Incorporating Climate Change Considerations in Environmental Assessment:

General Guidance for Practitioners

Prepared by
The Federal-Provincial-Territorial Committee on
Climate Change and Environmental Assessment

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above the obligations that will be imposed through the implementation of the general climate change policies. Likewise, the methodology described in this document for assessing potential climate change impacts should be recognized as an initial attempt to be tested and refined as new information becomes available.

Some proposed projects may not be covered by the obligations arising from the general policies. Inclusion of climate change mitigation considerations may be appropriate for those projects. For all projects, the assessment may include the consideration of the impact of climate change on projects, where the impacts may be significant, likely and applicable.

1.0 Context

The Earth's climate system has demonstrably changed on both global and regional scales over the past century. An increasing body of observations gives a collective picture of a warming world and other climate system changes. There is now new and stronger evidence that most of the warming observed over the past 50 years is attributable to human activities such as the burning of fossil fuels for industrial use, transportation, electricity generation and land clearing, which have resulted in increased atmospheric concentrations of greenhouse gases (GHGs).

EA is a comprehensive and systematic planning process designed to identify, analyze and evaluate the environmental effects of proposed projects and ensure that these considerations are factored into project decision making. This is an effective means for governments and project proponents to advance an agenda of sustainable development and environmental protection. Climate change described in this guidance document is one of several factors to be considered in EAs. Information collected through the EA process relating to GHG emissions and the impacts of climate change on a project can:

- help proponents manage or reduce the potential risk posed by the impacts of climate change to their projects and contribute to climate change action;
- provide assurance to the public that climate change implications are being appropriately considered in the assessment of proposed projects;
- provide environmental managers with information that will assist their broader climate change action; and
- help decision makers to address climate change implications in a risk management context.

Like other environmental considerations factored into the EA process, climate change parameters are not explicitly identified in Canadian EA legislation and there remains a lack of legally binding federal, provincial or territorial regulations or targets for GHG emission reductions. However, governments are developing policies and plans for managing GHG emissions, which, in the future, will provide thresholds or limits relevant to project EAs. For example, Alberta has established a target to cut emissions in the province relative to Gross Domestic Product by 50 % below 1990 levels by 2020. The federal government released the *Climate Change Plan for Canada* in November 2002, establishing that covenants will be used with large emitters for achieving GHG emissions reductions in industrial sectors (thermal electricity, oil and gas, and mining and manufacturing). When put in place by jurisdictions, and applied to entities and facilities, such covenants, targets and/or regulations, should constitute the mitigation required of practitioners subject to these provisions.

EA is an effective means to incorporate climate change considerations in project planning, yet challenges remain. The EA process cannot consider the bulk of GHG emitted from already existing developments. Furthermore, unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured.

Figure 2.1
Incorporating Climate Change Considerations in Environmental Assessments: Recommended Procedures

Environmental Assessment Process	GHG Considerations where a project may contribute to GHG emissions	Impacts Considerations where climate change may affect a project
1. Scoping	Preliminary scoping for GHG considerations	Preliminary scoping for impacts considerations
2. Data and Information Collection	If needed, identify GHG considerations: • industry profile • project specifics	If needed, identify impacts considerations: • regional climate and related environmental considerations • project sensitivity
3. Analysis of Environmental Effects	Assess GHG considerations: • direct and indirect emissions • effects on carbon sinks	Assess impacts considerations: • impact on project • risks to public and the environment
4. Identification of Mitigation Measures[1]	If needed, prepare GHG management plan: • jurisdictional considerations • project specifics, if appropriate	If needed, prepare impacts management plan: • project specifics • ongoing data clarification
5. Monitoring and Follow up	Monitoring, follow-up and adaptive management	Monitoring, follow-up and adaptive management

[1] Climate change related mitigation measures should be consistent with jurisdictional policies, plans and programs which may extend beyond the specific project subject to assessment, for example, the purchase of emission credits internationally. As such, the consideration of mitigation measures could accommodate policies that address emissions at a national or international level.

2.1 Greenhouse Gas Considerations: Where a Project May Contribute to GHG Emissions

The objective of this section is to help practitioners consider whether GHG emissions associated with a project are sufficient to be addressed in greater detail within the EA. This analysis can help decision makers identify, where applicable, the need for, and scope of practical measures to manage the project's GHG emissions, and where possible, link GHG prevention methods with air and water pollution reduction opportunities. This should reflect jurisdictional climate change policies and regulations, taking into account broader measures such as domestic and international emission credit trading and other initiatives. The analysis can also help decision makers consider other offsetting options or any large-scale effects that a project might have on carbon sinks. The consideration of GHG emissions in EA should be commensurate with the level of anticipated emissions from individual projects, and should reflect applicable policies and the specifics of each region and jurisdiction.

