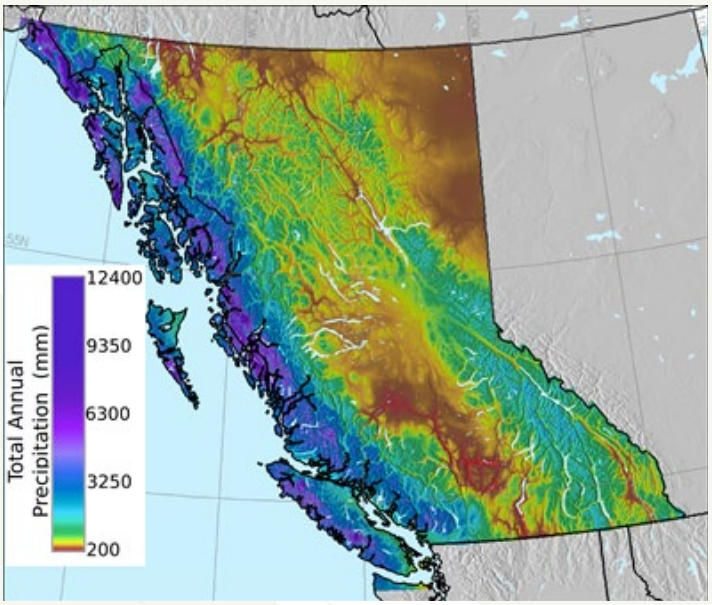


Figure 4: PRISM 1971-2000 precipitation climatology..

PROVIDING HIGH RESOLUTION CLIMATOLOGICAL MAPS

Using sophisticated spatial mapping techniques, we will produce updated high resolution climatological maps of maximum, minimum, and mean temperature and precipitation in British Columbia for the most recent 1981-2010 climate normal period (Figure 4 gives an example of 1971-2000 precipitation climatology). Work on this project will also involve the generation of time series of monthly maps. Initially, monthly time series of maps of temperature and precipitation variables will be generated for the period 1971 to present. Future work will explore production of monthly maps into the early and mid-twentieth century, and the possibility of eventually producing maps at a daily temporal resolution and mapping extremes.

The new climate maps, the monthly time series, and eventually time series of daily maps will be used for everything from driving hydrologic models to deriving basic almanac information about the province, to enhancing the seasonal climate review process.

Delivery Mode: The PCIC Data Portal

The PCIC Data Portal will play host to the updated climatological maps produced using the spatial interpolation methods. As an example, recently produced maps for the 1971-2000 climate normal period can be found at http://www.pacificclimate.org/data/high-resolution-prism-climatology. Available through a user-friendly interface, the user will be able to select data from his or her area of interest and have that data delivered in one of several widely used formats.

PROVIDING HIGH SPATIAL RESOLUTION CLIMATE CHANGE INFORMATION

High spatial resolution climate information is required fro many applications. PCIC will continue to improve the utility of future climate change projections through downscaling to higher resolution and a continuing focus on the ability of statistical downscaling to well represent extremes. Ongoing work will include delivering state-of-the-science projections at 10 km and 1/16 degree resolution for the 21st century primarily by the using state-of-the-art statistical downscaling. Statistically downscaled and available dynamically downscaled projections will be assessed to ensure their robustness. Statistically downscaled projections will be further improved by considering additional technical advances in statistical downscaling methods, such as synchronous (variables paired in time) transfer function-based approaches. PCIC will make use of dynamical downscaled results that are produced elsewhere as community projects, such as the Coordinated Regional Climate Downscaling Experiment (CORDEX) for North America. Updating PCIC's holdings of regionally downscaled information serves the needs of an extensive cross-section of users and provides the basis for PCIC to continue to conduct sophisticated analysis and interpretation.

Delivery Mode: Online Tools

A range of high-resolution downscaling results will continue to be delivered via PCIC's online tools.

Delivery Mode: The PCIC Data Portal

Users will be able to access downscaled climate change scenarios data produced via the PCIC Data Portal. Currently, a range of Canada-wide statistically downscaled climate scenarios at a gridded resolution of 10-km is available at http://www.pacificclimate.org/data/statistically-downscaled-climate-scenarios.

