Perceptions of the leaders and professionals of Eeyou Istchee in regard to climate change and its effects on human health: Report on the consultations

Prepared by:

Miyupimaatisiwin aa uhchi pimipiyihtaakinuwich utih eeyou istchee
Direction de santé publique de la région des Terres cries de la Baie James
Conseil cri de la santé et des services sociaux de la Baie James

Conseil Cri de la santé et des services sociaux de la Baie James
Cree Board of Health and Social Services of James Bay

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Authors: Anne Foro
Laure Béziers
Elizabeth Robinson
Jill Elaine Torrie

Under the direction of: Jill Elaine Torrie
Assistant Director of Public Health
torrie.jill@ssss.gouv.qc.ca

Formatting and editing: Katya Petrov
katyapetrov@sympatico.ca

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Summary

The Cree have a long experience with their territory, known today as Eeyou Istchee. This territory had already been inhabited for over 5,000 years before being seen by Europeans for the first time, and archaeologists can demonstrate that the Cree and their ancestors have been there for at least 2,000 years.

This report presents the results of a consultation on Climate Change (CC) in the Cree territory of James Bay. It forms a component of the project: “Developing tools to address the social and health impacts of climate change (CC) in the ex-ante environmental assessment of projects in Cree territory.” The purpose of the consultation was to compile a portrait of perceptions on CC, in order to facilitate the development of relevant tools to be used in assessing the health impacts of projects from a Cree perspective.

The consultation process is a qualitative study using the semi-structured interview format and the gathering of documents. The data gathered from institutional players and members of the Cree community were analyzed using a qualitative approach.

Among the respondents, the results show an ontological consistency between their definition of health and their world view. Their perception of CC highlights an inherent uncertainty underlying the phenomenon's causes and effects. Using a pragmatic approach, they present the environmental and social and health effects of CC and of development projects (DP). The most frequently mentioned environmental effects are ice conditions, together with their associated transportation risks; weather changes, together with the inconveniences associated with temperature variations; the effects of scarcity or abundance of certain game or fauna, and the change in travel paths of certain species. From a health perspective, accidents occurring on the ice, occasionally resulting in deaths, are among the most worrisome effects. There is also concern about certain diseases, such as diabetes and obesity, which are thought to be linked to changes in lifestyle and dietary habits. In this regard, the consumption of traditional foods, which have become less and less available to communities, is a factor in maintaining good health, particularly when compared to processed foods, which are being consumed with increasing frequency. The contents of their statements also reveal a fear of losing their way of life in this transformation, which could be called the meaning and essence of Cree culture, or “Creeness.”

Lastly, the study shows that for the majority of local organizations, CC is not a formal component of their mandates.

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List of acronyms

AFN	Assembly of First Nations
AQEI	Quebec Association for Impact Assessment
CBHSSJB	Cree Board of Health and Social Services of James Bay
CC	Climate Change
CCAP	Climate Change Action Plan
COMEV	Evaluating Committee
CRA	Cree Regional Authority
DCS	Diploma of College Studies
DEP	Associate's Degree
DES	Quebec High School Diploma
DESS	Post-Graduate Diploma
DP	Development Project
DSP	Director of Public Health
GCC	Grand Council of the Crees
INSPQ	National Public Health Institute of Quebec
IPCC	Intergovernmental Panel on Climate Change
JBACE	James Bay Advisory Committee on the Environment
MDDEFP	Ministry of Sustainable Development, Environment, Wildlife and Parks
NOAA	National Oceanic and Atmospheric Administration
Ouranos	Consortium of Regional Climatology and Adaptation to Climate Change
UNFCCC	United Nations Framework Convention on Climate Change

...it is our belief that the construction of knowledge can benefit greatly from the experience that the communities have of the practical side of research. This is true in this case, as indicated by Girard et al. (2012): the Cree have a long experience with their territory, known today as Eeyou Istchee. This territory had already been inhabited for over 5,000 years before being seen by Europeans for the first time, and archaeologists can demonstrate that the Cree and their ancestors have been there for at least 2,000 years[1]

1. Introduction

In a recent article published in the New England Journal of Medicine, McMichael notes that in the view of many, we are living in the Anthropocene Era, as human activity, above all other geological and natural forces, has become the dominant force altering the "major components...of the great natural Earth system beyond boundaries considered to be safe for continued human and biologic well-being" (McMichael 2013: 1335) (free translation). Altered weather conditions as a result of human induced CC indicate how we will experience the interdependence of human and economic development, on the one hand, and the environment on the other. The impacts of these changes, which can already be observed, call for local and inter-regional action in order to come to a better understanding of the phenomenon of CC, and to limit its harmful effects as effectively as possible (Parry, Canziani et al. 2007).

It is against this background that the Public Health Department of the Cree Territory of James Bay has carried out consultations on local perceptions of CC and its impacts. This exploratory study is part of a greater project of the National Public Health Institute of Quebec (INSPQ) on CC in the context of DP in Eeyou Istchee, the Cree territory in the eastern part of James Bay. The goal of this larger project is to develop, first of all, tools that can assist Cree institutional staff who have concerns about the impact of CC on the economic and social life of the region, and, second, tools that can assist the individuals who have been called on to make long-term decisions on DP against this background of CC. More precisely, three types of tools will be developed: 1) a support tool for the analysis of the impact studies, intended for the CBHSSJB professionals involved in the impact assessments; 2) an advocacy tool for the CBHSSJB in order to assist them in their role of raising awareness among organizations so that these same organizations can incorporate CC and its health impacts into the various components/phases of their DP; 3) a tool to assist with the assessment of health effects, intended for the players involved in the environmental assessment process, enabling them to lead people to an understanding of CC as constituting a part:

"of a single syndrome, not a set of separate changes, that reflects the interrelated pressures, stresses, and tensions arising from an overly large world population, the pervasive and increasingly systemic environmental impact of many economic activities, urbanization, the spread of consumerism, and the widening gap between rich and poor, both within and between countries" (McMichael 2013: 1335) (free translation)

The INSPQ project is made up of three components. In the first of these, the university co-researchers conducted two reviews of the written materials, namely *a systematic review of the written materials on the approaches to health impact assessment and their appropriateness to the issue of CC in Cree territory*, as well as an *assessment of the impacts on human health in Cree*

[1] Girard R., Auger R., Collette V., Denton D., Labrèche Y., Perron N., 2012. "The Cree of Eeyou Istchee prior to the 17th century", in *History of Northern Quebec*. Quebec: Laval University Press, pp. 101-139.

territory that are associated with CC. The second component consisted of a consultation in the region with the individuals who participate in the decision-making process, or even with those who must live with the decisions resulting from the environmental impact assessment, so that they could provide their perceptions in this area. The third component will need to use the materials from the first two components in order to develop the range of tools presented above, which can assist the staff of Cree entities in taking the issue of CC into greater account in the context of DP.

As part of this large-scale project, the CBHSSJB was given the mandate to conduct consultations with the population. This consultation component of the INSPQ project was aimed at exploring the perceptions of public health professionals, decision-makers and regional and local leaders on CC within the framework of DP. The expected results should reflect the state of affairs at the institutional level. Three additional, immediate impacts were also identified. First, putting the issue of CC on the agenda of the Director of Public Health (DSP) can help to clarify the complexity and interdependence of the health issues of the region's population. Second, the project can create and strengthen the links among the entities of Eeyou Istchee so that they can work together on the issue of CC in connection with the development of industry and infrastructure. Third, the project can create institutional links between the public health specialists of Quebec, experts on issues of CC who work at Ouranos and the INSPQ, on the one hand, and the professionals of the CBHSSJB, the Cree Regional Authority (CRA), the Grand Council of the Crees (GCC), the Cree Trappers Association, and the James Bay Advisory Committee on the Environment (JBACE), on the other hand, to name only the most obvious, whose tasks include such CC issues.

2. Framework of the consultations

The impacts of CC are now an integral part of all of the health issues of the Eeyou Istchee population. In one sense, perhaps the greatest danger of CC in the region lies in the potential of such unpredictable disturbances to lead to a loss of confidence in the expertise that the Crees have of their territory. And yet, the institutions in the region still have not made a real and firm commitment in regard to the issue of CC. Indeed, since its participation in the Cree Trappers Association project,[2] and apart from some activities in connection with extreme weather events, the Public Health Department has had no programme or strategy to define its role where adaptations to CC are concerned, except for this current project. The Department's recent involvement in this issue stems from the fact that Quebec's expert on CC, Mr. Pierre Gosselin, is also the person responsible for the thematic programme of Health at Ouranos. Ouranos is the non-profit scientific consortium, with corporate members from universities, ministries and public services in Quebec and other provinces, that are concerned about adaptation to CC. In recent years, Ouranos has developed a set of reference materials related to the actual and potential impacts in Nunavik and Southern Quebec. On the other hand, very little information is available regarding the Mid North, approximately located between the 49th and 55th parallels of north latitude, even though this region is one of those expected to experience significant changes over the decades to come. In his role as a specialist in public health at the INSPQ, Pierre Gosselin has promoted a project aimed at improving current environmental assessments within the public health network, in order to address the potential impacts of CC in the context of industrial developments in the Mid North. He has thus laid the groundwork for a collaboration with Region 18.

