Climate change in Northern Québec: Access to Land and Resource Issues

Project initiative of the Kativik Regional Government

Progress Report

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Authors:
Violaine Lafortune[†], Christopher Furgal[*], Jonathan Drouin[†], Tuumasi Annanack[‡], Noat Einish[~], Betsy Etidloie[‡], Markusie Qiisiq[‡], Peter Tookalook[‡], and the Communities of Kangiqsujuaq, Umiujaq, Kangiqsualujjuaq, and Kawawachikamach[©] .[1,2]

[†]Consultant for the Kativik Regional Government, Kuujjuaq, QC
[*]Public Health Unit, CHUQ-CHUL, Ste-Foy, QC
[‡]Park Section, Kativik Regional Government, Kuujjuaq, QC
[~]Kawawachikamach, QC

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Summary

In northern communities, there is growing concern about the impacts of climate change on communities and their local environments. This study explicitly documents the impacts of climate change on the trail networks of one Naskapi and three Inuit communities of Northern Québec. Interviews and cartographic documentation conducted in February and March 2004 with local experts reveal that although climate change seems to have had little impact so far on the trail network of the inland Naskapi community, travel risks linked to increasing ice instability and weather unpredictability are becoming key safety issues in the three Inuit coastal communities. Comparison of local expert observations of changes with instrumental data yielded mixed results. Summer and fall mean monthly temperatures appear to be associated with trends in later freeze-up and earlier break- up of landfast ice reported by local experts, but climatic indicators relevant to this issue need to be further developed with the communities to more precisely define the timing and causes of ice formation and retreat. Analysis shows that weather unpredictability cannot be captured precisely using temperature values alone. For monitoring of local changes and prediction of potential community impacts, climatic indicators relevant to this issue must be developed taking into account instrumental data as well as local knowledge including, but not limited, to temperature.

The three Inuit communities are already employing forms of adaptive responses to cope with the increasing risks they report. To date, these adaptive strategies seem to buffer climate change impacts on access to resources since no changes on the location of hunting and fishing grounds were reported. Nevertheless, if climate change is to occur in Arctic regions at a rapid rate, as predicted, this may pose unprecedented challenges to northern communities. Present day adaptive responses and knowledge of local changes may not be enough to face new and quickly changing environments.

Résumé

Les manifestations du changement climatique au Québec nordique font l'objet de préoccupations importantes chez les populations résidentes. Le projet en cours documente directement les impacts des changements climatiques sur les réseaux de sentiers permettant l'accès aux territoires traditionnels et aux ressources dans une communauté Naskapie et trois communautés Inuit du nord du Québec. Des entrevues et une documentation cartographique menées en février et mars 2004 auprès d'experts locaux ont révélé que les changements climatiques ne semblent pas avoir eu d'impacts manifestes sur les réseaux de sentiers des Naskapis. Par contre, l'accès au territoire des communautés inuit a été récemment affecté par une augmentation de l'instabilité de la glace et de l'imprévisibilité du climat. La comparaison entre les observations des experts locaux et des données instrumentales a montré certaines discordances. Les températures moyennes des mois d'été et d'automne semblent associées à un gel tardif et un dégel hâtif de la banquise. Par contre, les indicateurs climatiques permettant de caractériser le comportement de la banquise doivent être développés de manière plus approfondie avec les communautés afin de caractériser les causes et les périodes de formation et de retrait de la glace. L'analyse des températures quotidiennes a montré que l'imprévisibilité du climat ne peut être caractérisée en utilisant uniquement les températures. Afin de faire le suivi des changements locaux et de prédire les impacts potentiels des changements climatiques sur les communautés, des indicateurs climatiques doivent être développés en tenant compte des données instrumentales et des connaissances traditionnelles incluant les températures, mais aussi d'autres variables climatiques.

ᒪᒪᓐ ᐃᒧᐅᓐ

ᐊᓐᑕ ᒋᐋᑎᓄᒃ ᐃᔦᔅᒋᔭ, ᓴᔅ ᒐᑳᓐ ᐊᔭᐃᒪᐃᑎᒥᐋᑦ ᐊᓯᒪᑕᐃᑖᒃ ᐊᓐᑕ ᐃᔭᒃ ᒋᓯᑯ ᐊᑕᐃᑖᒃ ᐊᓐᑕ ᐋᔅᑲ ᐊᔅᒋᒃ ᐅᐋ ᐃᒧᐅᓐ ᐊᒪᒨᔅᑕᑲᓄᒃ ᐊᐋᐃᑕᑲᓄᒃ ᐊᓯᒪᑕᐃᑖᒃ ᐃᔭᒃ ᒋᓯᑯ ᐊᑕᐃᑖᒃ ᐊᓐᑕ ᐃᑕᐅᓂᒃ ᐸᐃᑯ ᓇᔅᑲᐱ ᑭᔭ ᓂᔅᑐ ᐃᔅᒋᒪᐅᒃ ᐃᔦᔅᒋᔭ ᐊᓐᑕ ᐊᑎᑕᑯᓂᒋ ᒋᐋᑎᓄᒃ ᑯᐸᒃ. ᐊᓐᑕ ᑲᐱᒻᐱᔭᒃ ᐊᐋᐃᐋ ᑭᔭ ᐃᒧᐅᓐ ᑲᒪᒨᔅᑕᒃ ᐊᓐᑕ ᑲᑖᑲᐸᒋᑦᐱᓯᒫ ᑭᔭ ᒥᒍᐅᐱᓯᒫ,2004 ᑭᔭ ᐃᔦᒃ ᑲᐃᔅᒋᔮᔅᒃ ᐊᓐᑕ ᓇᔅᑲᐱ ᐊᔅᒋᒃ ᐊᑲ ᓯᑲ ᒪᑕᐃᑖᒃ ᒥᔅᑯᒃ ᐊᓐᑕ ᒥᔅᑯᒥᒃ ᑭᔭ ᐃᔭᒃ ᒋᓯᑯ ᐊᑕᐃᑖᒃ ᒥᑯ ᐊᐋᐸᑕᑲᓄᒃ ᑭᔭ ᐊᓇᓇᑭᒋᑕᑲᓄᒃ ᑭᔭ ᓂᔅᑐ ᐃᔅᒋᒪᐅᒃ ᐊᔅᒋᔭ ᑲᓄᐋᐃᑕᒃ ᐊᓐᑕ ᐃᔦᔅᒋᔭ ᐊᑎᑕᑯᓂᒋ. ᐊᓐᑕ ᑕᑎᐸᓐ ᐊᓯᓇᑐᔅᒐᐃᑕᑲᓄᒃ ᒐᑳᔦᐤ ᑲᐋᐱᓯᑦ ᑭᔭ ᐃᔦᒃ ᑭᔭ ᑕᑎᐸᓐ ᐃᒧᐅᓂᔦᐤ ᑲᑲᔅᑎᓇᒃ.
ᐊᓐᑕ ᐊᓂᐸᒃ ᑭᔭ ᐊᑏᑲᒋᒃ ᒋᓯᑯ ᐊᓐᑕ ᐊᑕᐃᑖᒃ ᐃᐃᑎᒥᒃ ᒋᓯᑯ ᐊᓇᑐᔅᒐᐃᑕᑲᓄᒃ ᐊᓯᒋᓯᑲᒃ ᑭᔭ ᐃᐱᒃ ᐊᔭᐸᓯᑦ ᐊᑯᓐ ᑭᔭ ᒥᔅᑯᒥᔭ ᐊᓐᑕ ᐊᔅᒋᔮᔅᒃ ᔅᓴᔦᒃ. ᐊᑕᐃᑕᑲᓄᒃ ᐊᓐᑕ ᑐᐃᔅ ᐃᒧᐅᓐ ᒐᒋ ᓇᑐᔅᒐᐃᑕᑲᓄᒃ ᑭᔭ ᐃᔦᔅᒋᔭ ᒪᒧ ᒐᒋ ᐅᒃ ᐊᑐᔅᒐᒪᑲᓄᒃ ᑕᓐ ᒋᓯᑯ ᐊᑕᐃᑖᒃ. ᐃᒧᐅᓐ ᑲᐃᔅ ᓇᑐᔅᒐᐃᑕᑲᓄᒃ ᐊᐋᐸᑎᐋᓄᒃ ᐊᑲ ᓇᔅᒃ ᒋᒋᐋ ᐃᒧᐅᓐ ᒥᔦᑲᔅᑎᓇᑲᓄᒃ ᐅᓴᒻ ᐊᑲ ᔅᒐᐃᑕᑲᓄᒃ ᒋᓯᑯ ᐊᓯᒥᔅᑯᒋᐱᐃᒃ ᒋᔅᒋᑯᒃ. ᐊᓐᑕ ᐊᑕᐃᑖᒃ ᒋᓯᑯ ᐊᓐᑕ ᐊᓇᑲᑐᐋᐸᑕᑲᓄᒃ ᐊᓯᒥᔅᑯᒋᐱᐃᒃ ᐊᓐᑕ ᐊᓯᓈᒃ ᒐᒋ ᐊᐱᒋᑕᑲᓄᒃ ᑲᐋᐱᓯᑦ ᑭᔭ ᐃᔦᐤ ᔅᒐᐃᑎᒧᐅᓐ ᐊᓐᑕ ᒋᓯᑯ ᐊᒋᑕᐸᑕᑲᓄᒃ.

ᐊᓐᑕ ᓂᔅᑐ ᐃᔅᒋᒪᐤ ᐃᔦᔅᒋᔭ ᐊᓐᑕ ᓴᔅ ᐊᔭᔅᑯᐱᐃᒃ ᑕᓐ ᒐᐃᓯᐱᒧᑕᒃ ᑭᔭ ᐃᒧᐅᓂᔦᐤ ᒐᒋ ᓇᑐᔅᒐᐃᑕᒃ. ᐊᓐᑕ ᐊᓯᓇᑲᑐᐋᐸᑕᑲᓄᒃ ᒋᓯᑯ ᐊᓐᑕ ᐊᓯᐱᒧᑕᓄᒃ ᐊᑲ ᐊᓐᑕ ᒪᑕᐃᑖᒃ ᓄᑎᒻ ᐊᓯᓐᑐᐅᓇᓄᒃ. ᐊᓐᑕ ᐃᓯᓈᒃ ᒋᐋᑎᓄᒃ ᐊᓐᑕ ᒥᔅᑯᒋᐱᐃᒃ ᒋᓯᑯ ᐊᑕᐃᑖᒃ ᒐᑎᑯᓐ ᐊᓐᑕ ᑲᐃᔅ ᐅᔅᑐᐱᔦᐤ ᐊᓐᑕ ᒋᐋᑎᓄᒃ ᑕᑐᐃᒃ ᐊᑎᑕᑯᓂᒋ ᐃᔦᔅᒋᔭ. ᐊᓄᒃ ᐊᓐᑕ ᐃᒧᐅᓐ ᐊᓯᐱᔅᑎᓇᑲᓄᒃ ᑭᔭ ᔅᒐᐃᑎᒧᐅᓐ ᐊᓐᑕ ᑕᑐᐃᒃ ᐊᐋᓐᒋ ᐊᐱᒐᑲᓄᒃ ᒐᐃᓄᑕᐱᐃᒃ ᑎᐸᓐ ᒐᐃᔅ ᐱᒧᑕᓄᒃ ᑭᔭ ᐊᒋᐱᐃᒃ ᒋᓯᑯ ᐊᒥᔅᑯᒋᐱᐃᒃ.

III

ᓇᐃᓈᕐᓯᒪᔪᑦ

ᑕᕐᕿᒥᐅᑦ ᓄᓇᓕᖕᒋᓐᓂ, ᐃᓱᒫᓗᓕᕐᐸᓕᐊᔪᖃᓕᕐᐳᖅ ᓯᓚᐅᑉ ᐊᓯᑦᔨᕈᓪᓕᐊᓂᖓᑕ ᓱᕐᕋᐃᓂᕆᓚᖓᔪᖓᓂᒃ ᓄᓇᓕᓐᓂᒃ ᐊᒻᒪᓗ ᑕᒃᑯᐊ ᐊᕿᑎᕐᖏᓐᓂᒃ. ᑕᒃᑯᐊ ᖃᐅᔨᓴᕐᑏᑦ ᐊᓪᓚᑕᐅᑎᑦᓯᓚᕆᓐᓂᐊᖁᑦ ᓯᓚᐅᑉ ᐊᓯᑦᔨᕈᓪᓕᐊᓂᖓᓄᑦ ᓱᕐᕋᑕᐅᓂᖏᓐᓂᒃ ᐊᖅᑯᓯᓂᕆᔭᐅᔫᓂᒃ ᐊᑕᐅᓯᕐᒧᑦ ᓈᒃᑳᐱᒃᑯᓄᑦ ᐊᒻᒪᓗ ᐱᖓᓱᓄᑦ ᐃᓄᐃᑦ ᓄᓇᓕᖏᓐᓄᑦ ᑯᐸᐃᒃ ᑕᕐᕿᖓᓂ. ᐊᐱᕆᐅᑎᐅᓚᐅᕐᑐᐃᓗ ᓄᓇᖕᖑᐊᑎᒍᓪᓗ ᐊᓪᓚᑕᐅᓚᐅᕐᑐᐃᑦ ᕖᕙᐊᕆᐅᑎᓪᓗᒍ ᒫᑦᔨᒥᓗ 2004-ᒥ ᐱᓇᓱᐊᕐᑲᑎᒋᔭᐅᑎᓪᓗᒋᑦ ᓄᓇᓕᒥᐅᑦ ᖃᐅᔨᒪᔪᒪᓂᕐᑐᑎᑦ ᑕᑯᔅᓴᐅᑎᑦᓯᓚᐅᕐᑐᑦ ᑕᒪᓐᓇ ᓯᓚᐅᑉ ᐊᓯᑦᔨᕈᓪᓕᐊᓂᖓ ᓱᕐᕋᐃᓚᑳᐱᓯᒪᑐᐃᖓᕈᔾᔪᕋᓗᐊᕐᑎᓗᒍ ᓄᓇᑐᐃᖓᒥᐅᑦ ᓈᒃᑳᐱᒃᑯᑦ ᓄᓇᓕᖕᒋᑦᑕ ᐊᖅᑯᓯᓂᕆᔫᖏᓐᓂᒃ, ᐊᐅᓚᓃᑦ ᐃᓕᖓᓂᕐᑲᕐᓯᑎᒃ ᓯᑯᑎᒎᑦ ᐊᑦᑕᓇᕐᑐᑎᒎᑦ ᐊᒻᒪᓗ ᓯᓚᐅᑉ ᐱᐅᓯᕆᓕᖓᔪᖓᑕ ᖃᐅᔨᒪᑦᓴᐅᔫᖓᐃᓂᓕᕐᓂᖓ ᐅᖄᔪᑎᐅᓗᐊᖑᐊᕐᑲᑦᑕᓚᐅᕐᑐᑦ ᐱᓂᕐᓗᑕᐃᓕᒪᓂᕐᔪᐊᖓᑦᓯᑎᒃ ᑕᒃᑯᓇᓂ ᐱᖓᓱᓂᒃ ᐃᓄᐃᑦ ᓄᓇᓕᖕᒋᓐᓂᒃ ᓯᑦᔭᒥᐅᓂᒃ. ᓄᓈᑦ ᖃᐅᔨᒪᔪᒪᓂᖏᑦᑕ ᑕᑯᓐᓈᓂᓕᓯᒪᔭᖏᑦ ᐊᓯᑦᔨᓯᒪᓕᕐᑐᓂᒃ ᑕᒪᒃᑯᓄᖓᓗ ᖃᐅᔨᓴᐅᑎᓄᑦ ᑐᑭᓯᒪᐅᑎᑦᓴᓕᐊᖑᓕᐅᕐᑐᑦ ᓄᐃᑦᓯᓕᐅᕐᑐᑦ ᐊᑦᔨᒌᖕᒋᑐᓂᒃ ᑐᑭᓯᒪᐅᑎᑦᓴᓂᒃ. ᐅᐱᒻᒫᖕᒍᓕᕐᒪᓗ ᐅᑭᐊᑦᓴᐅᓕᕐᒪᓗ ᒪᓕᑦᓱᑎᑦ ᑕᕝᑭᑕᒦᑦ ᓂᕈᒥᖕᓂᖕᒋᓪᓗ ᐃᒃᑮᓇᕐᓂᖕᒋᓪᓗ ᒪᓕᒻᒥᓱᑎᑦ ᖃᐅᔨᒪᔪᑎᐅᔪᖓᑐᑦ ᐅᑭᐅᑦᓴᐅᑎᑎᓂᐊᖕᒋᑑᒪᖕᒫᑦ ᐅᕙᓘᖕᓃᑦ ᐅᐱᕐᖕᖓᓴᐅᑎᑎᓂᐊᕐᒪᖕᒫᑦ, ᑭᓯᐊᓂ ᓯᓚᐅᑉ ᖃᐅᔨᒪᔭᐅᔪᑎᕐᖏᓐᓂᒃ ᑕᒪᑦᓱᒧᖓ ᐃᓕᖓᓂᕐᑲᕐᓯᑐᓂᒃ ᐱᕈᓪᓕᐊᑎᑕᐅᔪᕐᑲᓇᐊᓪᓚᓇᐊᓕᒃ ᓄᓈᑦ ᐃᓚᒋᓗᒋᑦ ᓇᓗᓇᐃᑦᓯᐊᓂᖅᓴᐅᖁᓗᒋᑦ ᖃᖓᐅᓕᕐᓗ ᓱᓇᓪᓗ ᓱᑯᐃᑦ ᓄᐃᑕᐅᓱᖕᒍᒪᖕᒫᑕᓗ ᐊᓯᐊᓱᖕᒍᒪᖕᒫᑕᓗ. ᕿᒥᕐᕈᔭᐅᓯᒪᔪᐃᑦ ᑕᑯᑎᑦᓯᓯᒪᓕᕐᑐᑦ ᑕᒪᓐᓇ ᓯᓚᐅᑉ ᐱᐅᓯᕆᓕᖓᔪᖓᓂᒃ ᖃᐅᔨᒪᓇᖕᖏᑐᓂᖓ ᖃᐅᔨᔭᐅᓪᓚᓇᖑᓇᓕᖓᖏᖏᐊᖓ ᓯᓚᐅᑉ ᓂᕈᒥᖓᓂᖓᓂᒃ/ᐃᒃᑮᓇᕐᓂᖓᓂᒃ ᖃᐅᔨᒪᐅᑎᑐᐃᖓᓄᐃᑦ ᐊᑐᕐᓗᑎᑦ. ᑲᒪᓇᓯᑦᑕᐅᕐᑯᓪᓗᑎᑦ ᓄᓇᓕᖓᓂ ᐊᓯᑦᔨᓕᕐᑐᐃᑦ ᓯᕗᓂᐊᑐᓪᓗ ᖃᐅᔨᒪᓚᓯᐊᕈᑎᑦᓯᔪᑦ ᓄᓇᓕᖓᓂᒃ ᓱᕐᕋᐃᒍᑎᐅᑐᐃᖓᓇᐊᓕᖓᓂᒃ, ᓯᓚᐅᑉ ᖃᐅᔨᒪᔭᐅᔪᑎᕐᖏᓐᓂᒃ ᑕᒪᑦᓱᒧᖓ ᐃᓕᖓᓂᕐᑲᕐᓯᑐᓂᒃ ᐱᕈᓪᓕᐊᑎᑕᐅᔪᕐᑲᓇᐊᓪᓚᓇᐊᓕᒃ ᑭᓪᓕᖅᑲᕐᕕᒋᔭᐅᑎᓪᓗᕐᒥᑦ ᖃᐅᔨᒪᔪᑏᑦ ᑐᑭᓯᒪᐅᑎᑦᓴᓕᐊᖑᓂᕐᖏᓐᓂᒃ ᐊᒻᒪᓗᑦᑕᐅ ᓄᓇᓕᒥᐅᑦ ᖃᐅᔨᒪᔭᑐᖅᑲᕐᖏᓐᓂᒃ ᐃᓚᖃᕐᑎᓗᒋᑦ ᑕᒃᑯᑐᐊᕐᔪᕐᑑᒐᓗᐊᓂᒃ, ᓯᓚᐅᑉ ᓂᕈᒥᖓᓂᒃ/ᐃᒃᑮᓇᕐᓂᖓᓂᒃ.

ᑕᒃᑯᐊ ᐱᖓᓱᑦ ᐃᓄᐃᑦ ᓄᓇᓕᖏᑦ ᐊᑐᓚᓱᐊᕐᑐᑐᖃᐅᓲᖕᒍᓕᕐᑐᑦ ᖃᓄᕐᑑᕈᑎᑦᓴᓂᒃ ᐊᑦᑕᓇᕐᑐᓂᒃ ᑐᓴᕐᑎᓯᒥᐊᖃᕈᑎᕐᖏᓐᓄᑦ. ᐅᓪᓗᒥᒎᑦ ᑎᑭᑦᓱᒍ, ᑕᒪᒃᑯᐊ ᐊᑑᑎᓚᑦᓴᓕᐊᖑᓯᒪᔪᑦ ᐊᐳᕐᕕᐅᑐᐃᖓᕈᔾᔪᖃᑦᑐᑦ ᓯᓚᐅᑉ ᐊᓯᑦᔨᕈᓪᓕᐊᓂᖓᑕ ᓱᕐᕋᐃᓂᕐᖏᓐᓂᒃ ᐱᕕᑦᓴᕆᓇᓂᖅ ᑕᑯᓈᓯᒍ ᑐᓴᕐᑎᓯᒍᑎᐅᔭᖃᓚᐅᔪᕐᒥᒪᑦ ᒪᖃᐃᕝᕕᒋᔭᐅᔫᓗ ᐃᖃᓗᓐᓂᐊᕝᕕᒋᔭᐅᔫᓗ ᐊᓯᑦᔨᓯᒪᓕᕆᓇᐊᕐᖓᓄᑦ. ᑕᐃᒪᐃᓚᐅᓗᐊᕐᑎᓗᒍ, ᐅᑭᐅᕐᑕᐅᑉ ᓄᓇᖃᕐᕕᕐᖓᓂ ᓯᓚᕐᖓᑦ ᐊᓯᑦᔨᑐᓪᒪᓇᐅᓂᐊᕐᐸᑕ, ᓚᕐᓗᓂᐊᕐᔫᓇᔭᐅᓪᒪᑦ, ᑕᒪᓐᓇ ᓄᐃᑦᓯᑐᐃᖓᓇᐊᖃᓚᕐᓗᔪᖅ ᓵᕐᓗᔭᐅᓚᐅᕐᓯᒪᕐᕐᑐᓂᒃ ᑕᕐᕿᒥᐅᑦ ᓄᓇᓕᖕᒋᓐᓄᑦ. ᐅᓪᓗᒥ ᖃᓄᕐᑑᕋᓱᐊᕈᑏᑦ ᐊᒻᒪᓗ ᖃᐅᔨᒪᔭᐅᔪᑐᖃᐃᑦ ᓄᓇᓕᖓ ᐊᓯᑦᔨᕈᓪᓕᐊᓕᕐᑐᓂᒃ ᓈᒻᒪᕆᑦᑑᑐᐃᖓᓇᐊᖃᓚᕐᓗᔪᑦ ᓵᕐᓗᔭᐅᔪᖃᓕᕐᐸᑦ ᓄᑕᓂᒃ ᐊᓯᑦᔨᑲᓪᓚᖃᑦᑕᓕᕐᑐᓂᓪᓗ ᐊᕿᑎᐅᓕᕐᑐᓂᒃ.

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Introduction 1

According to the most recent report of the Intergovernmental Panel on Climate Change, the sub-polar regions will be the most affected by global warming and may experience shorter winters and significantly warmer summers in the future (IPCC, 2001). Such changes in climate may impact the way in which subsistence-based northern communities can access land resources. For example, these new conditions may reduce by several weeks the period when it is safe to use ice trails, both inland and in coastal areas, a situation that has already been experienced by Northern communities of the Northwest Territories, Nunavut and Alaska (e.g. Fox, 2002; Kofinas and Communities of Aklavik, 2002; Nickels et al., 2002; Norton, 2002). Northeastern North America has been less affected by global warming than the northwestern part of the continent (IPCC, 2001). However, there have been recent reports of climate change impacts on access to territory in Northern Québec and Labrador, where unpredictable weather patterns and ice instability were shown to negatively affect traveling conditions (Furgal et al., 2002; Furgal and Communities of Labrador, 2003; Furgal and Communities of Nunavik, 2003). This can change the timing at which areas are reachable and hinder access to migrating wildlife (e.g. Thorpe et al., 2002), thus causing significant socio-economic and health problems, such as potential diet changes or abandonment of traditional hunting and fishing grounds.

Following on the work of Furgal et al. (2002) and Furgal and Communities of Nunavik and Labrador (Furgal and Communities of Labrador, 2003; Furgal and Communities of Nunavik, 2003), this study documents the impacts of climate change on trail networks which provide access to traditional territories and resources for four Northern Québec communities (Figure 1). Both traditional and scientific knowledge are used here in order to provide a better understanding of the scope of changes that alter access to land and resources. Community perspectives on climate change are compared to instrumental ice and meteorological data in order to determine potential climatic indicators that relate closely to northern priority issues for northern communities. Such climatic indicators are needed to help ensure that global climatic scenario outputs are relevant at the local scale.