Recommended Procedures

The recommended procedures for addressing GHG considerations are as follows:

1. Preliminary Scoping for GHG Considerations
2. Identify GHG Considerations: jurisdictional considerations, industry profile and project specifics
3. Assess GHG Considerations: direct and indirect GHG emissions, and effects on carbon sinks
4. GHG Management Plans: jurisdictional considerations and project specifics
5. Monitoring, Follow-up and Adaptive Management: jurisdictional considerations and project specifics

Figure 2.2 illustrates the flow of procedures.

industry standards, jurisdictional climate change policies and profiles. In particular, if the project plan demonstrates that the project does not fit the industry or jurisdictional profile, it should be examined in greater detail to determine if it should be dealt with as a "medium" or "high" intensity emitter.

2.1.3 Assess Greenhouse Gas Considerations

If the identification of industry profile and project specifics suggests that the project is likely to have GHG emissions of medium or high intensity or volume, or if the project plan indicates that the project will exceed the industry profile for GHG emissions, or relevant jurisdictional policies or regulations, the practitioner should assess the emissions in more detail.

The practitioner should seek to describe the project's direct and indirect GHG emissions and related effects, including possible large-scale impacts on carbon 'sinks' (e.g. impact on forests, agricultural soils, landfills or wetlands) or large GHG emissions, which are the consequence of accidents or malfunctions. **Annex A** includes a worksheet (Table A.2) providing a checklist of potential questions that could assist practitioners at this step. How a project will or will not comply with jurisdictional climate change policies, plans or programs should be noted.

2.1.4 Greenhouse Gas Management Plans

If the project is likely to result in GHG emissions that depart from jurisdictional criteria, are greater than the industry profile, are of relatively medium or high intensity or volume and/or have adverse effects on large-scale carbon sinks, the practitioner should clarify how emission considerations are addressed through jurisdictional policies or regulations and, if necessary, how the project has incorporated emission reduction or offset measures.[2] This consideration may be evidenced by the incorporation and/or consideration of mitigation measures,[3] such as international emission credit trading, industry best practices, GHG management plans, compensatory measures, etc.

The practitioner should first confirm that management plans are consistent with any GHG management policies or regulations that jurisdiction(s) might have in place. Then, if necessary, project-specific efforts should be considered, such as monitoring emissions, with a view to modifying the project or introducing other new mitigation measures in

[2] If a sinks-based mechanism is included in the EA as a mitigation measure, the practitioner should assess the potential impacts of future climate change on the sink component separately from an assessment of the impacts of climate change on the physical project.

[3] **Mitigation measures** refer to measures to reduce the adverse environmental effects of a project (see Glossary), and include, but are not limited to the control or reduction of GHG emissions. Depending upon jurisdictional policies, mitigation measures may extend beyond the individual project being assessed, and Canada itself, as in international emission credit trading recognized under the *Climate Change Plan for Canada*. In this case, additional project-specific measures may not be necessary.

response to new information. The GHG management plan could also link to other air and water pollution reduction opportunities, as these may reinforce each other, and should happen concurrently.

Information concerning GHG management plans should be reported to public interest decision makers, such as regulatory authorities and relevant expert departments, providing a context for their decisions, consistent with the parameters set out earlier in this guidance document.

2.1.5 Monitoring, Follow-up and Adaptive Management

The need for monitoring and follow-up through the EA process will vary by jurisdiction, and may also depend on the nature of the broader GHG management system that each jurisdiction has in place. For example, federal monitoring and reporting standards are currently being developed consistent with Canada's *Climate Change Action Plan*. During this phase, the practitioner should verify the GHG emission forecasts used in the EA. This should be consistent with established jurisdictional procedures. The practitioner should also seek to determine the effectiveness of any emission reduction, offset or compensatory measures that have been implemented. Adaptive management may be an appropriate method of implementing any remedial actions identified during the follow-up program and/or incorporating "lessons learned" into normal procedures.

Moreover, climate change related knowledge, technology, policy and legislation are evolving. For projects with longer lifespans, it may be appropriate to consider these changes as part of the follow-up program.