Region 18, or the CBHSSJB, is part of the health and social services network of Quebec, and also the INSPQ. However, the main concern of the region's Public Health Department was not CC in a theoretical sense, but rather to have a strategy in place to deal with the environmental impact studies in a systematic way. With this in mind, in April 2011, the DSP requested the INSPQ's assistance in developing a Cree-centred approach to conducting the health impact studies. For its part, the INSPQ proposed that this project should be funded through the CCAP and a grant application to Ouranos. In view of these funding sources, the project's objective has focused on CC in the context of the environmental assessment, which was more closely aligned to Mr. Gosselin's interests. Against this background, the Public Health Department has developed a partnership with the CRA, which has made the following possible: 1) to keep the objective of these CC consultations in the context of DP; 2) to plan a project to develop a regional DP management strategy together with regional partners.

[2] The prior experience of CC within the region comes from the respondents' personal experiences with the nival regime and with ice and wind conditions, in addition to their involvement in the project on CC developed by the Cree Trappers Association between 2009 and 2011. This project of participatory research with three communities was conducted in partnership with the CRA, JBACE and the CBHSSJB, with funding provided by the Ministry of Aboriginal Affairs and Northern Development Canada. The goal of this project is to document the effects of CC, as well as adaptation practices, using a shared website (GeoPortal: http://www.creegeoportal.ca/), updated regularly with its members' experiences.

3. Scope

In Quebec, the environmental assessment, required under the Environmental Protection Act, is a legal provision to establish guidelines for the process of implementing DP, in order to minimize their negative effects and optimize their benefits. In a Cree context, the framework for implementing this provision is set out by the James Bay [and Northern Quebec] Agreement (MDDEFP 2002). The environmental assessment could cover the health impacts of DP, as well as those of CC that are associated with them. However, for the majority of the assessments, the influence of the policies, programmes and DP on human health in terms of physical or mental illness, incapacity or death has been taken into account in a limited fashion up to this point. It is all the more important to remove this limitation in the assessment given that the Cree world view falls within a holistic perspective, and that health, according to their point of view, is the result of the balance that exists between human beings and nature (André, Yonkeu et al. 2012; Lester-Smith 2012; Shirt, Lewis et al. 2012; Blue, Darou et al. 2002). In the view of First Nations, “any approach to health must have a holistic perspective” (APN 2006: 6).

Northern Quebec, which today is the site of several on-going and upcoming mining projects, is showing a renewed interest in the issue of impacts, not only environmental, but also the social and health impacts of the DP and CC that they can cause.

The literature tells us that the impacts of DP and of CC would be context-sensitive. In other words, these impacts would be shaped by a number of vulnerability factors, including the social, cultural and economic factors that define the living environments of individuals and their communities. In order to identify these contextual factors to broaden the scope of the tools that will be used to assess the health impacts in Cree territory, it proved necessary to gather the perceptions of key players on CC, as well as the procedures for addressing CC in the DP. More specifically, the consultation was aimed at:

- Exploring the perceived effects of CC and DP
- Exploring the players' views regarding their roles in CC and adaptation measures
- Identifying the practices and tools that take health and CC into account in environmental assessments

4. Literature review

This section reviews the key concepts, particularly that of CC and vulnerability. It then raises the issue of the effects of CC and adaptation, and finally, the role of Public Health in the area of CC.

4.1 The concept of climate change

4.1.1 The experts' outlook

In Flannery's view (2006: 19), there is an easily created confusion among the three terms frequently used to explain the phenomenon of CC, namely greenhouse gases, global warming and CC: "if we are to understand Climate Change, we need to come to grips with three important yet widely misunderstood terms. The terms are *greenhouse gases*, *global warming* and *climate change*." According to the author, greenhouse gases are a category of gases that can confine heat close to the Earth's surface. When they become more concentrated in the atmosphere, the surplus heat that they confine leads to global warming. This warming, in turn, exerts pressure on the Earth's climate system, which may lead to CC. The "weather" corresponds to the meteorological conditions that we experience every day. The climate is the sum of all weather conditions over a long period, for a given region or for the entire planet.

The Intergovernmental Panel on Climate Change (IPCC) defines CC as "any change in climate over time, whether it is due to natural variability or to human activities" (Parry, Canziani et al. 2007). Natural Resources Canada gives it the same definition (Bourque, Bruce et al. 2008).

According to the National Oceanic and Atmospheric Administration (NOAA 2011), "climate change is a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years [...] Climate change may be limited to a specific region, or may occur across the whole Earth" (free translation). In its definition of CC, the INSPQ uses the same terminology, which is in line with its perspective of the climate scenario. The measurements of greenhouse gas variations, the ozone layer, world temperature, wind speed, precipitation, etc. are then used to establish projections, thus providing the scientific basis for CC, its causes and its effects (Kondratyev and Varotsos 2000).

4.1.2 The understanding of communities

According to a study carried out by Bostrom et al. (1994), public opinion does not differentiate between weather and climate, or between weather and CC: the scientific definition of climate and CC is equated with that of the weather (meteorology), and the scientific definition of greenhouse gases is equated to that of pollution problems. Those involved in this study identified automobile use, industrial emissions and pollution as being the main causes of global warming. Accordingly, the proposed mitigation strategies were focused on pollution control, with no direct connection to carbon dioxide or energy use. The effects frequently attributed to CC were skin cancer and adverse effects in the area of agriculture (Bostrom, Morgan et al. 1994). In a survey on the perception of health risks of CC in Canada, Berry et al. (2011) report that the understanding of the impacts of CC, as well as of proactive actions, were relatively limited. This suggests that public opinion regards the risks of CC as being rather remote (Lowe, Brown et al. 2006; Berry, Clarke et al. 2011).

Hence, there is a difference in understanding between the experts and the communities in regard to CC, a difference that must be accounted for, both in the impact analysis of CC, as well as in the analysis of mitigation and adaptation strategies (Ding, Maibach et al 2011).

4.2 The incremental effects of climate change

The state of existing knowledge predicates that the CC already underway has affected both the natural environment (including ecosystems, water, snow and ice, food production, etc.) and human health (Bolin 1986; Anderson, Cunningham et al. 2004; Ahern, Kovats et al. 2005; Parry, Canziani et al. 2007). However, individuals and their natural living environments do not share the same level of vulnerability in relation to the effects of CC. Some individuals, given their personal characteristics or their living conditions, are more likely to be affected by the adverse effects of CC. This is the case for individuals who are already affected by poor health, the homeless, those with poor housing conditions, the elderly, and children (Kovats and Kristie 2006; Brown and Walker 2008). Poverty, increasing inequalities and weakened social networks are regarded as factors that tend to increase the vulnerability of individuals and communities to CC. Occasionally, it is the development conditions of the environment, such as population density (for example, the increased vulnerability of urban areas to heat waves), the fragility of exposed areas or the dependence on certain resources like electricity, water and natural resources (for example, in the case of the First Nations in Canada) that explain the differences in the populations' vulnerability (Ford, Berrang-Ford et al. 2010; Semenza 2011; MDDEFP 2012).

In the case of the natural environment, where forecasts call for droughts in some areas, other areas are more subject to heavy rains with risks of flooding or landslides, and yet others will experience a thawing event or violent winds and hurricanes (Parry, Canziani et al. 2007). CC could have some positive effects, such as an increase in productivity conditions for agriculture (Lemmen, Warren et al. 2004). According to Quebec's Ministry of the Environment, the foreseeable effects of CC essentially involve the distribution and abundance of animal and plant species, the health and safety of populations, the state of infrastructure and the development of certain economical activities, such as tourism (DesJarlais and Blondlot 2010).

4.3 Climate change and the issue of adaptation

4.3.1 The concept of vulnerability

Vulnerability is a concept closely linked with that of adaptation; it underscores the differences that exist in individuals and communities, both in terms of their levels of risk to the effects of CC, and in terms of the measures required to adjust to these effects.

Vulnerability is often defined as being a function of exposure, sensitivity and adaptive capacity (McCarthy, Canziani et al. 2001). It also identifies, whether in individuals or in groups, the range of characteristics and conditions that can influence their capacities to anticipate, cope with, resist and overcome the impact of an event (Wisner and Wisner 2004).

Taking a more general view, Parry et al. (2007: 6) define vulnerability as “the extent to which a system is sensitive to, that is, unable to cope with the adverse effects of CC. It is based on the nature, the size, the pace of change and the climate variation to which the system in question is exposed, on this system's sensitivity and on its adaptive capacity.” Sensitivity refers to the degree to which the system is positively or negatively affected by climate variability or by CC.

4.3.2 The concept of adaptation

Adaptation is generally defined as the process of adjusting to a particular set of circumstances. According to McCathy et al. (2001), it is the entire range of measures to make adjustments in practices, processes and structures, in order to allow for changes in climatic conditions.

The IPCC's definition sets out the objective of adaptation to CC, which is to reduce the negative impacts and amplify the positive ones: “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (Parry, Canziani et al. 2007: 6).

Moser and Ekstrom (2010: 22026) define adaptation as a process that involves “changes in social-ecological systems in response to actual and expected impacts of CC in the context of interacting non climatic changes” (free translation). In their view, adaptation strategies can range from short-term coping to longer-term, deeper transformations, and aim to meet more than CC goals alone. They may or may not succeed in moderating harm or exploiting beneficial opportunities.

4.3.3 Adaptive capacity

Adaptive capacity, according to Burton et al. (2002: 6), is “a system's capacity to adapt to climatic change, including climatic variability and extreme events, to reduce potential damage, to take advantage of opportunities or to cope with the consequences of climate change” (free translation).