2 Methods

This study constitutes a first step in developing an adaptation toolkit comprised of trail maps, risk assessment maps, a documentary video, and a guide of adaptation measures which will assist communities in land use planning and development of appropriate adaptation strategies in relation to climate and environmental change.

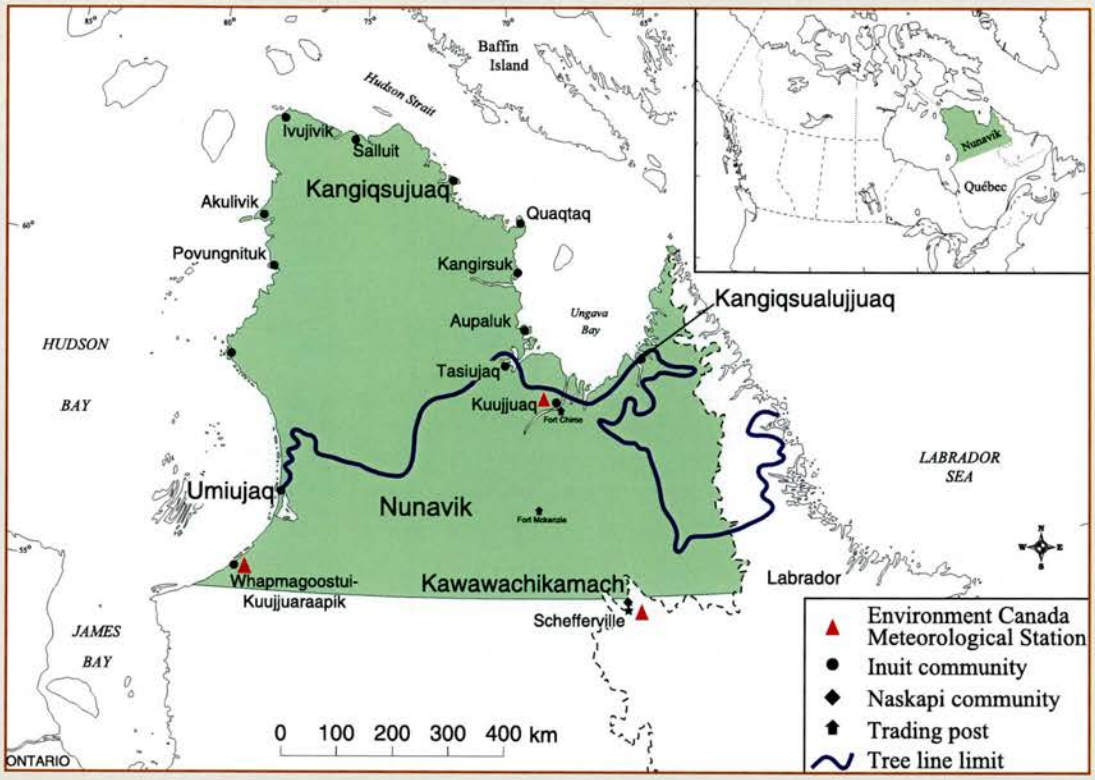

Figure 1 . Location map showing the four communities involved in the project, the former trading posts mentioned by local experts, and the meteorological stations used for climatic data analysis.

1 Methods

Interviews with northern residents and analysis of climatic datasets are the main components of this evaluation of trail network changes. Interviews were conducted in the Inuit communities of Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq, and in the Naskapi community of Kawawachikamach (Figure 1).

1.1 Communities involved in the project

1.1.1 Inuit communities

Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq are part of the Nunavik region, which spreads across the northern portion of the province of Québec (Canada), north of the 55th parallel (Figure 1). Approximately 10 000 people reside in Nunavik and are dispersed among the fourteen communities located along the coastal areas, each having between 200 and 2000 residents. Inuit comprise more than 85% of the population and more than half of Nunavimmiut are under the age of 25 (Statistics Canada, 2001). Subsistence activities remain a crucial part of the Inuit lifestyle and of the region's econo my. Caribou, small game, wildfowl, beluga whales, seals, walrus, and polar bears, as well as various freshwater and marine fish, are harvested in the region.

Kangiqsujuaq is located in the very northern portion of Nunavik along the Hudson Strait coast and north of treeline in the tundra biome. A trading post was first established on the site in 1910 and there has been

continuous occupation of the site since then (Makivik Corporation, 2004). Approximately 535 people now live in this community (Statistics Canada, 2001).

Umiujaq is located on the Hudson Bay coast, at the northern tip of Lac Guillaume-Delisle, which marks the limit between the tundra and the forest-tundra biomes. It is the smallest of the three communities involved in the project with a population of about 350 residents (Statistics Canada, 2001). It is also the newest village in the region, having been constructed in 1985-1986 when some of Inuit living in Kuujjuaraapik moved to Umiujaq in order to preserve their traditional lifestyle (Makivik Corporation, 2004).

The largest of the three communities, with 710 inhabitants (Statistics Canada, 2001), Kangiqsualujjuaq was constructed in 1962 at the mouth of the George River, just south of treeline in the forest-tundra biome, after Inuit of the area established the first co-operative of Northern Québec on the site (Makivik Corporation, 2004).

1.1.2 Naskapi community

Kawawachikamach is located in the forest-tundra away from any coast line (Figure 1). Subsistence-based activities are still an important part of the Naskapi lifestyle. Caribou, freshwater fish, small game and wildfowl are harvested by the community. The Naskapis now located in the community of Kawawachikamach were relocated numerous times during their history. In the first half of the 20th century, the Naskapis first moved from Fort Chimo to Fort McKenzie in 1915, then from Fort McKenzie to Fort Chimo in 1948, and finally from Fort Chimo to Schefferville in1956 (Naskapi Nation of Kawawachikamach, 2004). Once in Schefferville, the Naskapis moved more than once in the area until the community was relocated to the present site of Kawawachikamach after the majority of the Naskapis voted for the relocation in 1980. The Fort McKenzie area is still considered traditional hunting ground by the Naskapi Elders. There are now about 540 inhabitants in Kawawachikamach (Statistics Canada, 2001), the vast majority of which are Naskapis.

1.2 Local expert interviews

A team meeting of the project leaders and the local researchers from the three Inuit communities was first organised to review the objectives and goals of community interviews, to improve the preliminary interview guidelines prepared by the project leaders and one of the local researchers prior to the team meeting, and to train local researchers on interviewing techniques. In Kawawachikamach, discussions between one of the project leaders and the local researcher were made for the same purposes prior to conducting the interviews. Participatory research methods were used to document traditional knowledge insights on climate change impacts on trail networks. Traditional knowledge is defined here as « a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission » (Berkes, 1999). Semidirected and unstructured interviews were used to gather local-scale knowledge from community members having an extensive and thorough understanding of the area in order to provide a source of climate history and baseline data in each of the four communities (as in Riedlinger and Berkes, 2001; Bernard, 2002). All interviews were conducted between February 11 and March 22, 2004 by the local researcher in each community.

Using topographic maps, semi-directed interviews were conducted with local experts about perspectives of changes in access to hunting, fishing, and trapping sites, traditional traveling routes and the mobility of animal populations. The changes that climate-related variables have caused and may continue to cause on these activities were also investigated. In Kawawachikamach, an unstructured interview was conducted at the request of two participants who were not comfortable with the use of geographic maps. Most interviews were conducted with one local expert at a time, but in Kangiqsujuaq and Kawawachikamach, some participants felt more comfortable being interviewed in pairs (Table 1). Fourteen men and four women were interviewed. All participants but one are more than 45 years old and have a lot of experience on the land. The younger participant is an active hunter and has a good knowledge of actual trail conditions. Interviews were conducted

in wintertime, which may present a bias towards winter observations. Interviews were recorded using a digital recorder and then transcribed. Dialogues from the interviews were analysed by systematic coding leading to category development (as in Tesch, 1990; Bernard, 2002).

Table 1. Number and type of interviews for each community

	Semi-directed interviews		Unstructured interview	
	One participant	Two participants	Two participants	Total number of participants
Kangiqsujuaq	1	2		5
Umiujaq	4			4
Kangiqsualujjuaq	4			4
Kawawachikamach	1	1	1	5

1.3 Instrumental meteorological database

Changing climatic and ice conditions were documented through the analysis of available data from the meteorological stations of Environment Canada (Figure 1) and from the ice charts of the Canadian Ice Service.

Schefferville, Kuujjuaq, and Kuujjuaraapik meteorological stations have the longest and most complete meteorologic datasets of Northern Québec, with continuous recordings starting in the 1950s. Mean monthly and annual temperatures, as well as mean monthly and annual daily temperature variability, were calculated. The daily variability in air temperature was calculated using

$$|y| = Td - T(d-1)$$

where $|y|$ = absolute value of the daily temperature variability, T = temperature in °C, and d = day.

Linear regressions were computed both for the complete record length and for the recent period, starting in 1990. Kuujjuaraapik, Kuujjuaq, and Schefferville datasets start in 1955, 1957, and 1955 respectively when considering only the periods without major gaps in data. For the complete periods, 11-year smoothed average curves were applied to show decadal trends.

Only temperature records were used from Environment Canada meteorological stations. Wind and precipitation data show great variability related to onsite data collection and may not be reliable without a thorough investigation of the datasets, which will be conducted during the next phase of this project.

Sea ice charts were used to document fast ice conditions close to the three Inuit communities. Although landfast ice should be recorded on the ice charts produced by the Canadian Ice Service, landfast ice of the Nunavik coastal areas was not systematically documented. Nevertheless, information on ice concentration and thickness was available, even if fast ice was not always identified per se. Etkin (1991) suggests that pack ice break-up and freeze-up timings could arbitrarily be defined by the time at which the majority of the ice cover dropped (or increased) to 50% of the defined area. Since ice thickness is a key element for safety while traveling on ice trails, Etkin's threshold was modified slightly to include an ice thickness component: the 50% requirement must be met in conjunction with the disappearance (or reappearance) of grey-white ice (15-30 cm thick). For the freeze-up season, fast ice appearance (if recorded) replaced the previous threshold.

The Canadian Ice Service ice chart weekly or bi-weekly temporal coverage sometimes only starts in June. Prior to that, the ice charts are produced on a monthly basis. When the break-up occurred during a period with monthly resolution, the date obtained was not used for further analysis. As a result of the sampling frequency, break- up dates used here are accurate within two weeks. Freeze-up dates could not be computed using ice charts since the Canadian Ice Service weekly or bi- weekly temporal coverage often starts after the break-up occurred around Nunavik coastal areas. The dates could only be accurate within a month, which was considered as too coarse a resolution to study fast ice freezeup trends in Nunavik.

6 2- Inuit and Naskapi access to territory

Many things have happened since Inuit and Naskapi lifestyles changed from nomadic to more sedentary community based living, but the use of trails for harvesting activities and the fact that risks are always involved while out on the land still remain part of Inuit and Naskapis everyday life. The switch to motorized means of transportation is one of the main changes that have occurred in trail use, with the most noticeable effects on safety issues rather than on the trail network per se.

2.1 Means of transportation and trail use

The introduction of snowmobiles, motorized canoe/boats, four-wheelers, trucks and even airplanes obviously had an impact on Inuit and Naskapis access to resources. However, the traditional trail networks and their main purposes remain mostly unchanged, at least for the Inuit communities participating in this study (Figure 2, Figure 9). Apart from the walking trails which are much less used today (Figure 6 to Figure 9), traditional Inuit dogteam and kayak trails are generally still used for hunting, fishing, trapping, or traveling to other communities. Since the Inuit moved into permanent settlements, the farthest traditional trails are not used on a regular basis anymore, but all traditional trails are still accessible and therefore cannot be described as having been "abandoned". The recent move from Kuujjuaraapik to Umiujaq did not change the trail network to a great extent since the area surrounding Umiujaq was already part of the traditional trail network, even before the creation of the new village. The situation is different for the Naskapis, whose relocation from Fort Chimo to the Schefferville area in 1956 implies that Elders now live far from the hunting grounds of their youth. Naskapi Elders still consider the Fort Chimo and Fort McKenzie areas as their traditional hunting grounds, but now hunt, trap, and fish mainly in the Kawawachikamach area.

Changes in modes of transportation have resulted in some minor changes in trail use. Dogteams are efficient in rough terrain, while snowmobiles are mainly used on flat areas, avoiding forest patches and steep, rocky slopes. Nevertheless, snowmobile trails are more numerous than dogteam trails since snowmobiles are more manageable and can reach a distant objective much faster. Most importantly, the change from dogteam to snowmobile had an impact on travel safety. Dogs can feel unstable ice, and therefore act as early indicators of risky areas, and can pull a sleigh out of cold waters if it happened to be caught in breaking ice. With snowmobiles, one has to be more alert, and there is always the risk of mechanical problems.

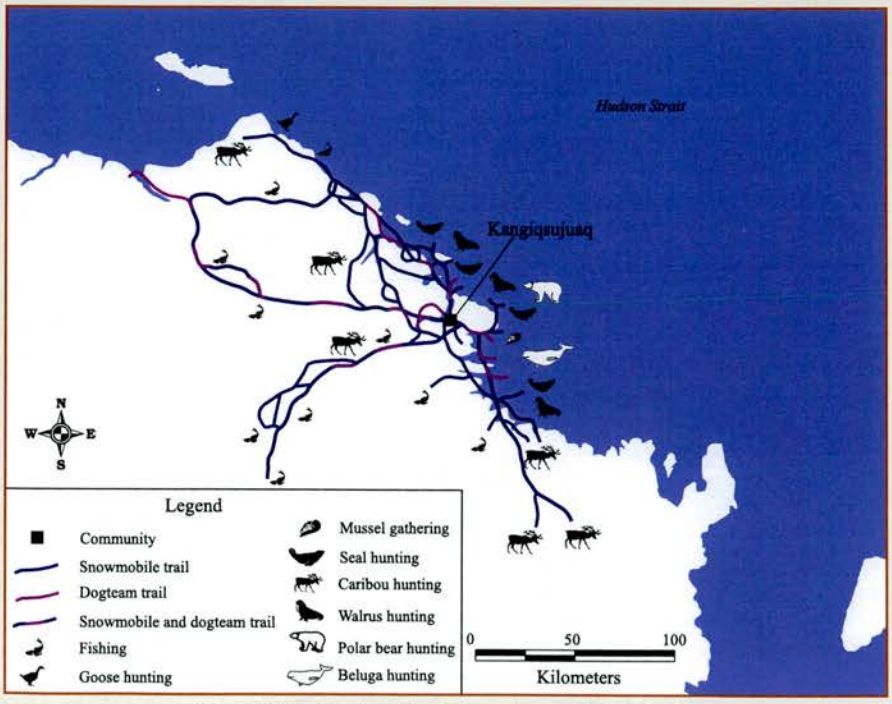

Figure 2. Kangiqsujuaq: Dogteam and snowmobile trails

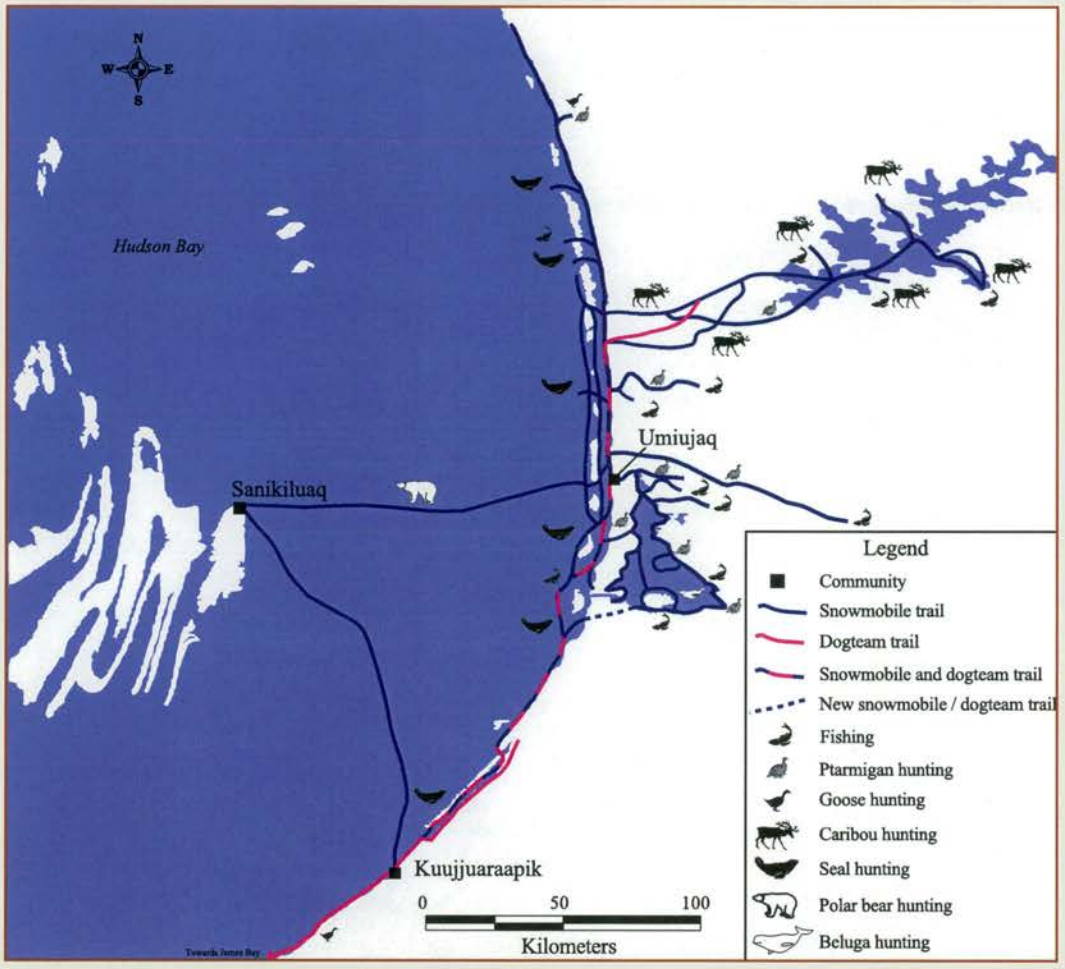

Figure 3. Umiujaq: Dogteam and snowmobile trails

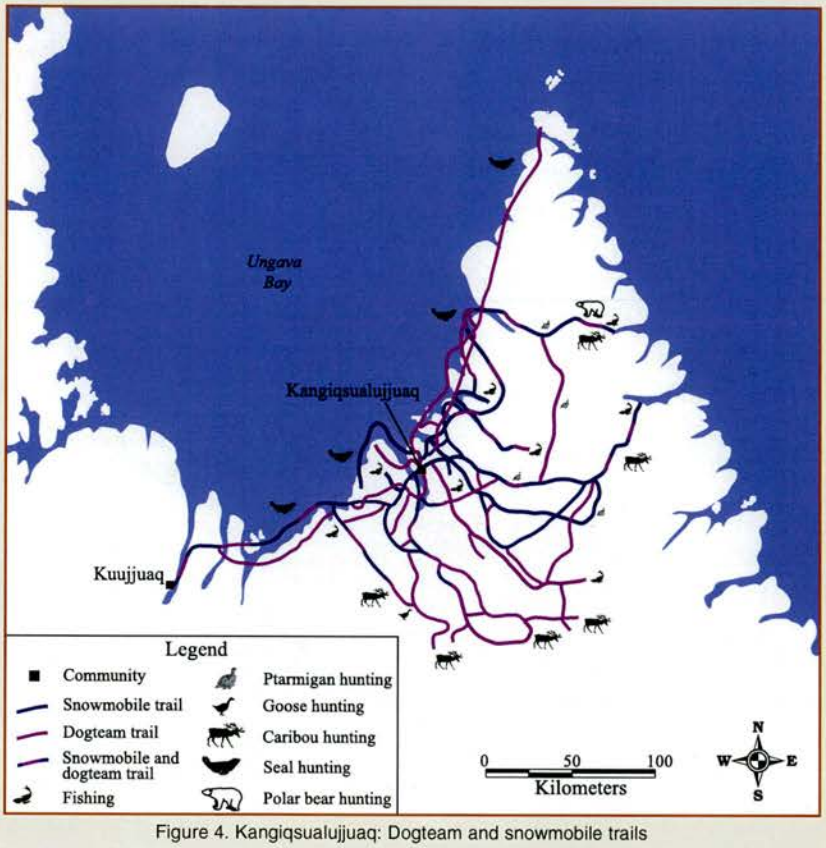

Figure 4. Kangiqsualujjuaq: Dogteam and snowmobile trails

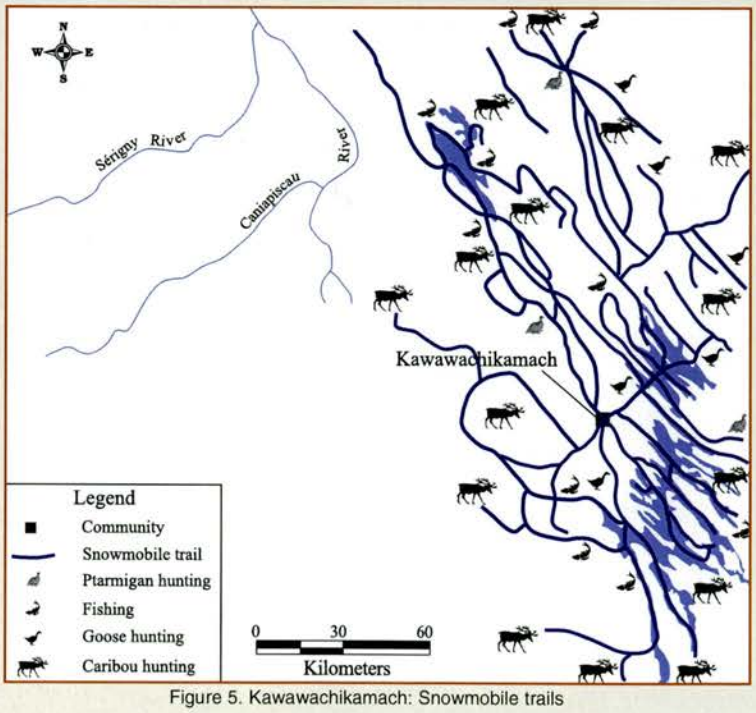

Figure 5. Kawawachikamach: Snowmobile trails

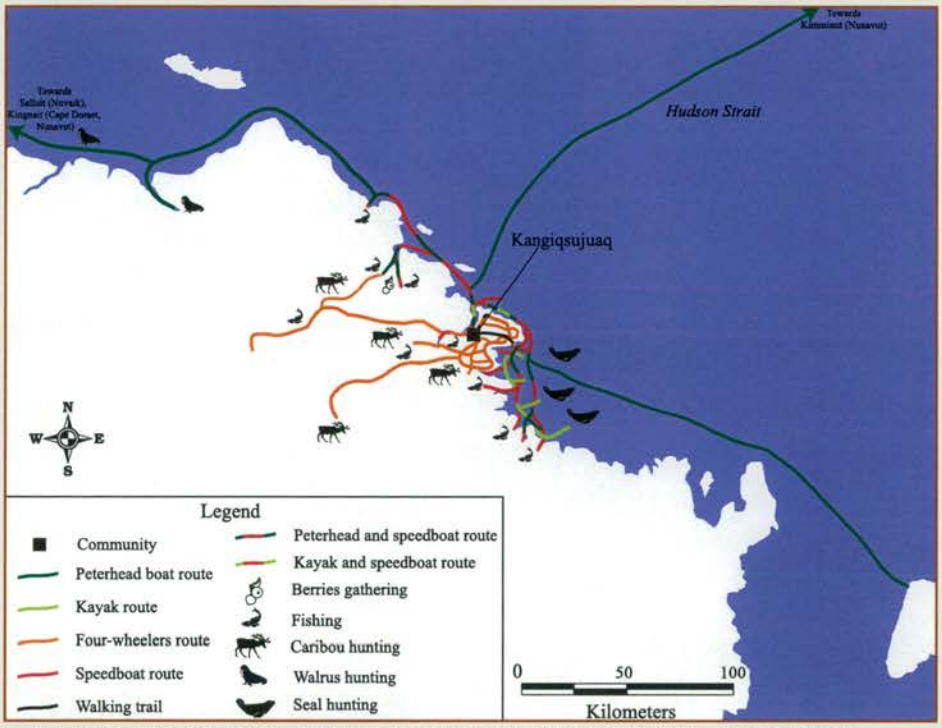

Figure 6. Kangiqsujuaq: Canoe, Peterhead boat, speedboat, four-wheelers routes, and walking trails