Delivery Mode: User Commissioned Reports

PCIC will provide regional climate information to users for use in specific regions, or applications to a particular sector.

V. OUR STRATEGIC OBJECTIVES

Achieving our service objectives requires a focused program that has three strategic objectives:

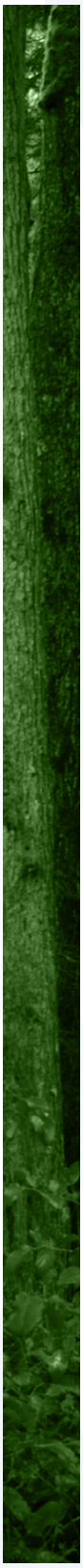
1. Build partnerships that enable service delivery and support our applied science program.
2. Ensure that PCIC has the scientific and information resources that are necessary to support its service delivery objectives.
3. Maintain operational and managerial excellence.

It is strategically important to build and maintain effective relationships with users and climate researchers in the course of developing and delivering regional climate services. This ensures that the services are as useful and relevant as possible, that they answer user needs, and that resources and effort are leveraged as effectively as possible. The activities in support of Strategic Objective 1 strengthen PCIC's strategic partnerships.

Structured around the three research themes at PCIC, our applied research program is the foundation for the successful delivery of regional climate services to our stakeholders and users and to the public. As such, Strategic Objective 2 will be realized through research activity under the three research plans (Regional Climate Impacts; Hydrologic Impacts; Climate Analysis and Monitoring) in partnership with our collaborators and stakeholders. Corresponding to our goal to revisit the strategic plan every two years, research objectives are defined on two and five-year time scales.

Achieving operational excellence, Strategic Objective 3, builds on the foundation of PCIC's successful organizational growth, maintaining the highest degree of professionalism and accountability regarding our financial accounts, operating procedures and human resources management.

The next section elucidates the strategy and activities in support of the three strategic objectives.



STRATEGIC OBJECTIVE 1

Build partnerships that enable service delivery and support our applied science program

PARTNER WITH USERS

PCIC 's research programs, projects and products are user motivated, meaning that we maintain a clear perspective on the users of our results throughout our planning, research and dissemination of findings. Over the next five-years (2015-2019), PCIC plans to maintain and improve its two-way dialogue with its user community. The results of this dialogue will be demonstrated in PCIC's products and communication materials.

Specific activities in support of this objective include:

- Foster user-partnerships: PCIC will continue to foster partnerships with its user and stakeholder community by attending sector specific events as speakers and participants, by responding to user requests; and by including the most active stakeholders on the PCIC Program Advisory Committee.
- Extend scientific publications: PCIC scientific publications convey the findings of major research projects and programs to a scientific audience. To meet the needs of users who do not have specialized climate science expertise, PCIC will translate these findings into a more accessible format for users.
- Continue to improve our website and online interfaces that allow users to access results and employ PCIC tools.
- Continue active consultation with users as part of PCIC's planning process.

LEVERAGE RESEARCH PARTNERSHIPS

PCIC is uniquely positioned to translate the results of academic climate research into information tailored to the needs of users. Its location at UVic, an internationally respected centre of climate-focused research, gives PCIC privileged access to leading edge climate science. PCIC undertakes innovative science when it is necessary to do so to meet user needs. This user-motivation provides scope to organize our research programs and core scientific staff. However, our research programs do not encompass all the work that contributes to the scientific basis that PCIC relies on to produce results. Thus maintaining strong collaborative relationships with researchers at UVic and with research institutions performing leading edge research allows PCIC to produce robust applied research results that meet contemporary standards.

Our relationships with leading climate research institutes provides PCIC the opportunity to engage academic research groups on collaborative research projects that expand PCIC's knowledge base, and provide it with access to new scientific data and results, and to state-of-the-art modelling results.