Accordingly, on the basis of some considerations (resources, awareness and democratization), it is generally acknowledged that the developed countries are less vulnerable to CC (Ford and Berrang-Ford 2011) and better equipped to cope with its impacts through adaptation. However, a retrospective analysis of past climate crises (the heat wave in Europe, the drought in Australia, the threat posed to the Boreal Forest by the mountain pine beetle, and Hurricane Katrina) demonstrates that their management has not been entirely successful (Lagadec 2004; Parkins and MacKendrick 2007). This illustrates the challenges that remain in utilizing their adaptive capacity for practical measures on the ground.

This initial/intuitive view of adaptation to CC for developed countries can be explained by the influence of certain factors that are often not considered (Pielke, Prins et al. 2007). A first group of factors that could be identified as extra-local includes the disparities – sometimes considerable – that exist within such countries, and which determine access to resources for adaptation; this is true in the case of indigenous communities designated as “fourth world,” due to their poverty levels. In this respect, McLeman et al. (2011), and Ford et al. (2010) have documented the pressures that some small remote communities in Canada have to cope with. Although they possess a significant adaptive capacity, these communities must cope with physical pressures, such as inadequate resources, which can affect the implementation of adaptation strategies. Also thought to have a significant influence on the implementation of adaptation strategies are institutional weaknesses, the uneven utilization of technology, the social and health consequences of an aging population, and the policy issues involved in decision-making (Wolf 2011).

The second group of factors, which can be classified as local, accounts for the availability of specific information, long-term planning capacity and the consideration of socio-cultural factors underlying the implementation of adaptation processes. Some studies (O'Brien 2009; Wolf, Adger et al. 2010; Wolf 2011; Crate 2011 ; Adger, Barnett et al. 2012) underscore the importance of standards and a social network, of knowledge and behaviours, and of culture and values in the integration of adaptation strategies by communities. In Wolf's view (2011), adaptation is a social process that is based on the perceived risks of CC and on the individuals' sense of competence vis-à-vis the adaptation strategies that have been proposed (Bandura 1977; Ajzen 1991). This is illustrated by the results of a survey in the Manitoba region, which

showed that people had little incentive to carry out operations to adjust to and prepare for the risks of CC (Berry, Clarke et al. 2011). In a survey on public perceptions on CC in Portland and Houston, Semenza et al. (2008) also found that the individuals most willing to change their behaviour were those who had the greatest concerns about CC, the highly educated, young people and those from Portland. As regards the social network that is generally considered to be a protective factor, a study carried out by Wolf et al. (2010) showed that the social network had no direct bearing on the ability to protect the elderly against heat waves. To summarize, recent developments in the literature draw attention to the risks of a partial analysis of the capacity to adapt to CC in developed countries. This is a result of certain contextual factors that determine the conditions of vulnerability and the adaptive capacity of communities.

4.3.4 Adaptation to climate change and the role of organizations, particularly that of Public Health

4.3.4.1 Approaches

In order to cope with the effects of CC, two approaches are generally proposed: mitigation (or moderation) and adaptation. Mitigation aims at reducing greenhouse gas emissions, whereas the goal of adaptation is to increase the resilience of the natural and human system to current and future impacts of CC. In Füssel's view (2007: 1), “Mitigation has traditionally received much greater attention in the climate change community than adaptation, both scientifically and from a policy perspective.” The majority of the policies have thus centred on mitigation from the outset (Burton, Huq et al. 2002; IEA 2002). In Australia, for example, a policy of adaptation was implemented in 2004. In Great Britain, there was an emphasis on adaptation at the end of the 1990's (Smith, Thomsen et al. 2011). In Canada, Dickinson and Burton (2011) present adaptation to CC as a patchwork of provincial and territorial initiatives following the United Nations Framework Convention on Climate Change (UNFCCC). As for the province of Quebec, the Climate Change Action Plan (CCAP), while placing emphasis on mitigation measures, also includes adaptation components, including the implementation of Ouranos in 2001 (an organization whose mission is to encourage the development of knowledge in the analysis of the impacts and adaptation to CC) as well as the governmental adaptation strategy of CCAP 2013-2020 (MDDEFP 2012). At the global level, over the last five years, there has been a growing recognition of the complementarity of the two approaches (Klein, Huq et al. 2007; Parry, Canziani et al. 2007; Pielke, Prins et al. 2007; Costello, Abbas et al. 2009). As underscored by Ford and Berrang-Ford (2011: 4), mitigation is insufficient and, what is certain is that “adaptation is unavoidable if we are to reduce the risks of significant damage.” Burton claims (2002; 2011) that this policy and research thrust towards adaptation is being pushed by developing countries in their negotiations to absorb the costs of adapting to CC.

Two approaches to CC adaptation are generally recognized: reactive adaptation, also known as autonomous or spontaneous adaptation, and planned adaptation. According to several authors, reactive adaptation is triggered by a change in the natural and human systems. Planned adaptation, however, is a conscious decision, the goal of which is to take action to counteract the expected impacts of CC before they occur (Burton, Huq et al. 2002; Füssel 2007; Parry, Canziani et al. 2007). Characterized by spontaneity, reactive adaptation is often the result of individual, local initiatives to cope with climatic events, whereas planned adaptation often relies on the implementation of public policies.

Planned adaptation to CC is a decision-making process based on the forecast of the climate's potential changes and on a rigorous assessment of the effects of CC, of vulnerability (potential

repercussions for the environment, health, the social system, etc.) and of adaptive capacities (Burton, Huq et al. 2002). It also includes a range of measures, from a general adjustment of the health system to the development of specific interventions for case management during a climatic emergency. General adaptation measures that have been recommended for the health impacts of CC can be grouped into 3 categories (Ebi and Schmier 2005; Kovats and Kristie 2006; Füssel 2008; Ogden, Sockett et al. 2011; Toronto 2011):

1. The implementation of an early warning system
2. The improvement of infrastructures for an adequate response
3. The implementation of an adequate monitoring system for current and extreme events

4.3.4.2 The Role of Public Health

CC is a process that affects many aspects of the social and environmental life of individuals and their communities. The health risks linked with slow or sudden climate variations account for recent efforts to integrate Public Health and its growing role in policies to adapt to CC (Ebi, Smith et al. 2005; Füssel 2008). Public Health intervention mainly consists in prevention, classically defined at 3 levels: primary, secondary and tertiary. Actions at the primary level are aimed at reducing exposure to risk factors, and it applies more to other development sectors (transportation, industry, environment, etc.). At this level, Public Health's contribution would be in terms of protection measures, as in the case of ultraviolet rays, for example. Secondary prevention (early responses to the first signs of an infection: for example, strengthening monitoring programmes and early interventions in emergencies) and tertiary prevention (reducing disabilities linked with the effects of CC: medical and surgical treatment and psychosocial support during climatic crises), however, coincide largely with adaptation strategies (Frumkin, Hess et al. 2008; Ebi 2009).

Semenza (2011) and Ebi and Semenza (2008) propose three entry points for adapting to CC within the area of Public Health: 1) the strengthening of social capital to increase the capacity of communities; 2) the improvement of the built environment; and 3) the development of community-based social services and emergency intervention plans. In a larger context, the development and implementation of adaptation policies and strategies, the treatment of patients in emergency situations, the monitoring of the sources of contamination, emerging infections and other health impacts of CC, as well as professional training and research in the area of adaptation, are elements that enter into Public Health's role in the management of CC and its impacts.

5. Methods: Data collection and analysis

This study seeks to compile a portrait of the perceptions on CC in the Cree territories of James Bay. With this aim in mind, we considered the qualitative research approach, which is based on a consultation process, as being the most appropriate (Berg 2001). The table below summarizes the key steps of the consultation process that led to the gathering of data from key players. This table is followed by a brief description of each of the steps.

Table I: Summary of the consultation process

Step	Institutional Players Involved	Results
1. Development of the tools	▪ INSPQ* ▪ CBHSSJB** ▪ University of Montreal ▪ Laval University	▪ Interview grid ▪ Individual sheet ▪ Consentf orm
2. Development of a collection plan 2.1 Identification of key players 2.2. Interview scheduling	▪ CBHSSJB	▪ Initial list of resource persons ▪ List with phased-in updates/completed list ▪ Appointment scheduling
3. Data collection	▪ CBHSSJB	32 registrations of individual and group (2 to 3 people) interviews
4. Transcription of interviews and validation	▪ CBHSSJB	Material consisting of 32 verbatim reports
5. Data analysis	▪ CBHSSJB	Consultation/research report

NB: *INSPQ: National Public Health Institute of Quebec
**CBHSSJB: Cree Board of Health and Social Services of James Bay

5.1 Data collection

▪ **Development of the data gathering tools**: The appropriation of the project by the various parties (Ouranos, INSPQ, CBHSSJB) has led to the implementation of a joint monitoring and coordinating committee. On the basis of the objectives agreed upon in the Memorandum of Understanding, the organization of a consultation process to be steered by the CBHSSJB was initiated. Several meetings via teleconferencing made it possible to finalize the consultation protocol and the initial interview grid proposed by the INSPQ. This is the tool, adapted over time that was used to conduct the consultations.

▪ **Development of a collection plan**: The CBHSSJB drew up a consultation plan based on the consultation protocol, which had already proposed the key players to be interviewed. In order to contact the people involved, several locations were selected, including the 9 Cree communities of James Bay (Mistissini, Nemaska, Waswanipi, Oujé-Bougamou, Waskaganish, Wemindji, Eastmain, Whapmagoostui, Chisasibi), Montreal and other forum locations (2013 Annual Conference of AQEI in Quebec). Contacting people individually made it possible to agree on the interview dates with each person involved.