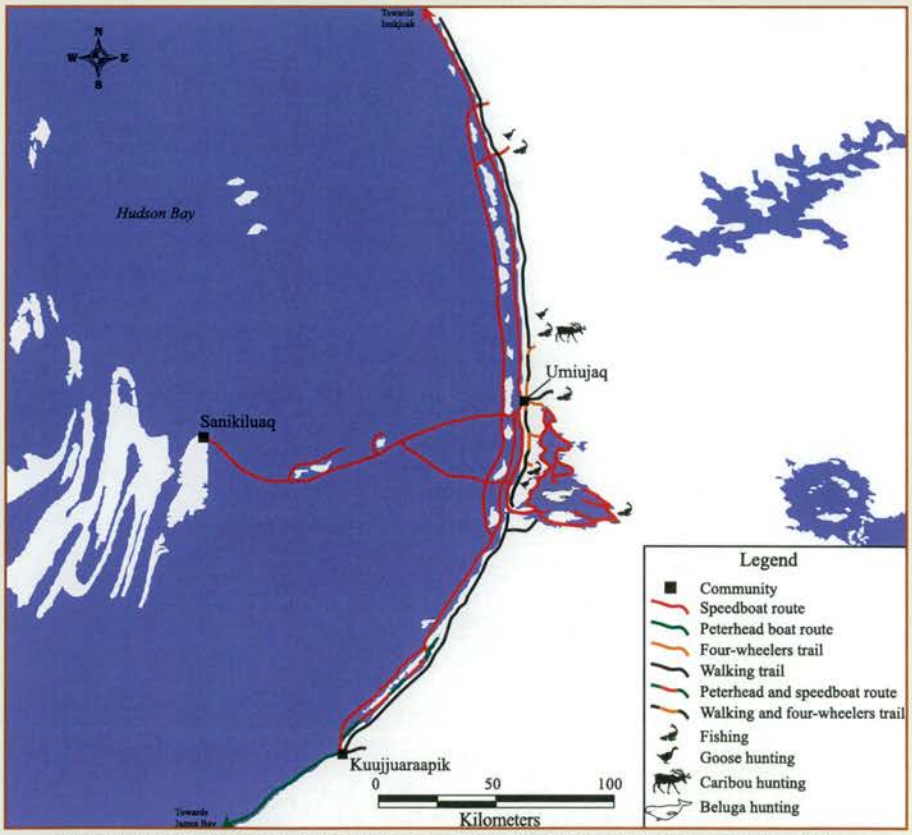

Figure 7. Umiujaq: Canoe, Peterhead boat, speedboat, four-wheelers routes, and walking trails

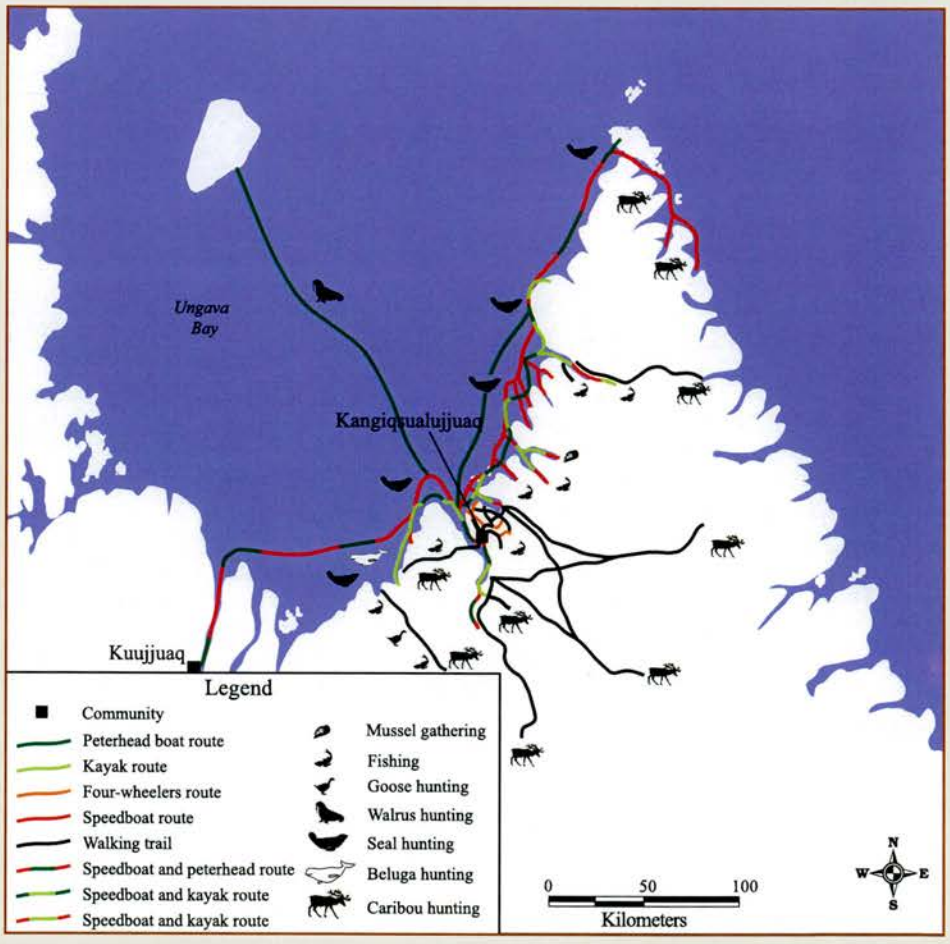

Figure 8. Kangiqsualujjuaq: Canoe, Peterhead boat, speedboat, four-wheelers routes, and walking trails

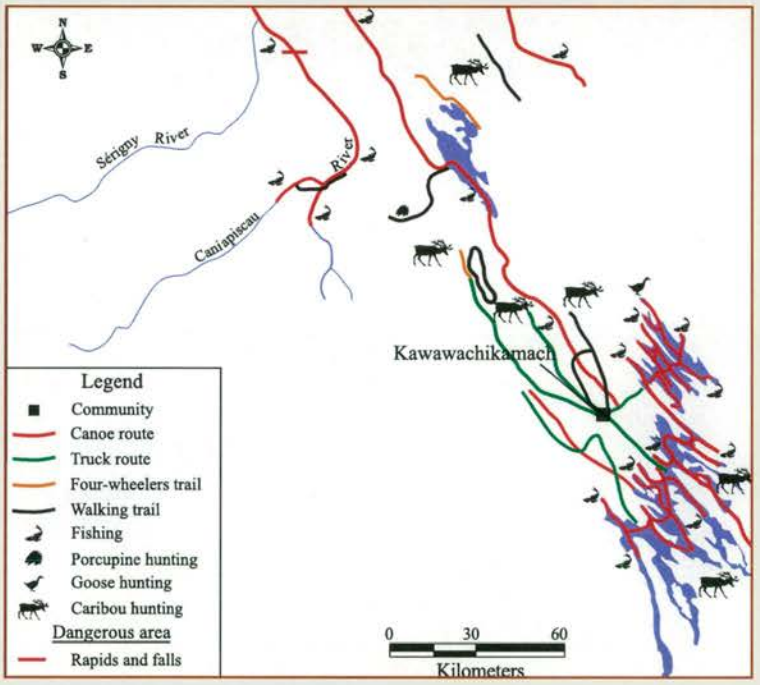

Figure 9. Kawawachikamach: Canoe, four-wheelers routes, and walking trails

2.2 Hazard awareness

Increased risks associated with travel and hunting did not suddenly appear with the transition from dogteams to snowmobiles. Northern subsistence-based communities have always been confronted by risks associated with travel. Drownings while out with dogteam, holes in canoes, and animal attacks are part of the oral tradition of Inuit and Naskapi communities. At present, incidents related to boat or snowmobile engine problems are often reported. Impeded visibility before nightfall (flat light) has resulted in several snowmobile accidents. People have been stranded on drifting ice while seal hunting. Four-wheelers may tip over on steep hills. Avalanche-prone areas are numerous in the region. Travel safety is therefore of obvious concern to both Inuit and Naskapis. "Hazardous" or dangerous zones are part of all trail networks (Figure 10 to Figure 13 and Figure 9) and are well-documented in the collective knowledge of communities.

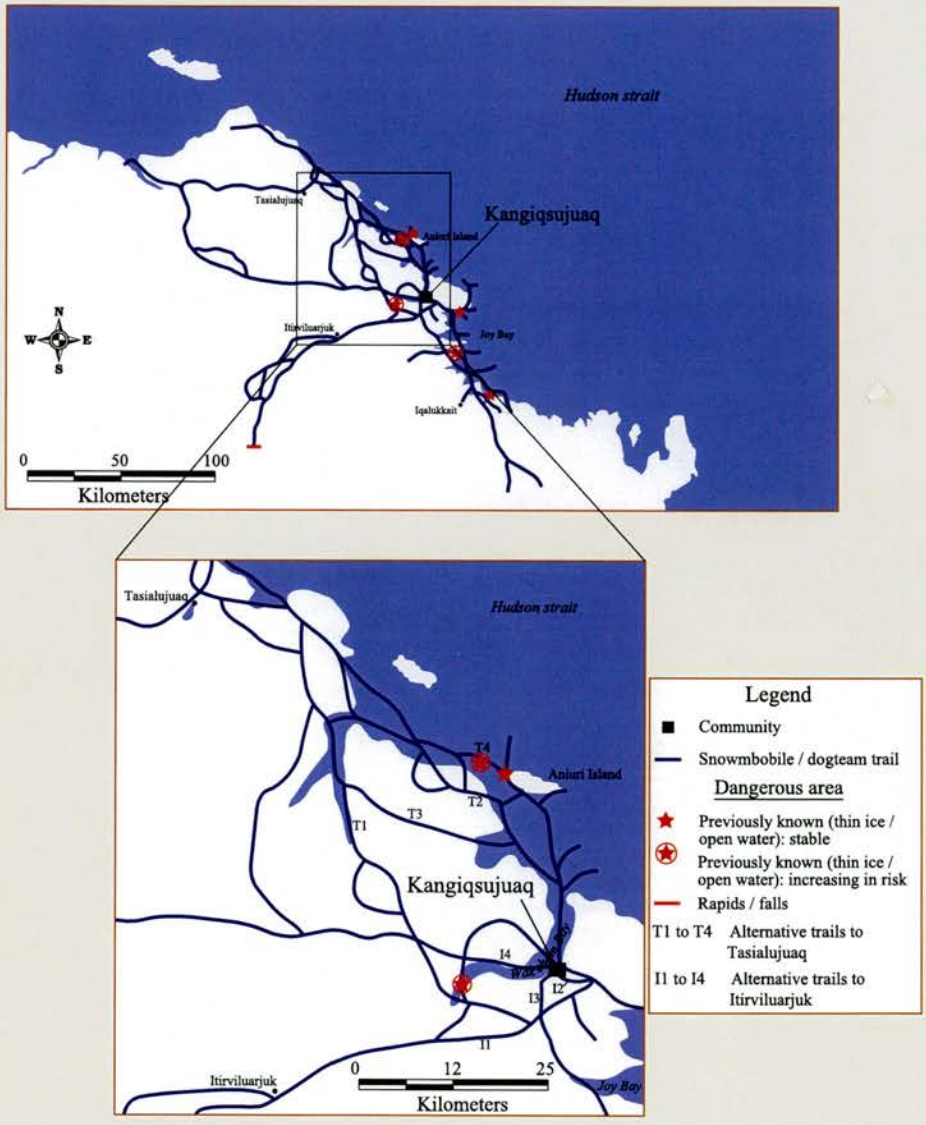

Figure 10. Preliminary risk assessment map for Kangiqsujuaq: snowmobile and dogteam.

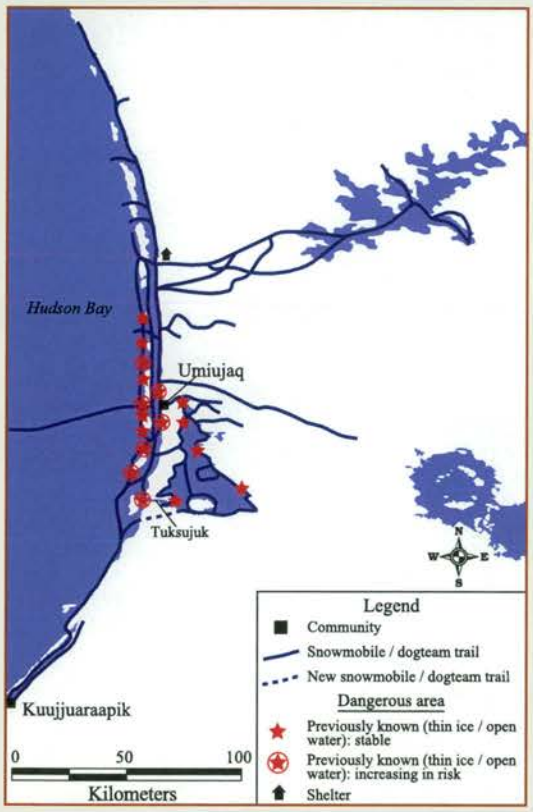

Figure 11. Preliminary risk assessment map for Umiujaq: snowmobile and dogteam.

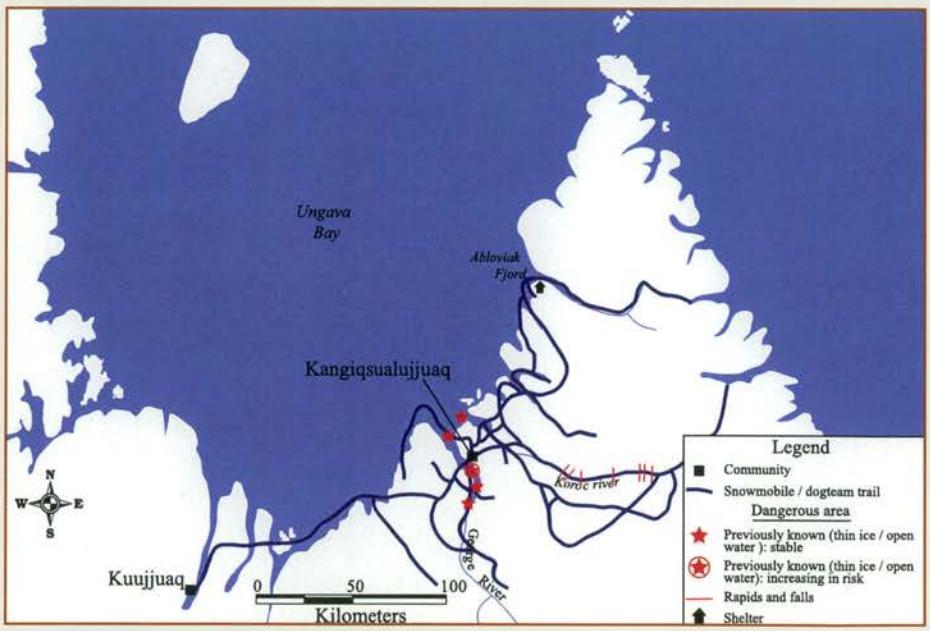

Figure 12. Preliminary risk assessment map for Kangiqsualujjuaq: snowmobile and dogteam.

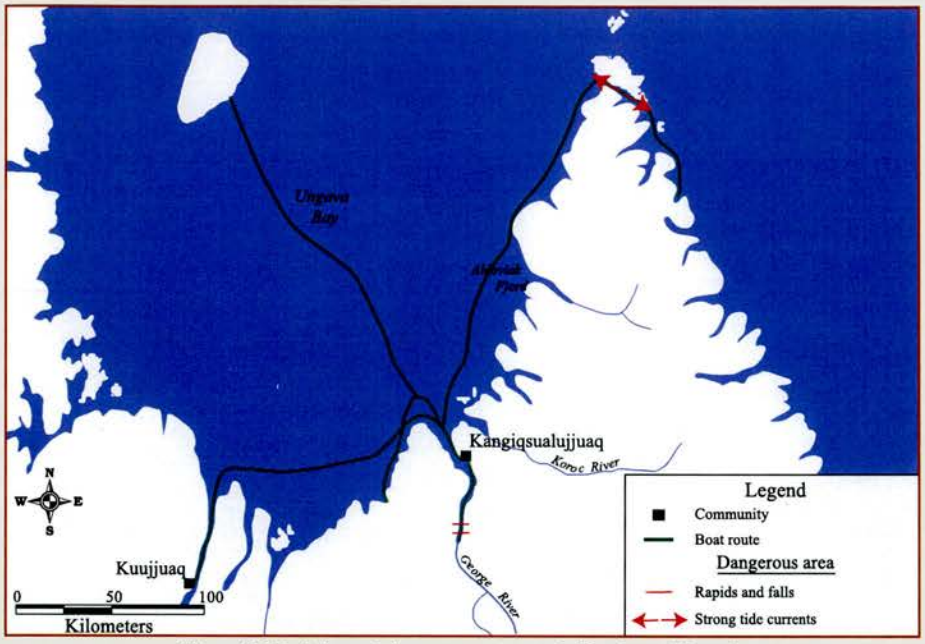

Figure 13. Preliminary risk assessment map for Kangiqsualujjuaq: boat.

In all three Inuit communities, dangerous areas are mainly related to ice instability, which affects snowmobile travel safety in late fall, winter and early spring. In coastal areas, thin ice and/or open water is caused by currents formed at river mouths (Figure 10 to Figure 12), near mainland/island points which are often very shallow (Figure 10, Figure 11), or – in the case of Lac Guillaume-Delisle – along the narrow channel connecting the Lake to Hudson Bay, where tidal currents keep the ice from freezing, even well into Hudson Bay (Figure 11).

> Along all the points, it is always open water or very thin ice. You could just fall through while on it. Anybody who doesn't have much experience, they could think it is a good area, but it's dangerous (Davidee Niviaxie, Umiujaq).

> The most dangerous area is the Bay where the river ends. For example in the spring there are currents. It's the worst in spring. I am scared to go into the open water in the coastal areas (Susie Morgan, Kangiqsualujjuaq).

Wintertime inland hazards are related to thin or absent river ice along rapids or where creeks/rivers enter a larger water body, such as a lake or a larger river (Figure 10 and Figure 12). These hazards are especially noticeable during freeze-up and break- up, but can occur throughout the winter season.

> In Quurgualuk, there is a spot that never freezes all year round because of the river currents (...). Someone who doesn't know the land shouldn't try to lead because there are some dangerous spots in that area (Pitsiulaq Pinquatuq, Kangiqsujuaq).

> For the Koroc River, there are creeks flowing into the Koroc River. I know this is the river that melts the fastest in spring. There are fast currents, rapids, ice, and the snow melts faster than other rivers (...). The Koroc River is the most sensitive to heat of all the routes I know (Tivi Etok, Kangiqsualujjuaq).

In Kangiqsujuaq and Kangiqsualujjuaq, tide movements must be taken into account to ensure travel safety while on the ice.

> When we go seal hunting and it is extremely cold, if anybody wants to go seal hunting in open water, the person has to be very careful. I would check on the tide first before I go seal hunting. Wait until the tide gets low. If I get to the edge of ice and the tide is rising, I wouldn't want to stay there when the tide is getting low. I'd rather not go beside the open water when the tide is getting low because when the tide goes down, there is a current: everything goes down. The ice breaks and you could leave with the ice. You know when things are frozen, they can break easily, same thing with the ice when it is too cold (Pitsiulaq Pinquatuq, Kangiqsujuaq).

> We were seal hunting on the edge of the ice, the ice broke and we started drifting towards the Koroc River. The ice broke loose while the tide was going down and we were quite far away from the coast (Johnny Sam Annanack, Kangiqsualujjuaq).

In Kangiqsualujjuaq, risky areas are also identified for the summer time (Figure 13). Dangerous areas were reported near Kawawachikamach only for the summer season (Figure 9). These areas relate to rapids and falls on rivers, and also to tidal currents in Kangiqsualujjuaq.

> There is one place that is very dangerous. There are high cliffs and it is very narrow to go through by canoe. You have to go through there to get to the other side of the river. I tie the rope to my canoe and I let it slide down the river (Joe Guanish, Kawawachikamach).

> I travelled to Nachvak from George River. Two times. Looking for eider down. If you know where you are going, if you are familiar with the area, that wouldn't be a problem. If you don't know the area, it is not a good place to be because it is very narrow with fast currents. You have to know what to expect in that area. How the water is when it is windy. And you have to be aware of the tide when it is very windy. Especially for the Killiniq area, the channel is fast because it is narrow. You have to know where you are and if you are not familiar with the area, you have to respect the people who are, because you have to be aware of the wind and the tide. You have to rely on the tide to go through that channel. If you go when the tide is going down in that cha nnel, it is going to be very fast current and rough. For that channel, you have to be aware where the currents are flowing, it flows both ways because of the tide (Johnny George Annanack, Kangiqsualujjuaq).

As many local experts mentioned, knowledge of the area – or accompanying people who have this knowledge – can greatly increase travel safety.

16 3- Climate change and access to resources:

Climate change and access to resources: perspectives from the communities

Going out on the land presents many challenges and one has to know where the dangerous areas are so as to prevent risky situations. Furthermore, dangerous areas are not static, they can change over time. However, trail changes were reported by residents of the three Inuit communities and some of these changes are related to climate. It is noteworthy that although negative impacts on wildlife by former mining activities were reported, no climate related changes were reported in Kawawachikamach. Indeed, interviews conducted during the winter 2004, during a student's bachelor degree project, showed that in the Schefferville area, mixed perceptions of climate changes were reported with definite warming trends mentioned by some hunters and cooling trends mentioned by others (Katy Langlois, personal communication). Accordingly, one out of four interviewees in Kangiqsualujjuaq did not report climate-related trail changes. Changes such as path erosion by four-wheelers and sea level lowering were also identified. Many studies showed that sea level lowering in Nunavik is related to glacio- isostatic rebound (Gray et al., 1993; Lajeunesse and Allard, 2003) and are therefore not climate related. Observed changes that occur without climatic forcing imply that, although climate change is having an impact on trails in Inuit communities, it may not necessarily be the sole environmental change of concern to Inuit communities, and it is certainly not a priority in Kawawachikamach, at least at this point in time. Nevertheless, climate change does seem to have an impact on travel safety and must therefore by taken into account for sustainable access to land and resources and health and safety reasons.

3.1 General climate changes observed in the communities

Preliminary results suggest that Nunavimmiut accounts of climate-related changes are broadly similar in all three Inuit communities visited. Warmer temperatures, decreased inland snow depth and late sea- ice freeze-up and/or early break-up were repeatedly stated as highly noticeable, albeit not necessarily observed in all three communities (Table 2). These changes greatly affect the annual season cycle.

> For the winter months, the timing was pretty accurate for freeze- up and amount of snow. For example, back then December was colder than the freezing point. When I was a boy, during the winter season between December and February, it was colder. And springtime was on the right beat with the month. The timing was just right for the month and the season (Tivi Etok, Kangiqsualujjuaq).

> We get ice very late nowadays, even when it is already supposed to be frozen. Spring is earlier, in spring time there used to be ice, but now it melts a lot earlier than before (Eyuka Pinguatuk, Kangiqsujuaq).

> First time I find February warm like this. In Inuttitut, February is called Nalirqaituq, which means: there is no other time like this, the coldest month of the year. Inuit named it in the way that there will be no other month like that (Amaamak Jaaka, Kangiqsujuaq).

> There used to be winter for seven months. But now it is only for five months. This has affected me very much. It is totally different now (Davidee Niviaxie, Umiujaq).

Table 2. Observed climate-related changes in Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq

	Kangiqsujuaq	Umiujaq	Kangiqsualujjuaq
Ice	Early sea ice break-up Early lake ice break-up Late freeze-up	Early sea ice melt Early melt (land)	Late freeze-up Thinner lake ice
Snow	Less snow inland	Unpredictable snowmelt Many snowmelt episodes before permanent snow cover Less snow inland	Less snow inland More avalanches
Temperature/ Sun	Warmer winter Warmer (in general) (not cold for long periods)	More heat from the sun More extremes in warm and cold temperatures	Warmer winter Warmer summer
Wind	Windy more often		More windy Wind more violent
Weather		Unpredictable weather Rainy days in February	
Rivers			Lower levels

Other climate-related changes were reported locally. An increase in wind frequency and intensity was reported for Kangiqsualujjuaq and Kangiqsujuaq. In Umiujaq, the onset of the permanent snow cover in early winter is not as predictable as it used to be. Before, the first November snow usually stayed on the ground, but now there are many snowmelt episodes before the onset of a permanent snow cover as late as December. Weather was also found to be more unpredictable in Umiujaq. Unpredictable climate was not mentioned in Kangiqsujuaq during this series of interviews, but was reported in community workshops by Furgal and Communities of Nunavik (2003b) in this community. Thinner lake ice and an increase in avalanche frequency were also reported for Kangiqsualujjuaq.

3.2 Climate change impacts on trail networks

Weather unpredictability has had some impacts on trail networks, with some hunters choosing not to travel far from shore by boat or canoe in order to avoid unexpected bad weather. To date, this does not seem to have affected access to the territory in any major way. On the other hand, increased ice instability seems to have had the most important effects on Nunavimmiut trail networks with these changes affecting mainly dogteams, where dog mushers are still active such as in Kangiqsujuaq and Kangiqsualujjuaq, and snowmobile trails. Specific areas with increased risks were mentioned by the local experts especially in the coastal areas (Figure 10 to Figure 12).