2.2.1 Preliminary Scoping for Impacts Considerations

The objective of the preliminary scoping is to assist the EA practitioner in determining relatively quickly and as early in the process as possible, whether there are likely to be important climate change impacts on the project, the potential level of risk posed to the public or the environment, as well as the level of confidence that the scientific community places in readily available climate change projections relevant to the project (see **Annex B** for Sources of Information). Additionally, a rationale should be provided as to why or why not climate change impacts were considered in more detail within the EA.

Preliminary scoping should focus on general considerations rather than detailed, quantitative analysis, and can be undertaken as part of the scoping activities conducted in most EA processes. An examination of the potential impacts of climate change on key climate parameters is part of the thorough assessment of the interactions between the environment and the project. Projects may be affected by a change, over time, in climate parameters, or in the frequency and/or severity of extreme events.

The preliminary scoping identifies the key components of the project and whether these are sensitive to changes in climate and weather parameters. The practitioner assesses whether any of these parameters are projected to change over the duration of the project, and may pose a risk to the project, and consequently to the public or environment. For most projects of short to medium duration, impacts considerations will not require further analysis.

The practitioner should focus upon readily accessible information sources regarding changes to regional climate patterns[4], reports by the Intergovernmental Panel on Climate Change (IPCC), previous EAs of similar projects, regional EAs, local experience and traditional ecological knowledge (TEK). Confidence in the accuracy of climate models and climate change scenarios is higher at the continental level than at the local or regional levels. Due to the related uncertainty surrounding projections of future impacts, and the limitations inherent in existing data, judgment-based analytical tools (such as surveying regional/local experiences, expert opinion, TEK and employing a range of possible outcomes in the risk assessment) may be used when compiling climate change information.

For practitioners to describe and assess risks related to the project as well as possible under these circumstances, they will need to identify the level of confidence associated with the applicable climate change projections and the range of climate change impacts that may affect the project. As more scientific data is collected and climate change knowledge improves, it is hoped that the predictive power and confidence levels related to the climate change projections and risk assessments will be strengthened.

[4] i.e. http://adaptation.nrcan.gc.ca/posters/home-accueil_en.asp; or http://adaptation.nrcan.gc.ca/perspective_e.asp?CatID=13&PgID=25 which is written on a sectoral basis but includes more detailed regional considerations, and the Canadian Climate Impact Scenarios Project listed in **Annex B**.

If medium or high levels of sensitivity or risks to the public or environment are identified, the practitioner should proceed with the analysis outlined below. Most projects would not require additional assessment of impacts considerations.

2.2.2 Identify Impacts Considerations

The identification of impacts considerations should:

- identify the sensitivity of the project to variations in or changes to specific climate parameters (e.g. precipitation, wind, water levels, temperature, humidity, ice conditions, etc.) and identify the potential impacts that changes in such parameters may have on the project, including the possible impacts resulting from changes to multiple parameters; and

- review available information on how regional climate change may affect these parameters to which the project is sensitive and on the level of confidence of the information and forecasts.

Table A.3 in **Annex A** provides a matrix that may be useful in identifying climate parameters that are important to any phase of a project's life cycle, from construction to decommissioning, or any of its key components.

A project may be sensitive to the impacts of climate change if any of its components or any of its life cycle stages:

- could be easily affected by or are dependent on specific climate parameters; and/or

- could be at risk if subject to long-term climate parameter patterns that differ from historical norms.

If the project is identified as sensitive to one or more climate parameters, the practitioner should conduct further analysis and consider the range of possible climate change scenarios and determine the confidence level associated with the data. **Annex B** contains links to various information sources that might be of use to practitioners.

An important aspect is the timing of the project. Climate change parameters will not change appreciably for projects of short duration. Therefore, projects that are likely to be completed and decommissioned within a few years time are unlikely to be sensitive to longer-term climate change effects, although they could be sensitive to variations in or changes to climate variables including the frequency and/or severity of extreme weather events.

The practitioner should identify the potential magnitude and likelihood of changes in the climate parameters over the life of the project (e.g., high, medium or low likelihood).