▪ **Data** collection: Consistent with the qualitative research approach, two collection techniques were used, the main one being the semi-structured interview as part of a consultation process. Participants were identified according to two methods: purposeful collection and snowball

collection. In the first method, the initial respondents were identified on the basis of their knowledge of the terrain, that is to say, the institutional players best able to provide relevant information on the subject of CC (Berg 2001). Next, over the course of the first interviews, the respondents were asked to suggest new resource persons (Biernacki and Waldorf 1981). The interviews were mostly conducted face-to-face, using an open-ended question grid. However, for practical reasons, one interview took place by telephone. The majority of the respondents (25) were interviewed individually;furthermore 7 group interviews (6 interviews of 2 people and 1 interview of 3 people) took place. The length of the interview was approximately one hour, and in each case was preceded by an express consent to the interview and recording. Three main topics were discussed, namely CC (general knowledge, personal experience, impacts of CC and the role of their organization in addressing CC; adaptation (individual and community practices, the role of their organization) and DP (familiarity with the links between DP and CC, experience with impact assessments). The second collection technique consisted in collecting relevant documents from the interviewees: articles, research reports, website references, etc.

▪ **Transcription and validation of the interviews**: all of the interviews were entirely transcribed in English. Some of the interviews that had been conducted in Cree were translated into English for the transcription. In order to ensure the validity of the data, a follow-up of the transcribed interviews was organized with the interviewees. They then had the opportunity to remove or correct the contents of their statements, if necessary.

5.2 Data analysis

The corpus obtained by transcribing the interviews was examined utilizing a descriptive and analytical approach with QDA Miner software. A thematic analysis based on a mixed approach of coding was carried out (Miles and Huberman 2003). Based on an analysis plan in line with the interview grid and a re-reading of the transcripts, an initial list of codes was drawn up and discussed by three members of the CBHSSJB team, and then expanded during coding. These codes were then grouped into three large categories, namely, climate change: “CC,” adaptation: “Adapt”: and Development Projects: “DP.” In order to ensure a measure of objectivity in the coding, a test of the coding was conducted by a second member of the CBHSSJB team. Once the coding was completed, the examination and the linkage of the content of the various codes (extracts relating to a code) made it possible to interpret the corpus by drawing up suitable result headings.

5.3 Limitations and strengths of the process

The consultation relies primarily on the perceptions of key players. Such an approach is subject to the limitations of qualitative research, particularly the subjective understanding of reality and the conditional transferability of the results (Berg 2011). However, the subjectivity that is generally attributed to qualitative research is also one of its strengths. Indeed, the constructivist epistemology that underlies the qualitative approach makes it possible to go beyond the single vision of the researcher, and to co-construct knowledge that takes into account the experiences and values that underpin the perceptions and behaviours of the players (Berger and Luckmann 1986). This is what has made the detailed description of perceptions on CC possible in this case. The fact that the interview was partially directed made it possible to delve more deeply into the explanations and to have the opportunity to discover the causal relationships, whether local or procedural (Maxwell 2004). As regards the transferability of the results, it is determined by similarities to the targeted context, namely the Cree territory of James Bay. In this case,

however, this does not represent a limitation, since the aim of the consultation was to provide a detailed portrait of perceptions on CC in the specific context of James Bay.

6. Results

6.1 Profile of the respondents

In total, 40 people (Table II) were interviewed, 26 of whom were men and 14 were women. Grouped into 4 age categories, 50% of the respondents were between 30 and 59 years of age. They came from a variety of social structures, such as one of the nine communities of James Bay, the Cree Trappers Association, First Nations institutions, The Grand Council of the Crees (GCC), the Cree Regional Authority (CRA), other organizations such as the James Bay Advisory Committee on the Environment (JBACE), the Cree Board of Health and Social Services of James Bay (CBHSSJB) and Niskamoon. Two individuals from independent businesses were also consulted. 14 individuals, or 35% of the sample, held managerial positions (director, department head, manager or negotiator) or coordinating positions. The areas of experience were also diverse, whether they were the environment, project management (including impact assessment), negotiation of agreements, management of community organizations, health, and education and training, etc. The data on their place of residence showed that 85%, or the great majority of them, had some experience of life in Eeyou Istchee. More than half of the respondents, or 62%, report that they engage in traditional activities (hunting, fishing and trapping, among others), either regularly or on an occasional basis.

Table II: Profile of the respondents

Characteristics		Number of respondents
Interview Type	Face-to-face, individually (24) By telephone (1)	25
	Group (2-3 pers.)	7
	Total number of interviews	***32***
	Total number of respondents	***40***
Age Group	Group 1: 20-30	1
	Group 2: 31-45	6
	Group 3: 46-60	13
	Group 4: >61	20
	Total number of respondents	***40***
Gender	Female	14
	Male	26
	Total number of respondents	***40***
Organization	Community Members	14
	The Grand Council of the Crees (2) Cree Regional Authority - CRA (4)	6
	Niskamoon	2
	Cree Trappers Association	5
	Community of First Nations (employer)	6
	James Bay Advisory Committee on the Environment	2
	Cree Board of Health and Social Services of James Bay	3
	Other organizations: Consultancy Firms (1) and Law Firms (1)	2
	Total number of respondents	***40***
Position	Analyst	2
	Senior executive (unspecified position)	3
	Coordinator	5
	Advisor	1
	Director of an independent business	2
	Employee	4
	Manager/Leader	9
	Worker in the community/Personal activity	14
	Total number of respondents	***40***
Training	Additional skills	14
	Other training	5
	Bachelor's degree	5
	DEP – DEC – DES	10
	PhD (Doctor of Philosophy)	1
	Master's degree or DESS	5
	Total number of respondents	***40***
Living Environment	Eeyou Istchee	20
	Other cities	6
	Eeyou Istchee and other cities	14
	Total number of respondents	***40***
Traditional Activities	Very frequent	25
	Casual	8
	Never	7
	Total number of respondents	***40***

6.2 General knowledge and perceived effects of climate change

6.2.1 General knowledge

To describe their general understanding of CC, the majority of the respondents make reference to their personal experiences or to those of their community, as well as to the seasonal cycle; the points of reference are the temperature, ice conditions and seasonal activities. In the view of this respondent, the activities of his childhood are evidence that some changes have occurred:

> *"I see like the winters we have are no longer like the ones we used to have. And you look at the ice, I remember as a kid we could skate in December on the ice, and today it's snow, which means the ice is a lot more unstable"* (interview 11).

Another summarizes it in more general terms:

> *"Climate change in general, it's getting warmer […] we notice that the seasons are changing. The summers are hotter, the winters are warmer. The winters are shorter. Spring is here sooner, things like that"* (interview 18).

The exploration of general knowledge about CC also reveals that some respondents take into account the issue of uncertainty. In their reflections, they frequently mention the tension that exists between the need to anticipate and the uncertainty inherent to the effects of CC. They frequently raise the question of the extent to which the changes observed in the environment are attributable to the phenomenon of CC:

> *"It's very particular for James Bay Territory because there's climate change, but there's also impact from large development projects. So with the Hydro dams and reservoirs, well there's more inland water, so maybe this is something that influences the geese also to travel more inland"* (interview 10).

According to this other respondent, how did the change in the flight path of geese come about? Is it a natural cycle or the effects of CC:

> *"We don't know whether–we know that, you know, goose patterns change their cycle every hundred years. So, could it just be that they're just changing their patterns? Or is it because in the south they have more access to food and forage, because of climate change?"* (interview 2).

He states that it would be difficult for a scientist to convince him of the link between CC and the changing conditions of his environment:

> *"The weather has definitely changed. It's not as cold as it used to be. We never had winds at 150 km/hr but this year alone, this fall, we were measured 160. You know, where is this all coming from? Yes, I understand it's climate change, but I don't think there's any scientist that will be able to prove that to me"* (interview 13).

The former mentions the lack of evidence as regards the changes to eelgrass or sea kelp:

> *"Like eelgrass for example. But eelgrass isn't related to climate change. There is no proof that it has an effect, or was it related to hydroelectric […] What has been funded so far is that there is no direct link between the hydroelectric project because the disappearance of eelgrass is something that happens not only in James Bay but all over the east coast. They see the same… There was also the migration pattern of geese that have shifted. They are more inland than coastal. And is it related to climate change, we don't know"* (interview 8).

But his view contradicts that of other individuals, who, in line with expert opinion, consider this plant to be very sensitive to variations in water levels, levels that in the Cree context are seen as a result of hydroelectric projects.

As explained by these two respondents, the unpredictability of the changes could be a significant constraint on the implementation of certain adaptation strategies:

> *"Well I think the main challenge is the difficulty to know exactly what will happen with climate change. It's not clear exactly by how many degrees temperatures will rise. So I guess there's a little bit of a guessing game what kind of conditions will prevail, I suppose, in fifteen years, to adjust the project accordingly" (interview 10). "All their [mining companies] capacity built with some calculation with precipitation data we have now. We don't have certainty… it's still uncertain on what will be these precipitation in 40 years, but the design of these tailing plans and diminution plans are design according to accurate to the data we have now"* (interview 7).

6.2.2 Environmental effects

The environmental effects of CC mentioned by the respondents relate to weather conditions, to fauna (game and other hunting products: caribou, moose, etc; various bird species such as geese, gulls, ptarmigan, etc.; fish and other marine species: seals, whales, jellyfish, etc.; and various insects) and to flora (eelgrass, Labrador tea, willow, etc.).