In Kangiqsujuaq, changes reported appear to be quite recent. In Wakeham Bay, unstable ice conditions are now present on the path of a late fall and spring snowmobile trail (Figure 10). This part of the trail used to be accessible in late fall, but in February 2004, it was still only covered with thin ice. Further north, near Aniuri Island, there is also a new dangerous area on a winter trail path that was usually frozen by January, but the 2004

winter has also seen this area remain unfrozen as late as February. Furthermore, Joy Bay is usually frozen by January, but again, it was still not frozen by February 2004.

> This is a trail [Wakeham Bay area] that I take in springtime. We used to go there a lot but now it doesn't freeze anymore. This other trail [near Aniuri Island] is a trail I use in winter, but it is harder now because of thin ice and currents. It doesn't freeze anymore (Young hunter, Kangiqsujuaq).

> These areas [Wakeham Bay and Aniuri Island] are usually accessible in January, but this year we are in February and we are still not able to use those trails. For this month, February, it's never been dangerous. These places should be frozen by now (Pitsiulaq Pinquatuq, Kangiqsujuaq).

Winter 2004 seems to have been a special year in Kangiqsujuaq and this may reflect only a discrete unusual winter not directly related to any climate warming trend. But preceding years have also seen some changes in trail paths, with one area in Joy Bay opening more and more every year and Wakeham Bay being less accessible in spring.

In Umiujaq, there seems to be an increase in sea-ice instability in many coastal areas that are already known to be dangerous (Figure 11). These changes seem to have occurred in the recent past, i.e. during the last 20 years, but the timing of this issue was not explicitly discussed by local experts in Umiujaq.

> We were able to use all the points back then. Even near the shore, we used to use them, even in spring. But now we don't use them as much because the ice goes too fast. They are going to start melting in March nowadays. Back then, these routes were accessible even throughout the month of May. In the middle of March, these sensitive areas are no longer accessible nowadays (Elder man, Umiujaq).

> Before, we could go along the shore in front of Umiujaq all the time. Now you have to be careful. It is only during real winter that you can use that area (...). In May, the whole area is no longer useful. Back then we could have used dogteams. But now it is melting faster, the ice is going out faster (Davidee Niviaxie, Umiujaq).

In Kangiqsualujjuaq, trail changes seem to have occurred mainly near the mouth of the George River some four or five years ago (Figure 12).

> There is thin ice nowadays on the George River. It hardly freezes up and the route is more on the mainland (Susie Morgan, Kangiqsualujjuaq).

> The dogteam trail is not the same anymore. This used to be flat, but it is all ice piled up from strong currents (Tivi Etok, Kangiqsualujjuaq).

It is worth noting that even though the George River snowmobile trail was affected by climatic changes, it is not a regularly used trail anymore since it became a secondary trail after settlement in Kangiqsualujjuaq. On the other hand, climate change impacts on inland rive and lake ice trails were also reported in this community.

> The land is changing too. There is a big change. Back then we used to have a snowmobile race at Christmas, but nowadays we don't have it anymore because of late freeze-up (Susie Morgan, Kangiqsualujjuaq).

In all three Inuit communities, climate change seems to have had an impact on the trail network and this is reflected primarily in the timing of freeze-up and break- up of the ice. In Kangiqsujuaq, the break-up used to be in June, but now it is in May. In Umiujaq it used to be in May, but now it is in March. The break-up was reported to be almost one month earlier than before in these two communities.

There is some uncertainty pertaining to the timing of climate-related changes in all three communities. Cross-validation during a follow-up workshop will allow clarification of this timing issue.

3.3 Coping with climate change impacts on the trail networks

Local expert reports on climate change impacts on trails suggest that this is an important issue for travel safety and timing of access to resources. Nevertheless, Inuit have always lived in a highly variable environment, with changes in past and present climate and resource availability being the rule instead of the exception (Krupnik, 1993; McDonald et al., 1997). Adaptive responses to changes in trail networks are part of Inuit flexibility towards change. Two such adaptive responses are used so far in Nunavik to minimize travel risk associated with climate change. The first consists of slightly modifying the travel path and the second of using alternate trails.

The first response is commonly used by the three Inuit communities, both for winter and summer traveling. It consists of local path modifications that do not induce major trail changes. Such small path modifications may be used not only to cope with climaterelated trail changes, but also offset any local disruption of pathways. During the summer season, one can slightly modify a canoe or boat route by navigating close to shore to avoid unexpected bad weather. In winter, small path changes usually involve steering clear of sensitive areas.

> We are able to use this trail, but now you cannot go straight because of the thin ice around Wakeham Bay. This is the only area you have to avoid (Amaamak Jaaka, Kangiqsujuaq).

> When I go to Kuujjuaraapik by skidoo, I realize that Tuksujuk area is getting more and more dangerous each year due to the ice not being stable. I go way into the sea: never go close to the shore. If this road is too rough, I can also use an alternative route: the one where the Crees cut trees (Elder man, Umiujaq).

This last report from Umiujaq reflects the second response of using an alternate trail to reach the same area. In Umiujaq, one widely used alternate winter trail is the new trail south of Tuksujuk where the Cree recently cut trees to ease the way to the Lac Guillaume-Delisle area (Figure 11). In Kangiqsujuaq, two examples of alternate trails further illustrate this second adaptive response. First, to reach Tasialujuaq, a winter hunting and fishing area located northwest of the community, there are four possible alternate in the first section of the trail (T1, T2, T3, and T4 on Figure 10). T1 is a snowmobile trail used in fall/spring before/after the coastal zone freezes. When the sea ice is frozen, trails T2 or T3 are used since they are more direct. During the coldest winter period, when sea ice near Aniuri Island is finally frozen, trail T4 is used. As mentioned before, trail T4 is less used nowadays because of increasing ice instability. But this does not impede access to Tasialujuaq since other trails are available. T1-T4 remain the main trails, but other secondary trails are present, as can be seen in Figure 10.

The second example in Kangiqsujuaq is illustrated by the different trails that can be used to reach Itirviuarjuk (trails I1 to I4 on Figure 10). Trail I1 is a snowmobile trail used in fall for fishing or caribou hunting even before the coastal ice freezes. Later, when there is more snow, trail I2 can also be used. When the Bay is finally frozen, trail I3 is the preferred trail. In spring, trail I4 is normally used, but not as much as before since the sensitive area in Wakeham Bay does not freeze anymore. Here again, using different trails according to trail conditions allows for access to resources even if there is ice changes and instability in some areas.

On the whole, the second adaptive response usually consists of using more inland trails to avoid sensitive areas along the coast.

> Before, we used to go around the blue trail Aniuri Island by skidoo, but now it melts so quickly and the ice doesn't get thick enough to go around the unstable ice. When it is like that, we try to avoid it by going more inland (Pitsiulaq Pinquatuq, Kangiqsujuaq).

> The Bay freezes up late. That is how the trails are changing. It takes longer for the bay to freeze up because it is salty. We are using the routes more inland nowadays, not the coastal ones, because of late freeze-up (Susie Morgan, Kangiqsualujjuaq).

> On the George River, nowadays there is thin ice. It hardly freezes up and the route is more on the mainland (Susie Morgan, Kangiqsualujjuaq).

These adaptive responses lower the impact on access to resources by allowing access to hunting and fishing areas under many different trail conditions. But if timing of access was to change because of increasing ice instability, this could impede access to resources in spring and fall, when migrating wildlife has already left the area. Indeed, local experts in Kangiqsujuaq reported that specific trail changes impact access to territory with some areas no longer easily accessible at the usual time of the year.

> Nowadays, it is hard to go to the places we used to go. I remember on June 21, I went to Iqalukkait on skidoo! On our way back, there were some holes in the ice, but we were still able to come back. But now, it is not possible to go there in June, not even close to June. In May we stop going there. We also used to go north to Tasialujuaq in June, now it is impossible (Eyuka Pinguatuk, Kangiqsujuaq).

Going out on the land is naturally done according to seasonal trail characteristics. So far, freeze-up and break-up timing shifts observed by Nunavimmiut (Table 2) may have changed the timing when one area is reachable, but no hunting or fishing area seems to have been abandoned for safety reasons and no shifts in the resources harvested was reported in any of the three Inuit communities. But if climate changes were to induce a larger shift in the timing of shoulder seasons, there is a possibility that resources may not be available at the time the area is reachable. Then, abandonment of hunting and fishing areas would occur. This could result in much uncertainty in resource availability and have a strong impact on cultural identity and potentially health, even though replacing abandoned harvesting areas with new ones is an adaptive response inherent to the flexible Inuit way of coping with a highly variable environment (Krupnik, 1993).

The extended trail networks with their many alternatives to reach the different harvesting areas are a very clear illustration of Inuit adaptive capacities. Since both inland and coastal resources are harvested, there are many possibilities for adaptation measures in the face of climatic variability (Krupnik, 1993). As for the Naskapis, the wide trail coverage around the Kawawachikamach area also points to a very adaptive system of access to resources, but it is not possible at this point to expand further on this subject since no trail changes were recorded. Nevertheless, if the predicted climate change is to occur at a rapid rate, as is predicted (IPCC, 2001), this may pose unprecedented challenges to northern communities. Present day adaptive responses may not be enough to face new and quickly changing environments.

4- Comparison with climatic datasets

Types and ranges of climate change predicted by climatic scenarios can be used to facilitate decision making on mitigation and adaptation measures. Unfortunately, temporal and spatial scales of climatic scenarios are often too coarse to be applied directly at the local scale. Moreover, the climatic indicators used for prediction, such as mean annual temperature, are often of little use when applied to every day life. One way of filling this gap is to use instrumental data to find relevant climatic indicators that closely reflect northern community conditions, such as those expressed by local experts drawing on traditional knowledge (Berkes et al., 2001). By integrating such indicators into climatic scenarios, the science of climate change could become an applied "people's geography" (sensu Duerden and Kuhn, 1998), with climatic scenario outputs more readily accessible for decision-making at the local scale. Local experts of Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq reported that increasing ice instability and weather unpredictability are becoming key issues impacting travel safety. Since no climate change impact on trails was reported by the Naskapi local experts, the climatic reconstructions will focus mainly on the Kuujjuaq and Kuujjuaraapik meteorological stations.

4.1 Temperature and ice instability

Using sea ice charts from the Canadian ice service, Houser and Gough (2002) recently showed that no significant trend could be identified in the timing of pack ice formation and retreat within the Hudson Strait for the 1971-1999 period, but significantly later ice formation and earlier ice retreat could be observed in the 1990-1999 period. These later findings agree well with Kangiqsujuaq local experts' observations of later freeze-up and earlier break-up on the south shore of Hudson Strait (Table 2), even though Nunavimmiut observations of ice conditions relate primarily to landfast ice.

Revisiting the ice charts and focusing on landfast ice for the break-up season, differences between Houser and Gough's (2002) findings and local experts' observations were seen. A significant trend towards earlier break- up was found for the Kangiqsujuaq coastal area during the 1971-1999 period, but no significant trend was found for the recent period (Figure 14, Table 3).

In Umiujaq and Kangiqsualujjuaq, there are also discrepancies between landfast ice trends as computed from ice charts and local expert observations. On the east shore of Hudson Bay, no trend was observed in Umiujaq for all periods (Table 3), although local experts from this community reported that break-up is now occurring about a month earlier than before (Table 2). In Ungava Bay, ice chart analysis shows a significantly earlier break-up trend in Kangiqsualujjuaq during the period 1990-1999 (Table 3), although this is the only community where earlier break-up was not reported by local experts (Table 2). On the other hand, the significant trend for the recent period in Kangiqsualujjuaq disappears when data for 2000 to 2003 are included.

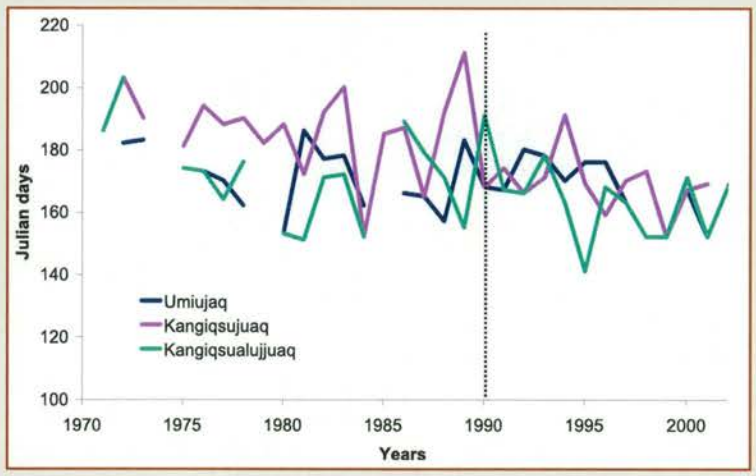

Figure 14. Landfast ice break-up timing in Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq.

Table 3. Break-up timing trends (linear regression coefficients) and their statistical significance for Kangiqsujuaq, Umiujaq, and Kangiqsualujjuaq.

Community	1971-1999[1]	1971-2003	1990-1999[1]	1990-2003
Kangiqsujuaq	-0.955**	-0.869**	-1.146	-0.372
Umiujaq	-0.412	-0.331	-2.024	-0.712
Kangiqsualujjuaq	-0.789*	-0.620	-3.170*	-1.134

[1]The period ends in 1999 for comparison with Houser and Gough (2002).
* < 0.05
** <0.01

An analysis of the mean monthly temperature records shows further discrepancies with the fast ice retreat timing obtained from ice chart analysis. Houser and Gough (2002) suggested that pack ice break-up may be closely related to the ice season temperatures. The most obvious feature of the mean temperature record is the significant increase in he mean December temperature for the two stations (Kuujjuaraapik and Kuuj juaq) since the 1990s (Table 4, Figure 15 and Figure 16). Therefore, this may account for earlier breakup observed by local experts in Kangiqsujuaq and Umiujaq, providing that December is included in the ice season, but is not reflected in the ice chart analysis. On the other hand, the December temperature warming trend also applies for Kangiqsualujjuaq, but no earlier break-up trend was reported by local experts in this community. April temperatures in Kuujjuaraapik also show a significant increasing trend in the recent period (1990-2003), but again this is not reflected in the Umiujaq break-up trends obtained from the ice chart analysis (Table 3).

The mean monthly temperature trends agree partly with freeze-up trends reported by local experts. Houser and Gough (2002) showed that pack ice formation timing is correlated with the ice-free season length and ice-free season temperatures. By extension, warmer temperatures in September and December (when still ice- free) could lead to a later freeze-up. This agrees well with Kangiqsujuaq and Kangiqsualujjuaq local expert observations of a later freeze- up, but does not account for the fact that no late freeze-up trend was reported by local experts in Umiujaq.

Three factors could explain the discrepancies between Houser and Gough's (2002) findings on pack ice, mean temperature trends (Table 4), local expert observations (Table 2), and fast ice timing trends (Table 3). First, land fast ice is not only dependant upon temperature. Fast ice extension, depth, and season length are closely linked to temperatures, but also to wind, currents, waves, and sea- level fluctuations (Norton, 2002; Divine et al., 2003). Temperature may not be the sole factor to consider and this may be why the temperature records do not always fit with local expert observations of progressively earlier break-up times. Second, the fast ice break-up timing trends presented here still need improvement. The trends presented for fast ice are a first approximation since the Canadian Ice Service sea ice charts lack precision in the nearshore environment. Moreover, the threshold we used for fast ice disappearance may not be the best available and should be further developed with the communities. Finally, there is the possibility that trends identified by local experts do not correspond to a linear temporal scale, but to a diachronic one with "before" and "now" serving as arbitrary memory landmarks. This may not be well captured by linear regression trends and further investigation on the temporal scales used by traditional and scientific knowledge should be made with the local experts during community workshops.

The thresholds used for local observations and climatologic analyses should be further defined with the local experts during community workshops. Fast ice monitoring by each community during freeze-up and break-up could also be conducted to improve the thresholds. Moreover, satellite imagery might be used as a complement to fast ice monitoring to observe present conditions. These result s may then serve as a baseline to gain a better understanding of Nunavik fast ice historical trends in extension, depth, and timing of formation and retreat.

Relevant climatic indicators could then be further developed. Following Houser and Gough (2002), the length of the ice- free season and its correlated degree-days should be taken into account since it has a direct impact on heat storage and therefore on freeze- up timing.

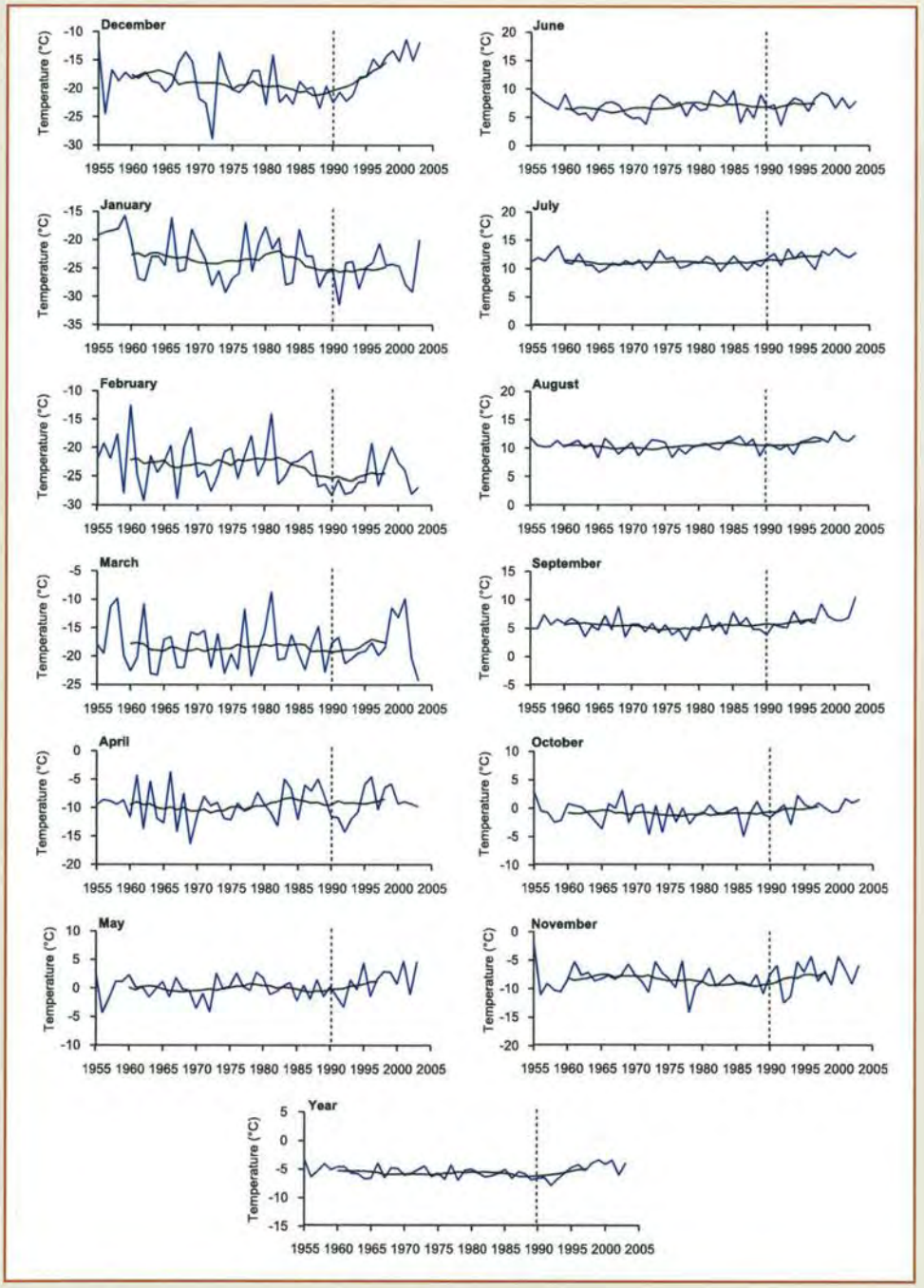

Figure 15. Mean annual and mean monthly temperatures for Kuujjuaq with corresponding 11 year moving average.

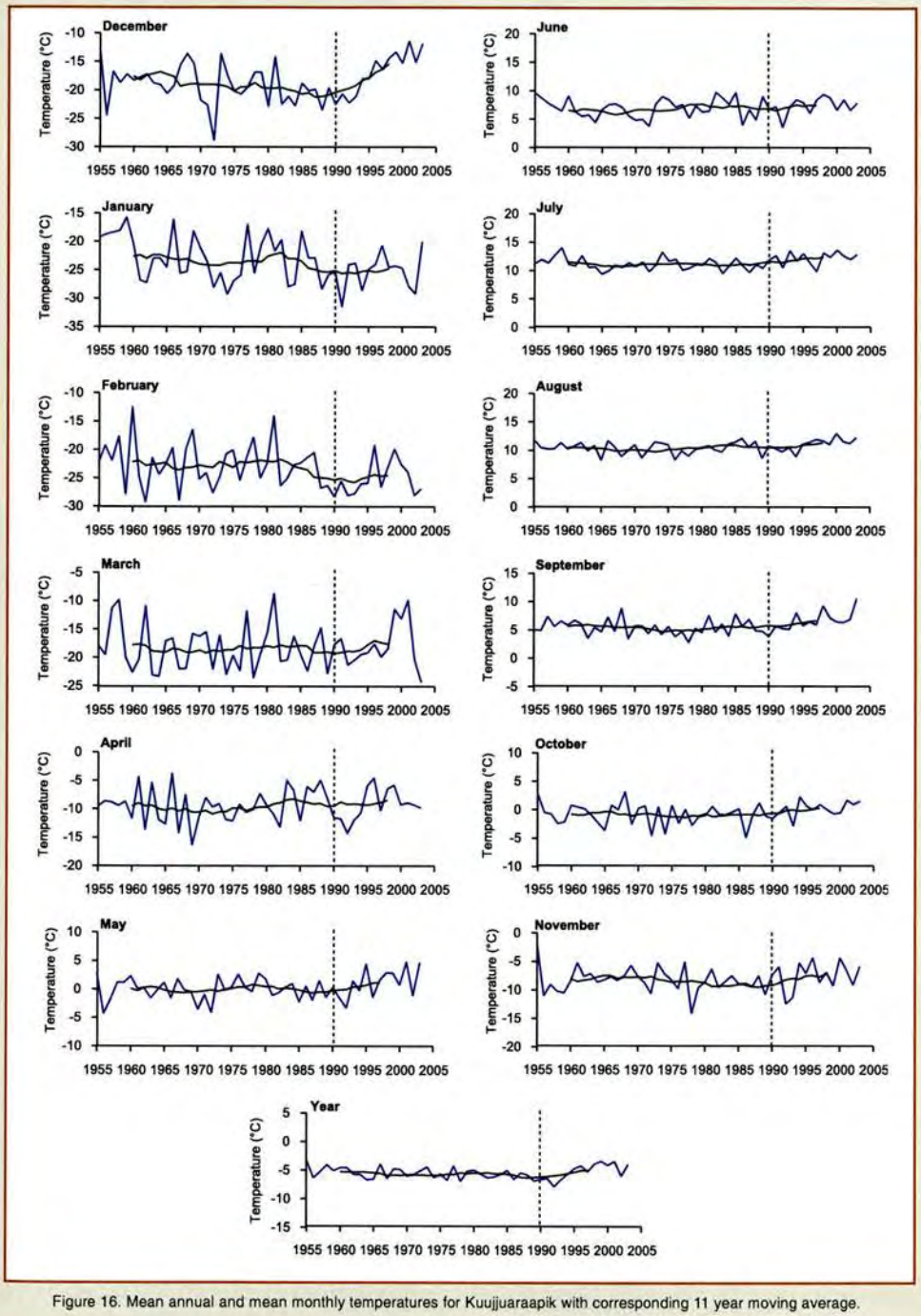

Figure 16. Mean annual and mean monthly temperatures for Kuujjuaraapik with corresponding 11 year moving average.

Although not included in the analysis, some important observations are worth noting regarding the climatic trends occurring in Kawawachikamach. Schefferville mean monthly temperatures show some significant warming trends similar to those observed in Kuujjuaq and Kuujjuaraapik, notably in September and November for the recent period (Table 4, Figure 17). These trends did not seem to have a significant effect on the Naskapi access to resources, since climate change was not brought up in local expert discussions as having any impact

on the trail networks. This may mean that new climate trends have not yet impacted day to day life in this area or simply that they are not perceived to have a noticeable impact in relation to other changes in the region.

It is worth noting that Kuujjuaq and Kuujjuaraapik recent mean monthly temperature trends were computed for only 14 years. In the Schefferville temperature dataset, there are missing data for years 1994-1996, and thus the regression for the most recent period was calculated with very few points. In all three stations, the small sample set for the linear regressions implies that caution should be used when interpreting recent climatic trends, especially since the significant warming trends obtained in the three meteorological stations appear to lie with in the natural variability of the last ~50 years.