PCIC's current collaborative research arrangements include joint activity with UVic (Pacific Institute for Climate Solutions, School of Earth and Ocean Sciences, Department of Mathematics and Statistics, Department of Geography), Environment Canada units at UVic (the Canadian Centre for Climate Modelling and Analysis and the Water and Climate Impacts Research Centre), and in Toronto (the Climate Data Analysis Section), Ouranos, Oregon State University, the Provincial Ministries, and three Canadian research networks, the Canadian Sea Ice and Snow Evolution Network (CanSISE), the Canadian Network for Regional Climate and Weather Processes (CNRCWP), and the Marine Environmental Observation Prediction and Response Network (MEOPAR). These relationships include exchanges of expertise, data, climate model output, joint authorship on papers and reports, and in some cases, shared supervisory responsibilities for students and postdoctoral researchers.

STRATEGIC OBJECTIVE 2

Ensure that PCIC has the scientific and information resources that are necessary to support its service delivery objectives.

This objective will be realized by undertaking an applied climate science program that fulfills the goals of the PCIC research plans that have been developed to support its service objectives.

REGIONAL CLIMATE IMPACTS RESEARCH THEME

The Regional Climate Impacts research theme is focused on improving the application of future projections of climate change in order to document and understand its impacts on the PCIC study region. To accomplish this, we require a comprehensive foundation of climate information and downscaling capability that must be continually improved in step with the evolution of climate modelling and downscaling science. We also must continually improve our ability to interact with users in order to articulate their questions as clearly as possible from a climate change perspective and so that we can develop tractable, time efficient and easily understood solutions to user problems.

This work is facilitated by the knowledge and experience obtained through previous applied research projects and significant user interest in regional climate analysis results. Previous projects documenting and researching the performance of a range of statistical downscaling tools have provided PCIC with insights that allow for an informed choice of tools and improved characterization of uncertainty. As well, user interest in understanding projected changes to rare or extremely rare climate events is increasing as users develop plans for reducing the risks associated with the changing incidence and intensity of extreme climate and weather events.

Activity over the first two years (2015-2016) will focus on the analysis of regional extremes and the production of future scenarios of regional climate change impacts based on temperature, precipitation and related extremes. These activities will be based on a new source of CMIP5-based high spatial and temporal resolution statistically downscaled climate scenarios. Further development of the research program (2017-2019) will involve developing greater insight into the uncertainty of future climate scenarios, downscaling available regional climate model (RCM)-based projections, and the continued development and evaluation of downscaling methods. As always, the activities of the Regional Climate Impacts theme will remain responsive to user queries.

Research objectives

2-year research objectives (2015-2016):

- Extremes: extend the analysis of projected future climate change to include changes in the frequency and intensity of extreme events in our region.
- Impacts: extend the analysis of projected future change to include regional impacts relevant to ecosystems, resource management, infrastructure, and local government.

5-year research objectives (2017-2019):

Specific objectives are expected to evolve over the medium-term as PCIC explores and responds to the needs of users. Since many conversations with users indicate confusion about the various sources of uncertainty that affect climate projections. Thus a reasonable medium-term objective would be to seek opportunities for projects that would help to quantify, and thus demystify, the sources of uncertainty.

HYDROLOGIC IMPACTS RESEARCH THEME

The Hydrologic Impacts research activity will incorporate a spatial domain that includes all drainage areas encompassed by the Pacific and Yukon Region of Canada. It anticipates that there will be stakeholder requirements for information on multiple time scales, and it considers the need for information on extreme hydrologic events and water resource impacts. The first two years (2015-2016) of work will focus on generating hydrologic projections to year 2100 due to anthropogenic climate change using updated CMIP5 climate change projections and improved hydrologic modelling tools. Subsequent work over the longer-term (2017-2019) will focus on using the generated hydrologic projections to assess impacts on hydrologic extremes and the availability and quality of water resources. Such work would likely involve the extension of PCIC hydrologic modelling capabilities to include accurate representation of water temperature and groundwater as well as the ability to quantify the hydrologic effects of land management, water abstraction and flow regulation.

This work is facilitated by the previous PCIC hydrological modelling and analysis work completed in support of BC Hydro and the BC Government that included watersheds chosen for their importance to hydro-power generation. Future work will continue to consider these needs and the increasing needs of other sectors and stakeholders to understand changes to future hydro-climatic conditions in BC.

Research objectives

2-year research objectives (2015-2016):

- Long-term Projection: Complete CMIP5-based transient hydrologic projections over the PYR based on an ensemble of global climate models (GCMs) and emissions scenarios.