Figure 2.4
Possible Cases Determined from the Preliminary Examination of the Data and Risks to the Public or Environment from Climate Change Impacts on a Project

	High risk • of impacts to the public or the environment	**Low risk** • of impacts to the public or the environment
High Confidence Level • of the project's sensitivity to a climate change parameter	**Case One** • proceed with risk assessment outlined in guidance document • implement appropriate monitoring, follow-up and adaptive management measures	**Case Two** • proponent should be provided with all relevant climate change information • report in EA • no further action required
Low Confidence Level • of the project's sensitivity to a climate change parameter	**Case Three** • proceed with risk assessment outlined in guidance document • emphasize the uncertainty inherent in climate change data • implement appropriate monitoring, follow-up and adaptive management measures	**Case Four** • no further action required • report in EA

2.2.4 Impacts Management Plan

For any probable outcomes indicating sufficient risks to the project, the practitioner and proponent should consider how the risk may be managed or avoided. Where possible, the practitioner should advocate the most efficient and effective design or mitigation measures. This step may be undertaken at the same time as the consideration of mitigation measures and the determination of significance in a typical EA, factoring in the uncertainty associated with climate change considerations. Additionally, jurisdictions have various options at their disposal such as lease or tenure renewals to facilitate mitigation measures.

Impacts management plans could include:

- the application of mitigation measures to reduce the project's vulnerability to changes in specific climate parameters (e.g., changes in project design and/or timing);
- implementing an adaptive management plan to reduce risks and adapt to future changes (e.g., collecting and evaluating data on key climate parameters over the lifetime of the project, with a view to modifying the project or introducing new mitigation measures in the future in response to new information);

- an attempt to reduce the uncertainty associated with readily accessible generic information sources by incorporating regional-scale information or results, if applicable; such as the *Canadian Climate Impacts Scenarios Project* as discussed in **Annex B**.

A key element when considering how risks may be managed is the extent to which the project or its components are flexible or adaptable to future circumstances. Some projects, such as bridges, are highly inflexible; it will be difficult to modify them in response to future changes in, for example, sea level, rainfall or streamflow patterns. Other projects, such as aquaculture farms or tourism projects may be more flexible and more easily modified to mitigate future impacts of climate change on a project.

The analysis should identify any risks that may not be managed or avoided (e.g., because there may not be any apparent mitigation measure or because the proponent decides to assume the risk), and any implications of proceeding with the project in the absence of a risk management measure.

It is essential in reporting possible impact considerations that the public and private sector risks are differentiated and that the practitioner does not recommend that public sector decision makers take responsibility or assume any liability for risks rightfully borne by the private sector. It should be noted that in cases where there are only private sector risks associated with the climate change impacts on the project, the private sector may simply wish to assume the risks and not undertake mitigation or adaptation measures.

2.2.5 Monitoring, Follow-up and Adaptive Management

During the monitoring, follow-up and adaptive management phase, the responsible federal, provincial or territorial authority may monitor the status of the project and the effectiveness of the mitigation measures that have been implemented. An adaptive management process may be employed by the proponent to implement any remedial actions identified as necessary during the follow-up program, as well as incorporate any new lessons learned into normal procedures. The adaptive management plan would also be implemented during the follow-up phase. Adaptive management can serve as an important learning tool for climate change action, as uncertainty about vulnerabilities and risks can be reduced by experience only if that experience is identified and passed on (to others) to benefit other projects.

Moreover, project and climate change related knowledge, technology, policy and legislation are evolving. For projects of longer lifelines, it may be appropriate to consider these changes as part of the follow-up program.

- land, water and air, including all layers of the atmosphere; and
- all organic and inorganic matter and living organisms.

Environmental Assessment – a systematic process of identifying, predicting, evaluating and mitigating the broad environmental effects of proposed undertakings before irrevocable decisions are made.

Environmental Assessment Practitioner – see **Practitioner**

Framework Convention on Climate Change (FCCC) – the agreement signed by 154 countries, including Canada, at the Earth Summit in 1992, under which climate change is monitored and addressed globally.

Greenhouse Gas (GHG) – gas that accumulates in the earth's atmosphere and traps heat, thus contributing to the greenhouse effect. The major GHGs responsible for causing climate change are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20). The Kyoto Protocol also addresses hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

GHG Emissions – releases of GHG, from either natural sources or from human activities, such as the burning of fossil fuels for electricity generation, industrial processes, or transportation.

Intergovernmental Panel on Climate Change (IPCC) – A body made up of the world's leading climate scientists, established in 1988 by the UN Environment Program and the World Meteorological Association to assess the scientific research on climate change and its environmental and economic impacts.

Jökulhlaup – A catastrophic release of water from a glacier. Jökulhlaups or outburst floods may originate from trapped water in cavities inside a glacier or at the margins of glaciers or from lakes that are dammed by flowing glaciers.