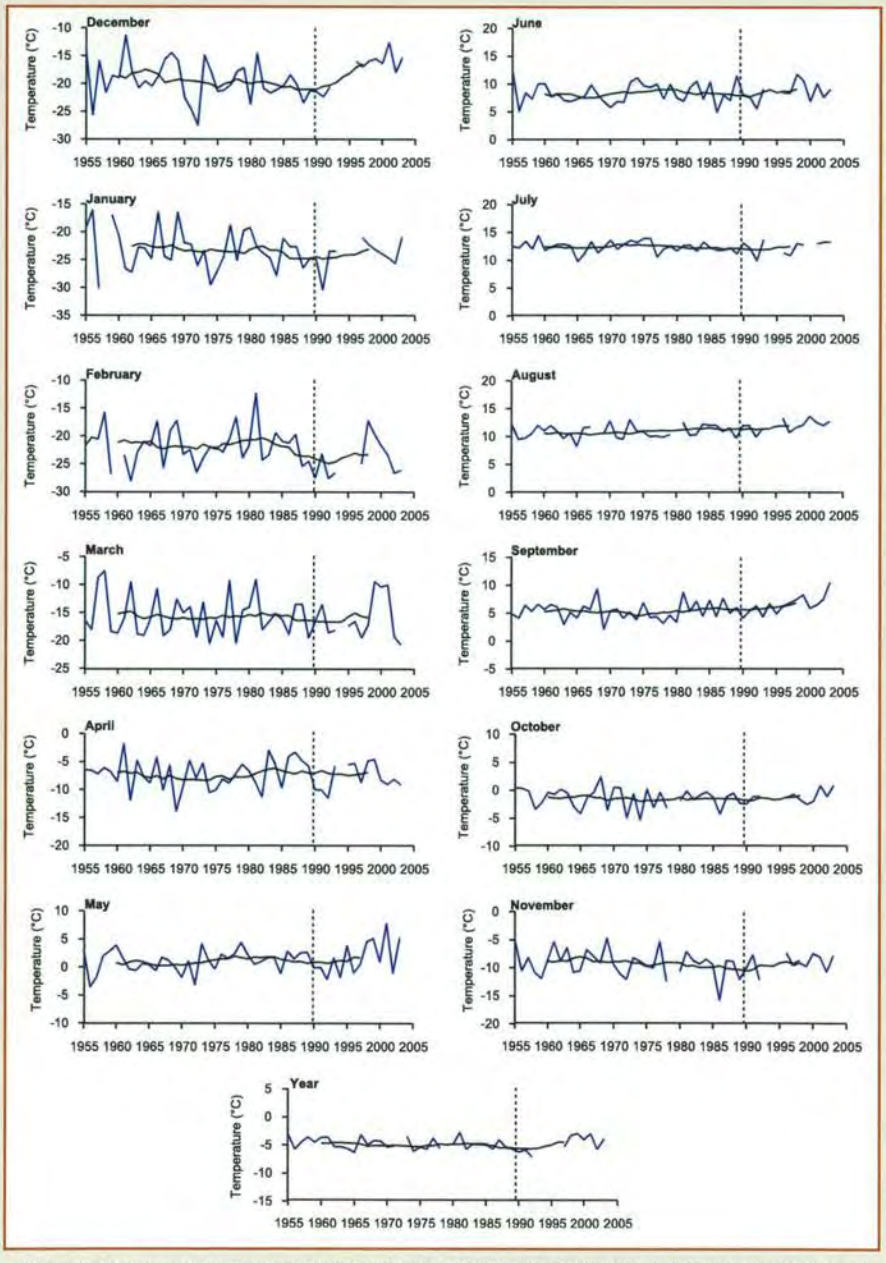

Figure 17. Mean annual and mean monthly temperatures for Schefferville with corresponding 11 year moving average.

Table 4. Linear regression slopes and statistical significance for mean monthly and annual temperatures for Kuujjuaq, Kuujjuaraapik, and Schefferville.

	Kuujjuaq		Kuujjuaraapik		Schefferville	
	1955-2003	1990-2003	1957-2002	1990-2002	1955-2003	1990-2003
January	-0.071	0.177	-0.019	0.304	-0.058	0.238
February	-0.076	0.210	-0.020	0.345	-0.068	0.220
March	0.001	0.150	0.021	0.349	-0.021	0.096
April	0.025	0.295	-0.002	0.464**	-0.001	0.119
May	0.038	0.317	0.028	0.405	0.042	0.401*
June	0.025	0.124	0.044*	0.190	0.013	0.137
July	0.020	0.059	0.033*	0.092	0.002	0.114
August	0.023	0.167**	0.070***	0.105	0.039**	0.106
September	0.031*	0.275**	0.022	0.256*	0.040**	0.294**
October	0.020	0.144	0.007	0.156	0.000	0.119
November	0.006	0.139	0.013	0.120	-0.017	0.096
December	0.030	0.817***	0.072	0.656**	0.028	0.545**
Annual	0.007	0.242**	0.023	0.287**	0.001	0.216

*p=<0,05 **p=<0,01 ***p=<0,001

4.2 Temperature and weather unpredictability

Since weather unpredictability was reported by local experts as having a negative impact on access to resources, especially during the summer, day to day temperature variability is used here as a first approximation of weather variability in Kuujjuaq and Kuujjuaraapik (Figure 18 and Figure 19).

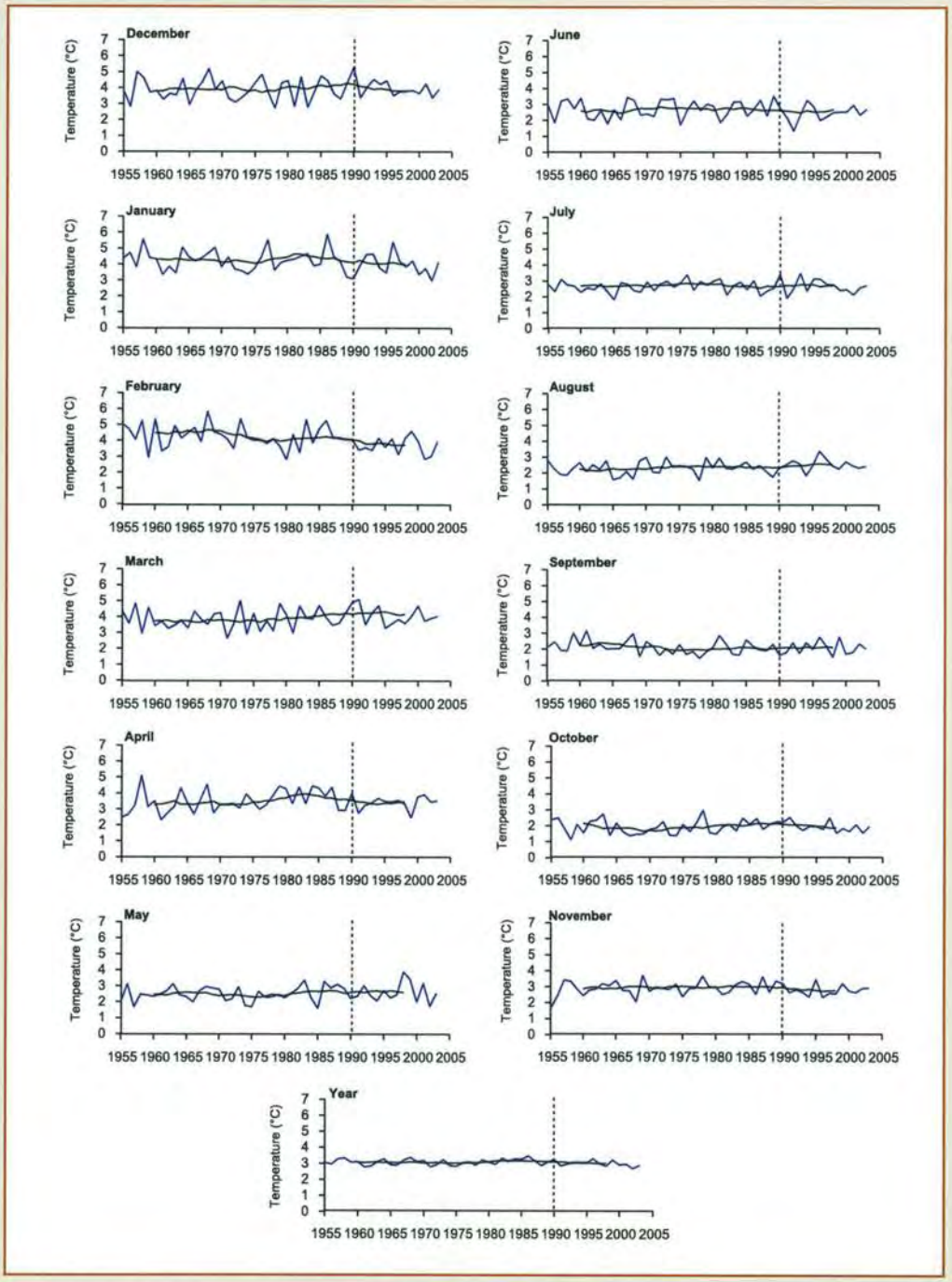

Figure 18. Kuujjuaq mean monthly and annual daily temperature variations (Td – T(d-1)) with corresponding 11 year moving average.

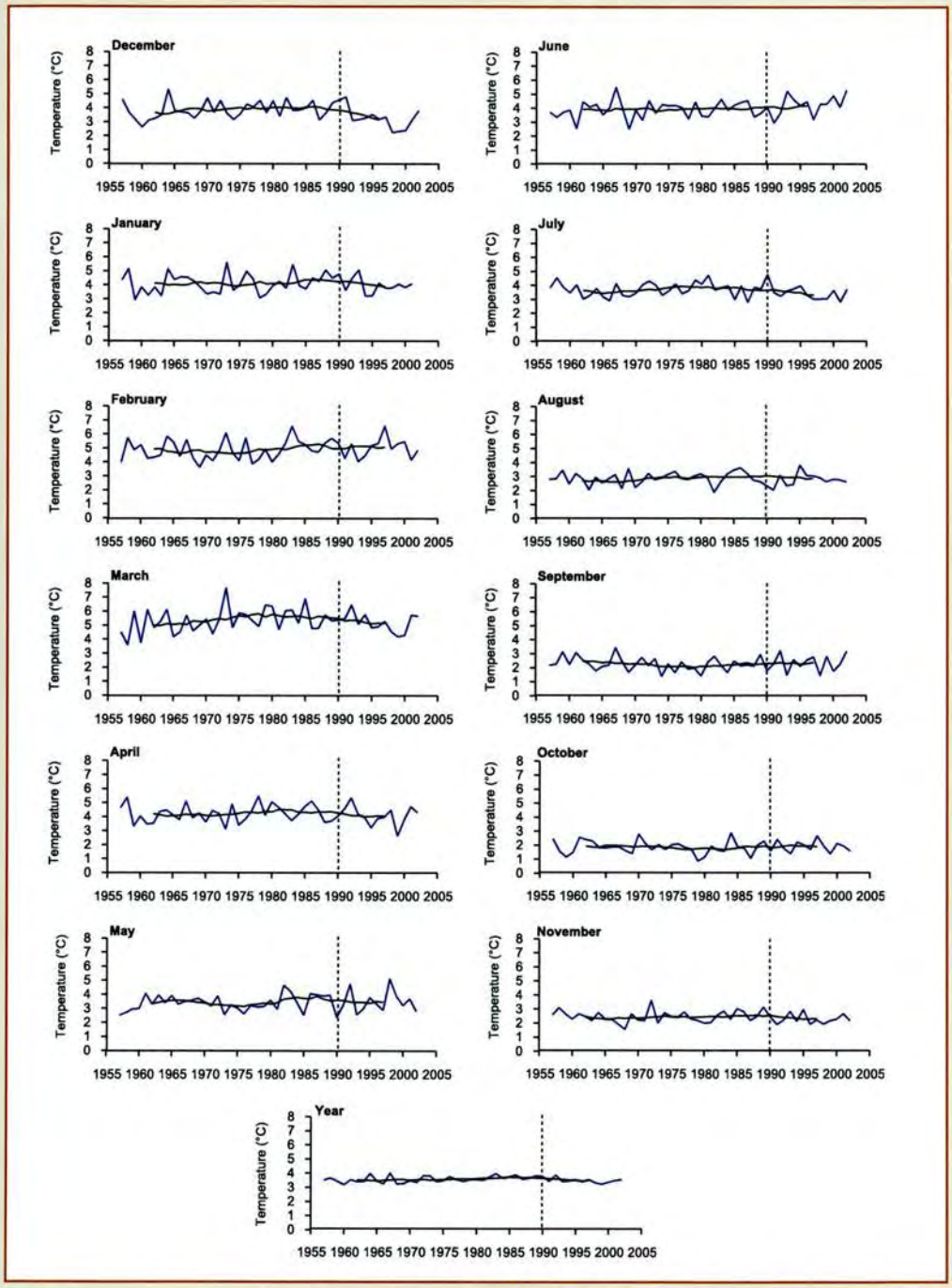

Figure 19. Kuujjuaraapik mean monthly and annua l daily temperature variations (Td – T(d-1)) with corresponding 11 year moving average.

Table 5. Linear regression slopes and statistical significance for mean monthly and annual daily temperature for Kuujjuaq and Kuujjuaraapik.

	Kuujjuaq		Kuujjuaraapik	
	1955-2003	1990-2003	1957-2002	1990-2002
January	-0.009	-0.025	-0.003	-0.077
February	-0.021**	-0.011	0.010	0.018
March	0.010	-0.051	0.006	-0.057
April	0.007	0.009	-0.002	-0.038
May	0.006	0.014	0.007	0.033
June	0.000	0.043	0.015*	0.075
July	-0.001	-0.030	-0.007	-0.073
August	0.007	-0.002	0.005	-0.034
September	-0.005	0.012	-0.001	0.026
October	-0.002	-0.032	-0.001	-0.006
November	0.000	0.000	-0.003	-0.004
December	0.000	-0.066	-0.012	-0.112*
Annual	-0.001	-0.017	0.001	-0.021

*p=<0,05 **p=<0,01 ***p=<0,001

Very few significant trends can be observed and there is even a trend towards lower day to day temperature variability in February in Kuujjuaq. The discrepancy between these results and local expert observations of increased weather unpredictability could be related, among other things, to the change from a nomadic to a sedentary life, which implies less time passed on the land observing weather patterns and therefore more uncertainty in weather prediction. The discrepancy may also be related to a number of sociological factors associated with the age of participants in this study, their level of participation in land based activities today, their general health or past experiences which all may influence their reported perception of overall increasing weather unpredictability. On the other hand, the indicator chosen here to capture weather unpredictability is likely far from being the most accurate and reliable for this outcome. Barometric pressure, wind, precipitation, and weather conditions could be of much more use in indicating rapid changes in weather systems. Unfortunately, these data are not always reliable due to instrument problems and are not often used in climatic studies conducted in Nunavik. Nevertheless, further attention should and will be given to these instrumental data in the next phase of this project.

30 Conclusions

Interviews conducted with local experts in Kangiqsujuaq, Umiujaq, Kangiqsualujjuaq, and Kawawachikamach allowed the gathering of information on climate change impacts on trail networks. Although climate change seems to have had little impact so far on the trail network of the Naskapis, increased travel risks linked to ice instability and weather unpredictability are important issues for Inuit communities. Mean temperatures seem to be correlated with the later freeze-up and earlier break-up reported by local experts, but climatic indicators relevant to this issue should be further developed with the communities to more precisely define the timing and causes of ice formation and retreat. On the other hand, weather unpredictability cannot be captured precisely using temperature values. Climatic indicators relevant to this issue must take into account instrumental data other than temperature, and much work in this area remains to be done.

Meanwhile, all three Inuit communities participating in this study reported using adaptive responses to cope with increasing risks, such as slightly modifying trail paths, switching to more inland trails when travel by snowmobile is hindered in coastal areas, or switching to travel near shore by canoe when unpredicted bad weather occurs in open water. The questions remains as to whether these adaptive strategies will be enough if future climate changes fall outside the known natural variability in this region and will younger generations learn these adaptive ways such that they will be able to continue to pursue aspects of traditional lifestyles important to culture, identity and health in these regions? While this project has reached the end of its first phase, these questions are still pending. Increased knowledge of changes (past, present, and future) and their related adaptive responses could help coping with unprecedented challenges that northern communities may experience in the face of climate change. These subjects will form the focus of the project during its next steps while developing an adaptation toolkit (documentary video, trail and risk assessment maps, guide of adaptation measures) for communities. This toolkit will be based on both traditional and ecological knowledge of climate change impacts on trail networks and will be aimed towards safer and sustainable access to traditional land and resources.

Recommendations 31

For the next phases of this project and others on this subject in the region, priority should be given to:

1. Merging trail maps from this project with Makivik's extensive land use database for accurate and updated trail maps to be used exclusively by the communities

2. Cross-validating winter 2004 results in workshops with each community involved

3. Conducting community workshops on risks and adaptation measures and characterizing the risks in more detail (season, type, causes)

4. Establishing the harvesting cycle timing and impact of trail changes on hunting and fishing activities

5. Characterizing nearshore ice with satellite imagery (past conditions)

6. Delivering satellite remote sensing images to the communities (present conditions)

7. Establishing climatic indicators that fit closely with the timing of freeze-up and break-up in order to compute them from the output of Global Circulation Models (future conditions)

8. Monitoring of fast ice, river ice and lake ice with each community

9. Deriving and validating new climatic indicators relevant to day to day Inuit and Naskapi lifestyles (weather unpredictability, snow season characteristics, warm and cold spell occurrences)

10. Producing maps of future potentially sensitive areas according to various climatic scenarios

11. Involving the youth in recording/mapping traditional names (search and rescue)

12. Producing an adaptation measures toolkit (video, risk assessment maps, booklet)

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References

Berkes, F., 1999. *Sacred Ecology: Traditional Ecological Knowledge and Resource Management.* Taylor & Francis, Philadelphia.

Berkes, F., Mathias, J., Kislalioglu, M., and Fast, H., 2001. *The Canadian Arctic and Oceans Act : the development of participatory environmental research and design.* Ocean & Coastal Management, 44: 451-469.

Bernard, H. R., 2002. *Research methods in anthropology: qualitative and quantitative methods.* 3rd Ed. AltaMira Press, Walnut Creek, 753 pp.

Divine, D., Korsnes, R., and Makshtas, A., 2003. Variability and climate sensitivity of fast ice extent in the north-eastern Kara Sea. *Polar Research*, 22: 27-34.

Duerden, F. and Kuhn, R. G., 1998. Scale, context, and application of traditional knowledge of the Canadian North. *Polar Record*, 34: 31-38.

Etkin, D.A., 1991. Break-up in Hudson Bay: Its sensitivity to air temperatures and implications for climate warming. *Climatological bulletin*, 25: 21-34.

Fox, S., 2002. These are things that are really happening: Inuit perspective on the evidence and impacts of climate change in Nunavut. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now.* Arctic Research Consortium of the United States, Fairbanks, pp. 13-53.

Furgal, C. and Communities of Labrador, 2003. *Inuit Observations on Climate Change: Report from the Labrador Regional Workshop*, Public Health Research Unit, CHUL - CHUQ, Ste-Foy, Québec.

Furgal, C. and Communities of Nunavik, 2003. *Inuit Observsations on Climate Change: Reports from the Communities Workshops in Ivujivik, Kangiqsujjuaq, and Povirnutuq*, Public Health Research Unit, CHUL-CHUQ, Ste-Foy, Québec.

Furgal, C., Martin, D., and Gosselin, P., 2002. Climate Change and Health in Nunavik and Labrador: Lessons from Inuit Knowledge. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now.* Arctic Research Consortium of the United States, Fairbanks, pp. 267-299.

Gray, J., Lauriol, B., Bruneau, D., and Ricard, J., 1993. Postglacial emergence of Ungava Peninsula, and its relationship to glacial history. *Canadian journal of earth sciences*, 30: 1676-1696.

Houser, C. and Gough, W.A., 2002. Variations in sea ice in the Hudson Strait: 1971- 1999. *Polar Geography*, 26: 11-24.

IPCC, 2001. *Climate change 2001: The scientific basis.* Cambridge University press, Cambridge, 881 pp.

Kofinas, G. and Communities of Aklavik, A. V., Old Crow, and Fort McPherson, 2002. Community contributions to ecological monitoring: Knowledge co-production in the U.S.-Canada Borderlands. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now.* Arctic Research Consortium of the United States, Fairbanks, pp. 55-91.

Krupnik, I., 1993. *Arctic Adaptations: Native Whalers and Reindeer Herders of Northern Eurasia.* University Press of New England, Hanover, 355 pp.

Lajeunesse, P. and Allard, M., 2003. The Nastapoka drift belt, eastern Hudson Bay: implications of a stillstand of the Quebec-Labrador ice margin in the Tyrrell Sea at 8 ka BP. *Canadian journal of Earth Sciences*, 40: 65-76.

Makivik Corporation, 2004. Community profiles - [online], http://www.makivik.org/eng/communities/index.htm.

McDonald, M., Arragutainaq, L., and Novalinga, Z., 1997. *Voices from the Bay:traditional ecological knowledge of Inuit and Cree in the Hudson Bay bioregion*. Canadian arctic resources committee, Ottawa.

Naskapi Nation of Kawawachikamach, 2004. Our Nation: History - [online], http://www.naskapi.ca/en/our_nation/history.htm.

Nickels, S., Furgal, C., Castleden, J., Moss-Davies, P., Buell, M., Armstrong, B., Dillon, D., and Fonger, R., 2002. Putting the human face on climate change through community workshops: Inuit knowledge, partnerships, and research. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now*. Arctic Research Consortium of the United States, Fairbanks, pp. 301-333.

Norton, D. W., 2002. Coastal sea ice watch: private confessions of a convert to indigenous knowledge. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now*. Arctic Research Consortium of the United States, Fairbanks, pp. 127-155.

Riedlinger, D. and Berkes, F., 2001. Contributions of traditional knowledge to understanding climate change in the Canadian Arctic. *Polar Record*, 37: 315-328.

Statistics Canada, 2001. 2001 Census - [online], http://www12.statcan.ca/english/census01/home/index.cfm.

Tesch, R., 1990. *Qualitative research: analysis types and software tools*. Falmer Press, New York, 330 pp.

Thorpe, N., Eyegetok, S., Hakongak, N., and Kitikmeot Elders, 2002. Nowadays it is not the same: Inuit Qaujimajatuqangit, climate, and caribou in the Kitikmeot region of Nunavut, Canada. In: I. Krupnik and D. Jolly (Eds), *The earth is faster now*. Arctic Research Consortium of the United States, Fairbanks, pp. 201-239.

Appendix 35

Appendix : Interview guidelines

Changes in the Use of Routes / Trails : Local Expert Interviews

Introduction to Participants: We are interested in discussing any changes to the main routes within the area that are related to changes in the environment. We are talking with people like yourself, who know a lot about the land and the routes within this area to collect this information. We are doing these interviews in Kangiqsujuaq, Umiujaq, Kangiqsualujjuaq and Kawawachikamach over the next month. We might also discuss with a small group of people from your community. We will be preparing a report for the KRG and the communities by the end of March, it will be translated and then sent back to the community through the community researchers and you will be provided a copy. The discussion should take about 1-2 hours.

Please have them review and sign the consent form before starting
Please ask the participant if willing to disclose his/her age
Please ask the participant if willing to have the following conversation recorded

Questions

1. We are going to talk about all the routes in the area that you use. Can you please mark the routes / trails that you use on the map?

Starting with the skidoo routes, go through each other form of transportation and give the participant the colour marker for that form of transportation

Ski-doo	Blue
Dogteam	Purple
Honda	Orange
Truck	Green (Naskapis)
Kayak	Green (Inuit)
Walking	Black
Canoe	Red
Speedboat	Red
Peterhead	Brown
Kayak	Green
Trapline	Pink

While the person is marking the trails on the map, please ask what the trail / route was used for and mark this at the end of the trail with the right code (create new code when needed):

Caribou = C	Polar Bear = PB	Fish = F
Black Bear = BB	Seal = S	Canada Goose = G
Beluga = B	Fox = FX	Mussels = M
Snow Geese = GE	Berries = BE	Walrus = W
Wooding = WD	Ptarmigan = P	Muskrats = M
Beaver = Be		

2. Please identify on the map which routes you use most often during a single year (Interviewer: please highlight these with a yellow pen and if it seems to cover more than one type of trail, ask interviewee if this is for skidoo, honda, etc.)

3. Has these routes always been the ones you use most often each year?

4. Are there any important areas you can no longer get to or that you can't get to when you normally could before ?

   Probe: Why is this area difficult to get to or no longer accessible ?

5. Are any of the traditional routes abandoned (not used any more)?
   (Interviewer: please have the participant draw them on the map and put some x's along the line)
   Probe: When was it abandoned?
   Probe: Why is it no longer used?
   Probe: What was it used for before?

6. For yellow marked routes:
   Looking at the routes you marked as being the ones you most regularly use, can you please tell if anything about when you use it, how you use it and what you use it for has changed?

7. For all routes:
   Can you tell us if anything about your use of any of the other routes that you put on the map has changed ? (how you use it, when you use it or what you use it for ?)