Weather phenomena are illustrated by changes in temperatures and seasons. Several respondents believe that daily temperature variations have become more significant, and sometimes sudden. Winters seem shorter and summers seem warmer. As some of them explain, the weather is most unpredictable in the winter, and one never knows how long it will last, and is no longer able to assess the ice conditions by traditional methods that were used in the past (interviews 11, 17, 23). The interviews indicate that winter is the most critical season for Cree communities. Indeed, in their view, ice conditions are the strongest indicators of CC. All the respondents note the fact that the ice has become thinner – clear ice no longer exists[3], and generally speaking, ice tends to melt more quickly:

> "*The spring comes earlier, the snow doesn't harden, there's barely any ice, the streams don't freeze over*" (interviews 12, 16, 19, 31, 35).

As regards fauna, several respondents mention the changes in the migration travel path of certain species, particularly that of geese:

> "*Well what I've heard is, Crees will say for instance, that the travel routes of migratory birds like the geese, have changed. So that they're more inland now"* (interview 10).

Others, like caribou, are alleged to have become rarer:

> "*We certainly have seen the effects on caribou and I think that's what we need to know and I think we need to take that information and communicate it to the people and say 'look, moose are moving north, that means that the caribou migration may alter significantly"* (interview 3).

[3] Clear ice (known as "black ice" in Eeyou Istchee) is formed as a result of the basin water freezing over; it is denser (and therefore more solid and safer for travel) than ice known as "white" and formed from snow.

This is confirmed by other respondents:

> *"For the caribou, there's none around right now"* (interview 35).

CC could increase the vulnerability of some animals, making them easy prey for hunters. According to two respondents, moose have become more abundant, likely because the melting snow makes it impossible for them to rescue themselves, as they sink:

> *"Moose seems to be more around. The snow isn't as deep as it used to be so there's an abundance of moose. There are more animals since there isn't as much snow"* (interviews 13, 25, 35).

The changes observed in the flora are represented by the appearance of new species, the increased scarcity of some species, changes in colouration, etc. Eelgrass was among the species mentioned most frequently. Some claim that the increased scarcity of this plant is linked to the change in the flight path of geese, as it is their main food source:

> *"Now we don't have any more eelgrass, so the geese doesn't want to eat here, along the James Bay. Long ago, we had geese - full of geese along the bays. But before, there was eelgrass up to 6 feet, maybe 8 feet. It's very poor now. We don't get no geese now. Not like we use to have"* (interview 28).

6.2.3 Health effects

Definition of health: almost all of the respondents have a multi-dimensional view of health. They emphasize that health cannot be limited to its mere physical component, but also includes emotional and spiritual dimensions. Several aspects of life contribute to health, including diet, physical exercise, the quality of social relationships, the living environment and respect for nature. Some place stress on the fact that a balance among these various components is essential. In the view of the following respondent, an individual's health depends on the quality of his interpersonal relationships:

> *"Good relationship – it starts from appreciating one another and recognizing that we are all one […]. A healthy species needs healthy environment – clean air, clean water, healthy food, healthy plants, healthy trees, healthy rocks, everything […] With that, everything else just falls in place"* (interview 17).

According to this other respondent, being healthy means being able to harness one's physical, mental and emotional potentials:

> *"It [healthy] means living in a way that helps you expand your capabilities, physical and mental and emotional […]. I think that people need physical exercise […] life also has to be meaningful for people… It has a spiritual aspect to it"* (interview 6).

Lastly, this respondent defines health as "being alive and well":

> *"Being alive well means that you have to teach your children all the skills they need to survive in the bush […]. Living well at that time was you're being polite […] and people at the time were very active. And they always moved – they physically always moved… being alive well. You're okay mentally, spiritually, and physically"* (interview 16).

Direct effects: The inconvenience due to heat, respiratory disease, as well as the emergence of new germs are among the potential risks of CC mentioned by the respondents:

> *"Well I guess, health impacts are mainly the discomfort and respiratory illnesses that can come from very hot environments in the summer, or from frequent*

changes in temperature between the freezing and the thawing. So I guess you can have health impacts from that" (interviews 10, 12).

Some also raise the issue of cancer risks:

"And the sun is hitting your face for long – it's, like, three days, you know. And when you hear the news about skin cancer we're saying, are we going to get skin cancer too?" (interview 16).

Indirect effects: among the indirect effects of CC, the insecurity of travelling over the ice seems to be the area of greatest concern. This is undoubtedly due to the seriousness of the consequences, occasionally in the form of death. As explained by the respondents, such events, quite rare in the past, have become more frequent:

"Now it's [drowning] the norm instead of the exception. Before you'd have to go back about six or seven years before, like 10 years ago we had somebody drowned in a boat, but that was later in the season. But now they're falling through the ice where the ice is supposed to be strong" (interviews 5, 6, 18).

It should also be noted that the deaths that have occurred in recent years involved veteran hunters who had many years of experience with travelling over the ice:

"People who were known as traditional users of the land and who were very knowledgeable, are suddenly sometimes falling through the ice and dying" (interview 6).

The change in dietary habits, sometimes mentioned in connection with obesity and diabetes, is seen as an effect of CC on a determining factor of health. Indeed, some point to the fact that access to traditional foods has become more difficult, even though this food source, from their standpoint, is a factor in health and well-being. Respondents explain in these terms:

"Unfortunately, there is less traditional food for elders. Their diet is fish, meat, and so on – all the wild meats. So because of them not being able to eat their traditional food for various reasons, they seem to get to be more sick than staying healthy. And we have more diabetes and so on because of less exercise, and from the less of good, traditional food, because of change of diet. So diabetes problem is increasing in all the communities" (interviews 17, 22, 25, 26, 29, 36, 37).

Others state that they have observed a change in the taste of certain foods, especially game:

"When I was in the bush for 10 years, and continue eating the same animal, yeah, there's a change, especially the caribou. The caribou in the bush in my younger days was more flavour to it, you know. But now it's almost like, it doesn't have a flavour" (interview 16); "All the game animals and fish taste different. It seems as though they've changed" (interview 36, 37); "Another thing is the country food that we Cree people eat - the game. The taste has changed compared to way back. The taste of waterfowl has changed and doesn't taste the way it tasted in the past from what I remember [...] This is because of how the land and water are affected by what is being done" (interview 27).

There is disagreement in this regard, as some consider that the taste of such foods has not changed:

"Do you think the taste of moose is different in the past 5 years? No, the taste is the same" (interview 35).

Still others tell how the abnormal appearance of some animals or their internal organs, particularly the liver, is a sign of sick game, and thus unsuitable for consumption.

> *"One time I did kill a moose. The liver was really big, […]. One of my cousins, he went to pick it up, they call me on the cell phone and said, "JULIA, what are we going to do with your moose? ''The liver smells off'' […]. So I told him take the liver home, I'll see it once if I get there […]. When you cut it, the liver, there was a liquid coming. So that meat's no good. I did see often those kinds of things […]. It affect the animals too. I do remember in the past, 20 years ago, it wasn't like that […]. There's people killing the moose, […] it was strange […] you could see the white spots in the moose liver […]. They [guys, they were moose hunting] were telling me, if they kill a moose, if I wanted that moose. I said, "I'm not going to take that moose until I see the liver." I went there, I see that liver. I cut it in half. Liquid comes out and I said, "I'm not going to eat it"*
> (interviews 25, 26, 35).

The decline of traditional practices, such as hunting, due to the precarious ice conditions, was broached by some as being one of the factors promoting obesity and diabetes:

> *"Well one of the obvious ones [health impacts] for the Cree will be a change in the traditional practices they have and in the harvesting that they do with the land. That's one of the big changes that is going to occur for us, and that is occurring"* (interview 11).

In the same context, these respondents comment on the link that exists between CC and the development of these diseases within Cree communities:

> *"Well, right now the obesity's a problem. And it's not only in the adult, you see that in the youth. As I was saying those hockey players cannot reach their potential because of that. And it's all related to the changes in the climate, and people don't know how to prepare"* (interviews 17, 25, 26).

6.2.4 The interdependence of the environmental and human effects of climate change

Through the interviews, several respondents, particularly members of the community, or those with experience of life in the community, present the human effects of CC in connection with the environmental effects. This connection likely fits into their overall concept of the relationships that they establish between human life and nature. This is also linked with the main element that is mentioned in the definitions of health that were formulated:

> *"When the animal is affected, whether it's fish, it's also affecting the people who depend on that. So every step of the way has to be considered, you know. And it's not just how is the – you know, when you think about the northerners, you know, it's a little bit, I guess, ignorant to say, 'How does the climate change affect northerners?' you know. Just that, so you study them"* (interview 16).

As related by this respondent, his view of CC is in line with a holistic approach to the various components of nature:

> *"The rock has its own purpose, the waters […] If you don't respect the rock, you know, you're going to affect everything else around it – the waters, and the life. And you affect the plant life, you're affecting the life of the wildlife. And when you affect the wildlife you're affecting the humans, like us. So that's why you never – a Cree would never fully support any kind of development in the Cree territory"* (interview 17).

It should also be noted that the respondents have not only observed negative effects of CC. According to this respondent, the increase in temperature has made the growth of certain plants possible:

> *"If I look at back home, the difference that climate changes, that I see it, in that 15 years ago I would have never been able to plant fruit trees, whereas today I have cherry trees and apple trees and grapes growing. So, in that sense I can't say I'm disappointed"* (interview 11).