Mitigation Measures – measures to eliminate, reduce or control the adverse environmental effects of a project, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. Mitigation measures may extend beyond the individual project being assessed, and Canada itself, as in international emission credit trading recognized under the *Climate Change Plan for Canada*. In which case, additional project-specific measures may not be necessary.

Offsets – When a new technology is introduced or activity undertaken that reduces emissions or removes GHG from the atmosphere, a credit or "offset" could be created within an offset system. For example, if the mass planting of trees meets all the conditions for a project in an offset system, then the resulting measured, reported and verified carbon sink could be sold as offset credits.

Practitioner – A person involved in some aspect of the conduct or the direction of an environmental assessment. A practitioner could be a proponent, a representative of the government or have some other affiliation. This guidance does not distinguish between government and proponent roles in environmental assessments because those roles vary under different environmental assessment regimes.

Project – An undertaking in relation to a physical work, such as any proposed construction, operation, modification, decommissioning, or abandonment, or any physical activity not relating to a physical work that is listed in the *Inclusion List Regulations* under the *Canadian Environmental Assessment Act*.

Sensitivity – The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.

Sinks (Carbon Sinks) – any activity, process or mechanism that removes a GHG from the atmosphere, such as oceans, forests, soils and wetlands. Human activities can either enhance sinks (i.e. help to store additional carbon) or release existing stored carbon (e.g., deforestation). Activities that protect and enhance carbon storage can be supported as two aspects of an overall climate change strategy.

TEK (Traditional Ecological Knowledge) – is generally used to refer to a component of Aboriginal traditional knowledge about the environment (e.g., weather, geology, biology) and the use of the environment (e.g., hunting and gathering). It is governed by community beliefs and values, and thus TEK is an integral part of a community's social, cultural, and spiritual framework. TEK is held by a community, although different segments of a community may hold different types of TEK. It is living knowledge. TEK is added to, and subtracted from, and therefore changes over time.

VEC (Valued Ecosystem Component) – Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern.

Proposed Worksheets – Impacts Considerations

Table A.3 can be used to identify project sensitivity to changes in specific climate and related environmental parameters. EA practitioners could rank the project's sensitivity to changes or variations in climate parameters on a scale of nil/low/medium/high, using the most relevant and readily available climate change information obtained during the preliminary scoping phase of the assessment. This table is meant to illustrate the types of sensitivities that a project might have, not to represent a complete or exhaustive list of all possible effects related to climate change. Proponents should also be aware of how changes in multiple components might interact and pose a risk to a project. Climate parameter-project component interfaces evaluated as being of medium or high risk should be assessed in more detail.

Table A.3
Ranking Project Sensitivities to Climate and Related Environmental Parameters
(rank: Nil, Low, Medium, High)

Climate Parameters	Typical Project Phases/Components						
	Construction	Large Structures	Linear Structures	Transportation and/or Energy Infrastructure	Raw Material Supply	Waste Disposal	Decommission-ing and Abandonment
Mean Temperature							
Frequency and/or Severity of Extreme Temperature							
Total Annual Rainfall							
Total Annual Snowfall							
Frequency and/or Severity of Precipitation Extremes (return periods)							
Sea level							
Lake Levels and Streamflows							
Soil Moisture and Ground Water							
Evaporation Rate							
Wind Velocity							
Frequency and Severity of Extreme Weather Events (other than temperature or precipitation)							
Arctic Sea Ice Extent							
Permafrost Extent/Levels							
Glacier Dammed Lake Failures (Jökulhlaup)							

literature. Six regional reports (B.C. and Yukon, Arctic, Prairies, Ontario, Quebec, and Atlantic), along with a series of reports on individual sectors and cross-cutting issues were released in 1997 and 1998. They are available at http://www.ec.gc.ca/climate/ccs. [Environment Canada is currently rebuilding its Web site]. The regional reports only are available at: http://www.carleton.ca/~tpatters/teaching/climatechange/canada/.

Climate Change Poster Series

Climate Change in Canada, a series of seven posters and related materials based on the Canada Country Study and depicting climate change impacts in regions across Canada, is available through the following Web site: http://www.adaptation.nrcan.gc.ca/posters/

Canadian National Assessment

Climate Change Impacts and Adaptation: a Canadian Perspective, is a review of Canadian impacts and adaptation research from 1997 to the present. The report builds on the *Canada Country Study*, and reflects a greater emphasis on review and assessment of existing literature. It provides information on various sectors, including water resources, agriculture, forestry, fisheries, coastal zone, and health, as well as general information on impacts and adaptation, advances in research techniques, and existing knowledge gaps. Sector-specific chapters are available at http://adaptation.nrcan.gc.ca/home2_e.asp?CaID=9&PgID=25. More comprehensive information on region-specific issues is expected to be released by 2006.