8. Starting with the routes you marked as being the ones you most regularly use, are there any difficulties or risks associated with these routes ? (dangerous places ? dangerous times to use them ? etc.)

9. Are these difficulties/risks always been there or is this something recent ?

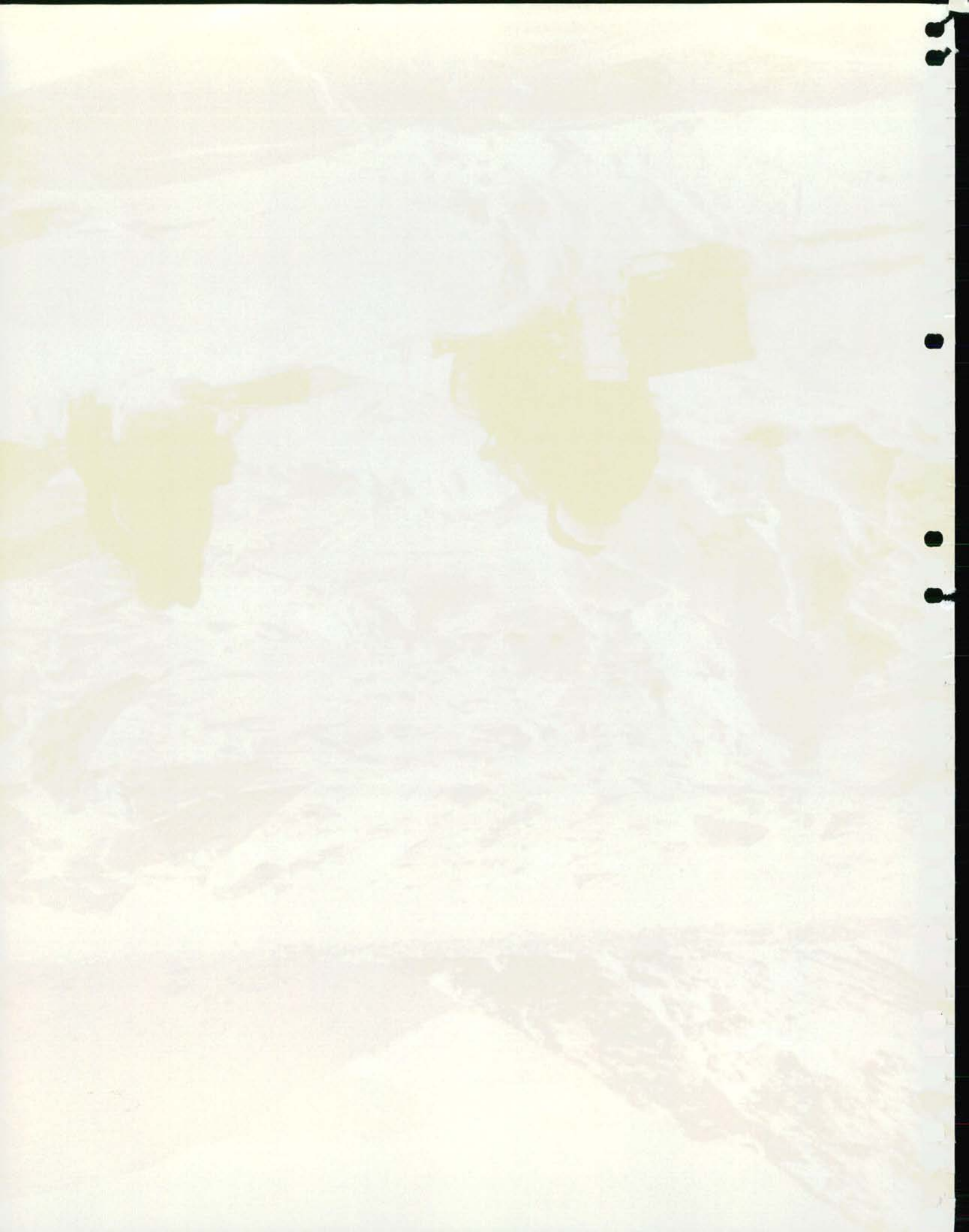
10. With notes: If specific changes were noted on the map, ask for each of these changes when they were first observed
    Probe: Since when has it been like that ?

11. What caused these changes? What are they related to?
12. Have you had any accidents or unexpected happenings while using any of the routes you marked on the map ?
    Probe: What happened
    Probe: When did it happened
    Probe: Where did it happened
    Probe: What was the result / impact to you ?

General Questions

1. Would you say that changes in the environment influences the routes that you use ?
   How ?
2. In general, what do these changes mean for you ? is it something important to you ?
3. Is there anything else you think we should know about, or that you would like to tell us about the routes or changes in the area ?
4. What would you like to see happen with this information (as a follow-up to collecting it on the maps and in a report)?

Thank you very much for participating in this interview.



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FACE ON CLIMATE CHANGE

PERSPECTIVES FROM

NUNAVIK COMMUNITIES*

Workshop Team:
The Communities of Kangiqsujuaq, Ivujivik and Puvirnituq
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- Nunavik Nutrition and Health Committee;
- Kativik Regional Government;
- the Town Councils of Kangiqsujuaq, Ivujivik and Puvirnituq.

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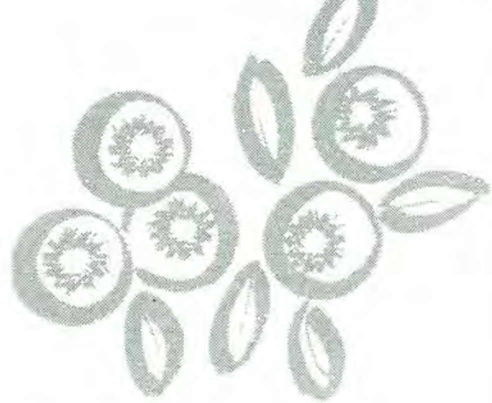

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1.0 ᓇᐃᑦᓯᒋᐊᖅᓯᒪᔪᑦ

ᐊᕐᕌᒍᐊᓂ 2002-2003, ᐃᓕᒋᔭᐅᓪᓗᑎᒃ ᐱᓕᕆᐊᕐᔪᓄᑦ ᑖᒃᑯᐊ ᑕᐃᔭᐅᔪᑦ *Identifying, Selecting and Monitoring Indicators for Climate Change,* ᓇᓗᓇᐃᔭᐃᓂᖅ, ᓂᕈᐊᖅᓯᓂᖅ ᖃᐅᔨᓴᕈᑏᑦ ᓯᓚᐅᑉ ᐊᓯᔾᔨᕐᕌᓂᐊᓂᐊᓂᒃ, ᓵᖅᑭᑕᐅᓚᐅᕐᑐᑦ, ᑲᑎᒪᑎᑦᓯᖃᑦᑕᕐᑎᓪᓗᒋᑦ ᐱᖓᓱᓂ ᓄᓇᕕᒻᒥ ᓄᓇᓕᐅᔪᓂ ᑲᑎᕐᓱᕐᑕᐅᓂᑯᐃᑦ ᖃᐅᔨᓴᐅᓯᒪᓕᕐᓂᖏᑕ ᓯᓚᐅᑉ ᐊᓯᔾᔨᕐᕌᓂᐊᑕ ᒥᒃᓵᓄᑦ. ᐅᑯᐊ ᓄᓇᓖᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ, ᐳᕖᕐᓂᕐᒃ, ᐃᕗᔾᔨᕕᒃ ᐊᒻᒪ ᑲᖏᕐᓱᔪᐊᖅ. ᑲᑎᒪᓂᓕᒫᖏᓐᓄᑦ ᑕᒪᐃᓐᓄᑦ ᑮᓇᕐᑐᕐᑎᖃᐅᓚᐅᕐᑐᑦ ᓄᓇᓕᐅᔪᑦ ᑲᑎᒪᖃᑕᐅᓪᓗᑎᒃ ᐃᓱᒪᒃᓴᕐᓯᐅᖃᑎᒌᓚᐅᕐᑐᑦ, ᐋᖅᑭᒃᓯᕐᑕᐅᓯᒪᔪᑎᒍᑦ ᑲᑎᒪᓂᖃᖅᓯᑎᒃ, ᑕᒪᒃᑯᐊ ᓄᓇᕕᒻᒥ ᖃᐅᔨᓴᐅᓯᒪᓕᕐᑐᑦ ᐊᑦᔨᑎᑦᑕ ᐊᓯᔾᔨᕐᕌᓂᐊᓄᑦ ᐃᒃᐱᒋᔭᐅᓯᒪᓕᕐᑐᓂᒃ ᐅᖃᐅᓯᖃᖅᓯᑎᒃ, ᖃᓄᕐᓗ ᐊᒃᑐᐃᓂᖏᓐᓂᒃ ᐅᑉᐸᓘᓐᓂᑦ ᑕᒪᒃᑯᐊ ᐊᓯᔾᔨᕐᕌᓂᐊᔪᑦ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᖃᓄᖅ ᓱᖏᐅᑎᑉᐸᓪᓚᐅᓯᐊᓕᕆᓪᓗᐊᖏᓐᓂᒃ ᐅᑉᐸᓘᓐᓂᑦ ᐅᖃᐅᓯᖅᓯᑎᒃ ᖃᓄᖅ ᐊᑲᐅᓂᕐᐸᐅᓚᔾᔪᕐᓂᖏᓐᓂᒃ ᓱᖏᐅᑎᓚᓯᐊᕆᐊᖃᕐᓂᕐᒧᑦ ᐅᑉᐸᓘᓐᓂᑦ ᓯᕗᓂᐅᓂᐊᕐᑐᒥᒃ ᖃᓄᖅ ᓱᖏᐅᑎᑉᐸᓪᓚᐅᓯᐊᕆᐊᖃᓂᐊᕐᒪᖔᕐᒥᒃ.

ᑲᑎᒪᓂᖃᖃᑦᑕᓕᐅᕐᒥᔪᑦ ᐊᖏᓂᕐᓴᓂ ᐱᓕᕆᖃᑕᐅᓪᓗᑎᒃ ᐊᕕᒃᑐᕐᓯᒪᓂᖏᑎᒍᑦ ᐃᓄᕕᐊᓗᐃᑦ, ᓚᐸᑐᐊᕐ, ᐊᒻᒪ ᓄᓇᕕᒃ ᓄᓇᖏᓐᓂ. ᑲᑎᒪᑎᑕᐅᖃᑦᑕᓕᐅᕐᑐᑦ ᑐᕌᖃᕈᑎᒋᓪᓗᒍ ᓄᓇᓕᓐᓂ ᐸᕐᓇᒃᐸᓪᓕᐊᒍᑎᒃᓴᖃᖁᓪᓗᒋᑦ ᐊᑭᓐᑎᑦᑕ ᐊᓯᔾᔨᕐᕌᓂᐊᓂᐊ ᐱᔪᑎᒋᓪᓗᒍ ᐊᒻᒪ ᓄᓇᓕᓐᓂ ᖃᐅᔨᓴᕆᐊᖃᓂᖅ. ᐊᓪᓚᑦ, ᑐᕌᒃᓴᖏᑕ ᐃᓕᒋᓪᓗᓂᐅᒃ ᑕᒫᓇ ᐸᕐᓇᐃᑦᓯᓪᓕᐊᓂᖅ ᑲᔪᓯᑦᓯᐊᕐᑎᑕᐅᓪᓗᑐᖅ ᐃᓄᕕᐊᓗᓐᓄᑦ ᑕᒫᓇ ᐱᓕᕆᐊᖓ, ᑕᒪᒃᑯᐊ ᑲᑎᒪᖃᑕᐅᔪᑦ ᐱᓕᕆᐊᒃᓴᒥᓂᒃ ᑎᒍᒥᐊᕐᓂᕐᓴᐅᔮᓪᓚᐅᕐᒪᑕ ᐱᓕᕆᖃᑕᐅᓂᓪᓖᒥᒍᑦ ᑲᑎᒪᓂᒃᑯᑦ, ᐊᒻᒪ ᑲᑎᒪᑎᑦᓯᓪᓚᐅᕐᓂᖏᒍᑦ ᒪᕐᕉᐃᓂᒃ ᓄᓇᓖᓐᓂᒃ ᑲᑎᒪᑎᑦᓯᑎᓪᓗᒋᑦᔭ.

ᐃᓱᓖᓗᒋᔭᓪᓚᐅᑦᑕᖏᑦ ᓇᐃᑦᓯᒋᐊᕐᓯᒪᑎᓪᓗᒋᑦ ᓄᓇᓖᓂᑦ ᐱᖓᓱᑦ ᓄᓇᕕᒻᒥ ᑎᑎᕋᖅᑕᐅᓪᓚᐅᕐᑐᑦ ᐃᒪᐃᓪᓚᖓᑎᓪᓗᒋᑦ:

- ᑕᒪᕐᒥᒃ ᓄᓇᓖᑦ ᐃᒃᐱᒍᓱᒃᓯᒪᓪᓚᕐᑐᑦ, ᖃᐅᔨᓯᒪᓪᓚᕐᑐᑦ ᓯᓚᐅᑉ ᓇᓪᓚᐅᒃᓵᕿᑦᓴᐅᒍᓐᓴᐃᕐᕌᓪᓚᐅᑐᐃᓐᓇᕐᓂᖓᓂᒃ ᐊᒻᒪ ᐅᖅᑰᓂᕐᓴᐅᓪᓕᕐᓯᓂ ᐅᑭᐅᒃᑯᑦ ᐊᒻᒪ ᐊᐅᔭᒥ ᓂᑦᓯᓪᓚᕐᓂᕐᓴᐅᓪᓗᓂ.
- ᑕᒪᕐᒥᒃ ᓄᓇᓖᑦ ᐅᖃᐅᓯᖃᓪᓚᐅᕐᑐᑦ ᓯᑰᑉ ᓵᓐᓂᕐᓴᐅᓪᓕᕐᓂᐊᓂᒃ, ᐊᐅᓴᕐᕿᓐᓂᕐᓴᐅᓪᓕᕐᓂᐊᓂᓗ ᐅᐱᕐᖓᒃᓵᒥ ᐊᒻᒪ ᐅᑭᐊᒃᓵᒥ ᓯᑯᓈᓯᖑᓪᓕᕐᓂᐊᓂᒃ.
- ᐊᒪᑦᑕᐅᖅ ᓴᖏᓂᕐᓵᓗᒻᒥᒃ ᐊᓄᓂᓲᒍᓪᓕᕐᑐᖅ, ᐊᐳᑎᖃᓲᒍᖏᓐᓂᕐᓴᐅᓪᓕᕐᓯᓂᓗ ᐊᒻᒪ ᓯᓪᓗᓲᒍᖏᓐᓂᕐᓴᐅᓪᓕᕐᓯᓂ ᑕᒪᐃᓐᓂ ᐱᖓᓱᓂ ᓄᓇᓖᓂ ᖃᐅᔨᔭᐅᓯᒪᔪᖅ.
- ᓄᓇᒃᑯᑦ, ᓯᑯᒃᑯᑦ ᐃᖏᕐᕋᓂᖅ ᐆᒪᔪᕐᓯᐅᕐᓗᓂ ᐊᑦᑕᓇᕐᓂᕐᓴᐅᓪᓕᕐᓂᕐᕿᑕᐅᔪᖅ ᑕᒪᐃᓐᓄᑦ ᓄᓇᓖᓐᓄᑦ ᐱᖓᓱᓄᑦ, ᐱᔾᔪᑎᓪᓗᒍ ᓯᓚᐅᑉ ᐊᓯᔾᔨᕐᕌᓂᐊᖓ ᐊᒻᒪ ᓯᓚᐅᑉ ᖃᓄᐃᑦᑑᒪᔭᕐᓂᐊᓂᒃ ᓇᓪᓚᐅᒃᓵᕈᓇᐃᓪᓕᓂᖏᑦ ᐱᔾᔪᑎᓪᓗᒍ.
- ᒪᕐᕈᐃᓈᒃ ᓄᓇᓖᒃ, ᐃᕗᔾᔨᕕᒃ ᐊᒻᒪ ᐳᕖᕐᓂᕐᒃ, ᑕᒪᕐᒥᒃ ᓯᕿᓂᕐᒥᒃ ᐆᓇᕐᓂᓵᓗᓂᕐᕿᐊᔪᑦ. ᑲᖏᕐᓯᒥᐅᓪᓗ ᑕᒪᑐᒥᖓ ᐊᑐᕐᓯᒪᖏᑦᑐᑦ ᓯᓪᓚ.
- ᐃᕗᔾᔨᕕᒻᒥᐅᑦ ᐊᒻᒪ ᑲᖏᕐᓯᒥᐅᑦ ᓂᒃᑯᓪᓚᐅᕐᓯᐊᕐᓯᑎᒃ ᐊᒃᑯᐅᓂᖅᑲᓗᒃ ᓂᒃᑯᓪᓚᐊᖏᑦ ᐊᓂᕐᓯᐊᕐᕌᓪᓗᑦ ᑕᐃᓯᒪᓂᕐᒥᑦ ᐊᐅᔭᕐᒥ ᓂᑦᓯᓇᕐᓂᕐᓴᐅᕙᓪᓕᕐᒪᑦ ᓄᓇᖓ.

ᓄᓇᓖᓐᓂ ᑲᑎᒪᓪᓚᐅᕐᓂᒃᑯᑦ ᖃᐅᔨᓴᓇᓪᓚᐅᕐᑐᖅ ᓄᓇᕕᒻᒥᐅᑦ ᐋᖅᑭᒃᓯᐃᒋᐊᖃᖅᑐᑦ ᓯᕗᓂᒃᓴᒧᑦ ᓱᖏᐅᑎᒍᑎᒃᓴᒥᓂᒃ, ᐊᒻᒪ ᓯᓚᐅᑉ ᐊᓯᔾᔨᕐᕌᓂᐊᓂᐊᓂᒃ ᐃᑯᓪᓚᐅᒥᑎᑦᓯᒐᓯᐊᕐᓂᐅᑉ ᒥᒃᓵᓄᑦ. ᐅᑯᐊ ᑕᕝᕙ ᐅᖃᐅᓯᐅᓪᓚᐅᕐᑐᑦ:

- ᖃᓄᐃᑦᑐᓂ ᐆᒪᔪᕐᓯᐅᕐᓂᐊᕐᒪᖔᕐᒥᒃ ᐃᒃᐱᒍᓱᒃᑲᑦᑕᕐᓂᖅᓴᐅᕆᐊᖃᓪᓚᐅᕐᑐᑦ, ᐆᒪᔪᕐᑕᐅᔪᑦ ᐃᓚᖏᑦ ᐱᐅᓯᕐᓯᖏᑦᑐᐊᓗᕐᕆᓪᓚᕐᒪᑕ.
- ᓄᓇᓕᑦ ᑕᐅᖅᓰᖃᑦᑕᐅᑎᓂᒃᑯᑦ ᓂᕿᓂᒃ ᐱᐅᓯᖃᖅᐸᓪᓕᐊᓪᓚᕐᑐᑦ ᐊᒻᒪ ᓂᕿᑦᓯᐊᕙᐅᖏᓐᓂᕐᓴᓂᒃ ᐊᑐᐃᓐᓇᖃᓂᕐᓴᐅᓪᓚᕐᓯᑎᒃ ᓂᐅᕕᐊᒃᓴᓂᒃ.
- ᓯᕿᓂᕐᒧᑦ ᐅᕕᓂᒧᑦ ᐊᒥᐊᓘᕐᓂᒃ ᐊᒻᒪ ᐆᔾᔭᐃᒃᑯᑎᓂᒃ ᑮᓇᐅᕐᒧᑦ ᐊᑐᕐᓂᕐᓴᐅᓪᓕᕐᓗᑎᒃ ᓄᓇᒦᓪᓗᐊᕈᑎᒃ ᐆᑦᑕᐃᓪᓗᑎᒃ ᓯᕿᓂᕐᒥᑦ.
- ᐊᒥᓱᕈᕐᐸᓪᓕᐊᔪᑦ ᐃᓪᓗᕌᑦ ᓄᓇᒥ, ᖁᐊᒃᑯᕕᖃᑦᓯᐊᕐᓂᕐᓴᐅᓗᑎᒃ ᐅᓗᑎᓪᓗ ᓄᓇᓪᓚᓂ ᓂᕿᒃᑯᕕᒃᓴᓂᒃ ᐊᒻᒪ ᑐᓴᐅᒪᖃᑦᑕᐅᑎᓯᐊᓂᓴᐅᑎᒋᐊᖃᓪᓚᖅᑐᑦ ᓄᓇᓪᓚᑦ ᓯᓚᑎᖏᓪᓗ ᓯᓚᐅᑉ ᖃᓄᐃᓈᓂᖓ ᖃᐅᔨᒪᔾᔪᑦᓴᐅᔪᓇᐃᕐᒪᑦ.
- ᐊᐳᒻᒥᒃ ᐃᒥᒃᓴᓪᓚᐅᖓᕐᐸᓪᓕᕐᓗᑎᒃ ᑕᓯᕐᒥᑦ ᓂᓪᓚᑦᑕᖏᖓᕐᓗᑎᒃ, ᐃᒪᐅᑉ ᑕᓯᕐᒥ ᐃᒃᑲᑦᓯᕆᓪᓚᐊᓂᐊᓄᑦ ᓱᕈᕐᓇᕐᑐᖃᖅᐸᓪᓚᐊᑐᐃᓐᓇᓪᓚᕐᒪᑕ.

ᑲᑎᒪᓂᑎᒍᑦ, ᐊᑐᓪᓚᕐᑯᔭᒥᓂᒃ ᓵᖅᑎᑦᓯᓪᓚᐅᕐᑐᑦ, ᐃᑲᔪᕐᑕᐅᔾᔪᑎᒃᓵᑦᑲᒃᑲᓐᓂᕈᒪᓪᓗᑎᒃ ᐱᓕᕆᔾᔪᑎᓵᒥᓂᒃ ᐊᒻᒪ ᐊᑲᐅᓂᖅᓵᒥᒃ ᑐᓴᐅᒪᑎᖃᑦᑕᐅᑎᓂᖅᓴᐅᓗᑎᒃ ᐊᒻᒪ ᐊᑐᐃᓐᓇᕈᖅᑎᑦᓯᓗᑎᒃ ᑐᑭᓯᒋᐊᕈᑎᒃᓴᓂᒃ ᓇᒧᑐᐃᓐᓇᖅ. ᑕᒪᒃᑯᐊ ᐃᓱᒫᓗᒍᑕᐅᔪᑦ, ᐊᒻᒪ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᓱᖏᐅᑎᓚᓯᐊᕐᕌᓪᓚᐊᒍᑎᒃᓴᐃᑦ ᖃᐅᔨᓴᕐᓂᒃᑯᑦ, ᐅᖃᐅᓯᓇᓱᐅᒃᑲᓐᓂᓪᓚᐅᕐᑐᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᓂ ᑭᖑᓪᓕᕐᐸᒥ ᑕᐃᔭᐅᓪᓗᑎᒃ "ᑲᔪᓯᖏᓐᓇᕐᓂᖅ", "Going Forward" ᐊᒻᒪ ᑖᓐᓇ ᑐᑭᖃᖅᑎᓯᐅᔪᖅ ᓄᓇᕕᒻᒥ ᓄᓇᓕᐅᔪᓄᑦ ᑭᐅᔾᔪᑕᐅᓇᓱᐊᕐᓯᑎᒃ ᐊᕐᓯᕈᕈᑕᐅᕙᓪᓕᐊᓂᐊᕐᑐᓄᑦ ᓯᓚᐅᑉ ᐊᒻᒪ ᐊᑦᔨᑎᑦᑕ ᐊᓯᔾᔨᕐᕌᓂᐊᓂᖏᑦ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ.