6.3 Development projects

6.3.1 The perceived relationships between development projects and climate change

The interviews clearly suggest that the majority of the respondents - both experts on environmental issues and members of the community - perceive links between the implementation of DP and a certain number of changes in their living environment. These changes relate to climate, as well as to the physical environment and lifestyles. This respondent makes this connection:

> *"I guess it's the process that started with industrialization in the 19th Century, and that's accelerated with the increase in population, and industrial activity late in the 20th Century. So I guess, now it's to the point where the emissions of gas and carbon dioxide in the atmosphere, is at a level where drastic reductions will be required from the businesses or also from citizens to try to – to counter global warming, in the long term"* (interview 10).

In this respondent's view, environmental pollution by industrial waste has been a threat to the Cree for the past several years:

> *"I think the Crees have been probably impacted for a long time by industrialization. I think one of the impacts was the heightened presence of mercury in the Cree environment. I don't know how far back that goes, but I expect that some of that mercury came from the 19th and early 20th century when–coal firing industry […] people who are wholly dependent or largely dependent on harvesting fish and other animals from the environment, are affected by these things perhaps more than people who are living in agricultural societies"* (interview 6).

According to these individuals from the Cree communities of James Bay, the changes occurring in their living environment are likely the result of certain DP:

> *"Ever since Hydro has existed, there have been so many effects. Things are disappearing. Too much chemicals in the water and killing the saltwater and too much mixing of the fresh water" (interview 28). "The places where there was never water, there's water there now. This is happening because of how the land was disturbed. An example being all the rivers that converge to the Chisasibi river, these are culminating into a greater effect" (interview 27). "And so we know that developments and prosperity have caused all this global warming – that's what I gather now"* (interview 16).

Some respondents refer to the links that are claimed to exist between DP and CC with some reservation, returning to the issue of uncertainty:

> *"Well I wouldn't say there's a direct link [between development projects and climate change], but obviously if you put all the development projects together,*

well then you can have a certain amount of greenhouse gas emissions. So it, if you have – the more that you have projects and the bigger they are, well of course we will produce more greenhouse gases" (interview 10).

6.3.2 The consequences of development projects

Many of the respondents see negative impacts in DP, particularly young people. Among the social and health impacts, there are hydrological changes, including variations in stream levels. These are perceived more as a direct consequence of DP than as a result of CC. Indeed, the declining river flows, in addition to the flooding of the inland areas, are often explained in connection with hydroelectric developments, which have led to stream flow diversions:

> *"But the more problem I see with development projects and climate change is we're putting in 300 or 400 people into an area where they have no idea what's going on with the surrounding water, and there's a big, a big hazard with the early seasons, the early end of seasons for them to go through the ice and drown"* (interview 18).
>
> *"The more money they make the worse off they are because they're used to subsiding on a small amount of funds and eating traditional food […] even the ones that are working and making good money, still it's a detriment to the health of their family because of the way they change their eating habits"* (interview 18).

Those are the terms used by one of the respondents in summarizing the social and health consequences of DP in Cree communities. Therefore, although the contribution of funding may foster a certain level of material comfort, it also entails negative spinoff effects in terms of changes in lifestyle and dietary habits, or the consumption of alcohol or drugs. As emphasized by several respondents, the physical activity that made traditional practices possible is severely reduced. Less certain of ice conditions, people go hunting by snowmobile less often, and use planes instead when they can afford to do so.

6.4 How do organizations incorporate climate change in their mandates?

In the view of the majority of the respondents, their knowledge of their organizations' mandates indicates that CC is not a major concern at this time. With the exception of some organizations, this means that such mandates do not include any formal statement explicitly providing that CC should be taken into account. The provisions related to the impact assessment of DP are rather seen as formalities that the sponsors must get through in order to implement their projects:

> *"There is nothing specifically about climate change. On the federal side though there is always the section about the effects of the environment on the project. So there is this section but it is not specific to climate change. It's not really about how the project will maybe influence weather patterns, it's more like about how weather patterns will affect the project" (interview 7). "They [proponents] will put out statistical data based on those weather stations which do exist in the region. And just simply present it. It's really not very useful at all. It's a formality the companies have to go through. They have to show they are aware of the climate data which is available and derived from weather stations. It's there but of marginal importance to the impact assessment process. So the quick answer is that climate change isn't really a factor at the moment"* (interview 5).

For this respondent, who has many years of experience with DP, this conclusion remains valid:

> *"When companies do their impact assessments, the climate, the impact on climate I don't think is a big consideration for projects related to extraction"* (interview 11).

Informally, however, some organizations provide support for the creation of awareness and recycling activities, or activities dealing with incidents linked to CC. This is the sense in which this respondent describes his involvement in an awareness activity on CC:

> *"I took the initiative to kind of bring awareness to the communities based on climate change and how we can do our small part. It first began with the James Bay Advisory Committee on the Environment. They did a report on climate change and how it affects the James Bay territory and what kind of changes could be seen…. So from that, with the CRA, I mean, we started to build you know, climate change awareness, global warming awareness"* (interview 2).

Another respondent describes his organization's contribution in addressing incidents linked to CC:

> *"One of our roles is the surveillance in the drinking water"* (interview 15).

The interviews indicate that organizations can also experience difficulty in identifying their role in CC. This would seem logical in the absence of a formal mandate for this aspect of intervention:

> *"So, you don't have any route for the moment for adapting to climate change? Not right now, we don't have anything other than the advertisements that we do during goose break about watching out for thin ice and to be sure to check the ice when you walk. But other than that, we don't do major things on climate change"* (interview 18).

According to the respondents, some provisions could help in taking more effective account of CC. They include in particular:

▪ Information and awareness of individuals and communities in regard to what CC is and what its potential risks are, and of the changes that are occurring in their hunting territories or other traditional activities (interview 17).

▪ The necessary support for them to adjust to the effects of CC:

> *"Do you have an idea how can climate change and health, can be taken into better consideration? Well I guess the ideal is to work on the adaptation"* (interviews 10, 12).

▪ The development of research on some dimensions of CC and adaptation:

> *"Some of the major episodes of starvation and death were related to these kinds of weather patterns. You're…about exceptional weather patterns, having and understanding that the frequency of weather systems which radicularly alter the structure of the implication for the survival of large mammals and put families in the bush at risk, that's relevant and that's the sort of thing that can be documented"* (interviews 5, 13, 18).

6.5 What tools are available to address climate change and development projects?

As regards the tools and supports that they use for their work on CC and DP, the respondents mention a variety of tools, among which are the following:

▪ Advocacy kits:

> *"Tools? Yeah we used the set of stuff from C.I.E.R., a whole file of stuff like on DIA on climate change that they provided us. So, there were three things. There was one set for classrooms for kids, one set for band councils, one set for, there was like four packages of stuff"* (interview 4).

▪ Analytical models of atmospheric gas cycles:

> *"Well, in my training for greenhouse gas auditing, there's definitely software out there for that. I use life cycle analysis software. So, simple algorithms for calculating equivalencies between one–carbon dioxide versus one methane versus one very strange floral ethane"* (interview 1).

▪ Documentation and websites:

> *"It's a single security site that we have. So everything about disasters: high winds, tornadoes, earthquakes. So you got the protocols too for each disaster" (interview 12) - "In this GeoPortal it was to consult the community"* (interview 15).

▪ Geographical maps:

> *"Did you have tools? Just a lot of maps, because they are very visual and we just kind of left the floor open to them to talk about anything they might have seen that was kind of off key on the land. So they had maps to do what they want on it and everything was mapped out and digitized"* (interview 2).

▪ An expert advisor:

> *"Well, we usually get somebody – an expert that understands a little bit more than the Crees or even the leadership. We always consult with our legal counsel, and our environmental group, which is DONALD" (interview 13) - "The tools are there. You don't have to invent them. So you have to use our elders. There are resources, you just have to know how to find them to help you in dealing with the climate change today"* (interview 17).

Two types of tools were proposed: guides and grids.

6.6 Adaptation to climate change

6.6.1 Are humans the only ones to undertake adaptation?

In the context of this consultation, consideration was given to human adaptation, but we have seen through the respondents' statements that they have also observed what could be called other forms of adaptation of "Living beings": the adaptation of both fauna and flora (change in colouration, appearance in a new environment). This is the case of geese, whose main food source appears to be diminishing. They are apparently adapting by consuming other foods:

> *"The grass that the geese eat, they no longer exist. Very very few. What do geese eat then? They eat everything - whatever they can find. They're on the hill, eating berries because their other source of food is gone"* (interview 28).

The changes in the behaviours of fauna also appear as a form of adaptation:

> *"Another thing we've noticed is the changes in behaviour of the animals. They've seems to have lost their wariness. This seems to be true for all game animals. There must be something affecting them. Long ago, if the caribou came across a trail, they would go very far away from it - same with the moose and the black bear. They had fear of the trail or road. Today, they don't fear it. Today, we see caribou on the highway and just pass them without them fleeing"* (interview 27).

In the same context, this respondent explains how certain species migrate in search of the conditions necessary for their survival:

> *"60 moose along the coastline – very unusual. [...]. Why is that? Hydro development is up here. Now what are you going to do when you're developing a new project? Where do you think all the animals and everything else is going to go? They have to find a new location. Same thing with migratory birds – you're cutting off the water resources in Hydro development, migratory birds no longer exist. They'll change pattern. They'll go where the water is"* (interview 13).