5-year research objectives (2017-2019):

Although specific objectives over the medium-term are expected to evolve in response to user needs, the following objectives are anticipated:

- Water temperature analysis: Quantify changes in water temperature for lakes and streams for defined sub-regions within the PYR study domain
- Regional analysis of hydrologic extremes: Quantify changes in flood and drought hazard
- Sectoral and ecological analysis of water resources impacts: Assess the impacts of hydrologic change on selected economic sectors and ecological functions

CLIMATE ANALYSIS AND MONITORING RESEARCH THEME

The Climate Analysis and Monitoring (CAM) theme at PCIC is focused on providing reference climate data to users and interpreting recent seasonal weather in light of climatology using climate data available for the province. To achieve this goal the CAM theme has set three objectives which are the continued development of the Provincial Climate Data Set (PCDS), high spatial resolution climate mapping and delivery of climate information.

Over the short-term CAM will focus on calculation of extreme indices on the station data, production of monthly PRISM time series maps of temperature and precipitation, and assessment of PRISM uncertainty. Analysis of seasonal weather and production of Seasonal Climate Reviews (SCRs) will accompany this work. Further development of the program (2017-2019) includes ongoing efforts to improve the PCDS (data homogenization and the completion of rigorous quality control), expansion of the SCRs, near real-time generation of monthly time-series maps, and a viability assessment of mapping daily weather variables and extremes.

This work is enabled by British Columbia's Climate Related Monitoring Program (CRMP) through a joint data sharing agreement between the province of British Columbia, Rio Tinto Alcan, BC Hydro, and PCIC. The CRMP agreement, which also has Environment Canada support, provides PCIC with station observations from more than 6,000 sites across the province of BC.

Research objectives

2-year research objectives (2015-2016)

- Seasonal Climate Reviews: Issue reports at three-month intervals analyzing the previous season's weather anomalies using data in the PCDS, PRISM maps, and publicly available atmospheric analyses.
- PRISM Time-series Mapping: Generation of a time series of 30 arc-second maps of temperature and precipitation in British Columbia on a monthly basis.

5-year research objectives (2017-2019)

- PCDS: Station data extensively quality controlled and metadata database developed
- PRISM Time-series Mapping: Near real-time production of monthly PRISM maps

STRATEGIC OBJECTIVE 3

As a not-for-profit corporation, PCIC is accountable to its Board of Directors, its stakeholders and the general public. We maintain a high degree of accountability in pursuit of operational excellence. Further, our success rests on maintaining a critical mass of scientific expertise in order to develop and maintain leading edge expertise in our research program areas. This means that recruitment and retention of exceptional personnel while recognizing the need to maintain operational and programmatic flexibility is a key component to achieving operational excellence.

PROMOTE STAFF PROFESSIONAL DEVELOPMENT

PCIC is dedicated to developing resident staff expertise. Through a commitment to professional development, PCIC provides our staff with the opportunity to build their professional expertise through challenging and stimulating work assignments, participation in coursework as appropriate to the needs of the position, and attendance of conferences and workshops.

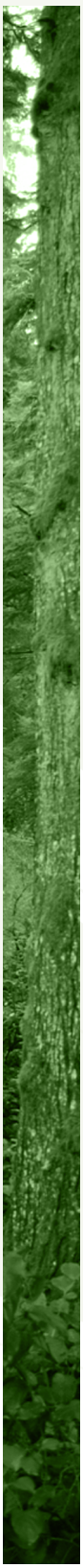
MAINTAIN A LONG-TERM BUDGETARY OUTLOOK

PCIC will maintain a 3-year budgetary outlook that provides context for all decisions it makes that have resource implications.

ADAPT AND RESPOND TO CHANGE

PCIC will continue to adapt and respond to external and internal changes that influence operational processes. It will maintain flexibility and agility by maintaining a balance between the long-term retention of key expertise and leadership, and the engagement of younger professionals who are developing career pathways in climate science and related areas. PCIC will continue to pursue accountability and transparency to the general public through the maintenance and refinement of corporate systems that adhere to accepted standards, such as the Public Service Accounting Board standards. Such systems include:

- Project management
- Financial management
- Quarterly progress reporting



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