ᑖᒃᑯᐊ ᑎᑎᕋᖅᓯᒪᔪᑦ ᑐᓴᖅᑎᑦᓯᔾᔪᑎᒃᓴᐃᑦ ᑲᑎᒪᔾᔪᑕᐅᓯᒪᔪᓂᒃ ᑐᑭᓯᒋᐊᕈᑎᒃᓴᐃᑦ ᐱᒻᒪᕆᐅᓂᖏᓐᓂᒃ ᐊᒻᒪ ᕿᒥᕐᕈᔭᐅᔭᕆᐊᖃᕐᓂᖏᓐᓂᒃ ᐱᔾᔪᑕᐅᔪᑦ ᓄᓇᓖᑦ ᐊᕕᑦᑐᕐᓯᒪᓂᖏᓐᓂᑦ ᐊᒻᒪ ᓄᓇᓕᓐᓂᑦ ᐊᑐᓂᑦ, ᑕᒪᕐᒥᒃ ᑕᐃᓖᑦᓴᐃᓇᖅ ᐊᒃᑐᕐᑕᐅᓂᖃᖏᓪᓕᒪᑕ ᓯᓚᐅᑉ ᐊᓯᔾᔨᕐᕌᓂᐊᓂᐊᓄᑦ ᐊᒻᒪ ᐊᑦᔨᑎᑦᑕ ᐊᒃᑐᕐᑕᐅᕙᓪᓕᐊᓂᐊᓄᑦ. ᑕᒪᒃᑯᐊ ᖃᐅᔨᓴᐅᓯᒪᓪᓚᕐᑐᑦ ᐊᑐᕐᓗᒋᑦ, ᓯᒋᐊᕈᑎᒃᓴᐃᑦ ᐊᒻᒪ ᐃᑲᔪᕐᑕᐅᔾᔪᑎᒃᓴᐃᑦ ᓈᒻᒪᓈᕐᑐᑦ ᐊᑐᐃᓐᓇᕈᖅᑎᑕᐅᔪᓇᕐᑐᑦ ᓄᓇᕕᒻᒥᐅᓄᑦ ᐊᕐᓯᕈᕈᑎᒃᓴᓗᐊᓕᓐᓂᖅᑐᓄᑦ. ᑭᖑᓪᓕᕐᐸᒥ, ᑖᒃᑯᐊ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ ᑲᑎᒪᔾᔪᑕᐅᖃᑦᑕᕐᑐᕕᓂᕐᓂᒃ ᐱᔾᔪᑎᖃᖅᑐᑦ ᐊᑦᔨᑎᑦᑕ ᐊᓯᔾᔨᕐᕌᓂᐊᑕ ᐅᔾᔨᕈᓱᒃᑐᖃᑦᑕᕐ-

ᓯᒪᓕᕐᓂᖕᖏᓐᓂᒃ, ᐊᒻᒪ ᐃᓄᐃᑦ ᑮᓐᖑᒪᔾᖏᓐᓂᒃ ᐊᒻᒪ ᓯᕗᓪᓕ-ᐅᔾᔪᕐᑯᔾᖏᓐᓂᒃ ᓇᓗᓇᐃᔭᐃᓯᒪᓪᓗᑎᒃ, ᐃᓯᒪᒃᕐᓯᐅᕈᑎᖃᓕᕐᐸᑕ ᐱᖃᓯᐅᑎᔭᐅᖃᑦᑕᕐᓗᒋᑦ ᐃᓯᒪᓕᐅᕐᑎᓄᑦ ᓄᓇᓕᓐᓂ, ᓄᓇᓖᑦ ᐊᕕᒃᑐᕐᓯᒪᓂᖏᓐᓂ, ᐊᑲᓇᑕᒥ, ᐊᒻᒪ ᓯᓚᕐᔪᐊᒥ.

2.0 SUMMARY

During 2002-2003, as part of a project entitled *Identifying, Selecting and Monitoring Indicators for Climate Change*, workshops were carried out in three Nunavik communities to collect observations on climate change. These communities included Puvirnituq, Ivujivik and Kangiqsujuaq. Each workshop brought together representatives from the communities to discuss, through a series of guided discussions, the changes that the people of Nunavik are seeing in their environment, the impacts or effects these changes are having and how they have already started to adapt or how they can best respond or adapt to them in the future.

As part of a larger project, workshops were similarly held in the Inuvialuit Region, Labrador and Nunavut. A key goal of these workshops was to build local capacity to implement and carry out future environmental change workshops and research in communities in the region. In fact, capacity building was successfully accomplished within the Inuvialuit portion of this project, as regional representatives there assumed greater responsibility throughout the successive workshops and in the end, were responsible for leading and facilitating the two latter community workshops.

By summarizing the main concerns of three Nunavik communities, this report shows that:

- All are experiencing more unpredictable weather with warmer temperatures in winter and cooler summers.
- All three communities have reported thinner ice, earlier ice thaws in the spring and later fall freeze-ups.
- Other common weather changes are stronger winds as well as less snow and rain in all three communities.
- Travel was reported to have become more dangerous in all three communities because of these weather changes and the difficulties in predicting the weather.
- Only two communities, Ivujivik and Puvirnituq, are experiencing increased heat from the sun. Kangiqsujuaq residents have not reported this phenomenon.
- As a result of opposite observations on intensity of heat from the sun, Ivujivik and Kangiqsujuaq residents are having very different difficulties with drying meat. Ivujivik residents reported that drying times for meat have sped up and that they have to be careful not to dry meat out. In contrast, Kangiqsujuaq residents are finding that drying meat is taking them longer than it used to because of summers being cooler now.

The community workshop reports show what the people of Nunavik require in order to develop further adaptation measures and to minimize the effects of climate change. These include such things as:

- Being more selective of which animals to consume as more and more animals with abnormalities are being found.
- Exchanging food between communities, which is an adaptive measure also being used to compensate for less healthy meat being available.
- Increased use of sun block and masks when out on the land to cope with increased intensity of the sunrays and heat.
- Increasing the number of cabins on the land, better utilizing the community freezer for meat and increasing communication between community members to compensate for increased unpredictability of weather patterns.
- Using melted snow rather than lake water for drinking water as low water levels are increasing potential contamination levels of local lakes.

Throughout these workshops, a number of recommendations, requests for more resources and increased communication and information dissemination were made. These concerns, along with current adaptive measures, are discussed further in the final section "Going Forward" which aims to define some of the ways that the residents of these Nunavik communities would like to respond to the challenges posed by climate and other forms of environmental change.

This report shows the importance and need of examining this issue from both the point of view of the region and from that of the individual community, since not all environmental changes affect each area in the same way. From these findings, the proper course of action and appropriate resources can be directed to the areas of concern that the people of Nunavik feel are the most pressing. Finally, this report was written in anticipation that these environmental observations, as well as Inuit needs and priorities, will be taken into account by decision-makers at the local, regional, national, and even international levels.

3.0 INTRODUCTION

Evidence of global warming is projected to become most apparent first in Arctic and sub-Arctic regions. Rising temperatures have already created a variety of changes in the environment, and these changes are expected to intensify. Some of these shifts include changes in the characteristics of the ecosystems that have supported traditional Inuit activities and life for centuries. Cycles and movements of migrating animals, a decrease in the period when it is safe to travel on the land and on the ocean, reduced access to certain natural resources, and the destabilization of trails have all become growing challenges for Inuit in the last few decades.

As residents of the higher latitudes and users of the land and its natural resources, Inuit possess unique and specialized knowledge about the land. They are sensitive to the effects of climate change emerging in the North. Inuit are closely observing all weather conditions, ice conditions, changes in flora and fauna, and physical changes to the landscape. Some of these changes are affecting their livelihood and culture, and affecting the subsistence and trapping economies that dominate Northern communities.

In the past 30 years, and in the past decade in particular, Inuit have been confronted with very difficult challenges to the ways they interact with the environment. This report looks at the observed changes that are taking place in the region of Arctic Quebec (Nunavik, Canada), an area that covers 507,000 square kilometers and is comprised of 14 Inuit communities that lie along the coasts of Ungava Bay, the Hudson Strait and Hudson's Bay, and the responses by the people living in these communities to these changes. This report represents a synthesis of information expressed at a series of community workshops held in three Nunavik communities during the period of 2002-2003. The workshops aimed at helping communities document their observations of environmental and climate change, the impacts these changes were having on aspects of Inuit community and individual life and what is already being done or could be done in response to these changes to minimize impacts and take advantage of whatever opportunities these changes may represent today and in the future.

Figure 1: Map of Nunavik

4.0 METHODS

4.1 Pre-Workshop Methods

For all community workshops, standard methods were adopted and used. The workshop team included representatives from KRG, the Université Laval and ITK. The team prepared written materials prior to the workshops outlining several exercises that could be used during the workshop to gather community observations of climate change and to develop a set of potential community indicators for monitoring change and climate change impacts. These exercises drew from participatory analysis and planning techniques including Participatory Rural Appraisal (PRA)[1] and Objectives Oriented Project Planning (ZOPP)[2]. ZOPP and PRA encourage participation by everyone at a workshop, allowing a community to identify and analyze its own issues.

Pre-workshop meetings with research team members and regional representatives helped to:

1. plan the workshops;
2. discuss objectives (overt and covert);
3. review the proposed workshop methodology;
4. adapt the methods as appropriate; and
5. plan training for regional and community representatives.

The facilitators agreed that an approach where all workshop participants – community members, regional representatives and facilitators – would be co-investigators in the process.

The workshops were intended to be a dynamic learning process for all, where everyone had an opportunity to investigate the issue of climate change and its meaning to their community. There would be an emphasis on animating a two-way exchange of information and perspectives on climate change.

To facilitate the commitment to co-investigation, the project team prepared a list of guidelines to follow during the workshops:

1. **Have fun!** The experience of learning and sharing knowledge with each other will be insightful and enriching.
2. **Appropriate Activities.** Try to choose activities that are most appropriate for the people you are working with. Not all of the activities will necessarily be useful or practical for every group.
3. **Be flexible.** The group or community may already have their own methods and techniques for sharing information. These ideas can be shared at the beginning of the workshop and incorporated as the group sees fit.

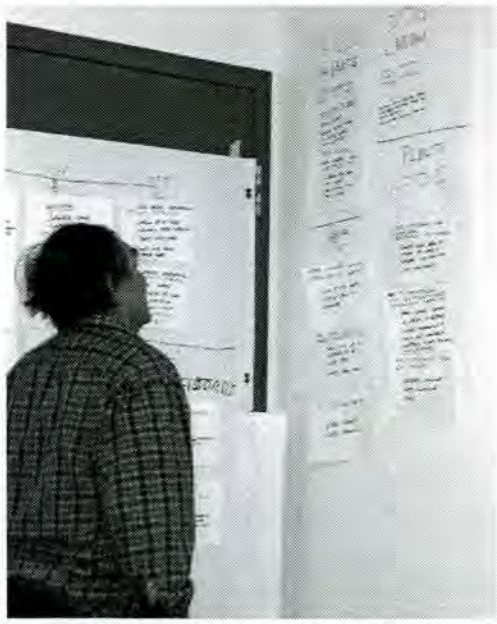

Figure 2: Nunavik participant reviewing observations on environmental change

[1]Robert Chambers of the University of Sussex pioneered the PRA approach over twenty years ago. He has written extensively on its use in promoting local input into project planning and implementation. See for example Chambers, R. 1997 Whose Reality Counts? Putting the First Last. Intermediate Technology Publications, London.

[2]The ZOPP technique was developed by the German development agency GTZ. ZOPP is an acronym for Ziel Orientierte Project Planning (see ZOPP: An Introduction to the Method. 1987 Deutsche Gesellschaft Für Technische Zusammenarbeit (GTZ) GmbH, Frankfurt, Germany)

4.2 During The Workshop

Each workshop began with a series of opening questions related to the groups' hopes and expectations for the workshop. The group was then asked to record on cue cards the changes they have noticed and heard about in and around their community associated with the environment, weather, climate, and so on. These observations were recorded one per card, and following the exercise were posted together on the wall in the meeting room for general discussion and to be viewed by all participants. All changes were reported to have taken place primarily within the last 10-15 years.

After the observations were placed in groups and participants reviewed them on the walls, adjusted the groupings and had a chance to add more observations to the lists, the group reviewed the observations to discuss the associated impacts they are experiencing as a result of these changes. These were discussed from the participants' personal perspectives as well as the views of the importance of the changes for their families and community.

After discussing the effects of the changes that have been observed, workshop groups discussed what could be done by individuals and communities to adapt or cope to these changes. Sometimes there were already things being done in the community to adapt to environmental changes, and many of these were noted. Participants were also asked to discuss who they wanted to know about their climate and environmental change observations, from local officials to international organizations.

The groups identified who should be told about these workshops in order to respond to the issues raised and to be aware of what concerns etc. exist within the communities on this issue. The final presentation of the workshops was directed at providing information to the participants as to how their observations were connected to initiatives at the regional, national and international levels on climate change in Indigenous communities.

4.3 Summarizing Workshop Observations

Throughout the course of the Nunavik workshops, hundreds of observations were recorded. Observations raised repeatedly during the workshop process and by more than one of the workshop groups were generally deemed the *most* important or *most* prevalent in that community, and were recorded as such. The remainder of this document aims to:

1. Highlight and discuss observations that are significant in all Nunavik communities (Sections 4.1 and 4.3). These are observations that indicate high priority concerns for all Nunavik residents, and should command significant future attention from scientific and governmental bodies.
2. Highlight and discuss observations that are unique to each Nunavik community (Section 4.2). Issues that are distinct to certain communities may be overshadowed by the collective concerns of the region. By isolating concerns specific to each community, the aim is to better understand the differences that belie the varying priorities within Nunavik. One example is the contrast in difficulties in drying meat between Ivujivik and Kangiqsujuaq. Residents in Ivujivik have reported a more intense heat from the sun and have seen meat drying times shorten considerably in this community. In fact, people have to be careful not to burn or dry meat out in Ivujivik. Kangiqsujuaq residents, in contrast, have found that the time required to dry meat in their community has actually slowed and it now takes longer to dry meat properly.

It is important to note that this report depicts only a synopsis of the observations discussed throughout the Nunavik workshops. If an observation does not appear here it is not necessarily because it is not considered a significant indicator of environment or climate change to Inuit in that area. The individual workshop reports for each community should be referred to in order to get a more complete picture of the environmental changes taking place in that community and the required adaptations that residents reported were needing to be developed.

Overall, methods employed throughout the workshop process aimed to flesh out an honest representation of the intricate and unique climate change observations distinct to each community, and to give life to some of the real impacts that climate change is having on the people of Nunavik. Due to the participation of the Nunavik residents who took part in the community workshops, the detailed documentation of each community's observations, based on the rich and valuable Inuit knowledge, has been recorded and is accessible for referral by local, regional, national and international bodies.

5.0 OBSERVATIONS

The following sections (5.1, 5.2 and 5.3) describe the results of the three Nunavik workshops. Section 5.1 summarizes all regional concerns and observations that were raised several times within each workshop and by all three communities. When warranted, some attention is also given to observations that were discussed in at least two of the three communities. Concerns that are unique to certain communities are discussed in section 5.2. Section 5.3 specifically presents a summary and discussion of the observations of bird species made at the workshops.

It may or may not yet be proven that some of the changes reported by the people of Nunavik are actual results of global warming, but even without scientific corroboration of their direct link to climate change, these observations are extremely valuable and represent legitimate data of change and matters of genuine concern to these communities. They should be viewed as sound and compelling statements that describe the Nunavik environment and the environmental changes that are taking place.

Figure 3: Sundog in the community of Kangiqsuujjuaq

5.1 Regional (Common) Concerns

The following environmental changes have affected all three communities participating in workshops in Nunavik (Table 1). As a whole, these observations and their effects should be given high priority and consideration when deciding what action and research is needed to aid in the adaptation, mitigation, and monitoring of environmental changes. It is important to realize that although these changes are felt throughout Nunavik, their effects can be very different given the economies, priorities, and values of each individual community. Whenever possible, attention is paid to the different effects and adaptations that each community expressed during their workshop.

Changes to Weather:

Warmer winters and cooler summers have been observed within all the Nunavik communities. Shorter winters and faster spring thaws were also observed. Overall, the three communities commented that weather has become much more unpredictable. People now feel unsure predicting the weather. Some weather elements, such as winds and clouds, which were once used to accurately predict future weather patterns, can no longer be relied upon. In Puvirnituq, oncoming bad weather used to be predicted by a red and hazy sunset. This prediction pattern can no longer be consistently used.

More people are reporting more severe sunburns because the heat and intensity of the sun has increased today. In Ivujivik, the **sun's heat and intensity has increased** in March and April in particular. More intense heat is also causing **earlier spring thaws**. This was mentioned in both the Puvirnituq and the Ivujivik workshops. The warmer sun in Ivujivik has actually considerably sped up the drying

Table 1: Summary of Shared Concerns

All Nunavik communities reported the following environmental changes taking place in their area:

Changes to Weather	• Winters are warmer and shorter. • Summers are less warm. • Weather is less predictable overall. • Sun is more intense now. • Less snow and rain. • Thunderstorms at different times of year; fewer incidences of thunder and lightning in some areas. • Stronger winds.
Changes to Landscape	• Ice is thinner. • Earlier spring break-up of ice. • Delayed fall freeze-up of ice. • Permafrost is thinner in some areas; permanent snow packs have decreased. • Lower water levels. • Landscape changes have taken place that affect travel.
Changes to Land and Vegetation	• Berry plants are producing fewer berries. • Land is changing (drier, eroding and "growing").
Changes to Fauna	• Decreases in numbers of certain species. • More polar bears. • Char are skinnier and flesh is changing from red to yellow. • Pollution is more common in fish and other animals.
Changes to Insects	• More black flies that bite.
Increased Stress and Awareness	• Travel has become more difficult. • Concern about pollution levels/ contaminants (hydroelectric development). • Concern for human health with these changes.

process of meat and people now have to be careful not to burn or dry their meat out too much when they hang it out in the sun. Food in the camps also spoils much faster now because of the warm sun and more food has to be thrown out as a result. Animals are also affected by the warm sun. Caribou, for example, are noticeably thinner because their food has dried out and they are eating less.

Earlier spring break-up of ice is also occurring in Kangiqsujuaq but residents from this community did not observe increased intensity of heat from the sun as was reported in Ivujivik and Puvirnituq. In fact, residents from Kangiqsujuaq have observed cooler temperatures in the summertime and reported that it is taking them longer to make *misirak*, dry caribou and dry beluga.

In addition to similar seasonal temperatures observed, all three communities noted **changes in snowfall and total snow cover**. Kangiqsujuaq and Puvirnituq residents have noted that in general, they get less snow than they used to. In Ivujivik, there is less snow on the land in the winter and snow comes later in the season. The **quality of snow and the loss of permanent snow packs** were also mentioned in the community workshops as being a noticeable change. In Ivujivik it was noted that snow doesn't pack as well as it used to, it melts faster, is of a different consistency and blows away whereas before it used to pack well and could

be used to build igloos. Near this community, there used to be areas of snow all year round on Mansell Island and on hills by the town. Now these areas melt in the summer and they are not there consistently throughout the year anymore. In Kangiqsujuaq, ash-like or darker snow has been seen in the springtime. This community has also seen a decrease in permanent snow packs. Those in Puvirnituq have noticed that sleds don't slide as easily as they used to on soft snow and they have reported changes in the quality of soft snow.

Participants at the workshops also commented on the **decreased levels of rain** observed in their areas. Because of these decreased levels, all three communities have also seen **lower freshwater levels** in their respective areas.

Both Kangiqsujuaq and Puvirnituq have noticed that they are seeing **fewer incidences of thunder and lightning** in their communities. Residents from Ivujivik, in contrast, commented on the fact that they are experiencing rainstorms of increased intensity today. Ivujivik residents also see thunderstorms in their area at **different times of the year**. There are now thunderstorms in spring in Ivujivik and thunderstorms are occurring much later in the year now than they have in the past (at a time when snowstorms used to occur). Puvirnituq residents have also noticed that the onset of thunderstorms is later in the year now, and this means there is less rain at a critical time of the year in spring. Kangiqsujuaq residents have also seen storms at different times of the year, noting in particular that lightning is now seen in April.

All three communities have noticed **stronger winds** in their areas. Ivujivik residents have seen more windy days lately, and stronger winds than ever before. October and November are now windy and are no longer good times for hunting whereas before weather used to be calm in these months. Wind is said to always change direction now in this community as well. Winds around Puvirnituq are also noticeably stronger now. Winds at forces of 100 km/hr are experienced today and never were felt in the past. Since the period of 1995-99, each year after the ice breaks, the winds have been high and it is now found to be windier during the summer after the thaw than before. Historically, residents only noticed high winds in the spring and during the fall. Kangiqsujuaq residents have also noticed that the wind is getting stronger in their area, in particular they are seeing more summer whirlwinds.

Changes to Landscape:

Shorter winters with milder temperatures are key factors in the observation of **thinner ice**. Thinner ice was noticed in all communities. In Puvirnituq, April lake ice is reported to be half as thick today as compared with 15 years ago. Sea ice thickness has also decreased in depth in this community. Kangiqsujuaq residents have noticed a decrease in the depth of ice, as they no longer need to use extensions for their ice augers to drill through ice now. Saltier water was mentioned as a contributor to thin ice in Kangiqsujuaq.

A thinner depth of ice contributes to **earlier and faster spring thaws of both lake and sea ice**. In Ivujivik, the ice used to melt and drift out at the end of June or beginning of July. Now it is almost gone at the mouth of the bay in late April. The community of Kangiqsujuaq has seen spring thaw move from the first week of July to June. Puvirnituq residents used to be able to travel by dog team on ice in July, now the ice is gone by this time.

Later freeze-ups of ice in the fall have also been observed in all communities. Both Kangiqsujuaq and Ivujivik residents have seen the time of freeze-up move from November to December. Puvirnituq has seen a greater change in the timing of the ice freeze-up. In the past, this community used to see ice in the bay in late November and it used to be frozen over by late December. Now, the freeze-up in Puvirnituq occurs in late December, or even in early January.

Milder winter temperatures have also caused **thinner and melting of permafrost** in areas. Puvirnituq residents have noticed that permafrost in the area is thinner and not as cold

today. Community members from Kangiqsujuaq have also noticed these changes in their area. Permafrost is melting in places and permanent snow packs on the hills are melting earlier now. Ivujivik residents have also noticed that an area on the hill that used to have ice year-round is now gone.

Lower water levels from decreased rainfall and less snowfall have greatly affected all communities. In Puvirnituq, it was observed that Fat Island is higher out of the water now and that islands now exist in areas where there were never islands before. In Kangiqsujuaq, water levels all over the community are lower. Rivers and lakes are smaller, currents have become weaker and in some areas, rivers and lakes have dried up altogether. In Ivujivik, water levels in lakes and rivers were also notably lower. In the bay, this is compounded by the hydroelectric development that is also influencing the water system. In fact, in all communities, levels have become so low that **polluted drinking water** is a concern. In Kangiqsujuaq, it was mentioned that drinking water from the Municipality is browner now and boil water warnings are more frequent these days.

Changes to Land and Vegetation:

Plants are producing **fewer berries** and berries that are **smaller and drier** than before. This was observed in Kangiqsujuaq and Ivujivik in particular. Puvirnituq residents feel that vegetation has been adversely affected by the irregularity of rain and the overall decrease in rain falling in the area. The land in Puvirnituq was said to be "growing" and "expanding upwards." **Drier land** is a contributing factor to decreased vegetation growth. Ivujivik residents have noticed that with low water levels, the land is dry and "lifts up in places." In Kangiqsujuaq, there is considerably less growth of vegetation on the hills. Soil with vegetation is eroding and rolling off hills in some places as well.

Changes to Fauna:

There have been **decreases observed in numbers of certain marine species**. Puvirnituq residents noted that marine species in general (seals, walrus, whales) are decreasing in numbers. Both Ivujivik and Puvirnituq residents have observed that the hydroelectric development is affecting ringed seals in their areas. In Ivujivik the number of these animals has decreased as a result of weaker currents, while in Puvirnituq ringed seals are reported to not be as healthy today. Seal livers and meat are being found with spots on them, which is affecting the blubber of these animals and is proving fatal we think as there was a case of many seals dying along the Hudson coast in previous years

All communities have seen **changes with beluga whales** near their communities. The community of Puvirnituq has noted that fewer beluga whales are being seen along the Hudson coast and Ivujivik residents note that beluga are coming past the community later in the fall. Kangiqsujuaq residents see fewer beluga whales in general today. In particular this community noted a change in the fall migration of beluga. Residents have noticed that fewer are coming close to Wakeham Bay now and they thought, perhaps, that they have moved to the Hudson Straight. Kangiqsujuaq residents also noted that beluga are skinnier today and that these animals, as well as seals, are found with less healthy skin now. Residents think that this may be a result of mercury or PCB poisoning.

Both Ivujivik and Kangiqsujuaq residents have observed **more polar bears** in their communities, although this was not observed in Puvirnituq. Also, in Kangiqsujuaq polar bears have been seen in the summertime.

Char are skinnier and the **flesh is changing from red to yellow**. Ivujivik residents noted that they are finding char with more yellowish meat along both the Hudson and Ungava coasts. In Puvirnituq, residents mentioned that the yellowish ones are not as good to eat. The fatter, red ones are preferred for eating, as they taste better. Kangiqsujuaq residents also noted that they are seeing char that are not as fat now.

More pollution in fish in general was noted in both Kangiqsujuaq and Puvirnituq. Community members from Kangiqsujuaq mentioned that they notice mercury and differences in some fish and other animals when they are opened up now. Those from Puvirnituq said that Elders once told them that one day they would not be eating fish from the rivers and they see this happening now because of pollution.

Changes to Insects:

More small black flies today were reported in both Ivujivik and Kangiqsujuaq. Puvirnituq residents have noticed that there are more flies on and within the skin of caribou near their community, but there was no specific mention that black flies have increased in this area. The black flies are a concern as they bite people. Children are getting bitten more and there is worry that these insects are carrying diseases (i.e. West Nile disease) and potentially transferring these diseases to people.