6.6.2 Local adaptation initiatives

Through the interviews, it was found that spontaneous initiatives for adaptation to CC already exist. This suggests that adjustment to the various effects of CC is clearly one of the essential needs of the community. According to one of the respondents, the interest of Cree communities lies in the development of sea ice research in order to adapt:

> *"Right now that's the biggest part of climate change is the ice conditions. The heat waves and stuff in the summer time can be, are easily dealt with for the moment, but it's more the ice conditions than the traditional knowledge that needs to be supplemented with more research and measurements. Because right now nobody's measuring what the ice is at any given time over the year. And I think this is something that needs to be done to be able to show how fast and how much it's moving so we are able to put up warnings and bulletins about the safety of the travel conditions"* (interview 18).

In the same context, this respondent states that the main problem is how to adapt to CC:

> *"I think quite frankly what my understanding of climate change is the fact that human activities have finally begun changing meteorological patterns in a significant way…So the issue is all about how adapted are we to deal with this change"* (interview 3).

Against this background, and because of the importance of traditional activities, like hunting, the Cree Trappers Association has made adapting to CC one of the main elements of its mandate:

> *"GeoPortal – that was meant for that, to address all of the impacts of climate change. Where we can post in the routes of safe journey routes, and places to avoid"* (interviews 14, 17).

Respondents also refer to recycling measures implemented in Wemindji:

> *"Well, actually, you know, we always spoke highly of Wemindji. They have their own recycling program. They did it with their own money. It wasn't funded by anybody. They took the initiative. So that's where we tried to share that experience, that Wemindji is, you know, had done something"* (interview 2).

In order to adapt to sea ice conditions, travelling is undertaken by plane, when necessary, rather than by snowmobile:

> *"I think before like when I was young, people started going out in March, but now it's like at the end of April or May. I guess it was because my father wanted to travel on the ice early and come back early because he used to bring us back here before there was any water on the ice. And now people take their time because they can't travel on the ice anymore, they travel by plane"* (interview 19).

6.6.3 Are the benefits of adaptation only perceived benefits?

It is worth noting that the respondents point out that spontaneous adaptation initiatives, including collective initiatives, are not necessarily the best ones:

> *"And then when everybody's going for the same adaptation, which may not be the best, they forgot there might be a better one. They just jump on the first one, you know. So there has to be some kind of a way to think about what is the best adaptation can we provide for the northerners while they're doing their own, you know – trapping methods, their hunting movements, you know"* (interview 16).

As explained by this respondent, they may not be safe:

> *"There's, yeah, with hunting there's new ways of hunting geese, but they're not always the safest, because a lot of people do it out of a boat, and that's not very, not as safe to be standing up shooting in a boat as if you're standing on the ice or on the ground"* (interview 18).

Beyond this risk of insecurity posed by adaptation strategies, there are other inconveniences, such as the cost of technologies, as well as the risks linked to their use. This is illustrated by the following comment:

> *"I guess you're going to adapt to it by having air conditioning in your home, you know. You're not hot […] And the question becomes, 'How does the air conditioning affect you?' You never had an air conditioning – exactly how is it going to affect you? And so each adaptation that you're trying to implant, it looks good, but it always comes back – how is that going to affect you? Or what is the side effects of trying to adapt, you know?"* (interview 16).

6.7 Some areas of concern

By taking advantage of the flexibility of an unstructured interview grid, the analysis of the data from this consultation has made it possible to identify some concerns among the respondents, related to CC and adaptation to DP.

With respect to CC, there is a need to know and understand its effects on human health, as well as the various means to adapt to it*:*

> *"I guess other germs in the house will thrive because the warm days – three consecutive days, or five consecutive days, you know. So how these things evolve in that environment, you know, that's something we don't know. What usually happen is that we don't know about it until things happen, you know"* (interviews 13, 16).

Another concern is the lack of information sources on CC, particularly research and monitoring devices for the region, or the availability and dissemination of data gathered by some participants on the ground:

> *"When the animal environment changes due to climate change, then you have to do other studies with the humans who are depending on the animals. These are the things that have to be studied further"* (interview 16).

As regards DP, one of the items of concern is the nature of the power relationships among players, as well as the negotiating issues: which players should be involved in the impact assessment, at what time and with what degree of influence?

> *"That's a very big issue, because it's the whole issue of health impacts, how it can be considered during the – the environmental assessment of projects. So ideally, indeed, if there were health issues that were brought at the directive, or guideline level, from the COMEV, I think that would probably be more helpful than to have an impact study, and after that organizations like the Cree Health Board may make comments on the impact study, it comes maybe at a stage that's too late have a significant influence on the impact study, or the review of the impact study. So yeah that's a very interesting question that certainly needs to be looked into. Yeah"* (interview 10).

The shared knowledge between the players on the ground is another area of concern. On the one hand, there is the mutual knowledge of the institutional players in regard to the possible roles that each and all could play in understanding and adapting to CC, and on the other, there is the knowledge between these institutional players and the communities:

> *"Do you talk with the DOL, the Centre d'études that's in YOUL? We don't know what they're doing. We saw them there, and they were doing a specific thing that they do. They don't tell us what they're doing. I know they're studying. They don't tell us what they do. And we don't bother them" (interview 16). "So she did a presentation to the JBACE, a study that the CHB had done. And the results like, mostly on diet and hunting, fishing, trapping habits for the Crees. So I think that was interesting to have the members more sensitized to that aspect, because at our committee, well the committee has to take into account environmental and social impact. For the environmental part, it's easier because it's usually something that can be measured. For the social impacts, well it's more subjective, so I think the members are less, tend to shy away from that, because they find it's more difficult to measure social impacts. So yeah, that's a big issue. I think it would be interesting to look into it more carefully, because among social impacts, obviously you have health impacts. So that's something that needs to be developed"* (interview 10).

There are also concerns about the difficulty of incorporating the values of the various environments to which the individual is currently exposed during his development, particularly the school environment and the traditional environment (in this regard, families can be successful or unsuccessful). This is tied in with the juxtaposition of traditional and modern knowledge, as well as the distrust that this juxtaposition could generate between the development players and local communities:

> *"And rightly so, they're trying to justify the importance of traditional knowledge. And the scientific community trying to explain the importance of the scientific knowledge, without getting anywhere. Whose knowledge is more important? It shouldn't be like that. Rather it should be how can we work together to use that*

for the benefit of the environment" basically "Well, we're very cautious now because we – that's what I'm talking about. So many times the developers are trying to convince CTA and people from the land to walk with them, just to support their own development projects. And having to say that these people agree seem to be enough for them, which shouldn't be like that. You know, they should have more – they should have broader thinking than that. Because these people even when they agree, do so reluctantly" (interviews 16, 36).

On the other hand, there are fears of losing the knowledge, values and meaning of Cree culture, or their "Creeness":

> *"I do miss about this, ever since I was in the bush with my grandmother, spent about 20 years with her. When she pulled me from the school, she pulled me out. She told me that she wanted me to know about my knowledge and all this traditional way […] So I really do miss that part, the trapping and all this. It was healthy and all this […] When you're in the bush, it's always a different day of life […] That's how people enjoy life being out there, because they do different things […] in the modern day life, when you work, you almost basically do the same thing every day […] You're running on time to do that. But out on the land, it's totally different. You don't run with time"* (interviews 16, 25, 26, 36).

As far as this actual research is concerned, a comment from one of the respondents suggests that the observation of CC has already been sufficiently proven, and that the research in communities must now go beyond this diagnosis.

7. Discussion of the results

The aim of this study was to compile a portrait of perceptions on CC in the Cree territories of James Bay. The results have made it possible to give a detailed description of the perceived effects of CC at the environmental and health levels, as well as the links between these two types of effects. The analyses also show that adaptation is a major area of concern, especially as regards the ability to continue practising traditional activities like hunting, fishing and trapping. Lastly, the study has made it possible to contextualize the players' general concept of CC and its effects, as well as the connections that they make between CC and DP.

The concept of CC: in order to describe their understanding of CC, the respondents often drew upon their personal experiences, as well as the changes that were observed in their living environment. The results of the study confirm Whitmarsh`s study (2008), who had found, during his research in England, that CC was demonstrated in three main ways: temperature and seasonal variations, as well as ice conditions. As shown by previous studies, CC is an abstract idea, which respondents generally tend to approach and describe on the basis of concrete events, particularly its environmental and human effects (Bostrom, Morgan et al. 1994; Flannery 2006). Understanding and explaining CC means linking atmospheric gas concentrations with a series of potential risks. This rather complicated conceptual exercise, of no practical interest in opinion research, is approached in a practical manner through the use of everyday events (Marquart-Pyatt, Shwom et al. 2011). As explained by Kempton (1997), people's opinions correspond to what they call the cultural model of CC, which is based on general ideas about the environment, such as pollution and ozone layer depletion, or on the observations that are made about the weather and the environment. In a study conducted in five countries (Canada, United States, Mexico, Portugal and Russia), Dunlap (1998) noted that several respondents admitted that they had limited knowledge of CC. This lack of knowledge was reflected in their responses to the questions on the causes and effects of CC, in which they conflated global warming, ozone layer depletion and pollution. In another study on knowledge of CC in Sweden, Sundblad et al. (2009) found that the most highly informed individuals were experts, followed by journalists, politicians and lay persons. In terms of the total body of knowledge, there was better knowledge about the causes of CC, whereas the health effects of CC were less well known. This difference in understanding of the concept raises two important issues: 1) the importance of having an in-depth understanding of public opinion; 2) taking this particular view into account in intervention strategies.