US National Assessment

The US *National Assessment of the Potential Consequences of Climate Variability and Change* – published in 2000 and 2001 – synthesizes, evaluates, and reports on current knowledge of the potential consequences of climate variability and change on the United States in the 21st century. It includes information about climate change impacts on 10 mega-regions, 19 regions, and five sectors: agriculture, water, health, forests, and coastal areas and marine resources. Much of this information, particularly in regions bordering on Canada, will be of value to Canadian practitioners. Both regional and sectoral reports are available from the main US National Assessment Web site, at: http://www.usgcrp.gov/usgcrp/nacc/default.htm.

B. Targeted Documents

Many other studies and reports describe climate change impacts on specific regions, bio-physical systems, or sectors in Canada. The following list, while incomplete, provides links to some of the most significant sources of such information.

Government of Canada – Natural Resources Canada

Natural Resources Canada hosts the main Government of Canada climate change impacts and adaptation Web site, at http://adaptation.nrcan.gc.ca/.

The Resource Centre portion of this Web site includes reports, fact sheets, presentations, papers, and links to other Web sites. The main link is http://adaptation.nrcan.gc.ca/resource_e.asp.

The Web site also includes links to projects funded under the federal *Climate Change Action Fund and Action Plan 2000*, by sector and by region, and links to related papers and resources http://adaptation.nrcan.gc.ca/home_e.asp?CaID=9&PgID=23. These projects include, for example, a study on the possible consequences of climate change along the Beaufort Coastlands (available at http://sts.gsc.nrcan.gc.ca/beaufort/), as well as critical information on permafrost and climate change (available at http://sts.gsc.nrcan.gc.ca/permafrost/climate.htm).

Government of Canada – Environment Canada

The main Environment Canada climate change Web site is http://www.ec.gc.ca/climate/ [the Environment Canada climate change site is currently under construction]

Adapting to Climate Change in the Toronto-Niagara Region: Towards an Integrated Understanding of Science, Impacts, and Responses (1999)

Adapting to Climate Change and Variability in the Great Lakes – St. Lawrence Basin (1998)

Climate Change and Canada's National Park System (1998)

Extreme Weather and Climate Change (1998)

Mackenzie Basin Impact Study: A regional study on the effect of climate change in Canada

Water Resources: Monitoring the effect of climate change on freshwater ecosystems

Canadian Climate Impacts and Adaptation Research Network (C-CIARN)

C-CIARN is a national network established and funded by Natural Resources Canada, which facilitates the generation of new climate change knowledge by bringing researchers together with decision makers from industry, governments, and non-governmental organizations. C-CIARN is comprised of six regional offices (British

Canadian Institute for Climate Studies

The Canadian Institute for Climate Studies (CICS) is a not-for-profit Canadian corporation established to further the understanding of the climate system, its variability and potential for change and the application of that understanding to decision making in both the public and private sectors. CICS hosts the Canadian Climate Impacts Scenarios Project (see below) and on a fee-for-service basis provides advice, consultation, analysis, interpretation and seasonal climate predictions to business, industry, government, and individuals whose decisions are climate sensitive. More information about CICS can be found at:
http://www.cics.uvic.ca/index.cgi?/About_Us/Canadian_Institute_for_Climate_Studies.

Canadian Climate Impacts and Adaptation Research Network

The Canadian Climate Impacts and Adaptation Research Network (C-CIARN) is a national network that facilitates the generation of new climate change knowledge by bringing researchers together with decision makers from industry, governments, and non-governmental organizations to address key issues. C-CIARN is comprised of six regional offices (British Columbia, Prairies, Ontario, Quebec, Atlantic and North) and seven sectoral offices (Health, Water Resources, Coastal Zone, Forest, Agriculture, Landscape Hazards and Fisheries), connecting researchers and stakeholders across the country. Individual C-CIARN offices may be able to identify resources and expertise for more detailed analysis of climate change impacts on specific projects. Further information about C-CIARN can be found at: http://www.c-ciarn.ca/.