Increased Stress and Awareness:

Weather unpredictability is disconcerting for many community residents, but Elders in particular feel afraid that the old prediction methods are being lost. The unpredictability in weather and difficulties with weather prediction mean that **travel has become more challenging**. More people are getting stuck on the land because of the changes in the weather and difficulties with prediction. It was mentioned both in Kangiqsujuaq and Puvirnituq that young people in particular are getting stuck out on the land more often. In Puvirnituq, lower water levels are also affecting travel. Low water levels limit boat access to regular hunting areas. Because of this, hunters now have to travel further to find certain animals. In Ivujivik, people used to navigate while traveling by using the direction of snowdrifts but now that the predominant wind is changing direction and the snow is melting earlier, this method of navigation can no longer be used. Because of the inconsistent weather, high winds, earlier thaws, thinner ice and rough seas, more hunters are having to stay at home more often now, as there are fewer "good" hunting days today. There has been a change in lifestyle in this community as a result. With less potential hunting days because of bad weather, more hunters stay home and community residents are consuming more food from the store. Less time out on the land also lessens the critical amount of time that children can be taught about the land, hunting and survival. In Kangiqsujuaq, it was mentioned in particular that people are uncomfortable going out because thinner ice is making traveling on the ice scary. Harvesting mussels is also sometimes not possible as the ice is too dangerous. Warmer weather conditions and shorter winters have also meant that hunters need to travel further distances, taking longer routes to reach places because of melted snow and thin ice. This has increased gas expenditures.

All three communities have expressed **increased levels of stress and concern about contaminants** being observed in the environment surrounding their communities. Puvirnituq residents see all weather unpredictability and weather changes as being related to pollution in the environment. There is concern that pollution has changed the ozone layer and that these changes are altering climate patterns. Ivujivik residents are worried about diseases (i.e. West Nile disease) potentially being carried by insects around their community. Since more contaminated animals are being found, Ivujivik and Puvirnituq residents are concerned that more people are eating less country foods and there is worry that more people are getting sick more often as a result. Residents from Kangiqsujuaq are also concerned about contamination issues and potential **impacts on human health**. It was mentioned that more unhealthy seals and beluga are being found now, possibly because of mercury or PCB poisoning and that caution must be used when selecting which animals to consume and which animals to discard. There is also worry in all three communities about water contamination because of low levels of rainfall. Residents from Kangiqsujuaq mentioned that they would like a better water treatment system to aid in coping with the decreased water quality seen in their area.

Both Puvirnituq and Ivujivik residents report that they have seen direct changes in their local environment because of their close proximity to the **James Bay development project**. Puvirnituq residents expressed that they see a direct link between this project, other development projects and the declining health of local animals. One example is the possible poisoning of animals due to barrels of oil leftover on the land. The residents of Ivujivik expressed concern that changes they are observing are a result of the James Bay hydroelectric development project. It was mentioned that all changes currently observed in the bay are results of this project. Weaker currents, different species of animals found there, altered ice formation and different ice break-up times were all mentioned as results of this project. Weaker currents have occurred as a direct result of the dam being built. These currents have moved some species of food for other species so it has therefore changed where the community finds certain animals. The weaker currents also mean that ice does not pack as well as it used to. Open water is now further away from the community and therefore travel time to get to seals has increased and travel has also become more dangerous.

Since contaminants and human health are so closely linked, they are matters of utmost importance and high priority. A perceived lack of information compounds their fear. To solve this sort of problem is no simple task, but several suggestions are made in the final section of this report, "Going Forward", such as bolstering communication and information dissemination, and creating strategic partnerships, as ways to help put people at ease and answer some of these important questions.

5.2 Community-Specific Concerns

Despite numerous overlapping observations and concerns in the Nunavik area (discussed in the previous section), appropriate attention should also be given to some of the unique environmental changes that have been observed in each community. These changes also have deep and significant impacts on the economies and wellness of the people that reside in Nunavik. The following are some of the environmental observations that are unique to each Nunavik community (Table 2).

Table 2: Summary of Community-Specific Concerns

A summary of environmental concerns unique to each Nunavik community

Ivujivik	• Stars and sun have changed location in the sky. • Altered conditions in the bay. • Harder rainstorms. • More haze in the sky. • Tides have changed. • Fish are bigger in general and there is one rare salmon sighting. • New insects.
Puvirnituq	• Caribou are sick and unhealthy. • Black rain. • Bald seals seen lately. • Rotation of earth is slowing. • Fish: Smaller, food-supply changing, fewer fish and more sick fish. • Insects: Butterflies, new flies and loss of one species.
Kangiqsujuaq	• Sky is darker blue. • More humid in summer. • Changes to marine species • New land animals. • Fish not migrating up river anymore and more capelin seen today. • Fewer mosquitoes.

Ivujivik

Stars and sun have changed location in the sky:
There have been notable changes in the sky above Ivujivik. The big dipper in the sky has changed in location. With the change in the placement of stars in the sky, it is now harder to use them for navigation. There is also concern about the change in location of the sun. On long days, the sun seems higher up in the sky. Where the sun sets on the horizon has also changed in location and people are concerned that the earth may be tilting.

Altered conditions in the bay:
The hydroelectric development project in James Bay has altered the strength of currents within the bay. Weaker currents do not move ice in the bay as well as stronger ones and this means that open water is further out than it used to be. Travel has become more dangerous because of these changes to the bay. Lower water currents have also changed locations of certain animal species, in particular seals and whales. These animals used to come closer to the community when open water wasn't as far out. Now that ice gets trapped in the bay the animals are found further away from the community.

Harder rainstorms:
Despite the observation that rainfall has decreased in this community, as it has in all three communities, Ivujivik residents have observed that the force of rain is stronger and that they experience harder rainstorms now.

More haze:
Community members of Ivujuvik have noticed that they do not have as many clear days with blue skies like they used to. They find there is more haze in the sky now.

Tides:
Ivujivik residents have noticed that tides have changed in their community. Low tides go out more and there is a slower change in tides now compared with before.

Fish:
Fish in the community of Ivujivik are becoming larger again. Size of fish in this community seems to cycle. Fish observed here used to be large, then they were small for some time and now they are large again. It was also observed that there was one rare case of a salmon being caught near this community.

Insects:
New insects have been seen in the community of Ivujivik. Dragonflies, large flies and little black flies that bite have all been seen recently in this community. There is concern about the potential diseases that these insects may be carrying as children are getting bitten by these insects more than before.

Puvirnituq

Caribou are sick and unhealthy:
Community residents have observed the caribou population near to the community of Puvirnituq closely and have noticed many changes in the condition of these animals. Caribou are exhibiting a great many new characteristics indicating that they are unhealthy: meat along the joints of caribou is more watery, there are white spots on caribou today, there are hard spots on caribou livers now, holes in the intestines of caribou are being found and more caribou are found with their lungs stuck to their ribs. Causes behind the changes observed in caribou were thought to be the thinning ozone layer and higher levels of contaminants in their food and water. There is concern that another cause could be new and an increased number of flies on caribou laying eggs under the skin. Their diet has changed also. Community residents have noticed that caribou are not eating as much lichen and are eating more along the shores and from the garbage dump now. Both the change in diet and the increased number of caribou needing to be discarded are concerns for human health. People are losing an important healthy food option as less of these animals are eaten.

Black rain:

One summer a number of years ago there was an incident where rain that fell was almost black. This event is seen as the primary event that marked the set of weather changes observed in the community of Puvirnituq. Rain is seen as more irregular now and coming less frequently. Vegetation growth has been affected by irregularities in rain, in particular it was mentioned that the black rain event adversely affected vegetation.

Bald seals seen lately:

Despite the fact that Puvirnituq residents are seeing fewer seals in general as of late, they have noted that bald seals are being seen in higher numbers around the community of Puvirnituq today.

Rotation of the earth is slowing:

During discussions on the topic of the land in the community of Puvirnituq, it was mentioned that residents believed that the rotation of the earth is slowing down. Residents believe that this is affecting the weather in their area.

Fish:

Changes observed with fish in general around Puvirnituq include, decreases in size, decreased food supply and changes to their diet, more sick fish and less fish in general were found today. Puvirnituq residents also mentioned that warmer temperatures are causing fish caught in nets that then die, to go bad faster than before.

Insects:

Last year during springtime, there were lots of butterflies of different sizes seen, migrating north. The loss of one specific type of insect, a small freshwater insect, was also reported in this community. It was thought that perhaps the intense sun had an influence on the loss of this insect. More and new flies in and around caribou near Puvirnituq were also reported.

Kangiqsujuaq

Sky is darker blue:

Kangiqsujuaq residents did not observe increased intense heat from the sun, as was observed in the other two communities. They did report however, that the sky over their community is now a darker blue. This change in colour is noticeable all year round.

More humid in summer:

As in the other two communities, Kangiqsujuaq residents have observed cooler summer temperatures. However, in contrast to the other two communities, it was mentioned in the Kangiqsujuaq workshop that the summer months are also more humid.

Changes to marine species:

Following the trend of decreased numbers of marine species observed in all communities, Kangiqsujuaq residents noted specifically that numbers of bowhead whales and killer whales (orcas) near their community have decreased. Similarly, narwhals used to be seen in Ungava Bay and now they aren't seen anymore. Harbour porpoise, or dolphins, in contrast, are a new species of animal seen near this community. They are now being seen southeast of this community in the summertime. Hooded seals are also seen in and around this community, though they weren't seen here before.

New land animals:

Musk ox are in the community of Kangiqsujuaq now, having arrived in 1968-69. Deer were seen in the summer of 2002 for the first time and abnormal sightings of black bear were also reported in this year and more of these animals have been seen recently. Kangiqsujuaq residents reported that many new species never seen before have been seen recently in this community for the first time.

Fish:

Kangiqsujuaq residents noted that the fish in their community are not migrating up the river anymore due to decreased levels of rain causing

rivers to be much shallower and smaller in size. In some cases, fish are getting stranded in ice because of these conditions. Higher numbers of capelin around this community have also been noted.

Insects:
Residents are reporting that there are fewer mosquitoes near their community today because of the lower water levels and as lakes and rivers are drying up. This is seen as both a positive and negative impact as humans prefer fewer mosquitoes but it also means less food for fish. There was also mention that bees are present in this community, although this is not new. Smaller black flies that bite have been reported to be new to this community in recent years.

5.3 New and Unusual Bird Life

Both **new bird species and decreases in bird species normally seen** were reported in all the Nunavik communities. There is concern about the drop in numbers of the different types of birds and the appearance of new species. Some believe that the presence of these new types of birds is an indicator of warmer temperatures. Changes have been observed with certain bird species already present in the communities that may also be indicative of weather changes. Ravens, for example, don't have a white moustache in winter anymore indicative of frost. Though there was mention that some of the new species of birds are becoming pests, for example robins in Puvirnituq, the consensus on the presence of new bird species is that they're not causing much difference in these communities, positive or negative.

Residents also reported some observations regarding changes in the **types of geese** visiting these areas and have observed changes in the **travel patterns of geese** near their communities. Ivujivik residents reported that there are less snow geese visiting their area and these geese are skinnier now because they have to fly over the area that is occupied by the hydroelectric dam. The timing of earlier ice break-up has caused the geese-hunting season to shorten as well in Ivujivik as access is limited to certain areas during the ice break-up period. Kangiqsujuaq residents have noticed that both snow and Canada geese migrations are now earlier in the spring near their community. Though this means that geese are harder to be ound in the fall, they are more plentiful in the spring. Fewer goose eggs are now found in Kangiqsujuaq. In Puvirnituq, it has been observed that when geese lay eggs now there is less snow to cover them. This community has also noticed that molting geese are no longer found on the ice in July, as there is no longer ice in July in this community.

The following table (Table 3) highlights the new species of birds, the species that have dropped in number and those that have disappeared altogether for the three communities.

6.0 GOING FORWARD

6.1. Community Adaptations

Since the environment surrounding these communities is changing to such a large degree, residents are finding that they need to alter certain behaviours and adopt certain adaptation measures in their homes and in their communities to address these issues. There are more unhealthy animals and some with abnormalities are being found within all communities participating to workshops in Nunavik. Communities have adapted to this by being more selective in what they consume and as a result more animals are now discarded. Community members from Ivujivik mentioned how they have already attempted to adapt to changes in their local food source by exchanging food with other communities. Though this system has already been started, it was stressed that it is needed even more now.

With the increased levels of heat from the sun, Ivujivik residents reported that people are having to adapt by wearing sun block and hunters are adapting by wearing masks when out on the land. In addition, a warmer sun has changed the way that residents dry meat in the sun. Because the sun is causing meat to

Table 3: Bird Species Observed in the Nunavik Area

Species	Puvirnituq	Kangiqsujuaq	Ivujivik
Snow Goose		Arrive earlier	Fewer
Canada Goose		Arrive earlier	
Grey legged Goose			New
Japanese Goose			New
European Goose			New
Red winged Blackbird			New
Burrowing Owl			New
Snowy Owl		Fewer	
Giant Sandpiper			New (once)
Sandpiper	Fewer	Gone	Gone
Robin	New	New	New
Chickadee			New
Ptarmigan	Fewer		Fewer
Common Hawk			Almost gone
Arctic Tern	Fewer	Gone	Gone
Cranes		New	
Turkey Vulture		New	
Ducks		New	
Snow Bunting		Fewer	
Plover	Fewer		
Sparrow		New	

dry out and burn sometimes, people are turning meat more often when drying it in the sun now so that it doesn't spoil. Puvirnituq residents have adapted to the increased incidence of food spoiling because of increased temperatures by quickly protecting food underground while out on the land or in freezers when at home. Temperature changes in the community of Ivujivik have also caused some people to start wearing rubber boots in the wintertime now, as conditions are warmer and wetter.

Unpredictability of weather patterns is a challenge in all three communities. Ivujivik residents have adapted to this unpredictability by increasing the number of cabins around popular hunting areas in an attempt to avoid people getting stranded by providing more

shelter. Cabins, in this way, also help compensate for times when it is hard to get onto the land and access regular hunting areas at regular times.

Water levels are reported to be severely affecting the quality of drinking water within the three communities. Puvirnituq residents are finding that they are now having to use melted snow for drinking water rather than simply taking their water from lakes as was the custom in the past when out on the land.

6.2 Resources And Equipment

Due to altered weather patterns and bad ice and snow conditions out on the land, more people are finding that access to certain hunting areas has become more difficult. Ivujivik residents discussed the idea of coordinating a community freezer to compensate for times when it is hard to get on the land and access regular hunting areas. Puvirnituq residents have found that they are traveling further now to access certain species. In fact, all communities reported similar problems. The community of Kangiqsujuaq has seen gas expenditures increase as a result. Residents from Ivujivik suggested that dog teams should be brought back, as these are considered a more reliable form of transportation when confronted with troublesome weather conditions.

With low rain and water levels, Kangiqsujuaq residents have observed that rivers are shallower and fish are having troubles passing through shallow rivers that are blocked by ice in the wintertime; many are getting trapped and dying as a result. Fisheries staff have already begun working on this problem by dredging and diverting rivers and by removing large rocks from shallow rivers in an attempt to increase depth and better allow fish to pass. This community has requested more resources and equipment to help fish migrate up rivers and to solve this problem. Low water levels in all communities are also greatly affecting the quality of drinking water. Residents in Kangiqsujuaq would like a better water treatment system in town.

In one specific case in Ivujivik, there is an area about three miles from town going onto the land, where snow machines regularly break down. It was suggested that either a bridge be created for this area, or changes to the trail be made (i.e. blast rock away).

6.3 Communication and Information Dissemination

Weather patterns are greatly affecting travel plans in all communities as bad snow and ice conditions are creating dangerous and unpredictable travel routes out on the land. Communities have already begun sharing information about travel conditions among community members. Elders, hunters and other community members are going on community radio stations to point out dangerous places out on the land to the rest of the community. It was emphasized however, that more needs to be done to avoid having people stranded out on the land and to better facilitate safe trips for community members on the land. It was stressed in Kangiqsujuaq for example, that whenever someone goes out hunting or fishing, they should always communicate their travel plans to someone else in the community to ensure their safety.

As weather patterns are changing so quickly and weather predictions are becoming difficult to make, particularly by Elders, there is concern that old prediction methods and knowledge about the land are being lost and that this information will not be adequately transferred to younger generations. More communication and information dissemination and exchange between generations was mentioned as key processes needed to help teach children about life on the land. Residents from Ivujivik were concerned particularly that children are not having as much opportunity now to learn about the land as they are in school on a much more regular basis. More cabins out on the land can help to better facilitate these learning practices.

ATV use is negatively affecting land and vegetation growth in certain areas of Nunavik. Communication within communities was also mentioned with reference to this problem of land damage by ATVs. Community residents,

particularly in Kangiqsujuaq, have reported that Hondas being driven on the land are damaging land and vegetation in some areas. Potential adaptations in light of this problem are to put up signs to communicate which areas are prone to such damage so that Honda use is limited in these areas. It was mentioned that dangerous cliffs and other areas should be marked as well.

Kangiqsujuaq residents discussed potentially increasing information dissemination within their community regarding scarcity and health of marine mammals and other species. An example mentioned in this regard was the beluga whale. More beluga have been found that are unhealthy and as of late, beluga are also scarcer. People within the community of Kangiqsujuaq would like more information regarding cases such as this and they would like to know more about potential impacts on the population – why are there fewer whales and why are more of them sick. Similarly, community members in Ivujivik stressed for the need to develop new and more accurate indicators for local weather changes. This community would like to see their youth, in particular, educated about these indicators.

6.4 Recommendations

There is concern that development projects are adversely affecting the environment and that research on animals will have negative ramifications for animal populations within and near these communities. It is recommended, particularly by residents in Puvirnituq, that harmful research and development projects should be stopped before greater harm is seen in the local environment. It is thought that these concerns and the potential impacts from harmful research and development projects should be communicated to the international community so that the activities causing these changes will be stopped.

Regarding the low-level water problem adversely affecting fish migrations in Kangiqsujuaq, some community members thought that a study checking on the depth of lakes and rivers may be useful in helping better identify and then address this problem. Others however, said that they thought rivers should be left alone and the community should just wait for more rain.

Difficulties with weather prediction were mentioned in all communities as negatively impacting travel plans for many people. Kangiqsujuaq residents would like Nunavik to be added to mainstream weather system news so that local forecasts are more readily available and more precise. This community would like these broadcasts made available to community residents via the community radio station.

In regards to the trade and transfer of foods between communities to alleviate the issue of food scarcity in some community at some times, residents of Ivujivik thought that foods should be shared and traded between community, but not bought from other regions.

Figures 4 and 5: Images from the communities of Kangiqsuujjuaq and Ivujivik

7.0 CONCLUSION

The workshops in Nunavik elicited community perspectives on climate and environmental change in this region. Climate change is affecting many aspects of the environment in this region. In fact, it is in the Arctic regions where many of the most drastic effects of climate change are already being seen. Local temperatures rise in the face of global warming and the physical environment, vegetation, animal and human life are all affected by the resulting changes in a variety of successive steps and chain-like processes. Being the last level of the chain for many impacts, humans are forced to respond, cope and adapt to changes directly to themselves and to those in the environment around them. As Inuit are so closely tied to the land, sea, and waters around them via the species these environments provide, and as the Arctic environment is one that is exhibiting very rapid changes in the face of global climate change, it is important to better understand Inuit and northern community perspectives on these issues and to being to work with communities to develop adaptation measures. The following diagram (Figure 6) summarizes the influence of global warming on Inuit communities.

To understand the climatic and environmental picture of the region as a whole, it was important to look at three distinct communities in

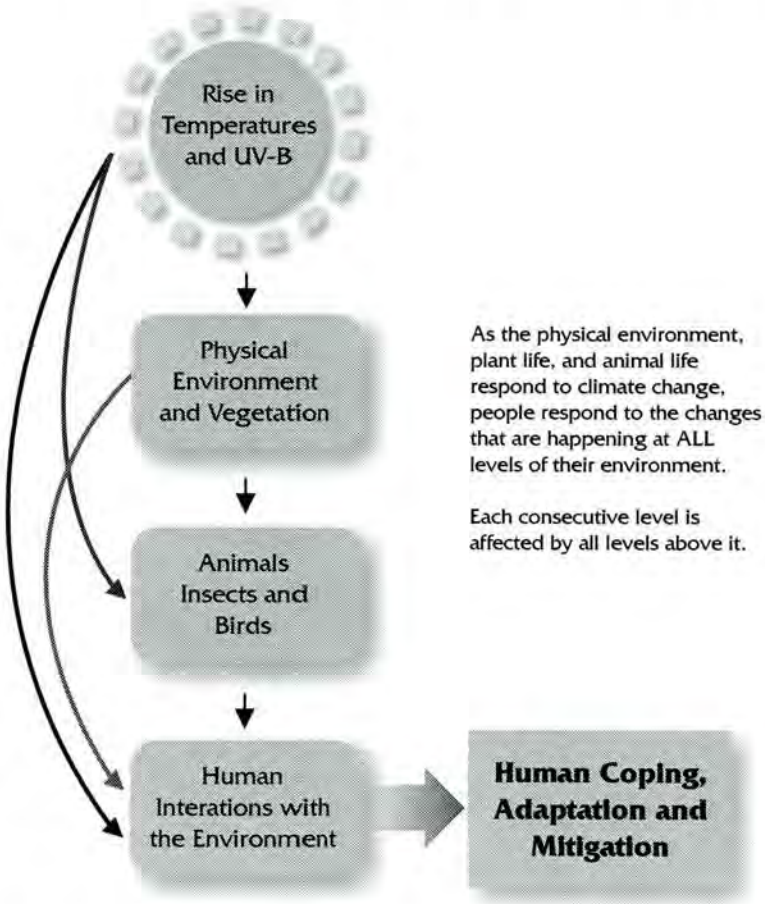

Figure 6: Influence of global warming and increased UV-B on Inuit communities.

the analysis of change occurring in Nunavik. The three communities who participated in these workshops were Ivujivik, Kangiqsujuaq and Puvirnituq. Owing to the uniqueness of each community's specific location as well as to their varied proximity to each other, a comparison and contrast of differences and similarities was possible within and between communities for this report. Observations in line with this theme are presented in Section 4.0. These observations cover shared concerns between all three Nunavik communities and a short synopsis of changes unique to each community. Further, the 'Going Forward' (Section 5.0) presents a thorough review of recommendations for future action and research as well as current or future potential adaptations to be made by these communities with regards to many of the changes observed. Based on the community workshops and perspectives expressed by residents in attendance, a summary of recommendations with regards to future research and action on the issue of climate change and community adaptations in Nunavik is presented in Table 4.

Table 4: Summary of Recommendations and Adaptations

Concern	Recommendation/Adaptation
• More unhealthy animals and animals with abnormalities found.	• Be more selective about which animals to consume. • Exchange food between communities.
• Increased heat from the sun and increased temperatures.	• Wear more sun block. • Wear masks when out on the land. • Turn meat more often when left out to dry. • Protect food underground or in freezers at home. • Wear rubber boots in the winter.
• Unpredictability of weather patterns.	• Increase number of cabins out on the land. • Use community freezer for meat. • Dog teams should be brought back. • Share info about dangerous places on the land between community members. • Always share travel plans with someone else when going out on the land to ensure safety. • Nunavik should be added to weather system news and these forecasts should be communicated to FM radio stations.
• Low water levels impacting drinking water and fish migration patterns.	• Use melted snow for drinking water rather than lake water. • Better water treatment system. • Dredge and divert rivers for fish. • More resources and equipment are needed. • A study should be done checking the depth of lakes and rivers to aid with fish migration.
• Old prediction methods and knowledge about the land are being lost.	• More communication and information dissemination between generations. • More cabins on the land can facilitate this learning.
• ATV use negatively affecting land and vegetation growth.	• Put up signs to mark areas prone to this damage and potentially dangerous areas also.
• Lack of information on animal health, possible impacts and potential indicators.	• Increased information dissemination to communities, particularly to youth.
• Concern about harmful development and research projects.	• These projects should be stopped. • Concerns and potential harmful impacts from these projects should be communicated to the international community.

8.0 APPENDIX

Table 5: List of Workshop Participants

Ivujivik	Mattiusi Luuku, Pauloosie Qaunnaaluk, Saviarjuk Usuarjuk, Mattiusi Iyaituk, Mary Ainalik, Johnny Qinuajuak (Interpreter/Translator), Sarah Mark-Tardif (Interpreter/Translator).
Puvirnituq	Nellie Nungak, Samisa Sala, Eli Kenuajuak, Tamusi Sivuarapik, Lizzie Sivuarapik, Lucassie Qumaaluk, Paulasi Kanayuk, Annie Amamatuak, Putuguk Qumaaluk, Atami Putuguk, Minnie Assapak, Matiusi Amarualik, Johnny Qinuajuak (Interpreter/Translator), Johnny Uitangak (Interpreter/Translator).
Kangiqsujuaq	Aqujaq Qisiiq, Inuluk Qisiiq, Minnie Editloie, Naalak Nappalak, Tiisi Qisiq, Amamak Jaaka, Opigak Ilimasaot, Jessica Arngak, Adami Alaku, Bernie Adams, Atittuq Kiatainaq, Annie Alaku, Aloupa Kulula, Aisik Sakiagak, Markusie Qiisiq (Interpreter/Translator), Betsy Etidloie (Interpreter/Translator).