Uncertainty: It should be noted that uncertainty, an inherent factor in scientific research, also comes up in the respondents' statements. This means that CC is a complex phenomenon that is weighted by uncertainty, both at the expert and non-expert levels. At the scientific level, it is known that forecasting methods, such as modelling, raises some difficulties, including the compilation of highly variable data (for example, atmospheric gas concentrations, temperatures and winds) over long periods, evolving measurement standards, etc. Public opinion is also confronted with uncertainties in regard to climatic events and their causes, particularly through controversies that are sometimes presented on information broadcasting channels (Corbett and Durfee 2004). In a survey conducted in the United States, only half of the people interviewed believe that CC is already underway, and that it is mainly anthropogenic in origin (Marquart-Pyatt, Shwom et al. 2011). The experience of major events, such as hurricanes, floods and bush fires, sometimes appears to contribute to awareness of the CC phenomenon. This caused Bord et al. to comment (2000) that the public's concerns about CC vary according to the changes in weather conditions and the media's degree of interest in the topic. The uncertainty in these

circumstances imposes a certain constraint on the decision-making process and the implementation of adaptation strategies. To some extent, this uncertainty also influences the process of adopting and appropriating such strategies.

Furthermore, the uncertainty linked to CC creates a degree of distrust at the level of traditional knowledge (McDonald et al. 1997). In a certain sense, possibly the greatest danger of CC in the region is the fact that these unpredictable weather conditions can lead to a loss of confidence in the expertise that the Crees have of their own territory, a know-how closely associated with the Cree identity as a distinct people. The knowledge of safe modes of travel in winter, spring and autumn no longer stands up to the test of time. The changes in the seasons that have occurred have given rise to uncertainty and a kind of caution that did not exist in the past. Parallel to this, there has been a premature loss of confidence in the knowledge of traditional medicine, and consequently, of the preventative practices that were at the heart of the Cree system of well-being. Today, the desire to restore confidence and to ensure the rightful place of healing practices remains a point of tension. It remains to be seen whether adaptation strategies can be developed to counter this loss of confidence, and in doing so, restore not only the knowledge of how to manage new situations, but also create confidence in the invaluable practicality of the Cree.

The effects of CC on the environment: The environment and human health are the main impact areas of CC. The environment includes both the built environment and ecosystems. In its fourth Assessment Report on CC, the IPCC reaffirms climate change at the global level, with three broad baselines: rising temperatures, ice melts and rising sea levels (Pachauri, Reisinger et al. 2007). From a Canadian perspective, changes in the climate affect several sectors, including water resources, forestry, fishing, agriculture, coastal areas, transportation and human health (Lemmen, Warren et al. 2004; Meunier 2007; Bourque, Bruce et al. 2008). Northern Quebec is located in the areas most vulnerable to CC. According to Ouranos (2010), by 2050, global warming will be more marked in the North, with winter temperatures increasing from 4.5 to 6.5 °C, whereas precipitation will increase by 16.8% to 29.4%. In this organization's view, the increased precipitation is expected to be accompanied by more significant snow accumulation. While supporting the projections in regard to temperature variations, the respondents also place an emphasis on sea ice conditions. In addition to these weather changes, the respondents also report changes linked to fauna. This information supports the results of a recent study, led by Royer (2012), on the effects of CC on traditional activities of James Bay communities. This study focused particularly on Canada geese and the caribou. The results of the study show, inter alia, an impact of CC on the travel path of Canada geese and caribou: the majority of those involved in this study believe that this animal has become less abundant.

The effects of CC on health: The impacts of CC on human health can be direct or indirect where they concern determinants of health. In the view of the respondents, the presence of certain diseases within their community, particularly obesity and diabetes, is claimed to be the result of CC. Their reasoning is based on the fact that healthy dietary habits, particularly the consumption of traditional foods, have been replaced by the consumption of processed foods. According to other studies, traditional foods have become less accessible to Cree communities. The changes in the environment and the various redevelopments of their territory over the past few decades have resulted in the disruption of their way of life, which in the past was organized around traditional activities like hunting, fishing and trapping (Lougheed 2010). Thus, on the one hand, access to healthy food sources is limited, and on the other, the physical exercise that traditional activities bring about has been reduced. In this regard, the most critical area is the risk linked to

traveling over the ice (Furgal 2008). It should also be noted that this breakdown of their lifestyles would appear to give rise to poor health. This can be explained by the fact that their understanding of health is part of a holistic and systemic perspective, in which nature, health and psychosocial balance each constitute a separate, interactive pillar of health.

8. Conclusion

The study has made it possible to compile a portrait of knowledge on CC and its impacts. The identification of environmental and human effects of CC by the respondents means that it is a reality in the territory of Eeyou Istchee. Yet, CC is not a priority in the mandates of most of the players, even though their knowledge of the phenomenon is relatively clear. Generally, the results of the consultation show that the individuals involved in the assessment process had limited experience of CC. They therefore experienced difficulties in expressing an opinion on what the needs are, or on the tools that would enable a more systematic approach in environmental assessments. Ironically, the individuals who did have personal experiences with CC were rarely involved in the environmental assessment activities. For these individuals, their experiences of CC were the result of challenges linked to snow and ice conditions, wind forces or other extreme climatic events. With a view to coping better with these challenges, and being able to continue their traditional activities, a groundbreaking project was implemented by the Cree Trappers Association. This initiative, originally funded by the Ministry of Aboriginal Affairs and Northern Development Canada, is currently facing difficulties in ensuring its sustainability. Nevertheless, it is evidence that CC has destabilizing and destructuring effects on communities, and that adaptation is a major concern. Indeed, the occurrence of tragic events, such as the accidental on-ice deaths of very experienced individuals, challenges their traditional knowledge of weather predictions and the use of their hunting grounds, trapping lines or other resources, like traditional medicine.

Those involved in this study also have concerns about the existence of some chronic diseases, such as diabetes and obesity, which, from their point of view, result from a sedentary lifestyle and dietary habits oriented towards processed foods. Lastly, one of the key concerns is to preserve the essence of Cree culture in this rapidly changing environment.

In regard to the issues raised over the course of this consultation, some recommendations can be formulated:

1) The strengthening of Public Health's role in the area of CC: given the need that was expressed by the respondents to have a better understanding of the health impacts of CC and DP, and to be equipped to cope with them, the CBHSSJB must ensure that it will address this concern. With this aim in mind, monitoring and research must be developed. It is also necessary for the CBHSSJB to be consistently involved in the impact assessments, and to take an active part in the implementation of a multi-sectoral team so that it can focus thinking in the areas of research and interventions in CC and adaptation.
2) Support of local initiatives: substantial support should be given to local initiatives, such as that of the Cree Trappers Association. This association's difficulties in securing funding for the continuation of its project demonstrate not only the uncertain nature of ad hoc funding, but also that this type of funding cannot be counted on in order to develop a long-term institutional capacity to understand and take measures to address the complexity of the social impacts of CC, which is a public health problem in itself.
3) Updating the weather monitoring system: given the importance of the data and information, both for the monitoring of the impacts of CC, as well as for the development of adaptation strategies, the strengthening of current monitoring systems

is necessary. Based on the information gathered over the course of this consultation (to be confirmed), the number of monitoring stations (3) is claimed to be insufficient for the large territory of Eeyou Istchee. Thus, in addition to increasing their number, the ability to publicize the data gathered by other organizations could contribute to making the forecasts and decision-making more effective.

4) Collaboration: it is necessary to build a collaboration between all the entities involved in monitoring (local, regional and national entities) and all those responsible for promoting adaptation to cope with CC and its effects.

At the close of this consultation, we are hopeful that it has made it possible to initiate and strengthen the relationships among the regional entities of Eeyou Istchee to work together on the issue of CC and DP.

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Appendix: Objectives of the project and specific objectives of the consultation

The general objective of the project is to improve the current framework of ex-ante environmental assessment[4] of projects planned in Cree territory, in order to incorporate the variable of social and health impacts of CC and of future climate conditions. More specifically, the project is aimed at the following:

1. Taking an inventory of the measured and perceived impacts of climate change on human health in the traditional Cree territory of James Bay;
2. Producing a critical summary of the ex-ante methods for assessing the impacts on health and its determinants, making it possible to address the social and health impacts of CC in the assessment of projects in the Cree context;
3. Developing practical and useful approaches to assess impacts on health in order to address CC in Cree territory;
4. With the involvement of the interested parties, comparing and assessing the approaches that were developed, placing particular emphasis on the social and health effects linked to CC and the specific circumstances of the environment and of the populations; this assessment will include an analysis of the tool requirements and of feasibility;
5. Equipping users (guidelines, summaries, grids, procedures, questions and answers, lists of available on-line training, on-line documentary sources, etc.) in order to ensure that adaptation to CC is now taken into account in the assessment of the projects, and in policies and decision-making;
6. Providing Cree communities with the tools necessary for a better understanding of the purpose of environmental assessments and of the projects that will be proposed, and thus promoting the *empowerment* of communities;
7. Establishing bases for future participative action-research aimed at adaptations to CC.

The consultation steps that are at the centre of this specification are directly associated with objective 4, thus also making it possible to meet objectives 5 and 6 as effectively as possible.

[4] This expression refers to an assessment prior to the decision and which complies with the principle of prevention (André et al. 2010: 305).