Ouranos

Ouranos is a research consortium founded by seven departments of the Government of Québec, Hydro-Québec, and Environment Canada's Meteorological Service of Canada. It hosts the Quebec office of the C-CIARN network. Ouranos looks at climate change issues and adaptation at the regional level throughout North America, although its area of emphasis is Quebec. It focuses on the needs of a changing group of users, the most proactive of which are the members of the Consortium. Through sharing human and financial resources, Consortium members gain access to scientific knowledge essential to decision making and to adapting their activities to climate change. Ouranos is accessible at: http://www. ouranos.ca.

Centre de Ressources en Impacts et Adaptation au Climat et à ses Changements is a Ouranos partnership site whose activities include climate monitoring, climate change scenarios development and linkages with the Ouranos site for Impacts and Adaptation issues. CRIACC can be found at: http://criacc.qc.ca.

Science Assessment Integration Group (Environment Canada)

The Science Assessment Integration Group within the Meteorological Service of Canada provides expert advice on impacts, predictions and modeled projections of climate change. Its Web site includes special reports on climate model projections for Canada, climate change and extreme weather, frequently asked questions, as well as annual reviews of emerging international literature, including those on impacts, which update the information available from IPCC. For more information visit the group's Web site at: http://www.msc.ec.gc.ca/saib/climate/climat_e.cfm.

Adaptation and Impacts Research Group (Environment Canada)

The Adaptation and Impacts Research Group (AIRG) within the MSC was established to ensure that information is available to Canadians on the environmental, social and economic impacts caused by vulnerabilities to atmospheric change, variability and extremes, and on viable adaptive responses. AIRG research results can be used by Canadians (e.g., decision and policy makers within communities, organizations, the private sector, and government) to promote and facilitate adaptation to atmospheric change, variability and extremes and to assist in identifying the need for other response options (e.g., mitigation when impacts and/or adaptation response are deemed unacceptable or insufficient). The main AIRG link is: http://www.msc-smc.ec.gc.ca/airg/

Climate Change Action Fund/Action Plan 2000 (Government of Canada)

The Climate Change Action Fund (CCAF) was established in 1998 by the federal government to help Canada meet its commitments under the Kyoto Protocol to reduce GHG emissions. Through the CCAF, the Government of Canada has taken steps to engage governments, businesses, communities and individual Canadians to address climate change. Budget 2000 extended the CCAF for three more years to 2003-2004 at $50 million per year. The CCAF now has five components:

- Building for the Future
- International Policy and Related Activities
- Public Education and Outreach
- Science, Impacts and Adaptation
- Technology Early Action Measures (TEAM)

CCAF main Web site:
http://climatechange.gc.ca/english/actions/action_fund/index.shtml.

The Science, Impacts and Adaptation (SIA) component of the CCAF aims to advance knowledge of the magnitude, rate and regional distribution of climate change and its impact on Canada and the capacity of Canadians to adapt to climate change. It supports global- and regional-scale climate modeling for impact and adaptation needs, as well as the development and provision of climate scenarios for impacts and adaptation

Jurisdiction	Web-link
Federal Government	http://www.ceaa.gc.ca/
British Columbia	http://www.eao.gov.bc.ca/
Yukon	http://www.gov.yk.ca/depts/eco/dap/yeaa.html
Alberta	http://www3.gov.ab.ca/env/protenf/assessment/index.html
Saskatchewan	http://www.serm.gov.sk.ca/environment/assessment/
Manitoba	http://www.gov.mb.ca/conservation/envapprovals/publs/procbull.html
Northwest Territories	http://www.rwed.gov.nt.ca/
Mackenzie Valley EIRB	http://www.mveirb.nt.ca
Ontario	http://www.ene.gov.on.ca/envision/env_reg/ea/English/index.htm
Quebec	http://www.menv.gouv.qc.ca/programmes/eval_env
Nunavut	http://www.gov.nu.ca/sd.htm; http://www.polarnet.ca/nirb/
New Brunswick	http://www.gnb.ca/0009/0377/0002/index-e.html
Nova Scotia	www.gov.ns.ca/enla/ess/ea
Prince Edward Island	http://www.gov.pe.ca/infopei/Government/GovInfo/EnvironmentandLand/_Environmental_Impact_Assessment/
Newfoundland and Labrador	http://www.gov.nf.ca/env/Env/EA%202001/pages/index.htm

Annex C: Case Studies of Canadian Approaches

This Annex provides examples of projects where climate change considerations have been incorporated into the EA process, either at the federal or provincial levels. The Annex outlines how each of these project EAs addressed the general steps outlined in Section 2. These case studies seek to illustrate how climate change considerations were incorporated into the EA, and do not seek to assess either the effectiveness of the assessment or the project outcomes.

Brooks Power Plant and Coal Mine Project

In 2001, Fording Coal Limited proposed the development of a 1000 MW coal-fired power generating station and associated coal mine near Brooks, Alberta. This project required an environmental assessment under both federal and provincial legislation and a joint review was commenced under the 1999 *Canada-Alberta Agreement for Environmental Assessment Cooperation*, with Alberta assuming the lead.

Step 1: Preliminary Scoping for GHG Considerations/Identify GHG Considerations

Alberta considered the order of magnitude of anticipated emissions from this project, the nature of the project and emissions from similar activities before deciding to assess GHG emissions as part of the project's EA.

Step 2: Assess GHG Considerations

The terms of reference issued by Alberta for this project required the proponent to address the incremental loading of GHG to the atmosphere as a result of the project. The proponent was asked to identify the sources and quantities of GHG emissions associated with the project, as well as the intensity of GHG emissions per unit of energy produced. Other requirements included: comparing emissions intensity to industry and technology performance (i.e. best available technology); addressing risk management, and considering phased action for continuous improvement and timing. Relative to continuous improvement, the proponent was also asked to describe how flexibility was accounted for in the plant design and layout to accommodate potential modifications that may be required by any future change in standards, limits and guidelines. While relevant to long-term management of GHG, this part of the terms of reference related to future changes in standards for any parameters.

Step 3: GHG Management Plans

The terms of reference for this assessment asked the proponent to discuss the impact of the plant emissions and Fording's overall project and corporate GHG management plans, including plans for the use of offsets or other innovative approaches, with reference to the objectives set out in Alberta's *Strategy for Action on Climate Change* (1998) and relevant national initiatives (including the Voluntary Challenge and Registry program). The

with changing icing conditions, higher summer temperatures, elevated risk of fire and increased snowfall were also evaluated with regard to the transmission line.

Step 4: Impacts Management Plan

Mitigation measures were considered in the design of the project. For example, adjusting tensions in the transmission line were designed to accommodate a temperature rise. In addition, potential effects from increased snowpack and faster runoff were offset by protecting riparian zones, road and crossing designs. These mitigation measures are consistent with the level of certainty of available climate change forecasts, as well as the risk of project effects.

Diavik Diamond Mine Project

The Diavik Diamond Mine, located in the Northwest Territories, was assessed by federal comprehensive study in 1999. The assessment considered both the potential contribution of the project to climate change and the potential impact of climate change on the project.

Step 1: Preliminary Scoping for GHG and Impacts Considerations

Scoping for GHG considerations was done both by the proponent and by Environment Canada in the early stages of the assessment. Given the relative size of the potential emissions from the project from a regional perspective (approximately 9% of combined Yukon and NWT emissions), further consideration of emissions was given in the EA.

The identified sensitivities of the project to specific climate parameters were related to the structural integrity of the mine's kimberlite containment dam which relied extensively on permafrost in the initial project proposal.

Step 2: Identify and Assess GHG and Impacts Considerations

In its EA overview and environmental effects reports, the proponent identified specific sources of emissions of carbon dioxide, methane and nitrous oxide associated with the project.

The likelihood of changes in key climate parameters (i.e., permafrost) was considered through the use of general circulation models and thermal modeling. This modeling work was done by Environment Canada. These models predict significant warming at high latitudes, including the NWT, over the next century, with consequent potential impacts on the containment dam.

Step 3: GHG and Impacts Management Plan

Both Environment Canada and the Government of the Northwest Territories recommended measures to reduce emissions from the project, through energy efficiency and energy reduction measures, as well as the use of alternative energy sources. Diavik Diamonds Mine Inc. agreed to register with the Voluntary Challenge and Registry Program, as part of its commitment to reduce emissions of GHG, and also agreed to consider the use of wind power on site.

While no immediate concern for permafrost was identified, it was recommended that special attention be directed to the permeability and stability of containment dams, emergency spillway and rock cap proposed for closure. It was also recommended that Diavik rely on geomembrane structures, rather than frozen core dams. A number of design modifications were made to the project on the basis of this assessment.

Step 4: Monitoring, Follow-up and Adaptive Management

While general follow-up was suggested for the overall environmental effects of the project, no specific follow-up program was required for GHGs and climate change.